BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

Original Application No.28 of 2026(SZ)

IN THE MATTER OF:

1. Kaliki Ramanareddy,
2. Boddu Gopal Reddy
   Andhra Pradesh . …Applicant(s)

With

State of Andhra Pradesh
And 3 Others. ...Respondent(s)

REPORT FILED BY
ANDHRA PRADESH POLLUTION CONTROL BOARD
RESPONDENT NO.3

Date: 24.03.2026

M/S. K. RAVINDRANATH
ADVOCATE
STANDING COUNSEL FOR GOVERNMENT OF ANDHRA PRADESH
ANDHRA PRADESH POLLUTION CONTROL BOARD
No.35, Flat No. A-2 'Aurora' Apartments,
Kandhan Street, Shenoy Nagar, Chennai-600 030
Mobile No.9840057777
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BEFORE NATIONAL GREEN TRIBUNAL

SOUTHERN BENCH, CHENNAI

ORIGINAL APPLICATION No. 28 of 2026

REPORT OF APPCB IN THE MATTER OF O.A. NO.28 of 2026 SUBMITTED TO HON'BLE NATIONAL GREEN TRIBUNAL, SOUTHERN BENCH, CHENNAI IN COMPLIANCE TO THE HON'BLE NGT ORDERS DATED 26th FEBRAUARY, 2026

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Andhra Pradesh Pollution Control Board,

ENVIRONMENTAL ENGINEER
A.P. POLLUTION CONTROL BOARD
Regional Office
NELLORE.

Date: 24.03.2026

Place: SPSR Nellore.

REPORT OF APPCB IN THE MATTER OF O.A. NO.28 of 2026 SUBMITTED TO HON'BLE NATIONAL GREEN TRIBUNAL, SOUTHERN BENCH, CHENNAI IN COMPLIANCE TO THE HON'BLE NGT ORDERS DATED 26th FEBRAUARY, 2026.

1. Sri Kaliki Ramana Reddy & Sri Boddu Gopal Reddy of Karedu, Prakasam District, Andhra Pradesh, submitted a letter petition to the Hon'ble National Green Tribunal, Southern Bench, Chennai, regarding the proposed large-scale establishment of an Integrated Solar PV manufacturing plant and in house float glass manufacturing facility over an extent of 8364 acres in Chevuru Village, Gudluru Mandal, SPSR Nellore District and Karedu Village, Ulavapadu Mandal, SPSR Nellore District, Andhra Pradesh by Indosol solar private limited and alleging that the project is undertaken without obtaining Environmental Clearance(EC) and Coastal Regulation Zone (CRZ) Clearance as required under the prevailing environmental laws. The Hon'ble National Green Tribunal, Southern Bench, Chennai, considered and registered the representation as O.A. No. 28 of 2026. The Chairman, APPCB is 3rd Respondent.

2. **Order of the Hon'ble NGT (SB), Chennai dated 26.02.2026:**

   The Hon'ble National Green Tribunal, Southern Bench heard the case on 26.02.2026 and issued the following directions:

   "

   1. *Let notice be issued to the respondents through the Tribunal as well as privately.*
   2. *The learned counsel Mr. K. Ravindranath accepts notice on behalf of Respondents No.1 to 3.*
   3. *Post the matter on 25.03.2026. In the meanwhile, the respondents are directed to file their respective replies/reports."*

   A copy of the Hon'ble NGT(SZ), Chennai order dated. 26.02.2026 is enclosed as **Annexure-I.**

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NELLORE.

3. It is to submit that M/s. Indosol Solar Private Limited proposed to establish Solar Photo Voltaic (PV) modules, PV cells, and PV wafers manufacturing industry at Chevuru Village, Gudluru Mandal, Prakasam District (Erstwhile SPSR Nellore District). The chronology of the events pertaining to the proposed establishment of Solar photo voltaic (PV) modules, PV Cells and PV wafers manufacturing unit are hereunder furnished -

4. It is to submit that M/s Indosol Solar Private Limited has proposed to establish Solar Photo Voltaic (PV) modules, PV cells, and PV wafers manufacturing industry at Chevuru Village, Gudluru Mandal, Prakasam District (Erstwhile SPSR Nellore District)

5. In this connection, it is submitted that M/s. Indosol Solar Private Limited on 03.06.2024 filed an application seeking Consent to Establish (CTE) of the A.P. Pollution Control Board (APPCB) at Regional office, Nellore to establish a industry to produce Solar Photovoltaic Modules, Cells and Wafers manufacturing unit at Chevuru Village, Gudluru Mandal, SPSR Nellore District with an investment of Rs.2000 Crores in an area of 49.06 Acres (198500 Sq.Mtrs) with built – up area of 107086.19 Sq.Mtrs.

6. The RO, Nellore vide letterdated.12.06.2024 has sought certain clarification from the Project Proponent to further process the CTE application. Copy enclosed for kind perusal as **Annexure-II.**

7. Subsequently, the Project proponent vide letter dated. 21.06.2024 submitted reply stating that the key raw materials are polysilicon, which will be brought from outside and no inhouse manufacturing activity is proposed to produce Polysilicon. Further, submitted list of raw materials/ chemicals proposed to use and to consider the activity under Red category. The nearest habitation is 0.24 km in Eastern direction. Copy enclosed for kind perusal as **Annexure-III.**

8. The RO, Nellore vide letter dated 25.06.2024 & 26.07.2024 again informed the Project proponent to pay the balance CTE fee under Red Category and sought additional clarification. Accordingly, the industry paid the balance CTE fee under Red category on 29.06.2024 and furnished reply on 23.09.2024. Copies enclosed for kind perusal as **Annexure-IV & V.**

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NELLORE.

9. The gist of the reply furnished by the industry on 23.09.2024 through Online are as follows -

    1. The key raw material for proposed Solar Photovoltaic Cells and Wafers manufacturing is Polysilicon, which will be brought from outside (From China, Taiwan). There is no manufacturing of Polysilicon (Raw material) by processing of silicon, carbon etc. which does not attract prior Environmental Clearance (EC) under the provisions of EIA Notification, 2006.

Raw Material	**Unit**	**Consumption Quantity**
Polysilicon – Virgin Size Small	Kgs/Annum	21,99,900
Polysilicon – Virgin Size Big Size	Kgs/Annum	3,88,218
Total	Kgs/Annum	25,88,118
	Tons/Annum	2588.12

    2. The Ministry of Environment, Forest and Climate Change (MoEF&CC), GoI issued a Notification S.O.2215 (E) dated 07.06.2024 on applicability of Environmental Clearance for the process involved in melting of non-toxic metals, as follows -

Fuel in the Furnace	Category B2	Category B1
1.Solid or Liquid Fuel	≥ 0.03 MTPA to < 0.06MTPA	≥ 0.06 MTPA
2.Gas fuel or electricity	≥ 0.06 MTPA to < 0.12 MTPA	≥ 0.12 MTPA

    The proposed raw material consumption quantity is only 0.0026 MTPA, which does not attract requirement to obtain prior Environment Clearance from the MoEF&CC, GoI.

10. The Water Resources Department, Government of Andhra Pradesh vide G.O. Ms.No.6 dt. 21.02.2023 accorded permission for allocation of 50 MLD of water from Sangam Reservoir to the industrial activities of M/s. Indosol Solar Private Limited.

11. Further, Industries & Commerce (P&I) Department, Govt. of A.P. vide GO.Ms.No.112 dt.09.11.2023 issued orders for exploring the possibility of allocation of water.

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Regional Office
NELLORE.

12. The CTE verification report submitted through APPCB, Zonal office, Tirupati to the APPCB, Head Office, Vijayawada on 25.09.2024. The issue was reviewed before the CTE Committee meeting held on 14.10.2024. After detailed review, the APPCB vide letter dated.20.10.2024 raised clarification on certain issues. Copy of the same is enclosed as **Annexure-VI.**

13. The proponent vide lr. dated.16.04.2025, furnished reply to APPCB to further process CTE application. Copy of the reply submitted by the proponent is enclosed for kind perusal as **Annexure-VII.** The issue was again reviewed in the CTE Committee meeting held again on 01.05.2025 and committee recommended to issue CTE order to the proposed activity, subject to submission of certain information.

14. Upon submission of additional information, the APPCB vide order dated.01.06.2025, issued Consent to Establish (CTE) to M/s. Indo solar Private Limited for establishment of PV Cells assembling unit in an area of 1,98,500 Sq.m. (49.06 Acres) at Chevuru Village, Gudluru Mandal, Prakasam District (Erstwhile SPSR Nellore District). The consented raw materials usage and products to manufacture with capacities, are as follows:

Raw Materials:

S. No.	Name of the Raw Materials	Quantity (Tons/Day)
1.	Polysilicon Virgin big size	3,88,218 Kg/Annum
2.	Polysilicon Virgin size small	21,99,900 Kg/Annum
3.	Nitric Acid	20,41,354 Lts/Annum
4.	Hydrofluoric Acid	3,40,226 Lts/Annum
5.	Wafer	14,72,72,727 Pcs/Annum
6.	Solar Cells	7,01,29870 Pcs/Annum

Products:

S. No.	Name of the Products	Quantity
1	Solar Photovoltaic (PV) modules	9,09,091 Nos./annum
2	Solar Photovoltaic (PV) Cells	14,02,59,740 Nos./annum
3	Solar Photovoltaic (PV) Wafers	14,72,72,727 Pcs/annum

A copy of the Consent to Establish (CTE) order dated. 01.06.2025 issued by the APPCB is enclosed for kind perusal as **Annexure-VIII.**

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Regional Office
NELLORE.

15. Further, the proponent has proposed to establish 6 MLD Marine outfall discharge through pipeline into Sea and submitted request letter to the APPCB, RO, Nellore for grant of CTE (NOC) on 05.07.2025. The RO, Nellore submitted report to the Board office, Vijayawada on 15.07.2025.

16. The issue was reviewed before the CTE committee meeting held on 07.08.2025 and issued CTE (NOC) order for establishment of Marine outfall by the industry on 23.08.2025. Copy of the CTE (NOC) issued by the APPCB is enclosed for kind perusal as **Annexure-IX**.

17. It is further submitted that the proponent vide letter dated. 08.09.2025 applied for No Objection Certificate (NOC) to Andhra Pradesh Coastal Zone Management Authority (APCZMA) for laying of Marine outfall pipeline to discharge 6 MLD treated waste water from the industry into Bay of Bengal. The issue was reviewed by the APCZMA meeting held on 23.10.2025. The recommendations of APCZMA on No objection under the provisions of CRZ notification,2011 has communicated to the MoEF&CC, GoI vide APCZMA letter dated. 06.11.2025.

18. The MoEF&CC, GoI vide file no: 11/118/2025-IA.III dated. 12.12.2025 issued approval for releasing 6 MLD treated effluent in Bay of Bengal at Ramayyapatnam, SPSR Nellore District, Andhra Pradesh through marine discharge pipeline

19. Subsequently, the industry applied for CTE (Amendment) for laying of pipeline with additional built-up area of 10,000 Sq.mtrs from the industry to Sea (about 8 Km with diameter of 400 mm to Land Fall Point (LFP) from the industry and about 1 Km with diameter of 400 mm into Sea).

20. The issue was reviewed before the CTE committee meeting held on 11.03.2026 & 13.03.2026. During the review, it was noted that ***the Hon'ble Supreme Court of India vide order dt.05.08.2025 in W.P (C). NO. 166 /2025 in the matter Vanasakthi vs Union of India, quashed the note no.1 to entry 8(a) (i.e. Building & Construction projects >=20,000 Sq.mtrs less than 1,50,000 Sq.mtrs of Built-up area) and set aside the MoEF&CC, GoI notification 29.01.2025 (i.e. exempting the industrial shed from EC purview).*** Thus, the committee recommended to obtain Environmental Clearance for the entire project before applying for Consent to operate (CTO) from APPCB.

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A.P. POLLUTION CONTROL BOARD
Regional Office
NELLORE.

21. Accordingly, the APPCB vide order dated: 19.03.2026 issued CTE (Amendment) to the PP to establish 6 MLD Marine outfall pipeline to discharge treated effluent by laying a marine discharge pipeline into bay of Bengal, instead of earlier proposed Zero Liquid Discharge (ZLD) System, stipulating certain conditions including an additional condition that "The industry shall obtain EC from SEIAA to the entire project before applying for CTO of the Board", Copies of the Hon'ble Supreme Court order dt. 05.08.2025 & MoEF&CC, GoI OM dated. 25.08.2025 and CTE (amendment) order issued by the APPCB are enclosed for kind perusal as **Annexure- X, XI & XII.**

22. Further, it is submitted that the A.P. Pollution Control Board has not received any application seeking Consent to establish (CTE) of the Board to setup a Solar Photo Voltaic, modules, cells, wafers manufacturing industry at Karedu Village, Ulavapadu Mandal, Prakasam District (Erstwhile SPSR Nellore District), either in the name of M/s. Indosol Solar Private Limited or by any other proposal till date.

23. It is submitted that the present matter in OA 22 of 2026, OA 5 OF 2026 and OA 28 of 2026 are identical in nature, though filed by different applicants with common respondent. In view thereof, it is most respectfully prayed that the Hon'ble Tribunal may be pleased to adopt and treat the report filed herein as forming part of the record in the connected matters as well.

This report is submitted to the Hon'ble National Green Tribunal in due compliance of the directions issued by the Hon'ble Tribunal. The APPCB will abide by all such directions, as the Hon'ble Tribunal may deem fit and appropriate.

Submitted.

24/03/26

ENVIRONMENTAL ENGINEER (FAC)

A.P. POLLUTION CONTROL BOARD

ENVIRONMENTAL ENGINEER
A.P. POLLUTION CONTROL BOARD
Regional Office
NELLORE.

Date: 24.03.2026

Place: SPSR Nellore.

Annexure - I

Item No.01:-

BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

[Through Physical Hearing (Hybrid Option)]

Original Application No.28 of 2026(SZ)

IN THE MATTER OF:

Kaliki Ramanareddy,
Andhra Pradesh & Anr.

…Applicant(s)

With

State of Andhra Pradesh and Ors.

...Respondent(s)

Date of hearing: 26.02.2026.

CORAM:

HON'BLE Smt. JUSTICE PUSHPA SATHYANARAYANA, JUDICIAL MEMBER

HON'BLE DR. PRASHANT GARGAVA, EXPERT MEMBER

For Applicant(s): Mr. A. Yogeshwaran.

For Respondent(s): Mr. K. Ravindranath for R1 to R3.

ORDER

1. Let notice be issued to the respondents through the Tribunal as well as privately.

2. The learned counsel Mr. K. Ravindranath accepts notice on behalf of Respondents No.1 to 3.

3. Post the matter on **25.03.2026.** In the meanwhile, the respondents are directed to file their respective replies/reports.

Sd/-
Smt. Justice Pushpa Sathyanarayana, JM

Sd/-
Dr. Prashant Gargava, EM

O.A. No.28/2026(SZ),
26th February, 2026. AD.

Annexure - II

ANDHRA PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE :: NELLORE.
Plot No.1, Prasanthi Nagar, Near Nellore Club, Podalakur Road, NELLORE - 524003.
Phone No: 0861-2329730 e-mail: ronlr-ee1@appcb.gov.in

LiFE Lifestyle for Environment

Lr. No. GN/PCB/RO-NLR/2024- **Dt.12.06.2024**

Sub: APPCB - RO, Nellore - M/s. Indosol Solar Pvt. Ltd. Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District- Clarification Sought -Reg.

Ref: 1. CTE application received on 03.06.2024.
2. B.O. Circular No:11/APPCB/CFE/RO-ZO/HO/2014 dated.07.08.2020.

* * *

With reference to the above, this office received a CTE application from your industry to establish a manufacturing unit to produce Solar photovoltaic cells and wafers at Chevuru Village, Gudluru Mandal, SPSR Nellore District under the orange category with an investment of Rs.2000 Crores.

On pre-scrutiny of the application, the following were observed:

1. The manufacturing process involves metallurgical operations (processing of silicon, carbon, etc.), which attracts EIA notification,2006. Hence, prior Environmental Clearance from the MoEF&CC, GoI, is required. The Board vide reference 2nd cited directed that the CFE/CFO applications received without EC order (for category A&B projects) shall not be processed and shall be rejected at RO Level itself.
2. The industry proposes to consume 10,365 KLD of raw water and effluent will be 7,509 KLD. After considering the recycled water, the overall water consumption will be 4,135 KLD, which is proposed to be drawn through a borewell. The industry needs to study the impacts in this regard.
3. The industry proposes to use highly corrosive and toxic substances such as Hydrofluoric acid, Hydrogen peroxide, Silane, Ammonia, Nitrous oxide, Tri-methyl amine, and Polyurethane etc.; the industry needs to submit the proposed storage details of the chemicals along with the safety measures that are proposed to be provided.
4. The industry proposed to manufacture solar photovoltaic cells and wafers and filed a CTE application under the orange category. However, such activity is not listed under the orange category of industries issued by the CPCB. They need to furnish justification in this regard.
5. In the EMP, it was reported that the nearest habitation is Kavali village at a distance of about 11 Km. But, the nearest habitation is Cheruvu, which exists at a distance of about 150m to 200m.

12/6/24

ENVIRONMENTAL ENGINEER

To
M/s. Indosol Solar Private Limited
16th Floor, Aurobindo Galaxy Towers,
Hitech City Road, opp. IKEA,
Hyderabad, Telangana-500081.

Annexure - III

INDOSOL
INDOSOL SOLAR PRIVATE LIMITED

A Subsidiary of SSE

Date: 21.06.2024

To,

The Environment Engineer
Andhra Pradesh State Pollution Control Board,
Regional Office, Nellore.

Sub: CFE Clarifications for proposed Solar Photovoltaic (PV) Cells and Solar Photovoltaic (PV) Wafers manufacturing unit by **M/s. Indosol Solar Pvt. Ltd.** at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru village, Gudluru mandal, SPSR Nellore district, Andhra Pradesh – reg.

Ref: 1. Lr. No. GN/PCB/RO-NLR/2024 dated 12.06.2024

Respected Sir,

With reference to above clarification Lr. No. GN/PCB/RO-NLR/2024 dated 12.06.2024, we herewith submit the point wise response;

1 **The manufacturing process involves metallurgical operations (processing of silicon, carbon etc.) which attracts EIA notification, 2006. Hence prior Environment Clearance from the MoEF&CC GoI is required. The Board vide reference 2nd cited directed that the CFE/CFO applications received without EC order (for category A & B projects) shall not be processed and shall be rejected at RO level itself.**

The key raw material for proposed Solar Photovoltaic Cells and Wafers manufacturing is Polysilicon, which will be brought from outside (From China, Taiwan).

There is no manufacturing of Polysilicon (Raw material) by processing of silicon, carbon etc. which does not attract prior EC.

2 **The industry proposes to consume 10,365 KLD of raw water and effluent will be 7,509 KLD. After considering the recycled water, the overall water consumption will be 4,135 KLD, which is proposed to be drawn through a borewell. The industry needs to study the impacts in this regard.**

INDOSOL SOLAR PRIVATE LIMITED HYDERABAD

Corporate office :
Plot no:1, Survey no:83/1, Opp IKEA,
Aurobindo Galaxy Towers, 16th Floor, A wing,
Rayadurgam, Serilingampally, Hyderabad
Telangana , India – 500081
Mobile: +91-63098 88497
GST no: 36AAGC15136E1ZQ

Registered office:
6-30879/B, Green Lands Road
G Pullareddy Building, Begumpet
Hyderabad, Telangana, India - 500016
Ph.no: 040-66255266
CIN: U31900TG2022PTC159366
Email: contact@indosolsolar.com

Manufacturing Plant
Survey No: 585/2, 585-5, 593-2A
Near Ramayapatnam Port Road,
Chevuru Village, Gudluru,
Nellore Dist. Andhra Pradesh,
India - 523291
GST No: 37AAGC15136E1ZO

The unit obtained permission from Industries & Commerce Department, Government of Andhra Pradesh vide G.O.Ms. No. 112 dated 09.11.2023 for allocation of water from nearby minor ponds (Ravuru Chevuru, Chevuru mini tank, Chennapalayam, pond) (Copy of G.O.Ms. No. 112 dated 09.11.2023 enclosed at **Annexure I**). No ground water is used for proposed Solar Photovoltaic Cells and Wafers manufacturing.

3 **The industry proposes to use highly corrosive and toxic substances such as Hydrofluoric acid, Hydrogen peroxide, Silane, Ammonia, Nitrous oxide, Trimethyl amine and Polyurethane etc. the industry needs to submit the proposed storage details of the chemicals along with the safety measures that are proposed to be provided.**

Name of Raw Material	Max Storage (Kgs)	Type of Hazard	Mode of Storage
Gases			
Ammonia	26.4 MT	Corrosive/Toxic	ISO Tube trailers
Nitrous Oxide	25 MT	Oxidizer	ISO Tube trailers
Silane	10 MT	Flammable	ISO Tube trailers
Hydrogen	235 Kg.	Flammable	Cylinders banks
Boron trichloride	700 Kg.	Toxic	Cylinders
Trimethylaluminum	600 Kg.	Flammable	Canisters
Argon	50 Kl	Non-flammable	Cryogenic Vessel
Oxygen	7 Kl		Cryogenic Vessel
Nitrogen	140 Kl		Cryogenic Vessel
Liquids			
Hydrofluoric Acid	6 Kl	Toxic/Corrosive	Double Containment Tank
Hydrochloric Acid	3 Kl	Corrosive	Double Containment Tank
Nitric acid	3 Kl	Oxidizer/Toxic	Double Containment Tank
Caustic Potash	6 Kl	Corrosive	Double Containment Tank
Hydrogen Peroxide	6 Kl	Corrosive	Double Containment Tank
Sodium Hydroxide	3 Kl	Corrosive	Double Containment Tank
Lactic Acid	100 Kg	Corrosive	Carboy Tank

- Gas cylinders storage should conform to SMPV-Unfired rules-1981. Pressure regulator, metal piping, non-return valve, and safe residue bleed off arrangement will be incorporated in installation design. Strict hot work control and display of danger signs.
- Double containment tubing where outside is under vacuum and inside gas will flow for supply of gas. In case inside tube got punctured then outside vacuum will get break and immediately supply will stop
- Installation of Gas Detector, UV/IR to detect immediately any leakage. Automatic gas supply cut-off by Life safety system.
- Dedicated scrubbers for ammonia gas

INDOSOL SOLAR PRIVATE LIMITED HYDERABAD

Corporate office :
Plot no:1, Survey no:83/1, Opp IKEA,
Aurobindo Galaxy Towers, 16th Floor, A wing,
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Email: contact@indosolsolar.com

Manufacturing Plant
Survey No: 585/2, 585-5, 593-2A
Near Ramayapatnam Port Road,
Chevuru Village, Gudluru,
Nellore Dist. Andhra Pradesh,
India - 523291
GST No: 37AAGC15136E1ZO

- Fire hydrant monitors in front of storage area
- Self-contained breathing apparatus (SCBA) and PPEs are mandatory
- Nitrogen blanketing for liquid storage tanks
- Double containment piping for transferring of chemical with leakage sensor @ 30m distance
- Fire extinguisher CO2, dry chemical, dry sand

Copies of all chemicals MSDS are enclosed at **Annexure – II.**

4 **The industry proposed to manufacture Solar Photovoltaic Cells and Wafers and filed a CTE application under orange category. However, such activity is not listed under the orange category of industries issued by the CPCB. They need to furnish justification in this regard.**

We are proposing to manufacture Solar Photovoltaic Cells and Wafers, which is not categorized by CPCB, however our process involves usage of chemicals and gases for process. In this regard we fall under "RED category Miscellaneous".

5 **In the EMP, it was reported that the nearest habitation is Kavali village at about 11 Km. But the nearest habitation is Chevuru, which exists at about 150m to 200m.**

The nearest habitation is Chevuru village in located at distance of 0.24 km from the site in east direction.

Kindly process our application for CFE at the earliest

Thanking you,
Yours Sincerely,
Pothireddy Manoj Kumar Reddy
(EA to CMD)
Indosol Solar Pvt. Ltd.
Hyderabad Knowledge City,
TSIIC Raidurg, Hitech City Road,
Hyderabad, Telangana 50008

INDOSOL SOLAR PRIVATE LIMITED HYDERABAD

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Near Ramayapatnam Port Road,
Chevuru Village, Gudluru,
Nellore Dist. Andhra Pradesh,
India - 523291
GST No: 37AAGC15136E1ZO

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

Industries & Commerce Department – Representation of M/s Indosol Solar Private Limited for providing certain additional tailor-made incentives for setting up vertically integrated solar photo voltaic manufacturing facility in Andhra Pradesh – Orders - Issued.

INDUSTRIES AND COMMERCE (P&I) DEPARTMENT

G.O.Ms.No. 112 **Dt:09.11.2023**

Read the following:-

1. G.O.Ms. No. 66, Ind & Comm. (P&I) Department, Dt:15.09.2022.
2. From the Director, Indosol Solar Pvt. Ltd., Lr.Dt:17.10.2023.
3. Minutes of the State Investment Promotion Committee meeting held on 20.10.2023.
4. Minutes of the State Investment Promotion Board meeting held on 30.10.2023.

***

ORDER:

In the reference 1st read above, orders were issued extending the certain incentives to M/s Indosol Solar Private Limited (ISPL), Ramayapatnam, SPSR Nellore District.

2. In the reference 2nd read above, M/s Indosol Solar Private Limited (ISPL) has requested certain additional Non Fiscal incentives i.e., allocation of land, power related, Mines related, Project grounding support and Fiscal incentives in addition to the above incentives to support their project.

3. Accordingly, the proposal was placed before the State Investment Promotion Board (SIPB) meeting held on 30.10.2023 with the recommendations of State Investment Promotion Committee (SIPC) in its meeting held on 20.10.2023.

4. Government after careful examination of the decisions of the State Investment Promotion Board and considering the mega-investment involved in the proposal and based on the previous instances of considerations of requests for similar incentives, hereby extend the following Non-Fiscal incentives and Fiscal incentives to M/s Indosol Solar Private Limited (ISPL), Ramayapatnam, SPSR Nellore District as follows:

A. Non- Fiscal incentives – Allocation of land

1. In addition to previously approved allotment of 5148 acres of lands, the Government to facilitate procurement of additional land of 3,200 acres land and subsequently allocate in the name of the parent company or designated SPV / subsidiary through APIIC/AP Maritime Board, under LA for others, as per the procedure in vogue, on payment of cost basis.

2. To follow the provisions of proposed new land allotment policy w.r.t the request of the firm for execution of sale deed.
3. To facilitate right of way for laying of pipelines and any other utilities related to the project.

B. Non- Fiscal incentives – Power Related

1. Energy department shall take steps for creating of separate sub – category under HT III (C) for power tariff to vertical integrated PV Solar modules manufacturing allocated under PLI.
2. In GO.Ms.No.66 dated:15.09.2022, under clause 6(i) for the words "Power (HT III B)", to be replaced with "Power (HT III C)".
3. Till the company establishes its own captive power or source from open access, the Company can draw 100% power/energy required from DISCOMS at the approved tariff under HT (III) C as per GO.MS. 66, dt:15.09.2022.
4. The Energy Dept. (AP Transco) to establish substation at its own cost with required capacity and power infrastructure/lines drawn upto the premises, including developmental and any other charges, until the substation is commissioned.
5. Energy Department to process the request of the firm for the energy settlement & billing to be generated on monthly basis.

C. Non – fiscal incentives – Water related

1. The Water Resource Department is requested to explore the possibilities of allocating 115 MLD from Kanigiri reservoir / Sangam barrage / Somasila reservoir through supplementation as necessary from time to time, at a cost as per the prevailing policy.
2. The Water Resource Department is requested to explore the possibility of allocation of minor ponds (Ravuru Chevuru, Chevuru mini tank, Chennapalayam pond) near to the project area to be used for water drawl and meeting the water storage requirements of the project.

D. Non – fiscal incentives – Mines related

1. The Mines department to examine the request of the firm for relaxing the extent provision under Rule 12(5)(f)(ii) of APMMC Rules 1966, owing to huge mineral requirement and for value addition within the state.
2. Agreed for the request of the company for the disposal of minerals produced from the allotted mines fall outside the required threshold specifications of end use plant.
3. The Mines department to expedite the process of preparation of requisite proposals/drawings for grant of LOI/mining lease.

E. Non – fiscal incentives – Project related

1. The Industries Department to set up a dedicated field office for overseeing project approvals (Single Window) and inter-departmental coordination, in order to expedite the project grounding and to take steps for constitution of IALA.
2. Agreed for the request of the firm not to permit establishment of RED industries within 20 km radius of proposed project and laying of Oil and Gas pipelines to be established within vicinity of project area, as per the existing rules of the Central and State Government as applicable and in force.

F. Fiscal Incentives

1. Exemption for the firm for Stamp Duty, Registration charges and Transfer duty for the allotted lands.
2. Exemption of stamp duty and registration fees for the subsequent transfer of lands to the SPVs / ancillary units.
3. Exemption for Land conversion charges (NALA), building permission and processing charges / site zoning charges, property / municipal / panchayat taxes and development charges for the allotted lands.
4. Energy Department to process the request of the firm for exemption of Development charges & Security deposit and any supervisory and administration charges for obtaining power supply from DISCOM.
5. Mining department to process the request of the firm for exemption of royalty / seigniorage, DMF, MERIT, consideration fee for consumption of Morrum/ Gravel & Ordinary Earth, Ordinary Sand, Road Metal & Ballast, Rough Stone/ Boulders & any other minor minerals for construction of buildings and project related infrastructure.
6. Mining department to process the request of the firm for exemption for additional premium amount, seignior age fee, dead rent, DMF, MERIT, consideration fee, security deposit fee and Stamp duty for a period of 10 years for the allotted mines and the request of the firm for obtaining Consent for Establishment & Consent for Operation for 10 years for mining leases.
7. I&C Department to extend the applicable incentives to the SPVs / ancillary units transferred lands as eligible, as granted to the firm.

5. Detailed operational guidelines, in consultation with the departments concerned will be issued, concerning all the departments for smooth implementation of the project. Further, through a dedicated agency/ team in the Commissioner of Industries, the implementation of operating guidelines and the processing of the claims of the approved incentives will be facilitated.

6. The incentives shall be made applicable subject to the company adhering to the definitive timelines for implementation of the project and investment & employment commitment from the company as per the DPR submitted and as per the rules in vogue.

7. The provision of Water, Power source (Electricity) and approach road, up to the door-step of the Industrial Units investing in the States should be addressed properly by the departments concerned.

8. The Commissioner of Industries, Mangalagiri, VC&MD, APIIC, DMG, Vijayawada, Energy Department and the Water Resources Departments shall take necessary action accordingly and intimate the status of the progress of the work done by the unit from time to time to the Government.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

N YUVARAJ
SECRETARY TO GOVERNMENT & CIP

To
The Commissioner of Industries, A.P., Mangalagiri.
The Vice Chairman& Managing Director, AP Maritime Board, Mangalagiri.
The Vice Chairman & Managing Director, APIIC Ltd., Mangalagiri.
M/s Indosol Solar Private Limited (ISPL), Ramayapatnam, SPSR Nellore Dist.
The Water Resources Department.
The I&C (M-III) Department.
The Energy Department/ TRANSCO.
The PR&RD Department.
The MA&UD Department.
The HM& F.W. Department.
The Revenue (CT) Department.
The Revenue (Registration) Department
The DMG, Ibrahimpatnam, Vijayawada.
The Collector& District Magistrate, Nellore District.
The District Industries Officer, District Industries Centre, Nellore District.
Copy to:
The Finance (EBS-VIII) Department.
The Law (H) Department
The Accountant General, Andhra Pradesh.
The State Commissioner of Commercial Taxes.
The Member Secretary, APPCB.
The P.S. to Spl. Chief Secretary to Chief Minister.
The P.S. to Chief Secretary to Government.
The P.S. to Hon'ble Minister (III &Comm&IT).
The P.S. to Secretary to Government & CIP, Industries& Commerce Department.
The G.A. (Cabinet) Department w.r.t. to their U.O.No.344/2023, Dt:06.11.2023.
SC/SF.

//Forwarded :: by order//

S. Swarnalatha
SECTION OFFICER

INDOSOL SOLAR PVT. LTD.

SY. NOS. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, CHEVURU VILLAGE, GUDLURU MANDAL, SPSR NELLORE DISTRICT, ANDHRA PRADESH

ENVIRONMENT MANAGEMENT PLAN

Project No. 0624-EMP-01
June 2024

Indosol Solar Private Limited
16th Floor, Aurobindo Galaxy Towers, Plot No 1, Sy No 83/1, Hyderabad Knowledge City, TSIIC Raidurg, Panmaktha Plot 1, Hitech City Road, opp. IKEA, Hyderabad, Telangana 500081
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SUBMITTED TO
ANDHPRA PRADESH STATE POLLUTION CONTROL BOARD
REGIONA OFFICE, TIRUPATHI

INDOSOL

CONTENTS

1.0 Introduction

M/s. Indosol Solar Pvt. Ltd. proposed to establish solar cell manufacturing unit for solar power generation capacity of 1000 MW in existing Solar Photovoltaic (PV) modules assembling unit at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru village, Gudluru mandal, SPSR Nellore district, Andhra Pradesh in an area of 49.05 acres (19.85 ha). The capital cost of the proposed solar cell manufacturing project is Rs. 2000 crores.

Environmental protection is an issue that no organization can neglect and hope to survive. The key to the success of the integrated approach to pollution prevention and control is the management and operation of the organization. Effective committed management delivers a successful industry. As total commitment to the environment, not just for compliance with legal or regulatory compliance will be the essence of environment management of an industry. Many companies have recognized the benefits of implementing an effective environmental management system. The Environment management plan is drawn in consultation with the project proponents with reference to various potential impacts that are monitored, and identified, and the necessary measures to be taken for the mitigation and control of the same.

1.1 Location of the Project

The proposed site is located at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B**,** Chevuru village, Gudluru mandal, Nellore district, Andhra Pradesh. The site is situated at the intersection of $14^0$59'44.7" (N) latitude and $80^0$00'27.7" (E) longitude. The site is surrounded by vacant land all directions, road connecting Chevur to Rudrakota is in east direction. The nearest habitation is Chevuru village in located at distance of 0.24 km from the site in east direction. The main approach NH-16 is at 0.8 km in west direction from the site boundary. Location map and site layout is shown in **Fig 1.1** and **Fig 1.2** respectively.

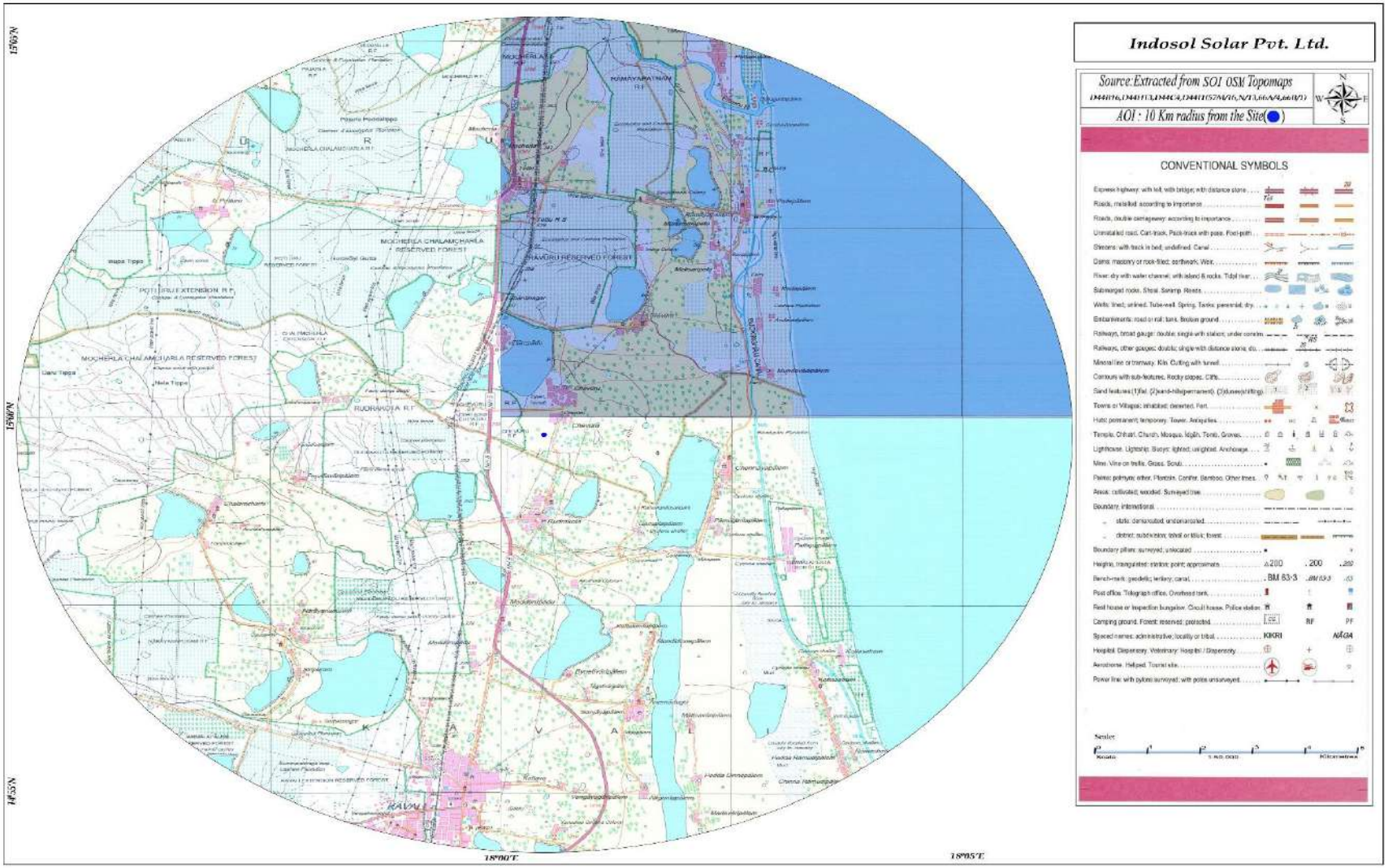
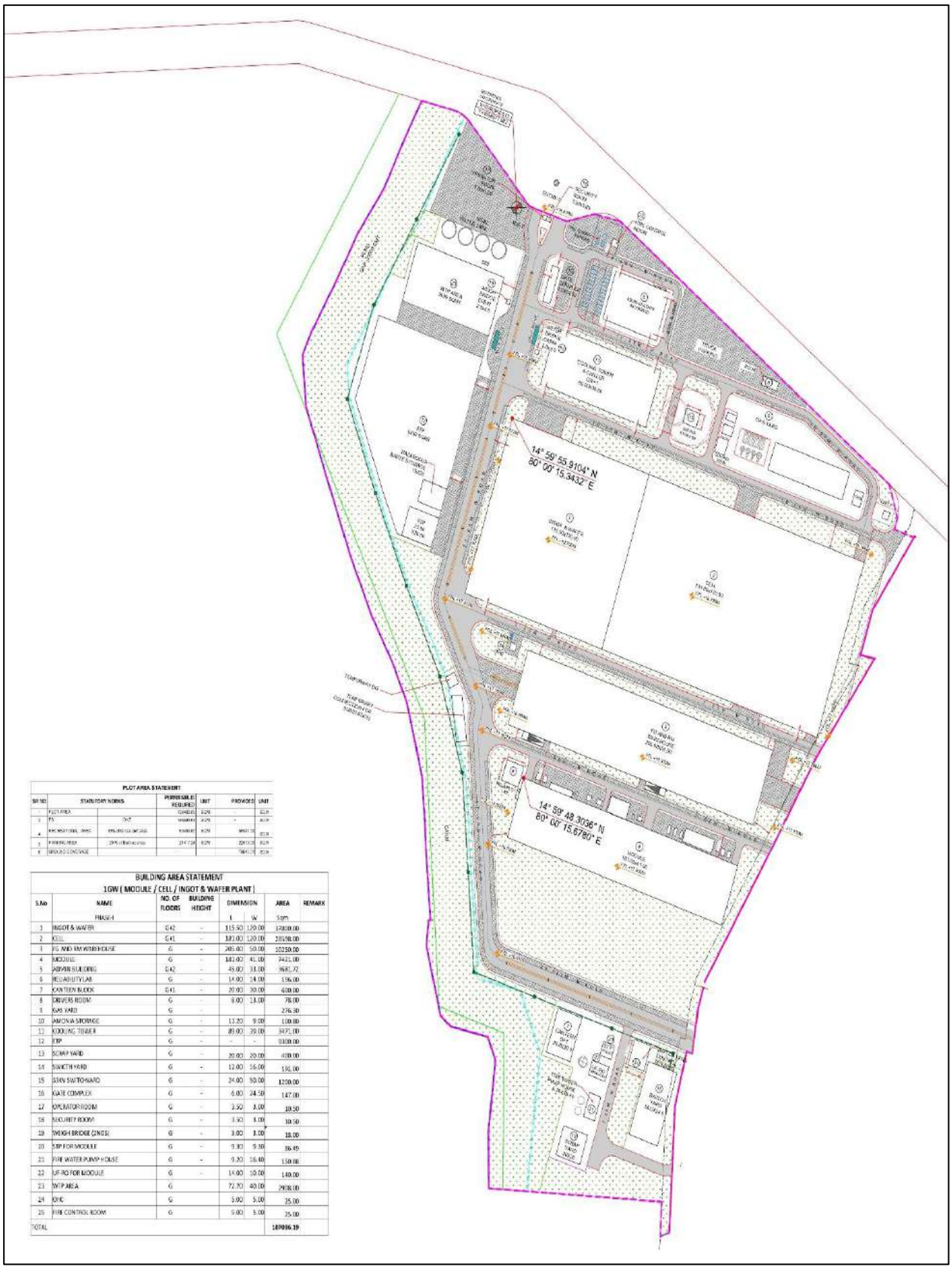


Fig 1.1 Location Map of Indosol Solar Pvt. Ltd.



PLOT AREA STATEMENT

SR NO	STATUTORY NORMS		PERMISSIBLE / REQUIRED	UNIT	PROVIDED	UNIT
1	PLOT AREA			SQM		SQM
2	FSI	OUT		SQM	-	SQM
3				SQM		SQM
4				SQM		SQM
5				SQM		SQM
6	GROUND COVERAGE					SQM

BUILDING AREA STATEMENT

1GW (MODULE / CELL / INGOT & WAFER PLANT)

S.No	NAME	NO. OF FLOORS	BUILDING HEIGHT	DIMENSION		AREA	REMARK
	PHASE-I			L	W	Sqm	
1	INGOT & WAFER	G+2	-	115.50	120.00	37800.00	
2	CELL	G+1	-	181.00	120.00	20598.00	
3	FG AND RM WAREHOUSE	G	-	205.00	50.00	10250.00	
4	MODULE	G	-	181.00	41.00	7421.00	
5	ADMIN BUILDING	G+2	-	45.00	33.00	9685.72	
6	RELIABILITY LAB	G	-	14.00	14.00	196.00	
7	CANTEEN BLOCK	G+1	-	20.00	30.00	600.00	
8	DRIVERS ROOM	G	-	6.00	13.00	78.00	
9	GAS YARD	G	-			276.30	
10	AMONIA STORAGE	G	-	11.20	9.00	100.80	
11	COOLING TOWER	G	-	80.00	39.00	3471.00	
12	ETP	G	-	-	-	0.00	
13	SCRAP YARD	G	-	20.00	20.00	400.00	
14	SWITCH YARD	G	-	12.00	16.00	192.00	
15	33KV SWITCHYARD	G	-	24.00	50.00	1200.00	
16	GATE COMPLEX	G	-	6.00	24.50	147.00	
17	OPERATOR ROOM	G	-	3.50	3.00	10.50	
18	SECURITY ROOM	G	-	3.50	3.00	10.50	
19	WEIGH BRIDGE (2 NOS)	G	-	3.00	3.00	18.00	
20	STP FOR MODULE	G	-	9.30	9.30	86.49	
21	FIRE WATER PUMP HOUSE	G	-	9.20	16.40	150.88	
22	UF RO FOR MODULE	G	-	14.00	10.00	140.00	
23	WTP AREA	G		72.70	40.00	2908.00	
24	GHC	G		5.00	5.00	25.00	
25	FIRE CONTROL ROOM	G		5.00	5.00	25.00	
TOTAL						107086.19	

Fig 1.2 Plant Layout of Indosol Solar Pvt. Ltd.

1.2 Product Profile

The manufacturing capacity is presented in **Table 1.1**. Material specification with annual requirement for module and cell, wafer and ingot is presented in **Table 1.2** and **Table 1.3** respectively.

Table 1.1 Plant Capacity Per Annum

Module	Unit	Existing	Proposed	Total
Solar Photovoltaic (PV) modules	Nos.	9,09,091	------	9,09,091
Solar Photovoltaic (PV) Cells	Nos.	------	14,02,59,740	14,02,59,740
Solar Photovoltaic (PV) Wafers	Nos.	------	14,72,72,727	14,72,72,727

Table 1.2 Material Specification with Annual Requirement - Module

Raw Material	Specification	Unit	Annual Requirement
Solar Cells		pcs	7,01,29870
Ribbon (Cell Connector)	φ0.30mm	kg	2,10,000
Ribbon (String Connector)	0.35×6mm	kg	23,636
Ribbon (String Connector)	0.35×5mm	kg	31,818
Front side Glass	thickness 2 mm	m2	22,71,513
Encapsulant (POE)	0.45 mm with 880 kg/m3 density	m2	46,65,898
Rear side Glass	thickness 2 mm	m2	22,71,513
Junction box	Cable Length: 30 CM, 25A	set	9,09,091
Frame	thickness 30 mm	set	9,09,091
Frame Sealant		kg	3,86,364
Flux		mL	27,273
Junction Box potting material-A white		kg	38,182
Junction Box potting material-B transport		kg	6,364

Table 1.3 Material Specification with Annual Requirement – Cell

Raw Material	Specification	Unit	Annual Requirement
Wafer		pcs	14,72,72,727
Front Busbar Ag Paste		kg	3,954
Front Finger Ag Paste		kg	8,290
Rear Busbar Ag Paste		kg	4,464
Rear finger Ag/Al Paste		kg	10,458
Front Busbar Screen	Front Busbar Ag Screen 400/18	pcs	1,020
Front Finger Screen	Front Finger Ag Screen 520/11 knotless	pcs	2,678
Rear Busbar Screen	Rear Busbar Ag Screen 280/25	pcs	638
Rear Finger Al Screen	Rear Finger Al Screen - Bifacial 360/16	pcs	1,403

Squeegee		pcs	22,574
Rolled paper for cell		pcs	22,574
HF - Hydrofluoric Acid	49%	L	9,13,172
HCl - Hydrochloric Acid	37%	L	1,53,046
KOH - Potassium Hydroxide	40%	L	8,18,794
H2O2 - Hydrogen Peroxide	31%	L	3,64,759
$POCl_3$ - Phosphoryl Chloride	5N	kg	1,786
Texturization Additive		L	53,566
Polishing Additive		L	1,07,132
SiH_4 - Silane	5N	kg	29,589
NH3 - Ammonia	5N	kg	35,711
N_2O - Nitrous Oxide	5N	kg	19,131
TMA - trimethylamine	solar grade	kg	383
N_2	5N	kg	40,30,201
O_2	5N	kg	43,363

Table 1.4 Material Specification with Annual Requirement – Wafer

Raw Material	Specification	Unit	Annual Requirement
Brick		kg	22,50,537
AB Glue for Gluing plastic plates		kg	7,793
AB Glue for Gluing Brick		kg	7,793
Plate	850*167*12	pcs	33,958
Diamond Wire (wafer slicing)	55um*80KM	km	4,29,603
Diamond wire Cutting Fluid	NY426 25KG/barrel	L	1,50,334
Silicone Chip Cleaner		kg	2,29,918
Wire wheel		pcs	25,051
Polyurethane	TT163-20KG	kg	5,370
$C_3H_6O_3$ - lactic acid		kg	33,622
KOH – Solid Potassium Hydroxide		kg	7,921
H2O2 - Hydrogen Peroxide (%26-28) IBC		L	2,29,851
Filter Bag		pcs	34,118
Polysilicon- Virgin size small	**Waker: SIZE 2,3,4; OCI:ST5, ST700**	**kg**	**21,99,900**
Polysilicon- Virgin big size	**Waker: SIZE 2,3,4; OCI:ST500, ST701**	**kg**	**3,88,218**
Quartz Crucible		pcs	20,536
Dopant	P Type,0.001-0.006 Ω.c, 4±1mm	g	1,03,94,789
Seed	<100>,P type, φ21±0.2/ 16±0.2mm * 170±3mm	pcs	20,536
Argon	≥99.999%	kg	60,75,146
Hot zone		pcs	856
HF - Hydrofluoric Acid	(%49±2) Barrel	L	3,40,226
HNO3 - Nitric Acid	(%69±1) Barrel	L	20,41,354

Small regulating wheel outer ring 158x8	158x8	pcs	19,309
Cropper Cutting wheel-small (260*11)	260X11	pcs	477
Cropper Cutting wheel-big (250*8)	250X8	pcs	743
Squarer Cutting wheel	220X15	pcs	1,222
PU - Desmodur TT163 Polyurethane	TT163-20KG	Kg	244
Big cropper diamond wire (0.37mm) /Squarer diamond wire(0.37mm)	0.37mm	km	3,005
Small cropper diamond wire(0.37mm)	0.37mm	km	323
Grinder Diamond wheel-200#	200#	pcs	90
Grinder Diamond wheel-500#	500#	pcs	102

2.1 Process Description

The process flow for the CZ method-based mono c-Si ingot growing and wafer production & process steps can be divided into two main stages;

- CZ method-based mono c-Si ingot crystallization and pulling and
- Cutting of bricks followed by slicing into wafer.

The process flow diagram of CZ mono c-Si Ingot and Wafer Production is presented in **Fig 2.1.**

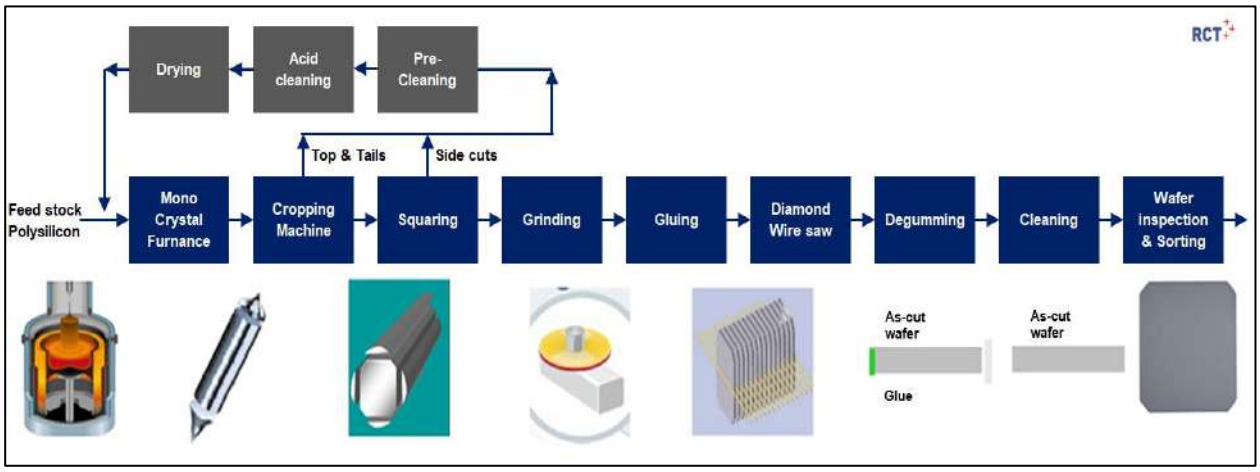


Fig 2.1 CZ mono c-Si Ingot and Wafer Production Process Steps

2.1.1 Process Description of Ingot (Czochralski Method (CZ) Method)

In the CZ method, polysilicon chunks of different sizes and the dopant (either B or Ga for p-type or P for n-type doping) are loaded in a quartz crucible set in a graphite crucible surrounded by graphite heaters in the crystal pulling chamber. Traditionally, quartz crucibles, made of high purity fused silica are used due to their specific properties. These are high purity, resistivity to thermal shock and superior chemical inertness. Aside from the charging with virgin polysilicon, it is possible to recycle the ingot's cut-off material. Especially the top, sides and tail are to a certain extent valuable, while the pot scrap contains the accumulated impurities and must be scrapped.

The polysilicon chunks are melted by heating in an argon atmosphere under a vacuum. Once the silicon is melted, the ingot is pulled slowly using a seed crystal. During the

crystallization, the silicon is solidified, as well as the dopant and impurity atoms. The segregation coefficient gives the fraction of foreign atoms in the solid and the liquid. Therefore, foreign atoms prefer to stay in the liquid, enabling a cleaning effect during crystallization. A segregation coefficient close to 1 is optimum for dopant atoms, leading to a homogenous dopant concentration along the ingot. This is nearly true for boron (p-type), but not for other prominent dopant atoms like phosphorous (n-type) or gallium (p-type). As innovations re-charging has been implemented, which is the charging of silicon and dopant after pulling of an ingot. This procedure is repeated typically four times, so five ingots can be pulled from one crucible. The process flow diagram of ingot pulling is presented in **Fig 2.2.**

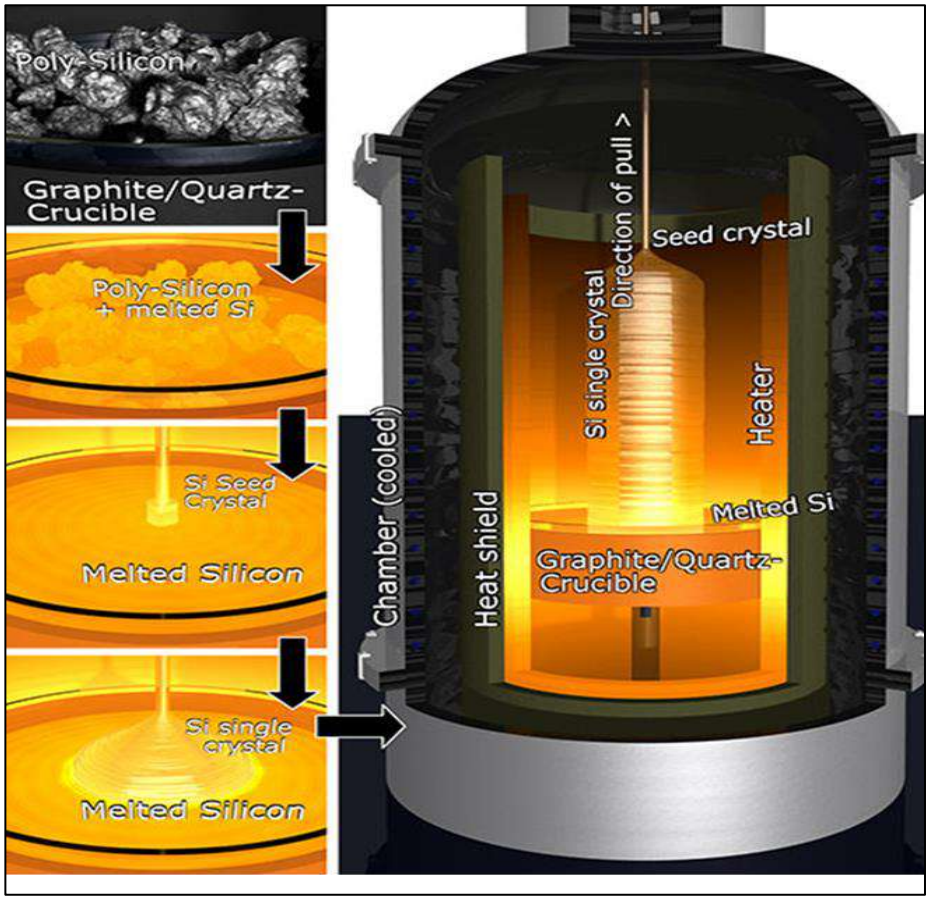


Fig 2.2 The Process Flow Diagram of Ingot Pulling

As the next production step, the head and tail cones are cropped as they have a high concentration of dislocations, and the large ingot is cut into smaller rods. Further, they are

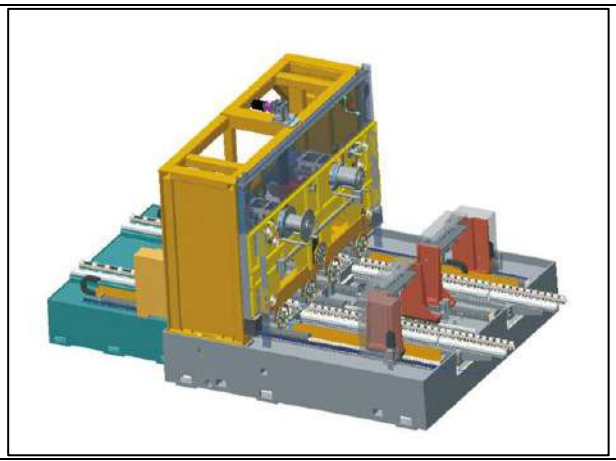
squared using a squaring saw. As the final brick treatment step, a grinding process will be applied to achieve a well-polished brick surface.

CZ method based mono c-Si ingot

Cutting (Cropping) of Mono c-Si Ingot (Brick Production)

The cropper takes a part of the quality control by slicing the disks for sampling, but also cuts the ingots into suitable lengths for further processing. The small ingot sections, known as rods, have a typical length of between 750 – 900 mm. The state-of-the-art process uses 0.25- and 0.35-mm thin diamond wire. Two different approaches are common in the industry. The multi-station cropper utilizes several blades with adjustable distance in parallel. The latest machines contain up to 9 blades. The cutting time of one ingot is faster due to the parallel blades, around 25 minutes for ingots with a diameter of 300 mm. The second approach is a single-station croppers with one blade and continuous feeding. The duration of one cut for 300 mm is around 8 minutes. Due to the axial feeding, the utilization of the machine is way better. The cropper mainly consumes diamond wire and running wheels.

Multi-Station Cropper



Single-Station Cropper with continuous feeding and two parallel blades.

Squaring

After the cropping, the rod gets squared. Two chucks clamp the rod on both sides' cross-section and guide it along its axis through the taut diamond wires. Adjustable running wheels guide the wires. One single wire is used and redirected over all wheels. The cutting fluid and diamond wires are the two most expensive consumables in this process. The Cutting fluid supports cooling, lubrication, and removal of the kerf loss. The slabs go into the recycling process and can be re-used. The cutting time for an 800 mm M10 brick is about 20 – 25 minutes. Schematic diagram showing wire cutting is presented in **Fig 2.3.**

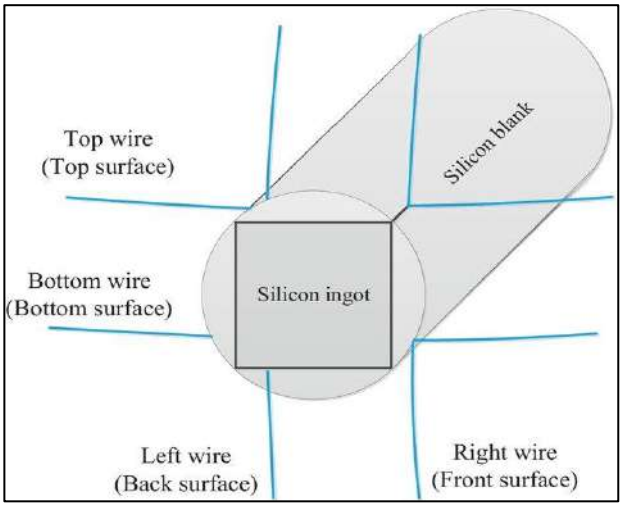


Fig 2.3 Wires Cutting Through Rod

Grinding and Chamfering

This process typically includes two steps: grinding the side surfaces and chamfering the bevel. The purpose is to eliminate notches, which can act as predetermined breaking points during slicing and further processing. By optimizing the surface finish, the yield in diamond wire slicing can go above 96%.

In the first step, two grinding wheels grind the side planes from two sides. The clamping turns the brick over 90° for accessing the other two side surfaces and over 45° to apply the same procedure to the bevels. A pre-grinding removes all rough unevenness. The grain size of the grinding wheels can be up to 200 grit. After the rough processing, everything will be repeated with a more finely grinding wheel up to 500 grit. The time for grinding an

M10 brick takes around 40 to 50 minutes, depending on the process and the machine design.

Recycling Process

Standard in today's ingot production is the recycling of the cut-off parts. The aim is to reuse all Si parts removed during the cropping and squaring process. After the recycling process, this Si material can be used grow new ingots and thereby reducing the Si losses. The share of recycled material ranges between 38% - 45% depending on the quality of the grown ingots. Quality control would remove some Si material from this cycle, for example, if a high concentration of unknown impurities or massive dislocations emerge during the inspection. Silicon recycling includes three main processes: crushing of the silicon material, chemical cleaning, and packaging. The heads, tails, cut-offs from the brick (slabs), and unqualified material are suitable for recycling.

Silicon Crushing

A crusher reduces the size of the polysilicon chunks according to the most considerable size 4 of the common standards. Due to unpredictable breakage behaviour, other sizes will appear by themselves. The quality requirements for the crushing are like those after the Siemens process in polysilicon production, so the machines are also suitable for recycling. There are different approaches. The oldest one is the mechanical crushing by hand. A worker crushes the silicon manually with a molybdenum hammer since the silicon is fragile enough to be hammered by hand.

A mechanical crushing machine reduces the required workers. To prevent any contamination, the machine parts in contact with the silicon or next to the area consist of tungsten carbide alloy. It is known that mechanical crushing can cause non-removable contamination.

Chemical Cleaning

Due to the segregation effect, parts from the grown ingot contain much less impurity concentration in the bulk than the virgin polysilicon. A calculation based on polysilicon

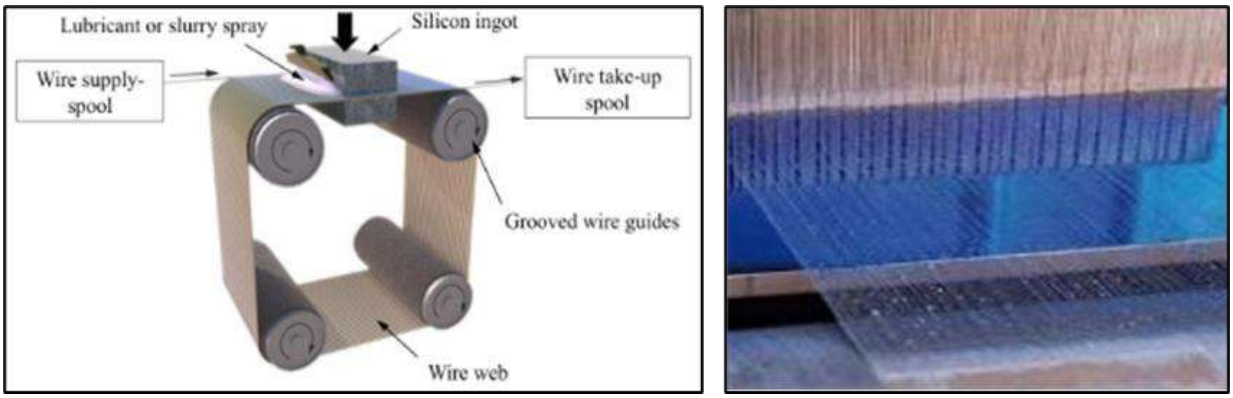
with an iron concentration of 5x1013 atoms/cm3 leads to an average iron concentration in the ingot of 3.4 x109 atoms/cm3 and is equivalent to a reduction by a factor of 15,000. During the processing in the brick factory and the crushing, impurities react with or adhere to the silicon surface. A batch-type machine cleans the chunks over a few process steps to remove the impurities. In the first step, hydrofluoric acid (HF) and nitric acid (HNO3) etches a few microns from the surface of the silicon to remove the surface impurities. After etching, some cleaning steps with water follow to remove most of the chemicals. In the last baths, the cleaning machine rinses the material with ultrasonic bubbling. After the batch process, a dryer removes the remaining water. The cleaning machines or personnel pack the silicon in bags and transport it to the charging area.

Batch-type Cleaning Machine

During the processing in the brick factory and the crushing, impurities react with or adhere to the silicon surface. A batch-type machine cleans the chunks over a few process steps to remove the impurities. In the first step, hydrofluoric acid (HF) and nitric acid (HNO3) etches a few microns from the surface of the silicon to remove the surface impurities. After etching, some cleaning steps with water follow to remove most of the chemicals. In the last baths, the cleaning machine rinses the material with ultrasonic bubbling. After the batch process, a dryer removes the remaining water. The cleaning machines or personnel pack the silicon in bags and transport it to the charging area.

2.1.2 Process Description of Wafer

The Diamond Wire Sawing (DWS) process is applied to manufacture wafers out of bricks, as illustrated in Figure 14 below. Using special adhesives, the brick is glued to a hollow plate and a brick holder. The 50-55 µm thick diamond wire, which is several kilometers in length, moves continuously back and forth (like a sawing action) and gradually from the bottom to the top of the brick to slice wafers with a thickness of 160 µm-170 µm. The wires are continuously cooled by a water-based cutting fluid during the slicing process.



Diamond Wire-Based Sawing of Brick

After slicing the brick, the wafers are still glued on the brick holder at one side like a comb structure and must be separated. Hence, the wafers then go through a degumming and cleaning process. Finally, the wafer is passed through a wafer inspection system to check the quality and are sorted into different quality bins. P-type wafers with either boron (B) doping or gallium (Ga) doping are the mainstream wafer types with a market share of > 85%. As Light Induced Degradation (LID) is not present due to the absence of the B-O complex, Ga-doped wafers are now gaining more acceptance in production and are dominating. N-type mono c-Si wafer doped with phosphorous (P) are used for higher efficiency solar cell architectures like TOPCon and HJT.

2.1.3 Process Description of Solar Cell Production

The crystalline silicon solar cell production flow is strongly dependent on the type of the technology used to create a targeted cell structure. Independent of the technology, over 85% of modern Si solar cells production lines include following basic process steps is presented in **Fig 2.4**.

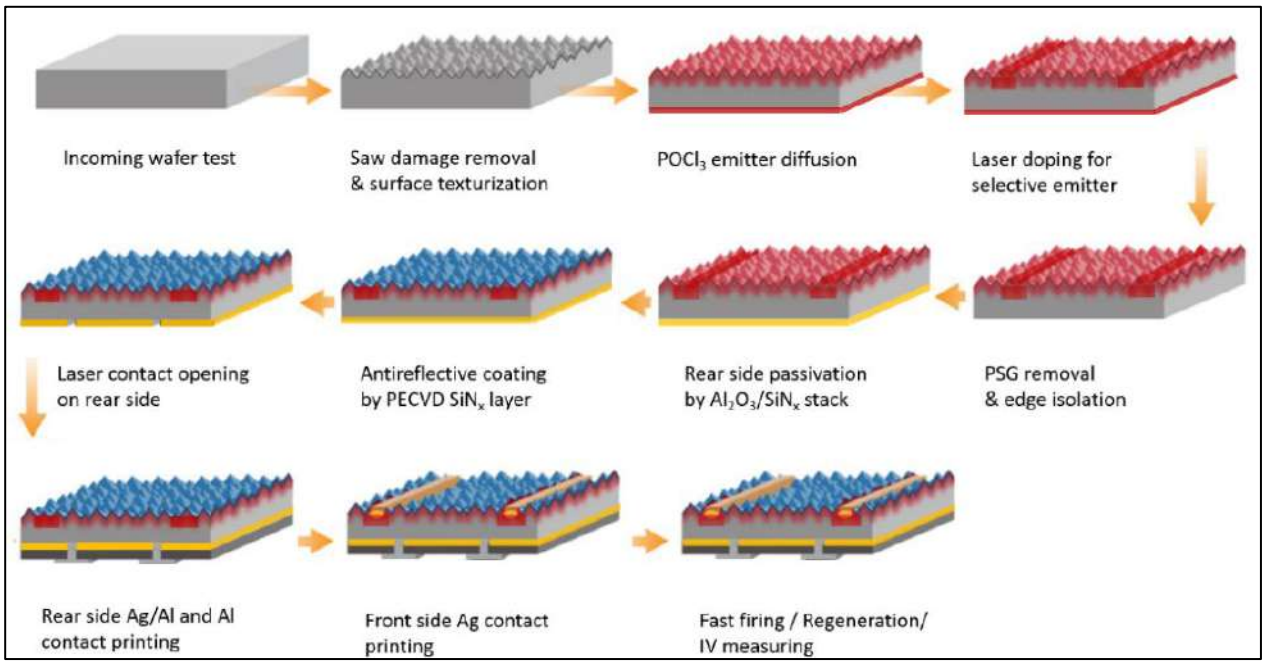


Fig 2.4 PEC Solar Cell Production Process Steps

Incoming Wafer Inspection

Incoming inspection of wafer material is an important issue to increase the yield and quality of solar cell production. Depending on the focus of inspection, different solutions implementing unstacking, optical breakage detection, geometrical inspection, surface inspection and microcrack detection, mechanical stability testing as well as contactless measurements of thickness, resistivity, and electronic quality (lifetime) concluding carrier/stack wafer loading can be integrated within one wafer inspection tool.

Surface damage removal / Texturing

Following the initial pre-check, the surface of the silicon wafers will be textured to reduce reflection losses of the incident light. For monocrystalline silicon wafers, the most common technique is the random pyramid texturing which involves the coverage of the surface with aligned upward-pointing pyramid structures. Pyramid structure is created by an anisotropic nature of chemical etching of the monocrystalline silicon surface by KOH (NaOH) alkaline solution. The proper alignment of the pyramids etched out is a result of the regular, neat atomic structure of monocrystalline silicon. Now, with such pyramid-

structure in place, the incident light does not reflect in the surrounding air but bounces back onto the surface below.

Typically, batch type of wet chemical equipment will used for this process step. Modern wet chemical texturing tool combines saw damage etching with texturing and cleaning processes and is operated by transportation of silicon wafers in carriers from one to other chemical baths. By this way saw damage removal, texturing, cleaning, and drying of the wafers can be performed continuously one by one on many wafer batches with typical wafer quantity 200 to 400 pcs each.

Junction Formation

The process of p-n junction formation consists of two phases: dopant application and drive-in (diffusion) of dopant atoms into volume of silicon substrate. The emitter diffusion refers to the deposition of a thin dopant material-containing coating on the wafer by passing the wafers through a diffusion coating furnace. Wafers that have already been pre-doped with p-type boron during the Cz crystal growth process are diffused with n-type dopant (Phosphorus) at a high temperature to create a p-n junction.

This junction of electron deficiency in the p-type and high electron concentration in the n-type allows for excess electrons from the n-type region to jump into the p-type region, creating an electron field at the junction. By this way, the electrons and holes generated by sun light in the volume of Si wafer can be separated and transferred to opposite wafer surfaces resulting in creation of electric potential and hence the name 'Photo Voltaic'.

The preferred way in the PV industry for p-n junction formation is batch diffusion furnaces. The wafers are collected in a quartz carrier, which is then loaded into a quartz diffusion tube. Dopant is deposited as Phosphor Silicate Glass (PSG) from gas phase ($POCl_3$ bubbler source). A temperature profile is used to achieve the right distribution of the dopant in the surface-near layer.

High-capacity diffusion boot with back-to-back loaded wafers

Edge Isolation and Rear Polishing

During the diffusion process, n-type phosphorous dopant diffuses not only into the desired wafer surface but also around the edges of the wafer as well as on the backside, creating an electrical path between the front-side (FS) and rear-side (RS). The objective of the edge isolation process is to eliminate this electrical path around the wafer and remove the remaining PSG after the diffusion process. The rear side polishing is required to improve the efficiency of the solar cell. A polished surface increases the back passivation and improves the open circuit voltage of the solar cell, thereby increasing the power output. The PSG formed on the front surface is also removed during this process.

The carryover of Al-BSF technology to PERC was the acidic inline etch isolation process involving HF and HNO3. In this process, an inline wet chemical tool will be typically used to perform the edge isolation process. In this case the rollers transport the wafers through the tool from one process bath to another. In the main etching bath, the RS of the wafer will be wetted and etched by HF/HNO3 etching solution. To avoid emitter, damage the FS is protected by DI water film. Followed processes include rinses, alkaline acidic cleaning as well final drying.

Industrial wet chemical machine for inline edge isolation and PSG removal is operating with throughput from 4,000 to 8,000 wafers per our using a 5- or 10-lane transportation system. Figure below shows Si wafers in the edge isolation etching bath.

Rear Side Etching for Edge Isolation in main Etching Bath of 5-lane Industrial Inline

Alkaline Etching

The alkaline chemistry does not produce the pointed edges typical of the spherical cap morphology of acidic texturing which results in even better passivation qualities. Also, this approach eliminates the use of HNO3 for process making it realtively environmental friendly. There are two ways to achieve alkaline rear side polishing – a) Inline process, and b) batch process.

Inline alkaline polishing: The complete wet treatment is carried out in a single inline tool where wafers travel on top of the conveyor. The critical steps for the process are HF single side etching, alkaline single side etching using KOH solution, PSG removal, cleaning and drying. For single side processes, the wafer is covered with water capping on the front side while it travels on the conveyor with chemicals acting on the back surface.

Alkaline batch polishing: Alkaline batch polishing process is carried out with a cluster arrangement in which the first steps of process involving PSG removal from the rear is carried out in inline fashion. This is because PSG on the front surface is to be protected for masking the emitter for the next batch process. The wafers are transferred from the conveyor to the carriers using intermediate wafer handling automation before the batch operations.

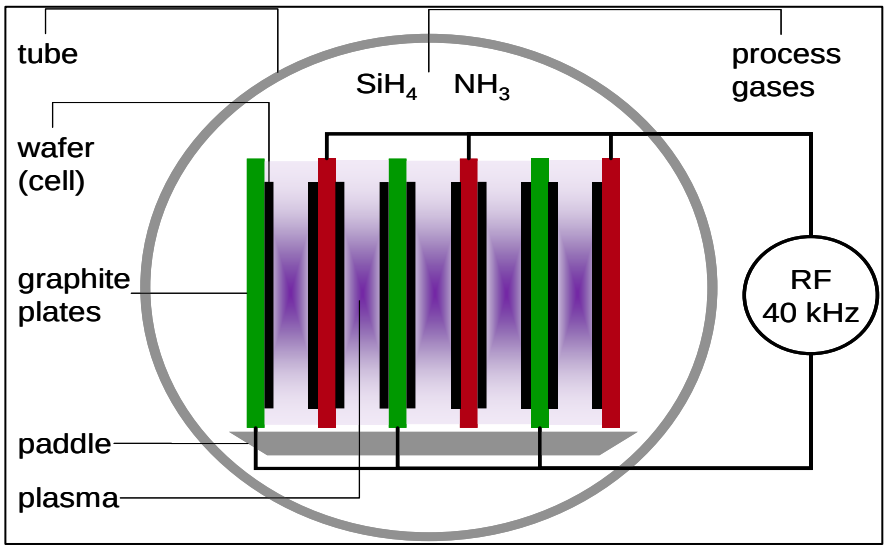
The wafers are completely submerged in the reactive alkaline solution. The rear surface of the wafers have exposed silicon for etching reaction with KOH solution whereas the front surface have an oxide film which retarders the reaction to protect the emitter.

The protection of sub-micron front emitter with a selective emitter structure poses a challenge for the alkaline batch polishing. This challenge hase been met by 1) using additional oxidation step after selective emitter (SE) laser to cover the PSG including SE features with an additional layer of oxide and 2) use of amphophilic additives in the alkaline solution. These additives selectively adhere to the front oxide layer on the wafer and further protect the emitter. This provides a very good process window for rear polishing by supporting longer process times. The additives also act as an accelerants etching and reduce KOH consumption. The cluster approach with batch alkaline polishing is the mainstream process for PERC process.

Anti-Reflective Coating

In addition to the surface texturing, anti-reflective coating (ARC) is applied on the FS to further reduce the reflection and increase the amount of light absorbed by the solar cell. The ARC is essential as the reflection of a bare Si wafer is greater than 30%. A silicon nitride (SiNx) based ARC is typically used and helps to reduce the surface reflection to 10%. In addition to the surface texturing, the total reflectance reduces to around 3%.

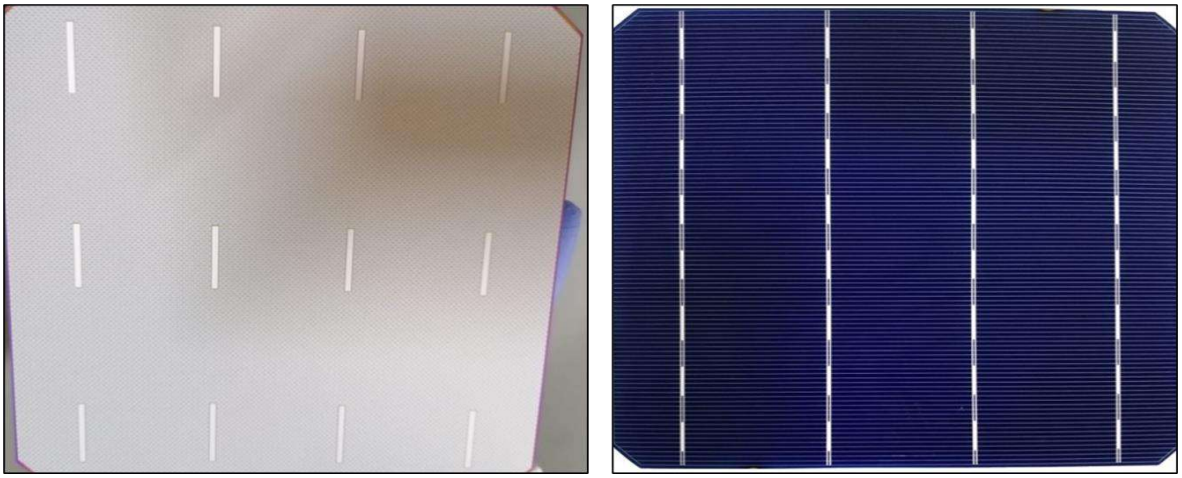
The application of a SiNx ARC greatly enhances the short circuit current. At the same time, the surface recombination can be significantly reduced by surface passivation of the dangling bonds, leading to increased voltage of the processed cells. Plasma Enhanced Chemical Vapor Deposition (PECVD) is the most common method for deposition of the ARC on the wafer. In the PECVD process, the pre-cursor gases react at the suitable temperature, pressure, and power to generate a plasma and deposit the film on the substrate.



Principle of Direct PECVD Process for Deposition of SiNx ARC Layer

Screen Printing of Front and Rear Contact System

As next step, metal contacts are printed by screen printing method on the wafer surface with the objective to create ohmic contact. This is achieved by printing the metal pastes with screen printing equipment that print the metal paste lines/areas onto the wafer FS and RS. After printing, the printed paste undergoes a drying process. Once dried, it is followed by printing of the other side/type contacts and subsequent drying. After all contacts have been printed and dried on the RS and FS, the screen-printed wafers are passed through a sintering furnace to solidify the dry metal pastes onto the wafers. Then, the wafers are cooled and can already be called solar cells as shown.



Screen Printed Solar Cell Metallization on Front (left) and Rear (right) Side

Testing and Sorting

In this final process, the now ready-to-assemble solar cells are tested under simulated sunlight conditions and then classified and sorted according to their efficiencies. This is handled by a solar cell testing device that automatically tests and sorts the cells. Measuring of IV-curve as well as final optical control by camera systems in visible and IR- wavelength range will be performed for each solar cell. According to the electrical and quality control data each cell will be sorted to one specific output performance bin. The operators then only need to withdraw the cells from the respective efficiency bin to which the machine assorted the cells. Subsequently, the sorted solar cells will be packaged and transferred to the module production.

2.1.4. Process Description of Solar Photovoltaic (PV) modules

The production process of solar module is tightly connected to the module design and used module components. Standard c-Si solar module consists of 5 layers is presented in **Fig 2.5.**

- Stringed solar cells
- Encapsulation foil 1 on the FS
- Encapsulation foil 2 on the RS
- Back sheet and cover glass

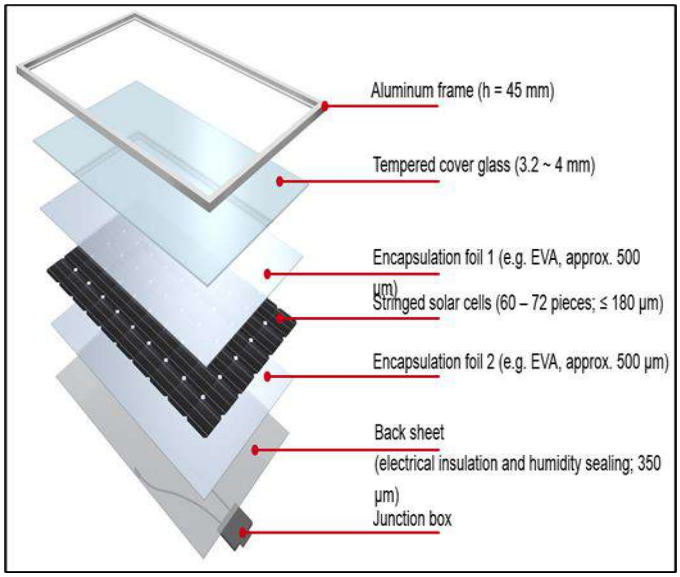


Fig 2.5 Standard c-Si Solar Module

In the module production the cells are aligned and attached to each other by tabbing and stringing. An automated production machine called stringer interconnects solar cells by soldering flat coated metal leads (string ribbons) to cell contacts. The stringer process principle is to perform series interconnection of solar cells by soldering string ribbons to cell contacts on top side (busbar pads) and to back contact of the following cell. Series interconnection principle of solar cells to strings is presented in **Fig 2.6.**

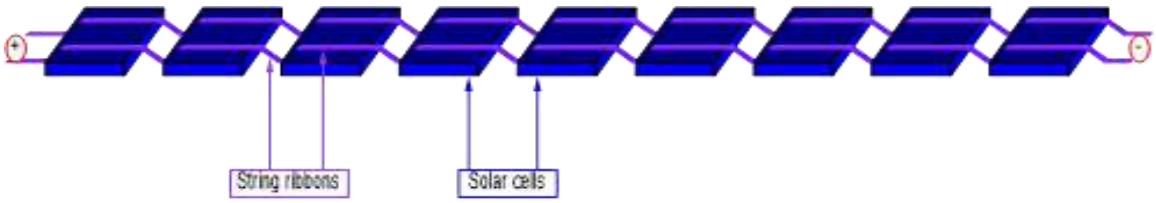


Fig 2.6 Series Interconnection Principle of Solar Cells to Strings

The six strings containing of 8 or 13 solar cells each will be placed face down on the glass and top encapsulation layer 1. After this lay-up operation the strings will be connected in series by soldering of cross-connection ribbons. Schematic design of solar cell interconnections in the module is presented in **Fig 2.7.**

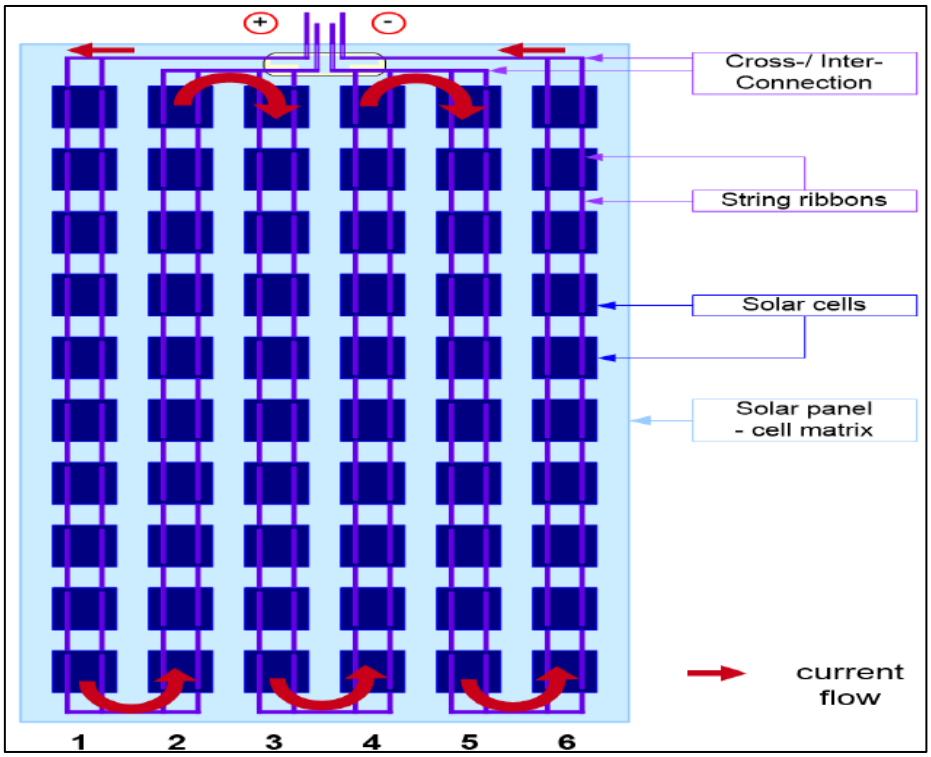


Fig 2.7 Schematic Design of Solar Cell Interconnections in the Module

Cells are connected in series and subjected to lamination process by exposing the cells in between two thermoplastic or thermosetting films, such as ethylene vinyl acetate (EVA) polymer or Polyolefine (POE), and glass sheets to high temperature and high humidity. This encapsulation process step protects the cell from the impact of harsh environmental conditions.

After module lamination, edge trimming and framing, a junction box will be mounted on the RS of the module. The junction box is used to connect the ribbons from the string interconnection with the outside power cable and to maximize the module power output in case of partial module shadowing by applying bypass diodes.

Finally, electrical performance and quality tests are performed, and the modules conform with the standards are packaged and sent to storage. A simplified module production process schematic diagram is presented in **Fig 2.8.**

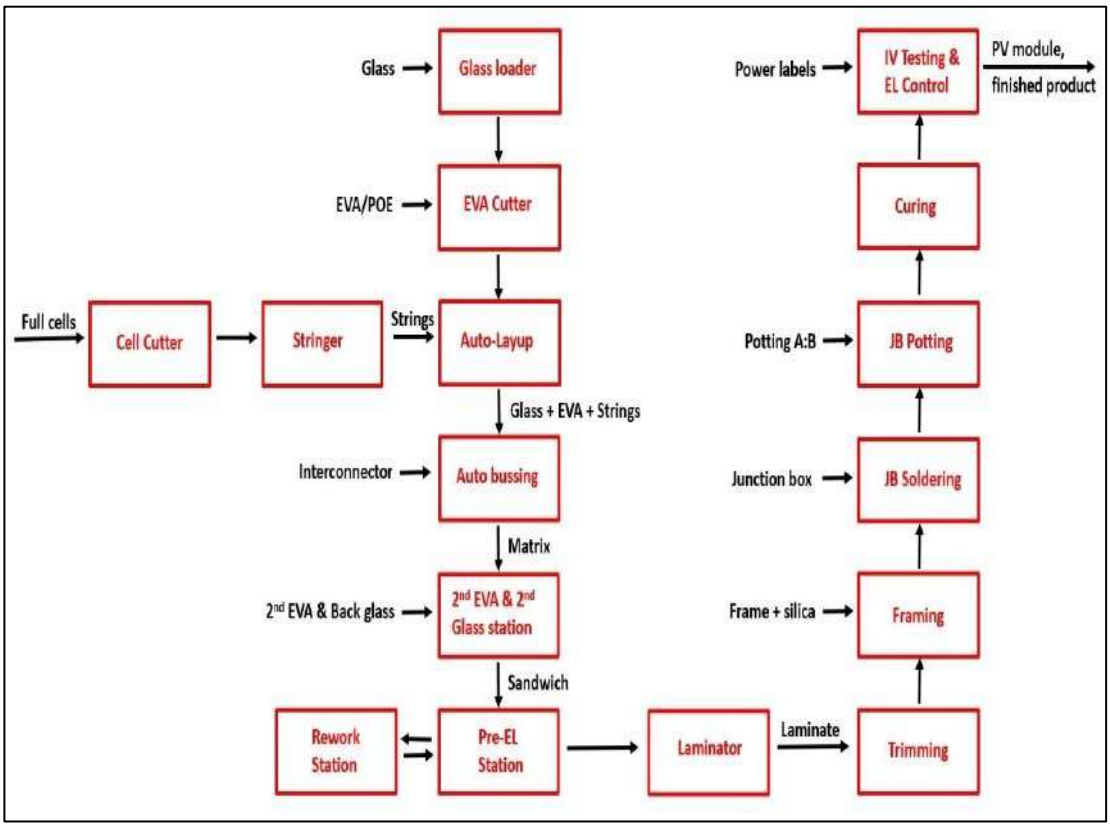


Fig 2.8 Schematic Diagram of Simplified Module Production Process

2.2 Utilities

The utility requirement shall be chillers, compressed air system and standby DG sets. List of utilities is presented in **Table 1.3.**

Table 1.3 List of Utilities

S. No	Description	Unit	Capacity
1	Chillers, and associated ancillaries, pumps, AHUs	TR	15000
2	Compressed air system (Air cooled)	CMH	5200
3	DG Set (standby)	KVA	2 x 1250 2 x 1500

2.3 Water Requirement

Water is mainly used in Process (washings), scrubbers, cooling towers, domestic purposes, and gardening. Total water requirement shall be 10365 KLD. The fresh water consumption is optimized by reusing treated wastewater to an extent of 6230 KLD, thus reducing fresh water consumption to 4135 KLD during operation. The total water balance is presented **Table 1.4.** The schematic diagram of water balance flow is presented in **Fig 2.9.**

Table 1.4 Total Water Balance

Purpose	INPUT (KLD)		OUTPUT (KLD)	
	Fresh Water	Recycled Water	Loss	Effluent
Process (washings)	679	3850	679	3850
Scrubber	100		60	40
Cooling Tower	2621		1790	831
DM Rejects	403	2285		2688
Domestic	120		20	100
Gardening	212	95	307	
Gross Total	**4135**	**6230**	**2856**	**7509**
Total	**10365**		**10365**	

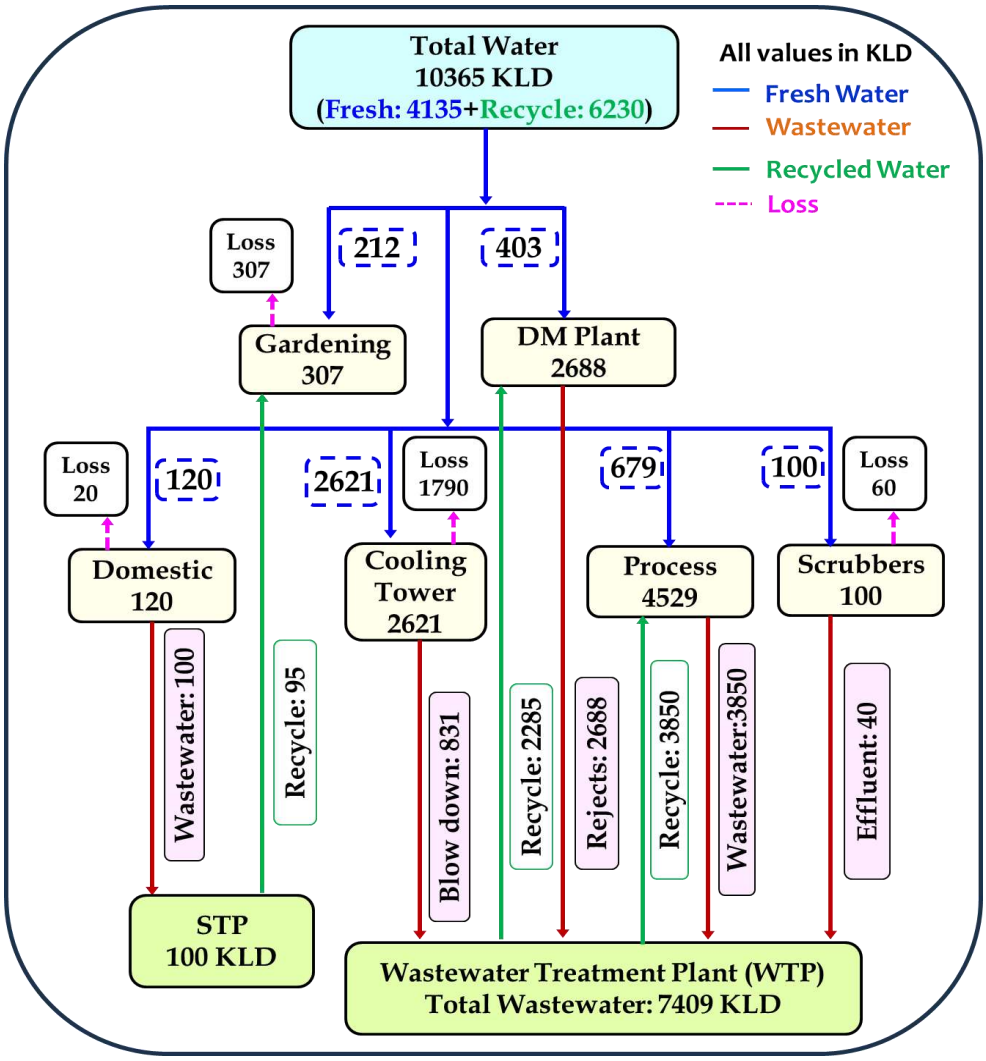


Fig 2.9 Schematic Diagram of Total Water Balance

3.0 Environment Management Plan

3.1 Construction Phase

Site Preparation

During the site preparation considerable amount of soil movement is involved due to slight leveling operations, which will be carried out. During construction it is necessary to control uplift of dust during the excavation, leveling and transportation by spraying water in the paths, and along the temporary roads. The clearing of plants, shrubs and trees will be kept to the minimum to leave sufficient space for erection of mechanical units and for few civil constructions.

Sanitation

Considering the standards of hygiene, the workers involved in construction will be provided proper sanitation facilities. The facilities like toilets, drinking water shall be provided to the construction labor. The toilets will be attached to septic tank to minimize the percolation and to control the subsequent impact on the environment.

Noise

The construction workers on site will be provided with necessary noise protection devices like earmuffs whenever they must work near the noise generating equipment/sources.

3.2 Operation Phase

The management, mitigation and mitigation/control measures identified for significant impact sources are presented in **Table 3.1.**

Table 3.1 Source of Pollution and Mitigation/Control Measures

S. No.	Pollution	Source	Probable Pollutants	Mitigation Measures
1	Air	Manufacturing Plant	General exhaust	Tool exhaust to be connect with exhaust suction blower and after this it will discharge through chimney/stack at the height describe by APPCB.
		Manufacturing Plant	Acid Scrubber	Tool Acid exhaust to be connect with Scrubber and after this it will discharge through chimney/stack at the height describe by APPCB.
		DG (standby)	Emission from DG Chimney	Emission will be discharge through chimney/stack at the height describe by APPCB.
2	Noise	Air Compressor	Sound	Silencer/noise reducing equipment to be fixed in Air compressor bypass line and Sound proof cabin to be built for operator and if operator or any person will enter in Compressor house, they will be using ear plug /required PPE.
3	Waste water	Washings, Scrubbers, CT blow downs and domestic	Wastewater treatment plant with ZLD principle	We will install WTP plant and treated effluent will be reused for washings, scrubbers and CT make-up.

4	Sanitation water	Sewage/canteen/ washroom	Swage water	We will install STP plant and after neutralization of effluent we will reuse of water as flushing water/irrigation purpose.
5	Solid waste	Effluent Treatment Plant	Chemical Waste	We will store in shaded and disposed off to secured landfill site.
6	Solid waste	Effluent Treatment Plant	Silicon Waste	We will store in shaded and disposed off to secured landfill site or sale to customer who will utilize it as raw material
7	Waste Oil	Manufacturing Plant	Waste oil	We will store in shaded and barricaded area and timely transfer oil waste to approved vendor.
8	Solid waste	Module production	Plastic/paper/ glass/used sealant drum	We will store in shaded and barricaded area and timely transfer solid waste to approved vendor.

3.2.1 Water Pollution

The main sources of effluent generation from the plant are from washings, blowdowns from cooling towers, and domestic wastewater. The total effluent generated and mode of treatment is presented in **Table 3.2.**

Table 3.2 Total Effluent Generated and Mode of Treatment

Purpose	Quantity (KLD)	Mode of Treatment
Process (Washings)	3850	Sent to Effluent treatment plant for neutralization, de-fluorination, coagulation, flocculation, precipitation, filtration, ultrafiltration, reverse osmosis. RO Permeate reused for process and DM Plant, while rejects sent to MEE followed by ATFD. Condensate from MEE (720 KLD) and ATFD (72KLD) is reused for process and DM Plant and salts send to TSDF.
Scrubber	40	
Cooling Tower	831	
DM Rejects	2688	
Domestic	100	Sent to Sewage treatment plant and treated effluent will be used for horticulture.
Total	**7509**	

3.2.1.1 Effluent Treatment System

The Effluent management system is developed to ensure `Zero Liquid Discharge', which begins with neutralization, de-fluorination, coagulation, flocculation, precipitation, filtration, ultrafiltration, reverse osmosis, MEE and ATFD.

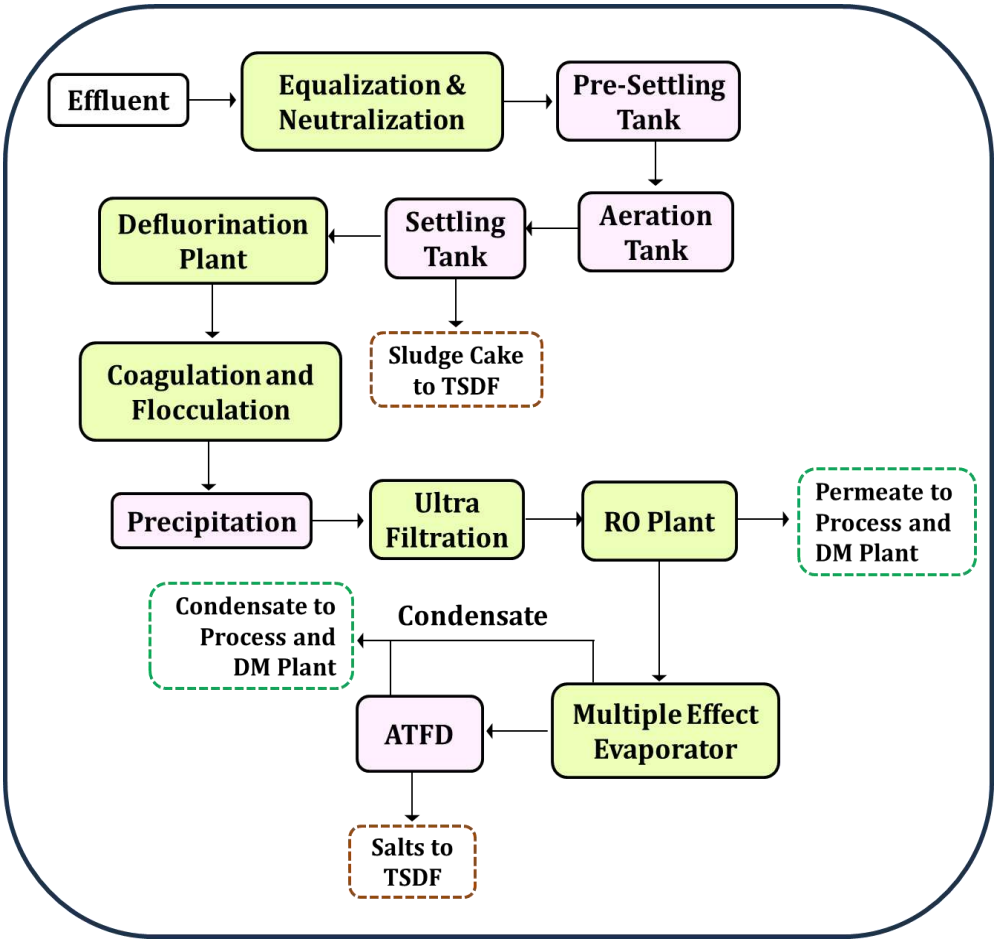


Fig 3.1 Schematic Diagram of Zero Liquid Discharge (ZLD) System

Table 3.4 Technical Specifications of Zero Liquid Discharge (ZLD) System

S.No	Description	Unit	Values
	Multiple Effect Evaporator (MEE)		
1	**Design Capacity**	**KLD**	**720**
2	Feed Rate	Kg/hr	25000-35000
3	Feed Concentration	mg/l	25000-35000
4	Feed Temperature	^{O}C	30
5	Initial Solids	%	2.5-3.5
6	Solids in Concentrate	%	25.0-35.0
7	Concentrate Output	Kg/hr	3.0
8	Water Evaporation Rate	Kg/hr	27.0
	Agitated Thin Film Dryer (ATFD)		
1	**Designed Capacity**	**KLD**	**72**
2	Feed Rate	Kg/hr	2500-3500
3	Initial Feed Solid Content	%	25.0-35.0
4	Final Moisture in Dry Bag-gable Product	%	10
6	Water Evaporation Rate	Kg/hr	2500-3500
7	Solid Output in Bag-gable at 8 – 11% moisture	Kg/hr	900-1200

3.2.2 Air Pollution

In the manufacturing process of photovoltaic solar cells, Hydrofluoric acid & Hydrochloric Acid is used. During process some of the acid vapors escapes the machine and enter to the environment. These vapors are dangerous for man, machine, clean room, structure & environment. Acidic Scrubber is used to dispose these acid vapors safely.

The scrubber is central part of system. It removes the acidic vapors by spraying alkaline water on the vapors. These acidic vapors contain HF & HCl molecule reacted with NaOH and converted to corresponding salts. These salts dissolved in the spraying alkaline water. The PP fab media is filled in the scrubber to increase the reaction area.

3.2.2.1 Description of Scrubbing System

The Acidic Scrubber have various parts mention below;

1. Inlet Ducting: The acidic vapors from production delivered to acidic scrubber via overhead polypropylene duct. The polypropylene is ideal material used for this type of application. The structure of polypropylene does not react with acidic vapors.

The polypropylene granules are available for various application. Sheet is made from these granules and these sheets welded along its length at once with special plastic machine to form ducts.

2. Blower & Chimney: The blower is used to create suction in the PP ducts & Scrubber. The acidic vapors pull in the duct and goes to the scrubber. The same blower is used to vent scrubbed air the environment via chimney.

The rotor and the body of blower is made with PPH Plastic. It is non-reactive material used for acidic applications. Schematic diagram of scrubbing system is presented in **Fig 3.2.**

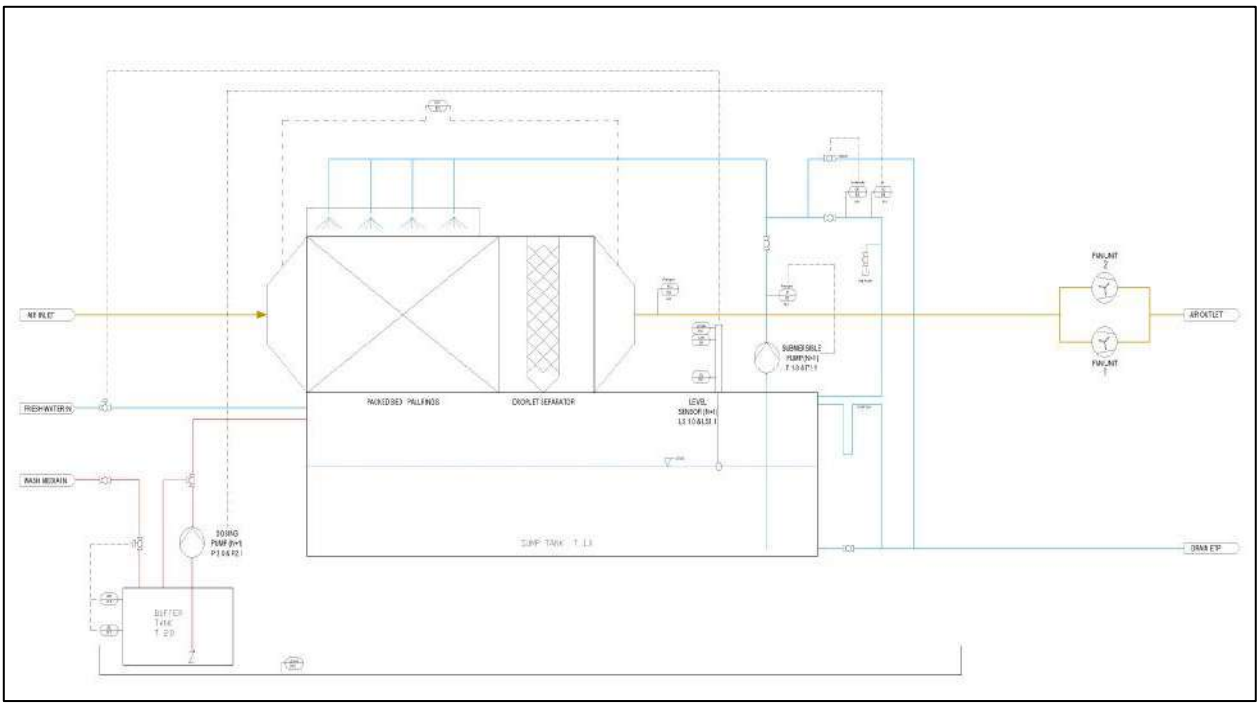


Fig 3.2 Schematic Diagram of Scrubbing System

3.2.3 Solid Waste

Total Solid Waste and Mode of Disposal

S.No.	Description	Unit	Quantity	Mode of Disposal
1	ETP Sludge	TPD	13.84	Sent to reuse / TSDF
2	Evaporation Salts	TPD	24	Sent to TSDF
4	Silica recovered from ETP	TPD	12.1	Sent to reuse
5	Oily waste	TPA	1	Sent to authorized agencies
6	Waste oils & Grease	KLPA	500	Sent to authorized agencies
7	Bio medical waste	Kg/ Month	200	Sent to authorized CBMWTF
8	Detoxified containers & bags	Nos/Month	300	Sent to authorized recyclers
9	Used PPE	TPM	0.5	Sent to authorized vendor
10	E- Waste including production reject	TPA	321.5	Authorized recyclers
11	Plastic Waste	TPA	10	Authorized recyclers
12	Metal Scrap	TPM	20	Sale to outside agencies/ recyclers
13	Used / Discarded RO Membranes cartridge	TPA	4	Sent to TSDF
14	Spent Resin	TPA	6	Sent to TSDF
15	Spent Anthracite	TPA	0.5	Sent to TSDF

4.0 Occupational Safety and Health

For safe operations, storage, handling the proposed unit will have common facilities like Fire Protection System, STP as well as special facilities like fire alarm system.

Operational safety

To ensure operational safety, need to familiar with and understand the safety signs used in this machine prior to the use of machine. Following step to be followed.

Instructions for use

- **Safety signs**-we will illustrate and explain the safety signs used in this machine.
- **Safety precautions**-we will warn the operators/engineer/supervisor of safety risks involved in the operation and Maintenance of machine and emphasize the importance of following the safe operation procedures.

Safety signs

Common Safety sign

We will paste safety sign wherever required on tool as per hazard requirements

- **Pinch hazard**-When the conveyor is running, do not put your finger into the timing wheel or timing belt area to avoid pinching.
- **Strong light Hazard**- Do not stare at the light source of camera when it is turned on to avoid injury to eyes.
- **Cutting of hands**- Do not put your hands into the working area of cutter or clamping devices when cutting. They are running to avoid the risk of hand.
- **Electric Sock**- Please take necessary measures against electric shock before opening the cabinet to do electrical work.
- **Hot surface**- The base plates of assembly conveyor are very hot while heating or shortly after heating. If you must touch the plates, please take proper precautions such as wearing heat-resistant gloves.

- **Crush Hazarded** - When the Upper String Pickup Arm is working, do not put your arms, head or any other parts of your body into its working any other parts of your body into its working area, to avoid the risk of crushing.

Device safety signs

- **Collision hazard from Traction Arm**- When the machine is working do not expose any part of your body into its working area, to avoid collision.

- **Electricity Hazard from Transformer**- When working on a transformer, take proper measures to avoid contact with electricity.

- **Hot surface hazard from servomotor**- The working servo motor will get hot. Take protective measures if you must touch it.

- **DO NOT hit servomotor**- Do not hit any servo motor during service.

- **Sign for soldering station**-The surface of soldering station is very hot and do not touch it with bare hands. The soldering station poses an electrical shock risk and please take proper precautions before making any necessary contact with it.

ROBOT safety Sign

- **Robot controller power lock out signage**- Before performing any maintenance and/or repair procedure to the controller, turn OFF the Controller and lock it out to prevent electric shock.

- **Robot controller residual voltage warning**- To prevent electric shock, do not open the cover of robot controller for electrical work when the controller is powered on or has been powered off for no more than 300 seconds.

- **Robot arm installation or removal from its base**- Before loosening the base mounting screws, hold the arm and secure it tightly with a band to prevent hands or fingers from being caught in the Manipulator.

- **Robot electricity hazard**- Hazardous voltage exists while the manipulator is ON. To avoid electric shock, do not touch any internal electric parts

- **Robot crush hazard-** You may catch your hand or fingers between the shaft and cover when bringing your hand close to moving parts.

- **Robot arm Collison hazard-** Do not enter the operation area while the manipulator is moving. The robot arm may collide the manipulator is moving. The robot arm may collide against the operator.

OHC (Occupational health center)

OHC to be built in manufacturing premises and trained person will be available 24X7 and all First aid facility/Medicine will be available in OHC for take care of any incident. First aid training shall be given to the selected members of emergency response team.

5.0 Prevention, maintenance, and operation of Environment Control System

The pollution control equipment and effluents will be monitored periodically and will be checked for its performance and pro-active maintenance will be adopted. The environmental monitoring results will be evaluated to identify the problems/under performance of the equipment. Necessary steps will be taken to rectify the identified problems/defects. All pollution control equipment are adequately sized and operating staff of the pollution control equipment will have good experience in the operation and maintenance of the equipment. Characteristics of influent and effluent are monitored on daily basis by the management and air emissions and effluent characteristics on monthly basis by third party.

6.0 Green Belt Development

The management will develop green belt in a total area of 16.25 acres covering the boundary of the site as part of environment management plan to enhance environmental quality through mitigation of fugitive emissions, attenuation of noise levels, balancing eco-environment, prevention of soil erosion, and creation of aesthetic environment.

7.0 Post Project Monitoring - in Plant

7.1 Air Pollution

The survey of air pollution comprises of the following monitoring aspects;

a. Ambient air quality survey

Ambient air quality survey is to be carried out by the industry to know the ground level concentrations time to time. Parameters like suspended particulate matter, sulfur dioxide, oxides of nitrogen will be monitored. The frequency of monitoring is preferably once in a month on 24-hour basis. The samples will be collected in accordance with the procedures given by CPCB.

7.2 Water Pollution

The wastewater generated requires continuous monitoring for raw effluent and treated effluent. Equipment and facilities for the measurement pH, Total suspended solids, Total dissolved solids, BOD, COD and Oil and Grease will be provided. The frequency of monitoring will be once in a day. The ground water samples from bore wells/wells surrounding the plant area are periodically monitored as per IS 10500. Methods of sample collection and preservation will be as per IS: 2488 (1966, 68, 74). Methods prescribed in "Standard Methods for Examination of Water and Wastewater" prepared and published jointly by American Public Health Association (APHA).

8.0 Other Management Practices

Proper housekeeping practices shall be adopted to maintain cleanliness and to minimize wastes, and reduce pollution. Proper parking place shall be provided adjacent to the industry for the heavy vehicles to avoid any congestion or blocking of the roads. Proper road safety signboards will be erected within the plant site to avoid road accidents. Raw materials and products are transported by road from the plant site. The staff of the vehicles transporting molasses are informed of the nature of the product and trained to manage exigencies due to spillage or accidents, before informing the competent authorities.

The industry will maintain the records as per the hazardous waste regulations and EPA regulations and apply for the annual consents for air and water, and renewal of

authorization for the storage of hazardous waste as per Hazardous Waste (Handling & Management) Rules, 1989. The records of hazardous waste manifest will be maintained.

The industry shall obtain the consent for operation (CFO) as required under section 25/26 of the Water Act, 1974 and under section 21/22 of Air Act, 1981 before trial production and commissioning from the State Pollution Control Board. The CFO will be renewed each year by the industry. The industry will obtain the necessary permissions under Hazardous Waste (Management and Handling) Rules 1989, and Manufacture, Storage, and Import of Hazardous Chemicals Rules, 1989, issued by the Ministry of Environment and Forests, New Delhi. The industry will submit environmental statement every year before September 30. The management ensures that it will comply with all the directions and regulations issued by the Ministry of Environment and Forests, New Delhi, State and Central Pollution Control Boards. The Consent for Establishment, Consent for Operation will be displayed in a conspicuous location for the information of the inspecting authorities of different departments.

ANDHRA PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE NELLORE
1st Floor, A P S F C Building,A K Nagar Nellore 524 004

Receipt.No.PCB/RO NELLORE/3129891 **Dated: 23-Feb-24**

Sub : APPCB – : RO NELLORE – M/s. Indosol Solar Private Limited, Sy. Nos. 584/9, 584/10, 584/11, Chevuru village, Gudluru mandal, Nellore district, Andhra Pradesh 500016 White Category Industry - Regarding.

Ref : 1) CPCB Lr.No.B – 29012/ESS/CPA/2015-16, Dated 07.03.2013.
2) B.O. Circular Memo No.7/APPCB/HO/CFO-UH.IV/2016, dated 21.03.2016.
3) Your Application No 3129891 Date 23-Feb-24

******

With reference to your information submitted to the A.P. Pollution Control Board through Single Desk Portal vide reference 3 rd cited for establishment of **Solar module non conventional energy apparatus manufacturing unit** in the name and style M/s. **Indosol Solar Private Limited, Sy. Nos. 584/9, 584/10, 584/11, Chevuru village, Gudluru mandal, Nellore district, Andhra Pradesh** Andhra Pradesh, your proposed activity vide reference 1 st cited comes under White Category Industry as per the CPCB Classification. White category industry does not require Consent from A.P.Pollution Control Board and an intimation to the concerned SPCB/PCC shall sufficient.

Please note that:

1. The industry shall not cause any air/water pollution problems to the surrounding environment if any.
2. The industry shall take all necessary measures to control the odour nuisance to the surroundings if any.
3. If line of activity changes from White to Green/Orange/Red or in case of any modifications in the process / operations, the industry will require to obtain consent from the Board under Water and Air acts.
4. The Board reserves its right to stipulate any additional conditions or to take any action in case any change in line of activity.
5. In case of submission of any false information to the Board by the industry vide reference 3rd cited, this receipt stands cancelled.

To
M/s. Indosol Solar Private Limited,
Sy. Nos. 584/9, 584/10, 584/11, Chevuru village, Gudluru mandal, Nellore district, Andhra Pradesh 500016

INDOSOL SOLAR PVT. LTD.

SY. NOS. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, CHEVURU VILLAGE, GUDLURU MANDAL, SPSR NELLORE DISTRICT, ANDHRA PRADESH

STUDIES AND DOCUMENTATION BY
TEAM Labs and Consultants
QCI: MoE&F OM, List A-1, S.No. 150.
(An ISO 9001:2008, ISO 14001:2004 &
OHSAS 18001:2007 Certified Organization)
B-115, Annapurna Block, Aditya Enclave
Ameerpet, Hyderabad-500 038.
Phone: 040-23748 555/616,
Telefax: 040-23748666
Email: teamlabs@gmail.com

Annexure - IV

ANDHRA PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE :: NELLORE.
PLOT.NO.1, PRASANTHI NAGAR, NEAR NELLORE CLUB, NELLORE - 524004.
Phone No: 0861-2329730 e-mail: ronlr-ee1@appcb.gov.in

LiFE Lifestyle for Environment

Lr.No: GN/PCB/RO/NLR/2024- 224 **Date.25.06.2024**

Sub: APPCB - RO, Nellore - **M/s. Indosol Solar Pvt. Ltd. Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District**- Applications for CTE of the Board - Govt. of A.P. fee structure - Balance fee to be paid - Reg.

Ref:
1. EFS&T (Sec.1) G.O. Ms.No.14 dated 26.02.2021 and the Andhra Pradesh Gazette Notification No. 103 dated 26.02.2021.
2. CTE application dt: 03.06.2024 filed through OCMMS vide application id: 3394532.
3. T.O.Lr.No.GN/PCB/RO-NLR/2024-144 dt.12.06.2024
4. Your letter dt.21.06.2024.

****

It is to inform that this Office is in receipt of your CTE application filed through single desk by paying CTE fee of Rs.15,00,000/-through online vide challan No.200111667 dt.03.06.2024 on the project cost of Rs.2000 Crores under Orange category vide reference 2nd cited.

Vide reference 4th cited, you have submitted that the activity falls under Red category miscellaneous. Accordingly, the proposed industrial activity considered under Red category. In this regard, you are required to pay balance fee of Rs.15,00,000/- towards CTE fee on the project cost of Rs.2000 Crores under Red Category as per revised fee structure.

Hence, you are hereby directed to pay balance **CTE fee of Rs.15,00,000/-** in the form of Demand Draft (DD) in favour of **"A.P. Pollution Control Board"** payable at Nellore (or) RTGS/ NEFT to **Account No:52078995023 in the name of Andhra Pradesh Pollution Control Board, IFSC Code: SBIN0020897, Branch: State Bank of India, Dargamitta, Nellore** for further process of your CTE application.

ENVIRONMENTAL ENGINEER

To
M/s. Indosol Solar Private Limited
16th Floor, Aurobindo Galaxy Towers,
Hitech City Road, opp. IKEA, Hyderabad,
Telangana-500081

ANDHRA PRADESH POLLUTION CONTROL BOARD
REGIONAL OFFICE :: NELLORE.
PLOT.NO.1, PRASANTHI NAGAR, NEAR NELLORE CLUB, NELLORE - 524004.
Phone No: 0861-2329730 e-mail: ronlr-ee1@appcb.gov.in

LiFE Lifestyle for Environment

Lr.No: GN/PCB/RO/NLR/2024- 412 **Date.26.07.2024**

Sub: APPCB - RO, Nellore - **M/s. Indosol Solar Pvt. Ltd. Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District**- Applications for CTE of the Board - Clarification Sought-Reg.

Ref:
1. EFS&T (Sec.1) G.O. Ms.No.14 dated 26.02.2021 and the Andhra Pradesh Gazette Notification No. 103 dated 26.02.2021.
2. CTE application dt: 03.06.2024 filed through OCMMS vide application id: 3394532.
3. T.O.Lr.No.GN/PCB/RO-NLR/2024-144 dt.12.06.2024
4. Your letter dt.21.06.2024.
5. T.O. GN/PCB/RO-NLR/2024-224 dt.25.06.2024.
6. Additional fee paid on 08.07.2024.

****

With reference to the above, this office received a CTE application from your industry to establish a manufacturing unit to produce Solar photovoltaic cells and wafers at Chevuru Village, Gudluru Mandal, SPSR Nellore District under the orange category with an investment of Rs.2000 Crores.

On pre-scrutiny of the application, this office, vide reference 3rd cited sought clarification on certain issues, and the industry, vide reference 4th cited, submitted a partial reply. It is required to clarify the following:

1. This office vide lr. dated.12.06.2024, sought clarification that *"The manufacturing process involves metallurgical operations (processing of silicon, carbon, etc.), which attracts EIA notification,2006. Hence, prior Environmental Clearance from the MoEF&CC, GoI, is required. The Board vide reference 2nd cited directed that the CFE/CFO applications received without EC order (for category A&B projects) shall not be processed and shall be rejected at RO Level itself".*

   The industry vide lr.dated.21.06.2024, reported that the key raw material for proposed Solar Photovoltaic Cells and Wafers manufacturing is Polysilicon, which will be brought from outside (From China, Taiwan). There is no manufacturing of Polysilicon (Raw material) by processing of silicon, carbon etc., which does not attract prior EC.

   But, In the EMP, it is proposed to produce CZ mono c-Si ingot and wafer production, which involves melting of Polysilicon Chunks, Purification, Mono c- Si Ingot preparation, which attracts EIA Notification,2006.

2. This office vide lr. dated.12.06.2024, sought clarification that "*The industry proposes to consume 10,365 KLD of raw water and effluent will be 7,509 KLD. After considering the recycled water, the overall water consumption will be 4,135 KLD, which is proposed to be drawn through a borewell. The industry needs to study the impacts in this regard*".

   The industry vide lr.dated.21.06.2024, reported that "the unit obtained permission from Industries & Commerce Department, Government of Andhra Pradesh vide G.O.Ms. No. 112 dated 09.11.2023 for allocation of water from nearby minor ponds (Ravuru Chevuru, Chevuru mini tank, Chennapalayam, pond) (Copy of G.O.Ms. No. 112 dated 09.11.2023 enclosed at Annexure I). No ground water is used for proposed Solar Photovoltaic cells and Wafers manufacturing".

   But, the G.O.Ms. No. 112 dated 09.11.2023 indicates that the Water Resource Department is requested to explore the possibility of allocation of minor ponds (Ravuru Chevuru, Chevuru mini tank, Chennapalayam pond) near to the project area to be used for water drawl and meeting the water storage requirements of the project. This G.O is not an allocation of Water to the proposed project.

3. The industry proposes to use highly corrosive and toxic substances such as Hydrofluoric acid, Hydrogen peroxide, Silane, Ammonia, Nitrous oxide, Tri-methyl amine, and Polyurethane etc.; the industry needs to submit the proposed storage details of the chemicals along with the safety measures that are proposed to be provided.

   The industry submitted the list of Hazardous raw materials with storage details and generic safety measures. But, not provided the specific safety measures proposed while handling the Hazardous chemicals. It is required to provide specific safety measures proposed keeping in view of the habitation at a distance of about 200m.

Hence, you are hereby directed to submit factual information regarding the proposed project for processing of the CTE application.

ENVIRONMENTAL ENGINEER

To
The Occupier,
M/s. Indosol Solar Private Limited
16th Floor, Aurobindo Galaxy Towers,
Hitech City Road, opp. IKEA, Hyderabad,
Telangana-500081.

Copy submitted to the Joint Chief Environmental Engineer, Zonal office, Tirupati for favour of information.

Annexure - V

INDOSOL
INDOSOL SOLAR PRIVATE LIMITED

A Subsidiary of SSE

Date: 23.09.2024

To,

The Environment Engineer
Andhra Pradesh State Pollution Control Board,
Regional Office, Nellore.

Sub: CFE Clarifications for proposed Solar Photovoltaic (PV) Cells and Solar Photovoltaic (PV) Wafers manufacturing unit by **M/s. Indosol Solar Pvt. Ltd.** at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru village, Gudluru mandal, SPSR Nellore district, Andhra Pradesh – reg.

Ref: 1. Lr. No. GN/PCB/RO-NLR/2024-412 dated 26.07.2024

Respected Sir,

With reference to above clarification Lr. No. GN/PCB/RO-NLR/2024-412 dated 26.07.2024, we herewith submit the point wise response;

<table>
<tr><td>1</td><td>The manufacturing process involves metallurgical operations (processing of silicon, carbon etc.) which attracts EIA notification, 2006. Hence, prior Environment Clearance from the MoEF&CC GoI is required. The Board vide reference 2nd cited directed that the CFE/CFO applications received without EC order (for category A & B projects) shall not be processed and shall be rejected at RO level itself.</td></tr>
<tr><td></td><td>The key raw material for proposed Solar Photovoltaic Cells and Wafers manufacturing is Polysilicon, which will be brought from outside (From China, Taiwan).

There is no manufacturing of Polysilicon (Raw material) by processing of silicon, carbon etc. which does not attract prior EC.

<table>
<tr><td>Raw material</td><td>Unit</td><td>Consumption Quantity</td></tr>
<tr><td>Polysilicon – Virgin Size Small</td><td>Kgs/Annum</td><td>21,99,900</td></tr>
<tr><td>Polysilicon – Virgin Size Big Size</td><td>Kgs/Annum</td><td>3,88,218</td></tr>
<tr><td>Total</td><td>Kgs/Annum</td><td>25,88,118</td></tr>
<tr><td></td><td>Tons/Annum</td><td>2588.12</td></tr>
<tr><td></td><td>MmTPA</td><td>0.0026</td></tr>
</table>
</td></tr>
</table>

Ministry of Environment, Forest and Climate Change (MoEFCC) issued a Notification S.O. 2215 (E) dated 07.06.2024, mention the following;

"Process involving melting of nontoxic metals;

Fuel in the furnace	Category B2	Category B1
1. Solid or Liquid Fuel	≥ 0.03 MTPA to < 0.06MTPA	≥ 0.06 MTPA
2. Gas fuel or electricity	≥ 0.06 MTPA to < 0.12 MTPA	≥ 0.12 MTPA

(Copy of notification enclosed)

Our proposed raw material consumption quantity is only 0.0026 MTPA, which does not attract prior Environment Clearance from the MoEF&CC.

2	**The industry proposes to consume 10365 KLD of raw water and effluent will be 7509 KLD. After considering recycled water, the overall water consumption will be 4135 KLD, which is proposed to be drawn through bore-well. The industry needs to study the impacts in this regard.**
	Please refer G.O.MS.No.66 dated 15-09-2022, Sr. No. 6.ix. Industries and commerce (P&I) department, Govt. of Andhra Pradesh, allocated 50MLD water from Sangam Barrage.. (A copy of GO No. 66 dated 15.09.2022 is attached)

3. Specific safety measures for handling Hazardous Chemicals.

Specific Safety Measures - Liquids

S. NO.	CHEMICALS NAME	HAZARDS IDENTIFICATION	ACCIDENTAL RELEASE MEASURES	FIRST AID MEASURES
1	**Hydrogen Peroxide (31%)**	**Emergency Overview** Color: colorless Physical state: liquid Odor: pungent **Classification of the substance or mixture:** Oxidizing liquids, Category 2, H272 Oral: Acute toxicity, Category 4, H302 Serious eye damage, Category 1, H318 Specific target organ toxicity - single exposure, Category 3, H335 Chronic aquatic toxicity, Category 3, H412 *For the full text of the	**In case of spill or leak:** Prevent further leakage or spillage if you can do so without risk. Evacuate area of all unnecessary personnel. Ventilate the area. Eliminate all ignition sources. Avoid generation of vapors. Avoid contact with cellulose, paper, sawdust or similar substances. Risk of self-ignition or promotion of fires. Combustible materials exposed to hydrogen peroxide should be rinsed immediately with large amounts of water to ensure that all the	1.**Inhalation:**If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. 2.**Skin:**In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. 3. **Eyes: In** case of contact, immediately flush eyes with plenty

		H-Statements mentioned in this Section, see Section 16. **Precautionary statements:** **Prevention:** P210 : Keep away from heat. P220 : Keep/Store away from clothing/ combustible materials. P221 : Take any precaution to avoid mixing with combustibles. P261 : Avoid breathing gas/mist/vapours/spray. P264 : Wash skin thoroughly after handling. P270 : Do not eat, drink or smoke when using this product. P271 : Use only outdoors or in a well-ventilated area. P273 : Avoid release to the environment. P280 : Wear protective gloves/ eye protection/ face protection. **Response:** P301 + P312 : IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. P304 + P340 : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for .	hydrogen peroxide is removed. Contain and collect spillage with non-combustible absorbent material such as clean sand, earth, diatomaceous earth or non-acidic clay and place into suitable properly labeled containers for prompt disposal. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Consult a regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits	of water for at least 15 minutes. Get medical attention immediately 4.**Ingestion:**If swallowed, DO NOT induce vomiting unless directed to do so by medical personnel. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person. Rinse mouth. 5. **Notes to physician:** Exposure to material may cause delayed lung injury resulting in pulmonary edema and pneumonitis. Exposed individuals should be monitored for 72 hours after exposure for the onset of delayed respiratory symptoms.
2	**Hydrochloric acid 32% (HCl)**	**Classification according to Regulation (EC) No 1272/2008** Corrosive to Metals	**1.Personal precautions, protective equipment and emergency procedures** Advice for non-emergency	**Description of first-aid measures** **1.General advice** First aiders need to protect themselves

		(Category 1), H290 Skin corrosion (Sub-category 1B), H314 Serious eye damage (Category 1), H318 Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335 For the full text of the H-Statements mentioned in this Section, see Section 16. **Label elements** Labelling according Regulation (EC) No 1272/2008 Pictogram Signal word Danger Hazard statement(s) H290 May be corrosive to metals. H314 Causes severe skin burns and eye damage. H335 May cause respiratory irritation. Precautionary statement(s) P234 Keep only in original packaging. P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray. P271 Use only outdoors or in a well-ventilated area. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection/ hearing protection. P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.	personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8. **2. Environmental precautions** Do not let product enter drains. **3. Methods and materials for containment and cleaning up** Cover drains. Collect, bind, and pump off spills.Observe possible material restrictions. Take up with liquid-absorbent and neutralising material (e.g. Chemizorb® H^+, Merck Art. No. 101595). Dispose of properly. Clean up affected area.	2.**If inhaled** After inhalation: fresh air. Call in physician. 3.**In case of skin contact** In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately. 4.**In case of eye contact** After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses. 5.**If swallowed** After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise. 6.**Most important symptoms and effects, both acute and delayed** The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

		P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **Other hazards** This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.		
3	**Hydrofluoric Acid (45-46%)**	Classification Section Hazard class Category Hazard class and category Hazard statement **Section Class** 2.16 substance or mixture corrosive to metals 3.1O acute toxicity (oral) 2 Acute Tox. 2 H300 3.1D acute toxicity (dermal) 1 Acute Tox. 1 H310 3.1I acute toxicity (inhal.) 2 Acute Tox. 2 H330 3.2 skin corrosion/irritation 1A Skin Corr. 1A H314 3.3 serious eye damage/eye irritation 1 Eye Dam. **The most important adverse**	**Personal precautions, protective equipment and emergency procedures** **For non-emergency personnel** Remove persons to safety. Ventilate affected area. Do not get in eyes, on skin, or on clothing. Do not breathe dust/fume/gas/mist/ vapours/spray. Wearing of suitable protective equipment (including personal protective equipment referred to under Section 8 of the safety data sheet) to prevent any contamination of skin, eyes and personal clothing. **For emergency responders** Wear breathing apparatus if exposed to vapours/dust/spray/ gases.	**General notes** Self-protection of the first aider. Remove victim out of the danger area. Take off immediately all contaminated clothing. Symptoms may develop several hours following exposure; medical observation therefore necessary for at least 48 hours. In all cases of doubt, or when symptoms persist, seek medical advice. In case of unconsciousness place person in the recovery position. Never give anything by mouth. Hydrofluoric acid 40 - 45% United Kingdom: en Page: 3 / 19 **Following inhalation**

		physicochemical, human health and environmental effects Skin corrosion produces an irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis. Spillage and fire water can cause pollution of watercourses. **Hazard statements** **H290** May be corrosive to metals. **H300+H310+H330** Fatal if swallowed, in contact with skin or if inhaled. **H314** Causes severe skin burns and eye damage. Precautionary statements **P234** Keep only in original container. **P261** Avoid breathing mist/vapours/spray. **P280** Wear protective gloves/protective clothing/eye protection/face protection. **P301+P330+P331** IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. **P303+P361+P353** IF ON SKIN (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower. **P304+P340** IF INHALED: Remove person to fresh air and keep comfortable for breathing	Warning and evacuating people in the neighbourhood. **Environmental precautions** In case of formation of gases/vapours/mists suppress with water spray Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority. **Methods and material for containment and cleaning up** **Advices on how to clean up a spill** Collect spillage. Absorbent material (e.g. sand, diatomaceous earth, acid binder, universal binder, sawdust, etc.). **Appropriate containment techniques** Neutralisation techniques. Use of adsorbent materials. **Other information relating to spills and releases** Place in appropriate containers for disposal. Ventilate affected area.	Provide fresh air. Mouth to mouth resuscitation should be avoided. Use alternative methods, preferably with oxygen or compressed air driven apparatus. If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. **Following skin contac**t After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water and soap. Rub with a gel containing calcium gluconate. Call a physician immediately. Causes poorly healing wounds. **Following eye contact** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Remove contact lenses, if present and easy to do. Continue rinsing. Rinse copiously with a calcium gluconate solution. **Following ingestion** Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting. 1%ige Calciumgluconat-

		P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P310** Immediately call a POISON CENTER/doctor.		Lösung in kleinen Schlucken trinken lassen (wenn nicht verfügbar: ersatzweise Milch oder Kreideaufschwemmung, sonst Wasser). Call a physician in any case. **Most important symptoms and effects, both acute and delayed** Nausea, Vomiting. Causes poorly healing wounds. Fatal if swallowed, in contact with skin or if inhaled. Causes severe skin burns and eye damage.
4	**Nitric Acid (69%)**	**Classification of the substance or mixture** **Classification according to Regulation (EC) No 1272/2008** Oxidizing liquids (Category 3), H272 Corrosive to metals (Category 1), H290 Skin corrosion (Category 1A), H314 Hazard statement(s) **H272** May intensify fire; oxidizer. **H290** May be corrosive to metals. **H314** Causes severe skin burns and eye damage. **EUH071** Corrosive to the respiratory tract. Precautionary statement(s) **P210** Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.	**1.Personal precautions, protective equipment and emergency procedures** Evacuate personnel to safe areas. Do not breathe vapors or spray mist. Wear a positive-pressure supplied-air respirator, flame retardant antistatic protective clothing. Shut off leaks if without risk. Keep people away from and upwind of spill/leak. **2. Environmental precautions** Contain or absorb leaking liquid with sand or earth, consults an expert. Prevent liquid entering sewers, basements and workpits. If substance has entered a water course or sewer or contaminated soil, advise police. **3. Methods and materials for containment and cleaning up**	**Description of first aid measures** **General advice** Show this safety data sheet to the doctor in attendance. **Inhalation** Move to fresh air in case of accidental inhalation of vapors. Keep patient warm. In case of shortness of breath, give oxygen. Apply artificial respiration only if patient is not breathing or under medical supervision. No artificial aspiration mouth to mouth or mouth to nose. Use suitable instruments/apparatus. **Skin contact** Remove contaminated clothing and wash affected skin with soap and water. Dab with

		P220 Keep away from clothing and other combustible materials. **P234** Keep only in original packaging. **P260** Do not breathe fume/gas/mist/vapours/spray. **P264** Wash hand thoroughly after handling. **P280** Wear protective gloves/protective clothing/eye protection/face protection. **P301 + P330 + P331** IF SWALLOWED: Rinse mouth. Do NOT induce vomiting	Spillage : soak up with inert absorbent material (e.g. sand, silica gel). Prevent liquid entering sewers, basements and workpits; vapor may create explosive atmosphere. Transfer to covered drums. Dispose of promptly.	polyethylene glycol 400. If signs of poisoning appear, treat as for inhalation. Obtain medical attention. Wash contaminated clothing before reuse. **Eye contact:** If the substance has got into the eyes, immediately wash out with plenty of water at least 15 minutes. Obtain medical attention. **Ingestion** Rinse mouth. Do not induce vomiting. Keep patient warm. In case of shortness of breath, give oxygen. Apply artificial respiration only if patient is not breathing or under medical supervision. No artificial aspiration mouth to mouth or mouth to nose. Use suitable instruments/apparatus. Obtain medical attention. Never give anything by mouth to an unconscious person. **Indication of any immediate medical attention and special treatment needed** After swallowing: make victim drink water (two glasses at the most), avoid vomiting, risk of perforation. Immediately call in physician. Do not attempt to neutralize.

5	**Potassium Hydroxide (40%)**	**Classification of the substance or mixture** Classification according to Regulation (EC) No 1272/2008 Skin irritation (Category 1A), H314 Acute oral toxicity (Category 4), H302 Hazard statement(s) H314 Causes severe skin burn and eye damage. H302 Causes serious eye irritation. Precautionary statement(s) P280 Wear protective gloves, protective clothing, eye protection, face protection. P260 Do not breathe dust, fume, gas, mist, vapours, spray. P264 Wash thoroughly after handling. **P270** Do not eat, drink or smoke when using this product. **P301 + P330 + P331** IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. **P305 + P351 + P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P304 + P340** IF INHALED : Remove to fresh air and keep at rest in a position comfortable for breathing. **P303 + P361 + P353**	**Personal precautions, protective equipment and emergency procedures** For emergency responders: Equip cleanup crew with proper protection. Ventilate area. For non-emergency personnel: Evacuate unnecessary personnel. **Environmental precautions** Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters. **Methods and materials for containment and cleaning up** Clean up methods: Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.	**General advice** Consult a physician. Show this safety data sheet to the doctor in attendance. **If inhaled** Immediately call a POISON CENTER or doctor. Remove to fresh air and keep at rest in a position comfortable for breathing. **In case of skin contact** Immediately call a POISON CENTER or doctor. Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing. **In case of eye contact** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor. **If swallowed** Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor. **Most important symptoms and effects, both acute and delayed** Symptoms relating to use : Causes severe skin burns and eye damage. Swallowing a small quantity of this material will result in serious health

		IF ON SKIN (or hair) : Remove immediately all contaminated clothing. Rinse skin with water/ shower. **P405** Store locked up. **P501** Dispose of this material and its container to hazardous or special waste collection point, in accordance with local, regional, national and/ or international regulation.		hazard. **Indication of any immediate medical attention and special treatment needed** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
6	**Sodium Hydroxide (48%)**	**Classification of the substance or mixture** **Classification acc. to GHS** **Section** **Hazard class** **Categor**y 2.16 Substance or mixture corrosive to metals 1 Met. Corr. 1 H290 3.2 Skin corrosion/irritation 1A Skin Corr. 1A H314 3.3 Serious eye damage/eye irritation 1 Eye Dam. 1 H318 **The most important adverse physicochemical, human health and environmental effects** Skin corrosion produces an irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis. **Precautionary statements** **Precautionary**	**Personal precautions, protective equipment and emergency procedures** For non-emergency personnel Use personal protective equipment as required. Avoid contact with skin, eyes and clothes. Do not breathe vapour/spray. **Environmental precautions** Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. **Methods and material for containment and cleaning up** Advice on how to contain a spill Covering of drains. **Advice on how to clean up a spill** Absorb with liquid-binding material (sand, diatomaceous earth, acid- or universal binding agents). **Other information relating to spills and releases**	**General notes** Take off immediately all contaminated clothing. Self-protection of the first aider. **Following inhalation** Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice. **Following skin contact** After contact with skin, wash immediately with plenty of water. Immediate medical treatment required because corrosive injuries that are not treated are hard to cure. **Following eye contact** In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist. Protect uninjured eye. **Following ingestion**

		statements - prevention P260 Do not breathe dusts or mists P280 Wear eye protection/face protection **Precautionary statements - response** **P303+P361+P353** IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower **P305+P351+P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing **P390** Absorb spillage to prevent material damage **Precautionary statements - disposal** P501 Dispose of contents/container to industrial combustion plant **Hazardous ingredients for labelling:** Sodium hydroxide	Place in appropriate containers for disposal.	Rinse mouth immediately and drink plenty of water. Call a physician immediately. If swallowed danger of perforation of the esophagus and the stomach (strong corrosive effects). **Most important symptoms and effects, both acute and delayed** Corrosion, Cough, Breathing difficulties, Gastric perforation, Risk of serious damage to eyes, Risk of blindness.

Specific Safety Measures – Gases

S. No.	GAS NAME	HAZARDS IDENTIFICATION	ACCIDENTAL RELEASE MEASURES	FIRST AID MEASURES
1	Silane	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas PYROPHORIC GASES - Category 1 ACUTE TOXICITY (inhalation) - Category 4 **Signal word / Hazard statements -** Danger Extremely flammable gas. Catches fire spontaneously if exposed to air. Contains gas under pressure; may explode if heated. Harmful if inhaled. May displace oxygen and cause rapid suffocation. May form explosive mixtures with air. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel" **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for**	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To

		when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution. **Prevention** - Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid breathing gas. **Response** - Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. IF INHALED: Call a POISON CENTER or doctor if you feel unwell. IF ON SKIN: Immerse in cool water or wrap in wet bandages. **Storage** - Protect from sunlight. Store in a well-ventilated place.	**containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
2	Ammonia	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** FLAMMABLE GASES - Category 2 GASES UNDER PRESSURE - Liquefied gas	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated

		ACUTE TOXICITY (inhalation) - Category 4 SKIN CORROSION - Category 1 SERIOUS EYE DAMAGE - Category 1 AQUATIC HAZARD (ACUTE) - Category 1 **Signal word / Hazard statements -** Danger Flammable gas. May form explosive mixtures with air. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. Harmful if inhaled. Causes severe skin burns and eye damage. Very toxic to aquatic life. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution. **Prevention** - Wear protective gloves. Wear eye or face protection. Wear	area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage. **Methods and materials for containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use	promptly by a physician. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately. Call medical doctor or poison control center immediately. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention

		protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing gas. Wash hands thoroughly after handling. **Response** - Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. **Storage** - Store locked up. Protect from sunlight. Store in a well-ventilated place.	spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

		Disposal - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.		
3	Nitrous Oxide	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 **Signal word / Hazard statements -** Danger May cause or intensify fire; oxidizer. Contains gas under pressure; may explode if heated. May cause drowsiness or dizziness May displace oxygen and cause rapid suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or

		children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service. Always keep container in upright position. **Prevention** - Keep away from clothing and other combustible materials. Keep reduction valves, valves and fittings free from oil and grease. Use only outdoors or in a well-ventilated area. Avoid breathing gas. **Response** - Call a POISON CENTER or doctor if you feel unwell. In case of fire: Stop leak if safe to do so. **Storage** - Store locked up. Store in a well-ventilated place. Keep container tightly closed. Protect from sunlight. **Disposal** - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - : In addition to any other important health or physical hazards, this	equipment. **Methods and materials for containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact**: No known significant effects or critical hazards. **Inhalation**: Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. **Skin contact**: No known significant effects or critical hazards. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Can cause central nervous system (CNS) depression. As this product is a gas, refer to the inhalation section. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The

		product may displace oxygen and cause rapid suffocation.		exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
4	Trimethylaluminum	**2.1 Classification of the substance or mixture** Classification according to Regulation (EC) No 1272/2008 Flammable liquids (Category 2), H225 Pyrophoric liquids (Category 1), H250 Substances and mixtures which in contact with water emit flammable gases (Category 1), H260 Skin corrosion (Sub-category 1B), H314 Serious eye damage (Category 1), H318 Reproductive toxicity (Category 2), H361d Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336	**Personal precautions, protective equipment and emergency procedures** - Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, and consult an expert. **Environmental precautions** - Do not let product enter drains. Risk of explosion. **Methods and materials for containment and cleaning up** - Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions. Take up carefully with	**General advice** - First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance. **If inhaled** - After inhalation: fresh air. Call in physician. **In case of skin contact** - In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately. **In case of eye contact** - After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses. **If swallowed** - After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of

		Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373 Aspiration hazard (Category 1), H304 Long-term (chronic) aquatic hazard (Category 3), H412 **Signal Word** - Danger **Hazard statement(s) -** H225 Highly flammable liquid and vapor. H250 Catches fire spontaneously if exposed to air. H260 In contact with water releases flammable gases which may ignite spontaneously. H304 May be fatal if swallowed and enters airways. H314 Causes severe skin burns and eye damage. H336 May cause drowsiness or dizziness. H361d Suspected of damaging the unborn child. H373 May cause damage to organs (Central nervous system) through prolonged or repeated exposure. H412 Harmful to aquatic life with long lasting effects. **Precautionary statement(s)** - P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P231 + P232 Handle and store contents under inert gas. Protect from	liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.	perforation). Pulmonary failure possible after aspiration of vomit. Call a physician immediately. Do not attempt to neutralise.

		moisture. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **Supplemental Hazard information (EU)** EUH014 Reacts violently with water.		
5	Phosphene Hydrogen Mixture (8%PH3/92% H2)	**Classification according to Regulation** **Physical hazards** - Flammable gases, Category 1 H220 Gases under pressure : Liquefied gas H280 Skin corrosion/irritation, Category 2 H315 Serious eye damage/eye irritation,	**Personal precautions, protective equipment and emergency procedures** - Avoid breathing vapours, spray mists or gases Provide adequate ventilation Eliminate ignition sources Evacuate personnel to a safe place Beware of vapours that accumulate	**General advice** - See a doctor. Show the safety data sheet to the attending physician **In case of inhalation** - In case of inhalation, remove the person from the contaminated area. **In case of respiratory arrest** - give artificial respiration. See a doctor **In case of skin contact** - Remove

		Category 1 H319 Acute toxicity (inhalation: gas) Category 2 H330 Specific target organ toxicity - Single exposure, Class 3, Respiratory tract irritation H335 **Signal word** - Danger **Hazard statements** - H220 Extremely flammable gas H280 Contains gas under pressure; may explode if heated H315 Causes skin irritation H319 Causes serious eye irritation H330 Fatal if inhaled H335 May cause respiratory irritation **Precautionary statements** - P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking P260 Do not breathe gas, vapours P280 Wear protective gloves, protective clothing, eye protection, face protection P302+P352+P315 IF ON SKIN: Wash with plenty of soap and water. Get immediate medical advice/attention P304+P340+P315 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention P305+P351+P338+P315 IF IN EYES: Rinse cautiously with water for	forming explosive concentrations. Vapours may accumulate in low areas **Personal protective equipment** - Goggles, Face Shield & Protective Gloves **Environmental precautions** - Try to stop the leak **Methods and material for containment and cleaning up** - Ventilate the area Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost)	contaminated clothing and shoes immediately. Wash with soap and plenty of water. Take victim immediately to hospital. See a doctor **In case of eyes contact** - Rinse thoroughly with plenty of water for at least 15 minutes and consult a doctor **In case of ingestion** - Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. See a doctor **Most important symptoms and effects, both acute and delayed** - At high concentrations can cause asphyxiation. Symptoms may include loss of mobility/consciousness. The victim may not be aware of the asphyxia May cause corneal irritation (with temporary visual disturbance) May cause skin irritation. May cause respiratory tract irritation, sneezing, coughing, burning throat, constricted larynx and difficulty breathing **Indication of any immediate medical attention and special treatment needed** - Consult a doctor immediately

		several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely P381 In case of leakage, eliminate all ignition source P410+403 Protect from sunlight. Store in a well-ventilated place P405 Store locked up		
6	Boron Trichloride	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas ACUTE TOXICITY (inhalation) - Category 3 SKIN CORROSION - Category 1 SERIOUS EYE DAMAGE - Category 1 **Signal word / Hazard statements -** Danger Contains gas under pressure; may explode if heated. Toxic if inhaled. Causes serious eye damage. Causes severe skin burns and eye damage **Precautionary statements - General** - Read and follow all Safety	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with	**Eye contact** - Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. **Inhalation** - Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be

		Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. **Prevention** - Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling. **Response** - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for	accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Chemical burns must be treated promptly by a physician. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an

		several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. **Storage** - Store locked up. Protect from sunlight. Store in a well-ventilated place. **Disposal** - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - Liquid can cause burns similar to frostbite.		unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Causes serious eye damage. Liquid can cause burns similar to frostbite. **Inhalation** : Toxic if inhaled. **Skin contact** : Causes severe burns. Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : Adverse symptoms may include the following:, pain, watering, redness, frostbite **Inhalation** : No specific data. **Skin contact** : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur, frostbite **Ingestion** : Adverse symptoms may include the following:, frostbite,

				stomach pains. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
7	Nitrogen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas SIMPLE ASPHYXIANTS **Signal word / Hazard statements -** Warning Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. May displace oxygen and cause rapid	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest

		suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. **Prevention** - Not applicable. **Response** - Not applicable **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : At very high concentrations, can displace the normal air and cause suffocation from lack of

				oxygen. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
8	Oxygen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or**	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10

		mixture: OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Compressed gas **Signal word / Hazard statements -** Danger May cause or intensify fire; oxidizer. Contains gas under pressure; may explode if heated. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service. **Prevention** - Keep away from clothing and other combustible materials. Keep reduction valves, valves and fittings free from oil and grease.. **Response** - In case of fire: Stop leak if safe to do so. **Storage** - Protect from sunlight. Store	personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use	minutes. Get medical attention. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : No known significant effects or critical hazards.

		in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - None known.	spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
9	Argon	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

		SIMPLE ASPHYXIANTS **Signal word / Hazard statements -** Warning Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. **Prevention** - Not applicable **Response** - Not applicable. **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.

				Inhalation : No known significant effects or critical hazards. Acts as a simple asphyxiant. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
10	Hydrogen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses.

		Classification of the substance or mixture: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas **Signal word / Hazard statements -** Danger Extremely flammable gas. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. Burns with invisible flame. May form explosive mixtures with air. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution. **Prevention** - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. **Response** - Leaking gas fire: Do not	without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.** **Methods and materials for containment and cleaning up (Large**	Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** -

		extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	**Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : No known significant effects or critical hazards. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Kindly process our application for CFE at the earliest

Thanking you,

Yours Sincerely,
Pothireddy Manoj Kumar Reddy
(EA to CMD)
Indosol Solar Pvt. Ltd.
Hyderabad Knowledge City,
TSIIC Raidurg, Hitech City Road,
Hyderabad, Telangana 50008

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

Industrial Promotion – M/s Indosol Solar Pvt. Ltd. (ISPL) proposes to setup an Integrated solar PV module manufacturing facility along with in-house Float glass manufacturing facility at Ramayapatnam, SPSR Nellore District – Extending a special package of incentives under Mega Project Category - Orders- Issued.

INDUSTRIES AND COMMERCE (P&I) DEPARTMENT

G.O.MS.No.66 Dated: 15-09-2022.
Read the following.

1. From M/s Indosol Solar Pvt. Ltd. (ISPL) dated 27.07.2022
2. Minutes of State Investment Promotion Committee meeting held on 29.08.2022
3. Minutes of State Investment Promotion Board meeting held on 05.09.2022.

*****

ORDER:

The Government of Andhra Pradesh (GoAP) is committed towards holistic and sustainable development with an objective to (i) promote industrial growth and productivity; (ii) create diverse employment avenues; (iii) optimally utilize its human resources; (iv) attain global competitiveness; and (v) position the State and India as a major player in new and renewable energy. This is aligned to GoAP's Industrial Policy 2020-23 targeted to provide the best-in-class infrastructure, zero hassle, setup skilled labour availability and end to end handling support for units to provide an industry-friendly environment at par with global standards. GoAP's policy is targeted to asset creation, providing ready-built pre-cleared facilities and skill development centres which can serve as a base for sustainable growth. Further, Government of India, as part of its stand at COP-26 to UNFCCC, has committed to achieve ffty percent (50%) of its total energy requirements from renewable energy and to reach 500 GW of Non-fossil energy capacity by 2030. Apart from increasing the capacity of RE in the energy mix and encouraging the usage of power from RE based sources, the policy landscape of the country GO MS/59/2022/INC01-Industries and Commerce File No.INC01-IND/210/2022-P-I also shows a keen focus on creating suitable infrastructure and supplying the required materials for implementation of RE based power generation. One such scheme includes the Production Linked Incentive (PLI) scheme announced in 2021 for manufacturing the equipment needed for solar power. This vision is coherent with Government of India's goal to accelerate domestic industrial production through 'Make in India' program and is aligned to 'Atmanirbhar Bharat' program.

2. The Shirdi Sai Electricals Limited (SSEL) along with its consortium partner, have participated in the PLI scheme for developing integrated solar PV module manufacturing floated by Indian Renewable Energy Development Agency Limited (IREDA). The SSEL consortium was allocated PLI for INR 1875 Crores from IREDA. M/s Indosol Solar Private Limited is a special purpose

(P.T.O)

vehicle incorporated by consortium led by SSEL to execute the project in line with PLI requirements.

3. In the reference 1st read above, M/s Indosol Solar Private Limited has proposed to setup India's frst fully integrated solar PV module manufacturing facility with a global scale capacity of 20 GW equivalent of Metallurgical silicon, 20 GW equivalent of Polysilicon, 15 GW of Ingot/Wafer, 10 GW of Cell and Module along with in-house glass manufacturing facility of 10 GW equivalent capacity with an investment of INR 43,143 Cr in 3 phases, and with a potential to create direct employment to 11,500 people and to about 10,000 - 11000 people indirectly, in a phased manner over a period of 5 years at Ramayapatnam, SPSR Nellore District. The project would also generate indirect employment to 11,000 people. Details of phasewise investments and employment are presented below:

Phase	**Investment in Rs. Crore**	**Employment (Direct)**
Phase 1	*20,836*	*5013*
Phase 2	*9,960*	*4072*
Phase 3	*12,348*	*4215*
Total	***43,143***	***11,500***

4. Accordingly, the proposal was placed before the State Investment Promotion Board meeting held on 05.09.2022 with the recommendations of the State Investment Promotion Committee.

5. The Board has taken note of the fact that proposed project is an integrated facility, 1st of its kind in India and decided to extend special package of incentives to M/s Indosol Solar Private Ltd.

6. Government after careful examination of the recommendations of the State Investment Promotion Board hereby extend the following incentives to M/s Indosol Solar Pvt. Ltd. (ISPL), Ramayapatnam, SPSR Nellore District.

i. Power (HT III B) at a fixed tariff of Rs.4.00 per unit for the first 7 years and @ Rs 4.50 per unit for the next 8 years, from the date of commencement of production, on the power consumed from the DISCOMS. This fixed tariff includes demand charges, energy charges and time of day charges. However, the power drawn from DISCOM by the company shall be limited to a maximum of 40% of total power consumption.

ii. Exemption of Open Access charges and cross subsidy surcharge, if any, for 15 years.

iii. Full exemption from payment of Electricity Duty for a period of 15 years from DCP.

iv. Energy Department (APTRANSCO) to establish substation with required capacity, without R&C and with N-2 contingency and socializing the same

for the industries coming up in and around the area, with the condition that:

a. The company has to lay the lines at their own cost.

b. The company has to provide sufficient land for construction of 765/400 kV Substation by AP Transco.

v. Net SGST reimbursement on sale of products for 10 years limited to Fixed capital Investment.

vi. 100% reimbursement of stamp duty and transfer duty paid by the Industry on purchase of land meant for Industrial use.

vii. Government shall facilitate procurement of 5148 Acres of land in Ramayapatnam through APIIC/AP Maritime Board, under LA for others, as per the procedure in vogue, on payment of cost basis.

viii. Agreed in principle for allotment of mines for captive usage, duly amending the rules, as the proposed project brings in value addition for the minerals within the State. Mines Department shall take necessary action accordingly.

x. Allocate of 50 MLD of water from Sangam barrage at a cost as per the prevailing policy, for meeting the requirements of the unit and the Port. The Company shall invest on the pipeline infrastructure and the Government would facilitate ROW including land acquisition, if any. Further the unit is advised to go for desalination in future, as providing fresh water for long time, may not be possible.

x. Allocate a dedicated berth at Ramayapatnam port to the company, which shall be developed at their own cost.

7. A detailed operational guideline will be issued separately.

8. Given the scale of the project, it is further advised that Industries and Commerce Dept. shall constitute a separate Project Implementation Unit (PIU) which shall facilitate and handhold approvals/ clearances for the proposed project.

9. The Energy Department, Mines Department, Water Resources Department, the Director of Industries, Andhra Pradesh, Mangalagiri, the Vice Chairman and Managing Director, APIIC, Mangalagiri, and the CEO, AP Maritime Board shall take necessary action, accordingly and intimate the status of the progress of work done by the unit from time to time to the Government.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

R. KARIKAL VALAVEN
SPECIAL CHIEF SECRETARY TO GOVERNMENT & CIP

To
The Director of Industries, Andhra Pradesh, Vijayawada.

The Vice Chairman & Managing Director, AP Maritime Board, Mangalagiri.
The Vice Chairman & Managing Director, APIIC Ltd., Mangalagiri.
The SPl CS, Energy Department / TRANSCO
M/s Indosol Solar Pvt. Ltd. (ISPL).
The PR& RD (PR) Department.
The MA& UD Department.
The H.M.& F.W. Department.
The Mines Department
The Collector& District Magistrate, SPSR Nellore District.
The General Manager, District Industries Centre, SPSR Nellore District.

Copy to

The Finance (EBS-VIII) Department.
The Revenue (CT) Department.
The Revenue (Registration) Department.
The Law(H) Department.
The Accountant General, Andhra Pradesh
The Commissioner of Commercial Taxes
P.S. to Secretary to Chief Minister
P.S. to Chief Secretary to Government
P.S. to Spl. Chief Secretary to Government & CIP, Ind. & Comm. Dept.
The G.A (Cabinet) Dept. (w.r.t. their U.O 259/2022)
SC/SF.

//FORWARDED:BY ORDER//

SECTION OFFICER

Annexure - VI

ANDHRA PRADESH POLLUTION CONTROL BOARD
Paryavaran Bhavan, APIIC Colony Road, Gurunanak Colony,
Autonagar, Vijayawada- 520007.
Website: www.pcb.ap.gov.in

Lr.No.299/APPCB/CTE/RO-NLR/HO/2024 20/10/2024

Sub: APPCB – CTE - **M/s. Indosol Solar Pvt. Ltd.** Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District – Applied Consent to Establish (CTE) of the Board – **Clarification sought** - Reg.

Ref:
1. CTE application received by the Board through APOCMMS on 03.06.2024.
2. SEE, ZO: Tirupati inspection report received on 25.09.2024.
3. CTE Committee meeting held on 14.10.2024.

***

M/s. Indosol Solar Private Limited is proposed to establish Solar Photovoltaic Modules, Cells and Wafers manufacturing unit at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1a, 1b, 2a, 2b, 595/2, 2b, 3b, 4a, 4b, 5a, 5b, Chevuru Village, Gudluru Mandal, SPSR Nellore District, with an investment of Rs.2000 Crores.

The Project Proponent (PP), vide reference 1st cited, submitted the CTE application to the Board through APOCMMS to manufacture Solar Photovoltaic (PV) modules - 9,09,091 Nos/annum, Solar Photovoltaic (PV) Cells - 14,02,59,740 Nos/annum, Solar Photovoltaic (PV) Wafers - 14,72,72,727 Pcs/annum. The SEE, ZO, Tirupati and EE, RO, Nellore inspected the proposed site on 09.08.2024 and the SEE, ZO: Tirupati submitted the report, vide reference 2nd cited.

The issue was placed in the CTE Committee meeting held on 14.10.2024. The EE, RO: Tirupati attended the meeting through video conference. The representative of the project proponent attended the meeting through VC and explained about the project.

After detailed discussions, the Committee recommended to seek clarification from the project proponent on the following:

1. Detailed layout plan clearly ear marking the locations of process area, ETP/ZLD system, area ear marked for greenbelt development all along the periphery, extent of land proposed to utilise the treated waste water, set back/ buffer zone to nearby habitations.
2. Status of the land acquired for establishment of the project and land documents of site. Details of manufacturing process module wise along with inventory of raw materials & finished products.

3. Details of the ZLD system including the capacities of proposed biological treatment system, RO Plants, MEE, ATFD, STP etc., along with the details of quantification of RO rejects, MEE/ATFD condensate
4. Details on source of water consumption for each purposes (fresh water & recycled water), waste water generation per stream wise, treated water to reuse for various purposes in the plant and method of disposal.
5. Details on sources of Air pollution and control measures proposed (for both point & non-point sources).
6. The details of DG sets proposed, if any.
7. Details of the solid waste (Haz & non-haz) generated and its mode of disposal for stream wise.
8. Storage of raw materials / hazardous chemicals and safety measures proposed.
9. Details of Energy requirement & source of supply.
10. Environmental Management Plan covering all the details.

In view of the above, it is requested to submit the above said information for further processing of the application.

Please note that No Construction or development work pertaining to above proposal shall be carried out without obtaining Consent to Establish (CTE) as per the notification dt:23.12.1996 and 30.04.1999 of the Board.

S SRI SARAVANAN, MS(SS)., O/o MEMBER SECRETARY-APPCB

To
M/s. Indosol Solar Pvt. Ltd.,
Chevuru Village, Gudluru Mandal,
SPSR Nellore District
Email: manoj@indosolsolar.com

Copy to: 1. The SEE, Z.O: Tirupati for information.
2. The E.E., R.O: Nellore for information and necessary action.

Digitally Signed by S Sri Saravanan
Date: 20-10-2024 11:11:14
Reason: Approved

INDOSOL™

Annexure - VII

Ref No :- ISPL/APPCB/2025-26/001 **16th April-2025**

To,

The Member Secretary
Andhra Pradesh State Pollution Control Board,
GM3C+G83, APIIC Colony Rd, Guru Nanak Colony,
Vijayawada, Andhra Pradesh 520007.

Sub: CFE Clarifications for proposed Solar Photovoltaic (PV) Cells and Solar Photovoltaic (PV) Wafers manufacturing unit by **M/s. Indosol Solar Pvt. Ltd.** at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru village, Gudluru Mandal, SPSR Nellore district, Andhra Pradesh – Regarding

Ref: i) Lr No 299/APPCB/CTE/RO-NLR/HO/2024 & CFE Meeting held on 14.10.2024 (Agenda Item No. 06)

Respected Sir,

We thank you very much for considering our project in CFE meeting held on 14.10.2024 and with reference to above cited (1), we are herewith submitting the point wise response for your clarifications -

1	Detailed layout plan clearly ear marking the locations of process area, ETP/ZLD system, area ear marked for greenbelt development all along the periphery, extent of land proposed to utilise the treated waste water, set back/ buffer one to nearby habitations.
	Attached Updated SMP Annexure-1
2	Status of the land acquired for establishment of the project and land documents of site. Details of manufacturing process module wise along with inventory of raw materials & finished products.

1. **Attached Land Documents as** Annexure-2 & Annexure-3
2. **Attached Process Description & Process Flow chart as** Annexure-4 & Annexure-5
3. **List of Raw Materials and Mode of Storage**

Name of Raw Material	Max Storage (Kgs)	Type of Hazard	Mode of Storage
Gases			
Ammonia	26.4 MT	Corrosive/Toxic	ISO Tube trailers
Nitrous Oxide	25 MT	Oxidizer	ISO Tube trailers
Silane	10 MT	Flammable	ISO Tube trailers
Hydrogen	235 Kg.	Flammable	Cylinders banks
Boron trichloride	700 Kg.	Toxic	Cylinders
Trimethylaluminum	600 Kg.	Flammable	Canisters
Argon	50 Kl	Non-flammable	Cryogenic Vessel
Oxygen	7 Kl		Cryogenic Vessel
Nitrogen	140 Kl		Cryogenic Vessel
Liquids			
Hydrofluoric Acid	6 Kl	Toxic/Corrosive	Double Containment Tank
Hydrochloric Acid	3 Kl	Corrosive	Double Containment Tank
Nitric acid	3 Kl	Oxidizer/Toxic	Double Containment Tank
Caustic Potash	6 Kl	Corrosive	Double Containment Tank
Hydrogen Peroxide	6 Kl	Corrosive	Double Containment Tank
Sodium Hydroxide	3 Kl	Corrosive	Double Containment Tank
Lactic Acid	100 Kg	Corrosive	Carboy Tank

4. **List of Products**

Module	Unit	Existing	Proposed	Total
Solar Photovoltaic (PV) modules	Nos.	9,09,091	------	9,09,091
Solar Photovoltaic (PV) Cells	Nos.	------	14,02,59,740	14,02,59,740
Solar Photovoltaic (PV) Wafers	Nos.	------	14,72,72,727	14,72,72,727

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3	Details of the ZLD system including the capacities of proposed biological treatment system, RO Plants, MEE, ATFD, STP etc., along with the details of quantification of RO rejects, MEE/ATFD condensate

1. **Attached ETP Layout Annexure-6 & Annexure-7**
2. **Attached STP Layout as Annexure-8**
3. **Attached CRZ Acknowledgement of 6 MLD Seawater discharge as Annexure-9**

4	Details on source of water consumption for each purpose (fresh water & recycled water), waste water generation per stream wise, treated water to reuse for various purposes in the plant and method of disposal.

1. **Attached GO NO 66 dated 15-09-2022 Annexure-10**
2. **Attached GO NO 18 dated 13-04-2025 Annexure-11 &12**

5 Details on sources of Air pollution and control measures proposed (for both point & non-point sources).

Source	Probable Pollutants	Mitigation Measures
Manufacturing Plant	General exhaust	Tool exhaust to be connect with exhaust suction blower and after this it will discharge through chimney/stack at the height describe by APPCB.
Manufacturing Plant	Acid Scrubber	Tool Acid exhaust to be connect with Scrubber and after this it will discharge through chimney/stack at the height describe by APPCB.
DG (standby)	Emission from DG Chimney	Emission will be discharge through chimney/stack at the height describe by APPCB.

6 The details of DG sets proposed, if any.

It is proposed to establish standby DG sets of 2 x 1250 kVA and 2 x 1500 kVA capacity to meet the power requirement during load shutdown period.

7 Details of the solid waste (Hazardous & Non-Hazardous) generated and its Mode of Disposal for Stream Wise

Total Solid Waste and Mode of Disposal

S.No.	Description	Unit	Quantity	Mode of Disposal
1	ETP Sludge	TPD	13.84	Sent to reuse / TSDF
2	Silica recovered from ETP	TPD	12.1	Sent to reuse
3	Oily waste	TPA	1	Sent to authorized agencies
4	Waste oils & Grease	KLPA	500	Sent to authorized agencies
5	Bio medical waste	Kg/Month	200	Sent to authorized CBMWTF
6	Detoxified containers & bags	Nos/Month	300	Sent to authorized recyclers
7	Used PPE	TPM	0.5	Sent to authorized vendor
8	E- Waste including production reject	TPA	321.5	Authorized recyclers
9	Plastic Waste	TPA	10	Authorized recyclers
10	Metal Scrap	TPM	20	Sale to outside agencies/ recyclers
11	Used / Discarded RO Membranes cartridge	TPA	4	Sent to TSDF
12	Spent Resin	TPA	6	Sent to TSDF
13	Spent Anthracite	TPA	0.5	Sent to TSDF

8 Storage of raw materials / Hazardous chemicals and safety measures proposed.

List of Raw Materials and Mode of Storage

Name of Raw Material	Max Storage (Kgs)	Type of Hazard	Mode of Storage
Gases			
Ammonia	26.4 MT	Corrosive/Toxic	ISO Tube trailers
Nitrous Oxide	25 MT	Oxidizer	ISO Tube trailers
Silane	10 MT	Flammable	ISO Tube trailers
Hydrogen	235 Kg.	Flammable	Cylinders banks
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Trimethylaluminum	600 Kg.	Flammable	Canisters
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Oxygen	7 Kl		Cryogenic Vessel
Nitrogen	140 Kl		Cryogenic Vessel
Liquids			
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Hydrochloric Acid	3 Kl	Corrosive	Double Containment Tank
Nitric acid	3 Kl	Oxidizer/Toxic	Double Containment Tank
Caustic Potash	6 Kl	Corrosive	Double Containment Tank
Hydrogen Peroxide	6 Kl	Corrosive	Double Containment Tank
Sodium Hydroxide	3 Kl	Corrosive	Double Containment Tank

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	Lactic Acid	100 Kg	Corrosive	Carbon Tank
	Specific Safety measures for handling Hazardous Chemicals enclosed at Annexure-13			
9	Details of Energy requirement & source of supply.			
	1. **Energy Requirement 4050 HP** 2. **Source of Power from APEPDCL**			
10	Environmental Management Plan covering all the details.			
	Attached revised EMP Annexure-14 & Annexure 15			

We request your good office to kindly process our application for CFE at the earliest and obilige.

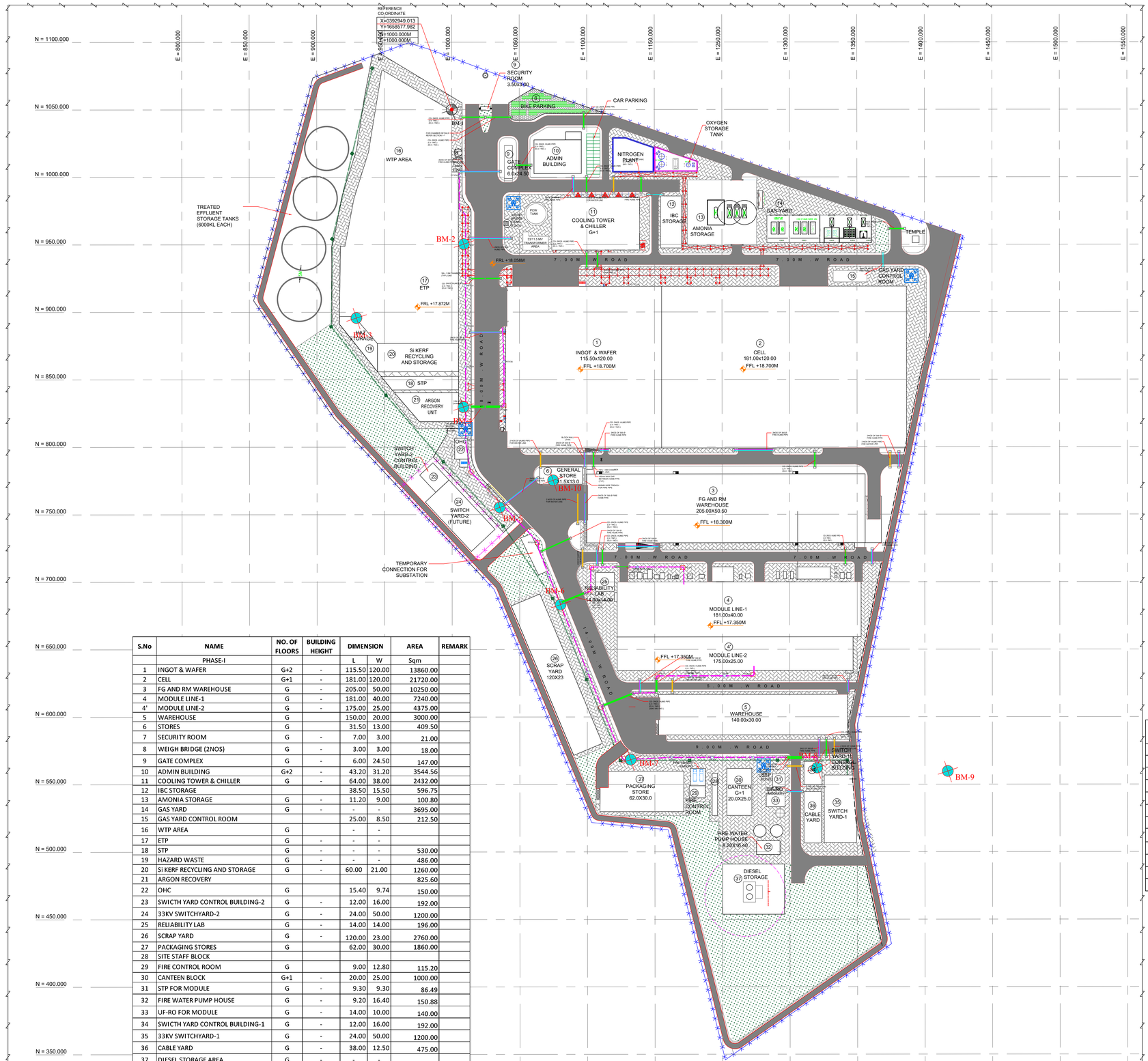
Thanking you,
Yours Faithfully,

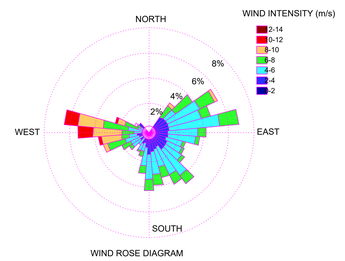
INDOSOL SOLAR PRIVATE LIMITED Hyderabad

For Indosol Solar Private Limited
Manoj Kumar Reddy
Phone: +91 8826890828
Email: manoj@indosolsolar.com

A.P. POLLUTION CONTROL BOARD AUTONAGAR, VIJAYAWADA-520 007.
16 APR 2025

DO NOT SCALE





WIND ROSE DIAGRAM

S.No	NAME	NO. OF FLOORS	BUILDING HEIGHT	DIMENSION		AREA	REMARK
	PHASE-I			L	W	Sqm	
1	INGOT & WAFER	G+2	-	115.50	120.00	13860.00	
2	CELL	G+1	-	181.00	120.00	21720.00	
3	FG AND RM WAREHOUSE	G	-	205.00	50.00	10250.00	
4	MODULE LINE-1	G	-	181.00	40.00	7240.00	
4'	MODULE LINE-2	G	-	175.00	25.00	4375.00	
5	WAREHOUSE	G		150.00	20.00	3000.00	
6	STORES	G		31.50	13.00	409.50	
7	SECURITY ROOM	G	-	7.00	3.00	21.00	
8	WEIGH BRIDGE (2NOS)	G	-	3.00	3.00	18.00	
9	GATE COMPLEX	G	-	6.00	24.50	147.00	
10	ADMIN BUILDING	G+2	-	43.20	31.20	3544.56	
11	COOLING TOWER & CHILLER	G	-	64.00	38.00	2432.00	
12	IBC STORAGE			38.50	15.50	596.75	
13	AMONIA STORAGE	G	-	11.20	9.00	100.80	
14	GAS YARD	G	-	-	-	3695.00	
15	GAS YARD CONTROL ROOM			25.00	8.50	212.50	
16	WTP AREA	G		-	-		
17	ETP	G	-	-	-		
18	STP	G	-	-	-	530.00	
19	HAZARD WASTE	G	-	-	-	486.00	
20	Si KERF RECYCLING AND STORAGE	G	-	60.00	21.00	1260.00	
21	ARGON RECOVERY					825.60	
22	OHC	G		15.40	9.74	150.00	
23	SWICTH YARD CONTROL BUILDING-2	G	-	12.00	16.00	192.00	
24	33KV SWITCHYARD-2	G	-	24.00	50.00	1200.00	
25	RELIABILITY LAB	G	-	14.00	14.00	196.00	
26	SCRAP YARD	G	-	120.00	23.00	2760.00	
27	PACKAGING STORES	G		62.00	30.00	1860.00	
28	SITE STAFF BLOCK						
29	FIRE CONTROL ROOM	G		9.00	12.80	115.20	
30	CANTEEN BLOCK	G+1	-	20.00	25.00	1000.00	
31	STP FOR MODULE	G	-	9.30	9.30	86.49	
32	FIRE WATER PUMP HOUSE	G	-	9.20	16.40	150.88	
33	UF-RO FOR MODULE	G	-	14.00	10.00	140.00	
34	SWICTH YARD CONTROL BUILDING-1	G	-	12.00	16.00	192.00	
35	33KV SWITCHYARD-1	G	-	24.00	50.00	1200.00	
36	CABLE YARD	G	-	38.00	12.50	475.00	
37	DIESEL STORAGE AREA	G	-	-	-		
TOTAL						**84441.28**	

BENCHMARK COORDINATES

S.No	GLOBAL COORIDNATES		SITE	
	X (E)	Y (N)	X (E)	Y(N)
BM-1	392949.01	1658577.982	1000.000	1000.000
BM-2	392925.950	1658480.678	1008.852	900.393
BM-3	392833.15	1658453.897	929.258	845.669
BM-4	392887.46	1658366.249	1008.478	779.665
BM-5	392889.47	1658287.202	1035.348	705.298
BM-6	392909.3	1658204.615	1080.246	633.201
BM-7	392922.22	1658079.212	1132.122	518.302
BM-8	393051.33	1658029.895	1270.199	512.289
BM-9	393142.31	1657996.896	1366.946	509.717
BM-10	392933.25	1658293.747	1074.826	725.338

GENERAL NOTES

LEGENDS

- GREEN AREA
- ROAD
- PAVED AREA
- PARKING
- PLOT LINE
- CHAIN LINK FENCEING
- HT LINE

REV. NO.	REVISION DESCRIPTION	DRAWN	CHK	APPROVED	CLIENT APPR.	DATE

CLIENT :

INDOSOL SOLAR PVT. LIMITED
AUROBINDO GALAXY TOWERS, A WING, 16TH FLOOR, SURVEY NO 83/1, OPP IKEA, PLOT #1, RAYADURAG, HITECH CITY RD, HYDERABAD, TELANGANA 500081

CONSULTANT/ VENDOR :

PROJECT

1GW PV SOLAR INTEGRATED PLANT
RAMAYAPATNAM, ANDHRA PRADESH

DRAWING TITLE :

SITE MASTER PLAN OF 1GW PILOT PLANT

DRAWING NO. | ISPL | REV. NO. | VENDOR/ CONSULTANT | REV. NO.

A0

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Product Profile

The manufacturing capacity is presented in **Table 1.1**. Material specification with annual requirement for module and cell, wafer and ingot is presented in **Table 1.2** and **Table 1.3** respectively.

Table 1.1 Plant Capacity Per Annum

Module	Unit	Existing	Proposed	Total
Solar Photovoltaic (PV) modules	Nos.	9,09,091	------	9,09,091
Solar Photovoltaic (PV) Cells	Nos.	------	14,02,59,740	14,02,59,740
Solar Photovoltaic (PV) Wafers	Nos.	------	14,72,72,727	14,72,72,727

Table 1.2 Material Specification with Annual Requirement - Module

Raw Material	Specification	Unit	Annual Requirement
Solar Cells		pcs	7,01,29870
Ribbon (Cell Connector)	φ0.30mm	kg	2,10,000
Ribbon (String Connector)	0.35×6mm	kg	23,636
Ribbon (String Connector)	0.35×5mm	kg	31,818
Front side Glass	thickness 2 mm	m2	22,71,513
Encapsulant (POE)	0.45 mm with 880 kg/m3 density	m2	46,65,898
Rear side Glass	thickness 2 mm	m2	22,71,513
Junction box	Cable Length: 30 CM, 25A	set	9,09,091
Frame	thickness 30 mm	set	9,09,091
Frame Sealant		kg	3,86,364
Flux		mL	27,273
Junction Box potting material-A white		kg	38,182
Junction Box potting material-B transport		kg	6,364

Table 1.3 Material Specification with Annual Requirement – Cell

Raw Material	Specification	Unit	Annual Requirement
Wafer		pcs	14,72,72,727
Front Busbar Ag Paste		kg	3,954
Front Finger Ag Paste		kg	8,290
Rear Busbar Ag Paste		kg	4,464
Rear finger Ag/Al Paste		kg	10,458
Front Busbar Screen	Front Busbar Ag Screen 400/18	pcs	1,020
Front Finger Screen	Front Finger Ag Screen 520/11 knotless	pcs	2,678
Rear Busbar Screen	Rear Busbar Ag Screen 280/25	pcs	638

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Rear Finger Al Screen	Rear Finger Al Screen - Bifacial 360/16	pcs	1,403
Squeegee		pcs	22,574
Rolled paper for cell		pcs	22,574
HF - Hydrofluoric Acid	49%	L	9,13,172
HCl - Hydrochloric Acid	37%	L	1,53,046
KOH - Potassium Hydroxide	40%	L	8,18,794
H2O2 - Hydrogen Peroxide	31%	L	3,64,759
$POCl_3$ - Phosphoryl Chloride	5N	kg	1,786
Texturization Additive		L	53,566
Polishing Additive		L	1,07,132
SiH_4 - Silane	5N	kg	29,589
NH3 - Ammonia	5N	kg	35,711
N_2O - Nitrous Oxide	5N	kg	19,131
TMA - trimethylamine	solar grade	kg	383
N_2	5N	kg	40,30,201
O_2	5N	kg	43,363

Table 1.4 Material Specification with Annual Requirement – Wafer

Raw Material	Specification	Unit	Annual Requirement
Brick		kg	22,50,537
AB Glue for Gluing plastic plates		kg	7,793
AB Glue for Gluing Brick		kg	7,793
Plate	850*167*12	pcs	33,958
Diamond Wire (wafer slicing)	55um*80KM	km	4,29,603
Diamond wire Cutting Fluid	NY426 25KG/barrel	L	1,50,334
Silicone Chip Cleaner		kg	2,29,918
Wire wheel		pcs	25,051
Polyurethane	TT163-20KG	kg	5,370
$C_3H_6O_3$ - lactic acid		kg	33,622
KOH – Solid Potassium Hydroxide		kg	7,921
H2O2 - Hydrogen Peroxide (%26-28) IBC		L	2,29,851
Filter Bag		pcs	34,118
Polysilicon- Virgin size small	**Waker: SIZE 2,3,4; OCI:ST5, ST700**	**kg**	**21,99,900**
Polysilicon- Virgin big size	**Waker: SIZE 2,3,4; OCI:ST500, ST701**	**kg**	**3,88,218**
Quartz Crucible		pcs	20,536
Dopant	P Type,0.001-0.006 Ω.c, 4±1mm	g	1,03,94,789
Seed	<100>,P type, φ21±0.2/ 16±0.2mm * 170±3mm	pcs	20,536
Argon	≥99.999%	kg	60,75,146
Hot zone		pcs	856

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HF - Hydrofluoric Acid	(%49±2) Barrel	L	3,40,226
HNO3 - Nitric Acid	(%69±1) Barrel	L	20,41,354
Small regulating wheel outer ring 158x8	158x8	pcs	19,309
Cropper Cutting wheel-small (260*11)	260X11	pcs	477
Cropper Cutting wheel-big (250*8)	250X8	pcs	743
Squarer Cutting wheel	220X15	pcs	1,222
PU - Desmodur TT163 Polyurethane	TT163-20KG	Kg	244
Big cropper diamond wire (0.37mm) /Squarer diamond wire(0.37mm)	0.37mm	km	3,005
Small cropper diamond wire(0.37mm)	0.37mm	km	323
Grinder Diamond wheel-200#	200#	pcs	90
Grinder Diamond wheel-500#	500#	pcs	102

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2.1 Process Description

The process flow for the CZ method-based mono c-Si ingot growing and wafer production & process steps can be divided into two main stages;

- CZ method-based mono c-Si ingot crystallization and pulling and
- Cutting of bricks followed by slicing into wafer.

The process flow diagram of CZ mono c-Si Ingot and Wafer Production is presented in **Fig 2.1.**

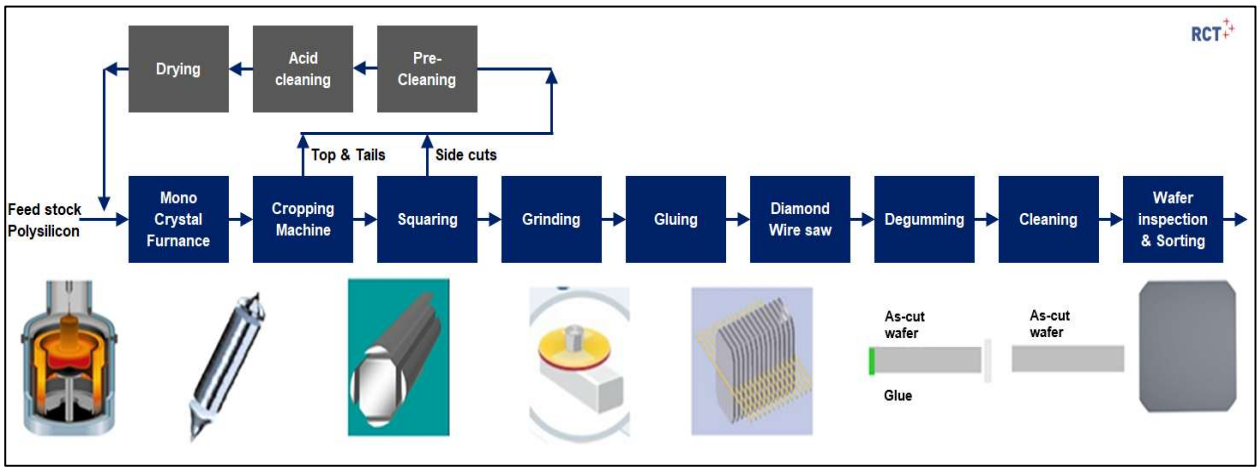

Fig 2.1 CZ mono c-Si Ingot and Wafer Production Process Steps

2.1.1 Process Description of Ingot (Czochralski Method (CZ) Method)

In the CZ method, polysilicon chunks of different sizes and the dopant (either B or Ga for p-type or P for n-type doping) are loaded in a quartz crucible set in a graphite crucible surrounded by graphite heaters in the crystal pulling chamber. Traditionally, quartz crucibles, made of high purity fused silica are used due to their specific properties. These are high purity, resistivity to thermal shock and superior chemical inertness. Aside from the charging with virgin polysilicon, it is possible to recycle the ingot's cut-off material. Especially the top, sides and tail are to a certain extent valuable, while the pot scrap contains the accumulated impurities and must be scrapped.

The polysilicon chunks are melted by heating in an argon atmosphere under a vacuum. Once the silicon is melted, the ingot is pulled slowly using a seed crystal. During the

crystallization, the silicon is solidified, as well as the dopant and impurity atoms. The segregation coefficient gives the fraction of foreign atoms in the solid and the liquid. Therefore, foreign atoms prefer to stay in the liquid, enabling a cleaning effect during crystallization. A segregation coefficient close to 1 is optimum for dopant atoms, leading to a homogenous dopant concentration along the ingot. This is nearly true for boron (p-type), but not for other prominent dopant atoms like phosphorous (n-type) or gallium (p-type). As innovations re-charging has been implemented, which is the charging of silicon and dopant after pulling of an ingot. This procedure is repeated typically four times, so five ingots can be pulled from one crucible. The process flow diagram of ingot pulling is presented in **Fig 2.2.**

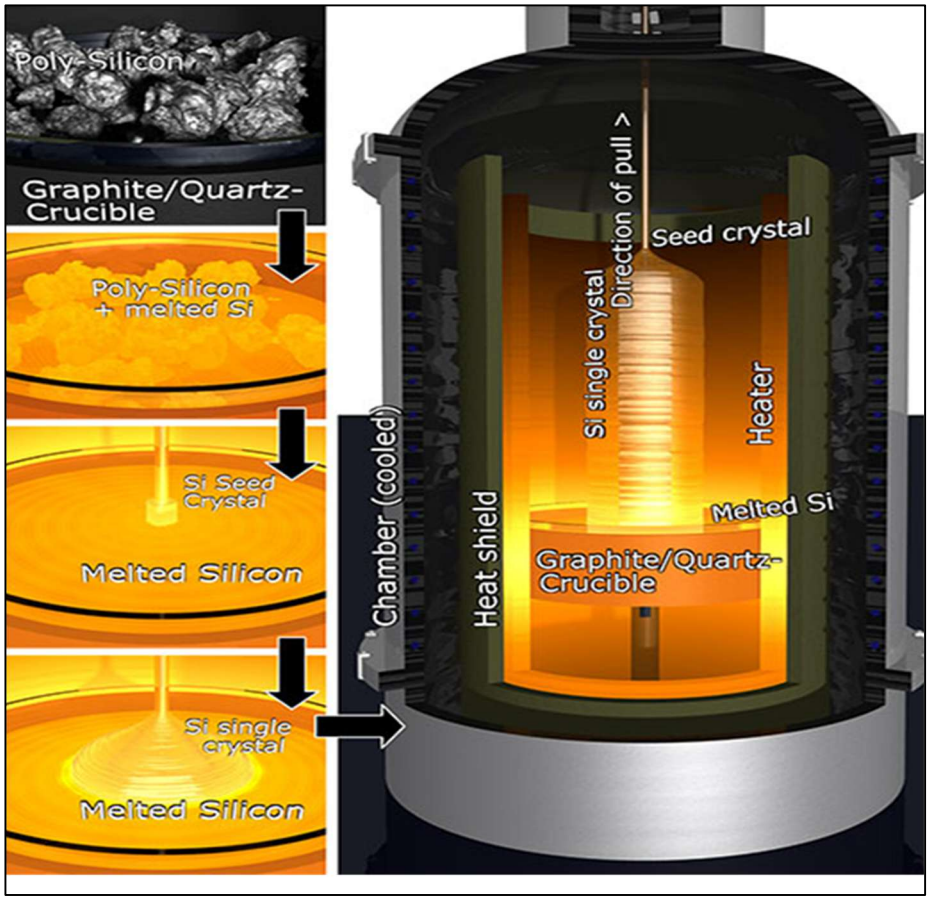

Fig 2.2 The Process Flow Diagram of Ingot Pulling

As the next production step, the head and tail cones are cropped as they have a high concentration of dislocations, and the large ingot is cut into smaller rods. Further, they are

squared using a squaring saw. As the final brick treatment step, a grinding process will be applied to achieve a well-polished brick surface.

CZ method based mono c-Si ingot

Cutting (Cropping) of Mono c-Si Ingot (Brick Production)

The cropper takes a part of the quality control by slicing the disks for sampling, but also cuts the ingots into suitable lengths for further processing. The small ingot sections, known as rods, have a typical length of between 750 – 900 mm. The state-of-the-art process uses 0.25- and 0.35-mm thin diamond wire. Two different approaches are common in the industry. The multi-station cropper utilizes several blades with adjustable distance in parallel. The latest machines contain up to 9 blades. The cutting time of one ingot is faster due to the parallel blades, around 25 minutes for ingots with a diameter of 300 mm. The second approach is a single-station croppers with one blade and continuous feeding. The duration of one cut for 300 mm is around 8 minutes. Due to the axial feeding, the utilization of the machine is way better. The cropper mainly consumes diamond wire and running wheels.

Multi-Station Cropper

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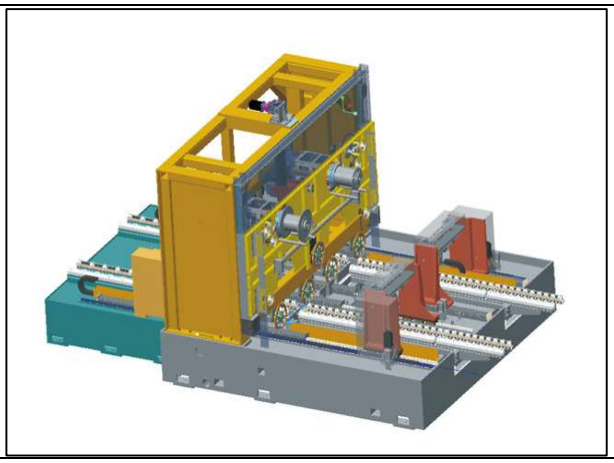

Single-Station Cropper with continuous feeding and two parallel blades.

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Squaring

After the cropping, the rod gets squared. Two chucks clamp the rod on both sides' cross-section and guide it along its axis through the taut diamond wires. Adjustable running wheels guide the wires. One single wire is used and redirected over all wheels. The cutting fluid and diamond wires are the two most expensive consumables in this process. The Cutting fluid supports cooling, lubrication, and removal of the kerf loss. The slabs go into the recycling process and can be re-used. The cutting time for an 800 mm M10 brick is about 20 – 25 minutes. Schematic diagram showing wire cutting is presented in **Fig 2.3.**

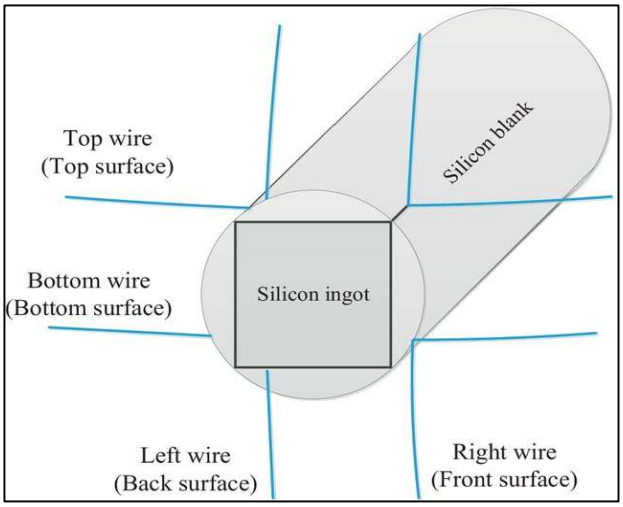


Fig 2.3 Wires Cutting Through Rod

Grinding and Chamfering

This process typically includes two steps: grinding the side surfaces and chamfering the bevel. The purpose is to eliminate notches, which can act as predetermined breaking points during slicing and further processing. By optimizing the surface finish, the yield in diamond wire slicing can go above 96%.

In the first step, two grinding wheels grind the side planes from two sides. The clamping turns the brick over 90° for accessing the other two side surfaces and over 45° to apply the same procedure to the bevels. A pre-grinding removes all rough unevenness. The grain size of the grinding wheels can be up to 200 grit. After the rough processing, everything will be repeated with a more finely grinding wheel up to 500 grit. The time for grinding an

M10 brick takes around 40 to 50 minutes, depending on the process and the machine design.

Recycling Process

Standard in today's ingot production is the recycling of the cut-off parts. The aim is to reuse all Si parts removed during the cropping and squaring process. After the recycling process, this Si material can be used grow new ingots and thereby reducing the Si losses. The share of recycled material ranges between 38% - 45% depending on the quality of the grown ingots. Quality control would remove some Si material from this cycle, for example, if a high concentration of unknown impurities or massive dislocations emerge during the inspection. Silicon recycling includes three main processes: crushing of the silicon material, chemical cleaning, and packaging. The heads, tails, cut-offs from the brick (slabs), and unqualified material are suitable for recycling.

Silicon Crushing

A crusher reduces the size of the polysilicon chunks according to the most considerable size 4 of the common standards. Due to unpredictable breakage behaviour, other sizes will appear by themselves. The quality requirements for the crushing are like those after the Siemens process in polysilicon production, so the machines are also suitable for recycling. There are different approaches. The oldest one is the mechanical crushing by hand. A worker crushes the silicon manually with a molybdenum hammer since the silicon is fragile enough to be hammered by hand.

A mechanical crushing machine reduces the required workers. To prevent any contamination, the machine parts in contact with the silicon or next to the area consist of tungsten carbide alloy. It is known that mechanical crushing can cause non-removable contamination.

Chemical Cleaning

Due to the segregation effect, parts from the grown ingot contain much less impurity concentration in the bulk than the virgin polysilicon. A calculation based on polysilicon

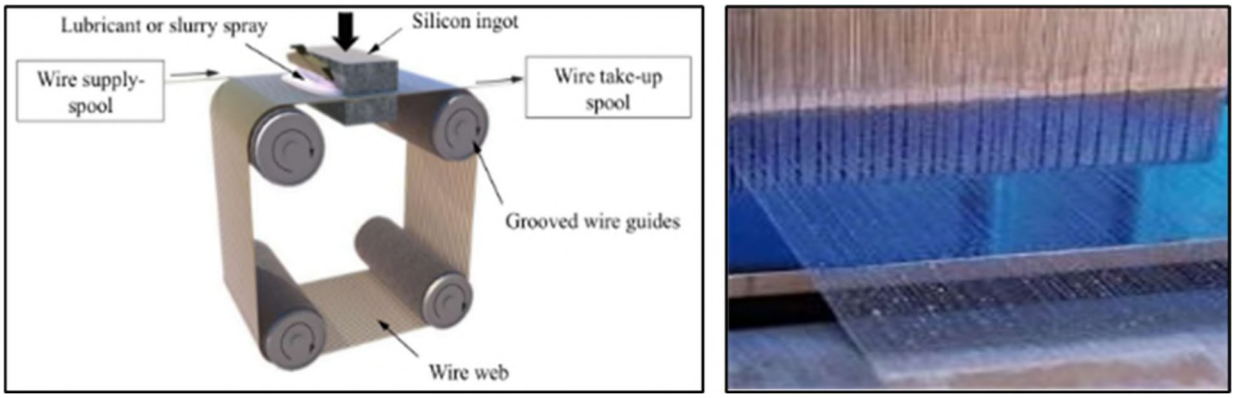
with an iron concentration of 5x1013 atoms/cm3 leads to an average iron concentration in the ingot of 3.4 x109 atoms/cm3 and is equivalent to a reduction by a factor of 15,000. During the processing in the brick factory and the crushing, impurities react with or adhere to the silicon surface. A batch-type machine cleans the chunks over a few process steps to remove the impurities. In the first step, hydrofluoric acid (HF) and nitric acid (HNO3) etches a few microns from the surface of the silicon to remove the surface impurities. After etching, some cleaning steps with water follow to remove most of the chemicals. In the last baths, the cleaning machine rinses the material with ultrasonic bubbling. After the batch process, a dryer removes the remaining water. The cleaning machines or personnel pack the silicon in bags and transport it to the charging area.

Batch-type Cleaning Machine

During the processing in the brick factory and the crushing, impurities react with or adhere to the silicon surface. A batch-type machine cleans the chunks over a few process steps to remove the impurities. In the first step, hydrofluoric acid (HF) and nitric acid (HNO3) etches a few microns from the surface of the silicon to remove the surface impurities. After etching, some cleaning steps with water follow to remove most of the chemicals. In the last baths, the cleaning machine rinses the material with ultrasonic bubbling. After the batch process, a dryer removes the remaining water. The cleaning machines or personnel pack the silicon in bags and transport it to the charging area.

2.1.2 Process Description of Wafer

The Diamond Wire Sawing (DWS) process is applied to manufacture wafers out of bricks, as illustrated in Figure 14 below. Using special adhesives, the brick is glued to a hollow plate and a brick holder. The 50-55 µm thick diamond wire, which is several kilometers in length, moves continuously back and forth (like a sawing action) and gradually from the bottom to the top of the brick to slice wafers with a thickness of 160 µm-170 µm. The wires are continuously cooled by a water-based cutting fluid during the slicing process.



Diamond Wire-Based Sawing of Brick

After slicing the brick, the wafers are still glued on the brick holder at one side like a comb structure and must be separated. Hence, the wafers then go through a degumming and cleaning process. Finally, the wafer is passed through a wafer inspection system to check the quality and are sorted into different quality bins. P-type wafers with either boron (B) doping or gallium (Ga) doping are the mainstream wafer types with a market share of > 85%. As Light Induced Degradation (LID) is not present due to the absence of the B-O complex, Ga-doped wafers are now gaining more acceptance in production and are dominating. N-type mono c-Si wafer doped with phosphorous (P) are used for higher efficiency solar cell architectures like TOPCon and HJT.

2.1.3 Process Description of Solar Cell Production

The crystalline silicon solar cell production flow is strongly dependent on the type of the technology used to create a targeted cell structure. Independent of the technology, over 85% of modern Si solar cells production lines include following basic process steps is presented in **Fig 2.4**.

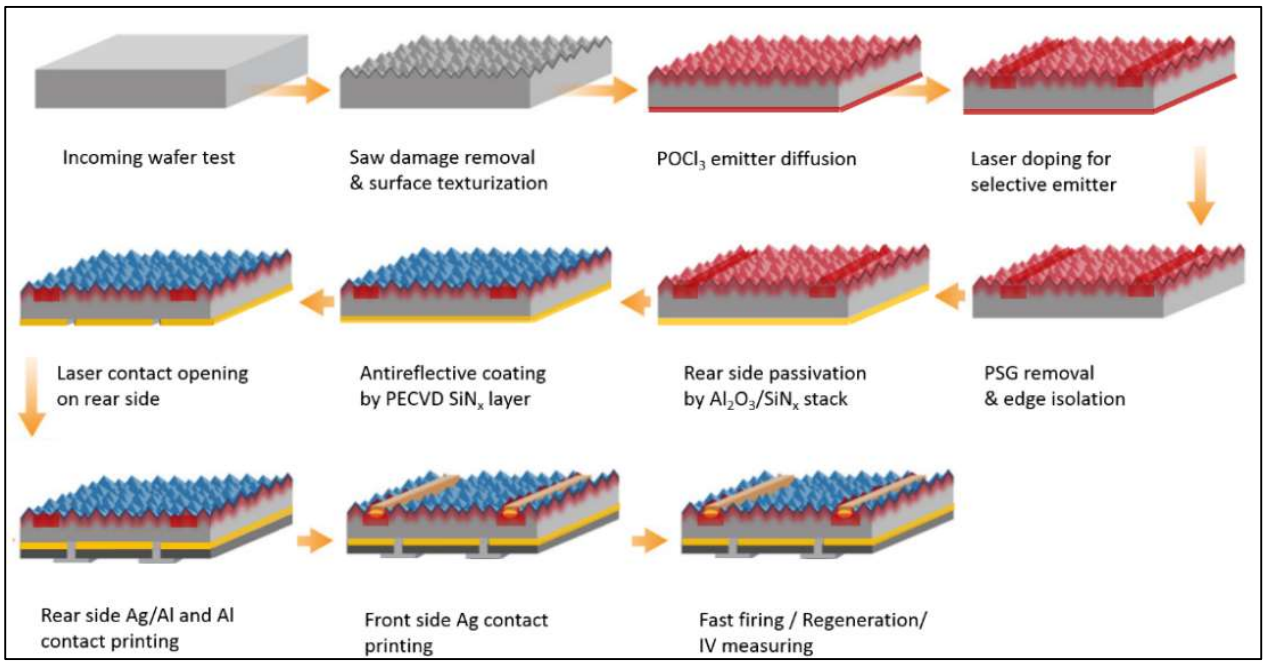


Fig 2.4 PEC Solar Cell Production Process Steps

Incoming Wafer Inspection

Incoming inspection of wafer material is an important issue to increase the yield and quality of solar cell production. Depending on the focus of inspection, different solutions implementing unstacking, optical breakage detection, geometrical inspection, surface inspection and microcrack detection, mechanical stability testing as well as contactless measurements of thickness, resistivity, and electronic quality (lifetime) concluding carrier/stack wafer loading can be integrated within one wafer inspection tool.

Surface damage removal / Texturing

Following the initial pre-check, the surface of the silicon wafers will be textured to reduce reflection losses of the incident light. For monocrystalline silicon wafers, the most common technique is the random pyramid texturing which involves the coverage of the surface with aligned upward-pointing pyramid structures. Pyramid structure is created by an anisotropic nature of chemical etching of the monocrystalline silicon surface by KOH (NaOH) alkaline solution. The proper alignment of the pyramids etched out is a result of the regular, neat atomic structure of monocrystalline silicon. Now, with such pyramid-

structure in place, the incident light does not reflect in the surrounding air but bounces back onto the surface below.

Typically, batch type of wet chemical equipment will used for this process step. Modern wet chemical texturing tool combines saw damage etching with texturing and cleaning processes and is operated by transportation of silicon wafers in carriers from one to other chemical baths. By this way saw damage removal, texturing, cleaning, and drying of the wafers can be performed continuously one by one on many wafer batches with typical wafer quantity 200 to 400 pcs each.

Junction Formation

The process of p-n junction formation consists of two phases: dopant application and drive-in (diffusion) of dopant atoms into volume of silicon substrate. The emitter diffusion refers to the deposition of a thin dopant material-containing coating on the wafer by passing the wafers through a diffusion coating furnace. Wafers that have already been pre-doped with p-type boron during the Cz crystal growth process are diffused with n-type dopant (Phosphorus) at a high temperature to create a p-n junction.

This junction of electron deficiency in the p-type and high electron concentration in the n-type allows for excess electrons from the n-type region to jump into the p-type region, creating an electron field at the junction. By this way, the electrons and holes generated by sun light in the volume of Si wafer can be separated and transferred to opposite wafer surfaces resulting in creation of electric potential and hence the name 'Photo Voltaic'.

The preferred way in the PV industry for p-n junction formation is batch diffusion furnaces. The wafers are collected in a quartz carrier, which is then loaded into a quartz diffusion tube. Dopant is deposited as Phosphor Silicate Glass (PSG) from gas phase ($POCl_3$ bubbler source). A temperature profile is used to achieve the right distribution of the dopant in the surface-near layer.

High-capacity diffusion boot with back-to-back loaded wafers

Edge Isolation and Rear Polishing

During the diffusion process, n-type phosphorous dopant diffuses not only into the desired wafer surface but also around the edges of the wafer as well as on the backside, creating an electrical path between the front-side (FS) and rear-side (RS). The objective of the edge isolation process is to eliminate this electrical path around the wafer and remove the remaining PSG after the diffusion process. The rear side polishing is required to improve the efficiency of the solar cell. A polished surface increases the back passivation and improves the open circuit voltage of the solar cell, thereby increasing the power output. The PSG formed on the front surface is also removed during this process.

The carryover of Al-BSF technology to PERC was the acidic inline etch isolation process involving HF and HNO3. In this process, an inline wet chemical tool will be typically used to perform the edge isolation process. In this case the rollers transport the wafers through the tool from one process bath to another. In the main etching bath, the RS of the wafer will be wetted and etched by HF/HNO3 etching solution. To avoid emitter, damage the FS is protected by DI water film. Followed processes include rinses, alkaline acidic cleaning as well final drying.

Industrial wet chemical machine for inline edge isolation and PSG removal is operating with throughput from 4,000 to 8,000 wafers per our using a 5- or 10-lane transportation system. Figure below shows Si wafers in the edge isolation etching bath.

Rear Side Etching for Edge Isolation in main Etching Bath of 5-lane Industrial Inline

Alkaline Etching

The alkaline chemistry does not produce the pointed edges typical of the spherical cap morphology of acidic texturing which results in even better passivation qualities. Also, this approach eliminates the use of HNO3 for process making it realtively environmental friendly. There are two ways to achieve alkaline rear side polishing – a) Inline process, and b) batch process.

Inline alkaline polishing: The complete wet treatment is carried out in a single inline tool where wafers travel on top of the conveyor. The critical steps for the process are HF single side etching, alkaline single side etching using KOH solution, PSG removal, cleaning and drying. For single side processes, the wafer is covered with water capping on the front side while it travels on the conveyor with chemicals acting on the back surface.

Alkaline batch polishing: Alkaline batch polishing process is carried out with a cluster arrangement in which the first steps of process involving PSG removal from the rear is carried out in inline fashion. This is because PSG on the front surface is to be protected for masking the emitter for the next batch process. The wafers are transferred from the conveyor to the carriers using intermediate wafer handling automation before the batch operations.

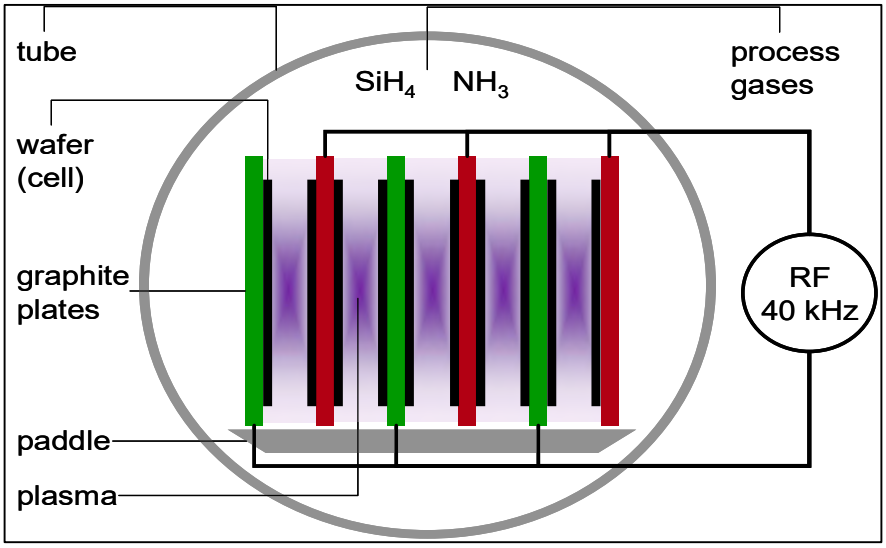
The wafers are completely submerged in the reactive alkaline solution. The rear surface of the wafers have exposed silicon for etching reaction with KOH solution whereas the front surface have an oxide film which retarders the reaction to protect the emitter.

The protection of sub-micron front emitter with a selective emitter structure poses a challenge for the alkaline batch polishing. This challenge hase been met by 1) using additional oxidation step after selective emitter (SE) laser to cover the PSG including SE features with an additional layer of oxide and 2) use of amphophilic additives in the alkaline solution. These additives selectively adhere to the front oxide layer on the wafer and further protect the emitter. This provides a very good process window for rear polishing by supporting longer process times. The additives also act as an accelerants etching and reduce KOH consumption. The cluster approach with batch alkaline polishing is the mainstream process for PERC process.

Anti-Reflective Coating

In addition to the surface texturing, anti-reflective coating (ARC) is applied on the FS to further reduce the reflection and increase the amount of light absorbed by the solar cell. The ARC is essential as the reflection of a bare Si wafer is greater than 30%. A silicon nitride (SiNx) based ARC is typically used and helps to reduce the surface reflection to 10%. In addition to the surface texturing, the total reflectance reduces to around 3%.

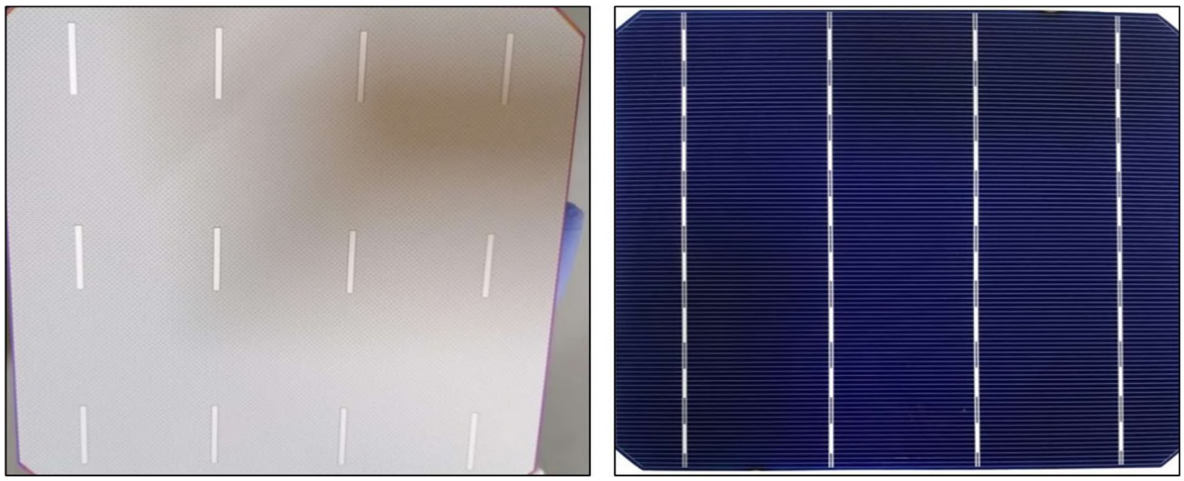
The application of a SiNx ARC greatly enhances the short circuit current. At the same time, the surface recombination can be significantly reduced by surface passivation of the dangling bonds, leading to increased voltage of the processed cells. Plasma Enhanced Chemical Vapor Deposition (PECVD) is the most common method for deposition of the ARC on the wafer. In the PECVD process, the pre-cursor gases react at the suitable temperature, pressure, and power to generate a plasma and deposit the film on the substrate.



Principle of Direct PECVD Process for Deposition of SiNx ARC Layer

Screen Printing of Front and Rear Contact System

As next step, metal contacts are printed by screen printing method on the wafer surface with the objective to create ohmic contact. This is achieved by printing the metal pastes with screen printing equipment that print the metal paste lines/areas onto the wafer FS and RS. After printing, the printed paste undergoes a drying process. Once dried, it is followed by printing of the other side/type contacts and subsequent drying. After all contacts have been printed and dried on the RS and FS, the screen-printed wafers are passed through a sintering furnace to solidify the dry metal pastes onto the wafers. Then, the wafers are cooled and can already be called solar cells as shown.



Screen Printed Solar Cell Metallization on Front (left) and Rear (right) Side

INDOSOL

Testing and Sorting

In this final process, the now ready-to-assemble solar cells are tested under simulated sunlight conditions and then classified and sorted according to their efficiencies. This is handled by a solar cell testing device that automatically tests and sorts the cells. Measuring of IV-curve as well as final optical control by camera systems in visible and IR- wavelength range will be performed for each solar cell. According to the electrical and quality control data each cell will be sorted to one specific output performance bin. The operators then only need to withdraw the cells from the respective efficiency bin to which the machine assorted the cells. Subsequently, the sorted solar cells will be packaged and transferred to the module production.

2.1.4. Process Description of Solar Photovoltaic (PV) modules

The production process of solar module is tightly connected to the module design and used module components. Standard c-Si solar module consists of 5 layers is presented in **Fig 2.5.**

- Stringed solar cells
- Encapsulation foil 1 on the FS
- Encapsulation foil 2 on the RS
- Back sheet and cover glass

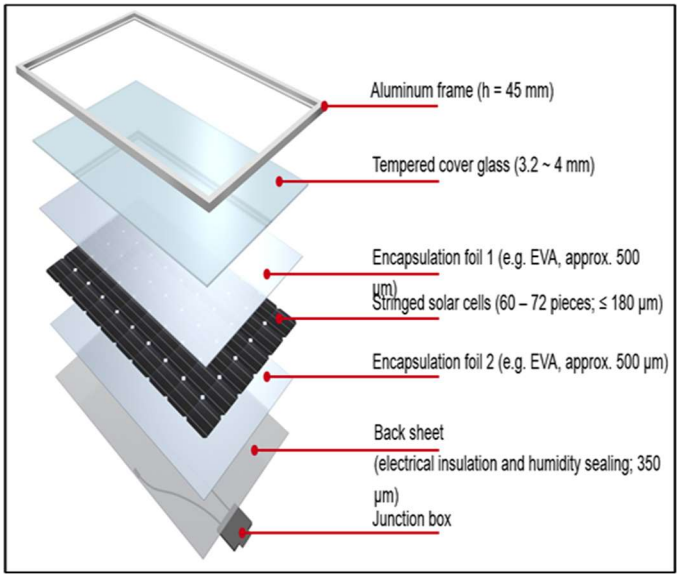


Fig 2.5 Standard c-Si Solar Module

In the module production the cells are aligned and attached to each other by tabbing and stringing. An automated production machine called stringer interconnects solar cells by soldering flat coated metal leads (string ribbons) to cell contacts. The stringer process principle is to perform series interconnection of solar cells by soldering string ribbons to cell contacts on top side (busbar pads) and to back contact of the following cell. Series interconnection principle of solar cells to strings is presented in **Fig 2.6.**

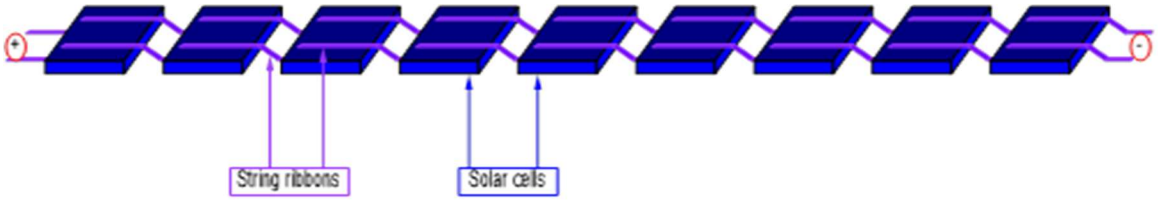


Fig 2.6 Series Interconnection Principle of Solar Cells to Strings

The six strings containing of 8 or 13 solar cells each will be placed face down on the glass and top encapsulation layer 1. After this lay-up operation the strings will be connected in series by soldering of cross-connection ribbons. Schematic design of solar cell interconnections in the module is presented in **Fig 2.7.**

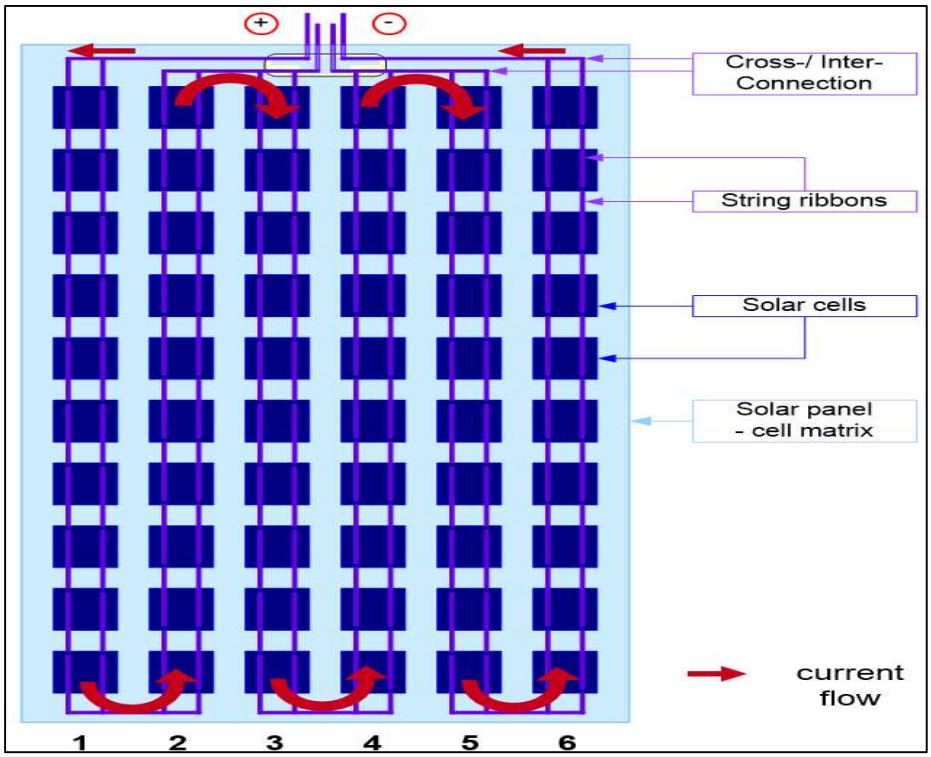


Fig 2.7 Schematic Design of Solar Cell Interconnections in the Module

Cells are connected in series and subjected to lamination process by exposing the cells in between two thermoplastic or thermosetting films, such as ethylene vinyl acetate (EVA) polymer or Polyolefine (POE), and glass sheets to high temperature and high humidity. This encapsulation process step protects the cell from the impact of harsh environmental conditions.

After module lamination, edge trimming and framing, a junction box will be mounted on the RS of the module. The junction box is used to connect the ribbons from the string interconnection with the outside power cable and to maximize the module power output in case of partial module shadowing by applying bypass diodes.

Finally, electrical performance and quality tests are performed, and the modules conform with the standards are packaged and sent to storage. A simplified module production process schematic diagram is presented in **Fig 2.8.**

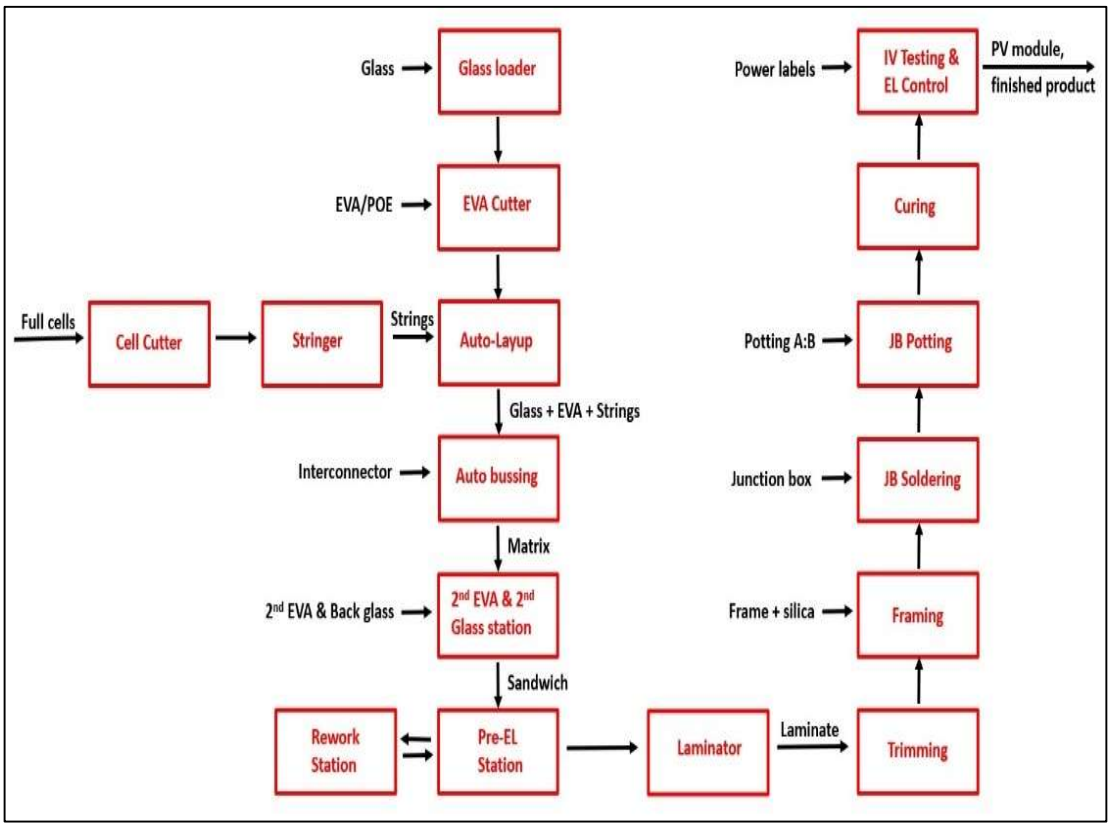
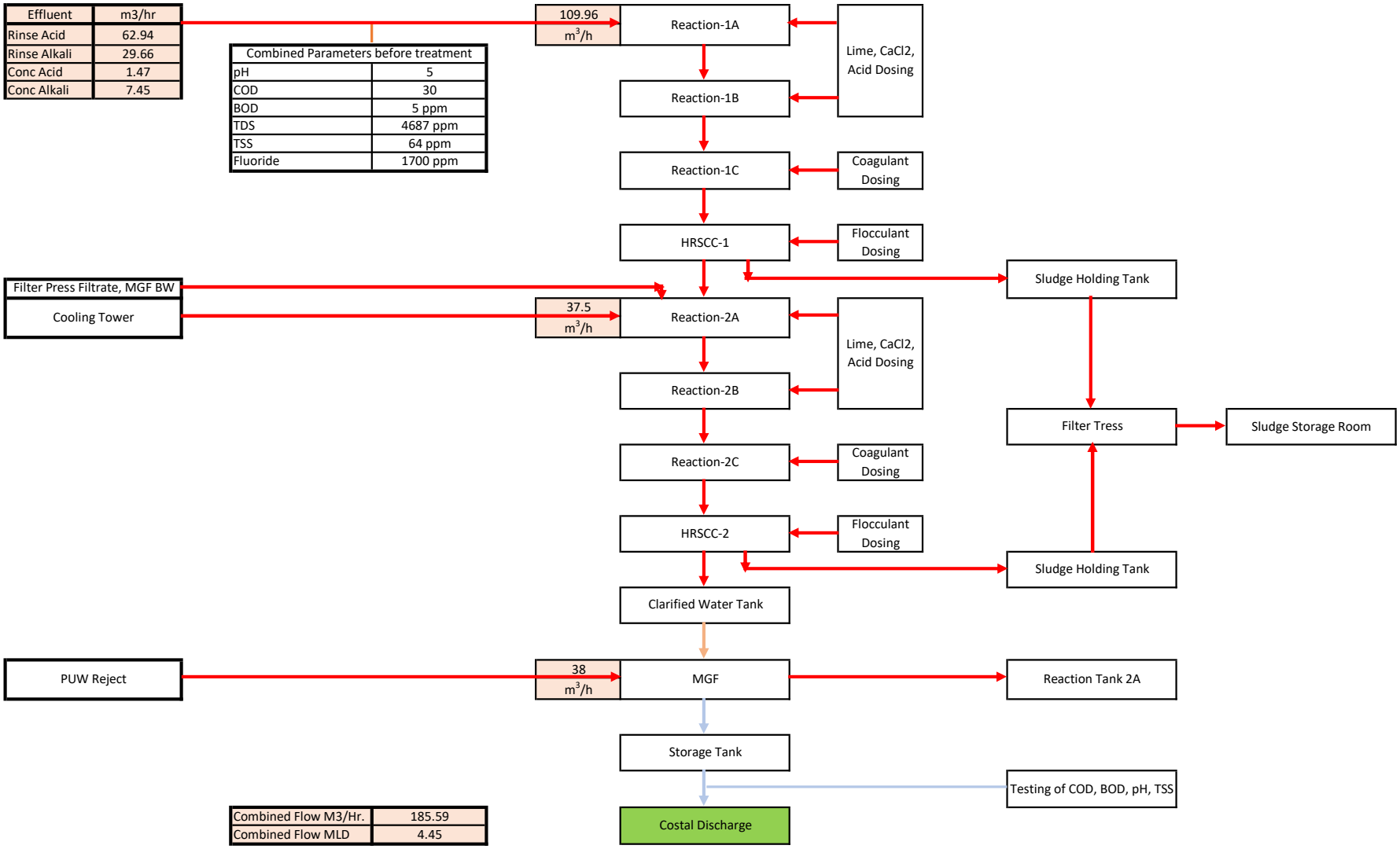
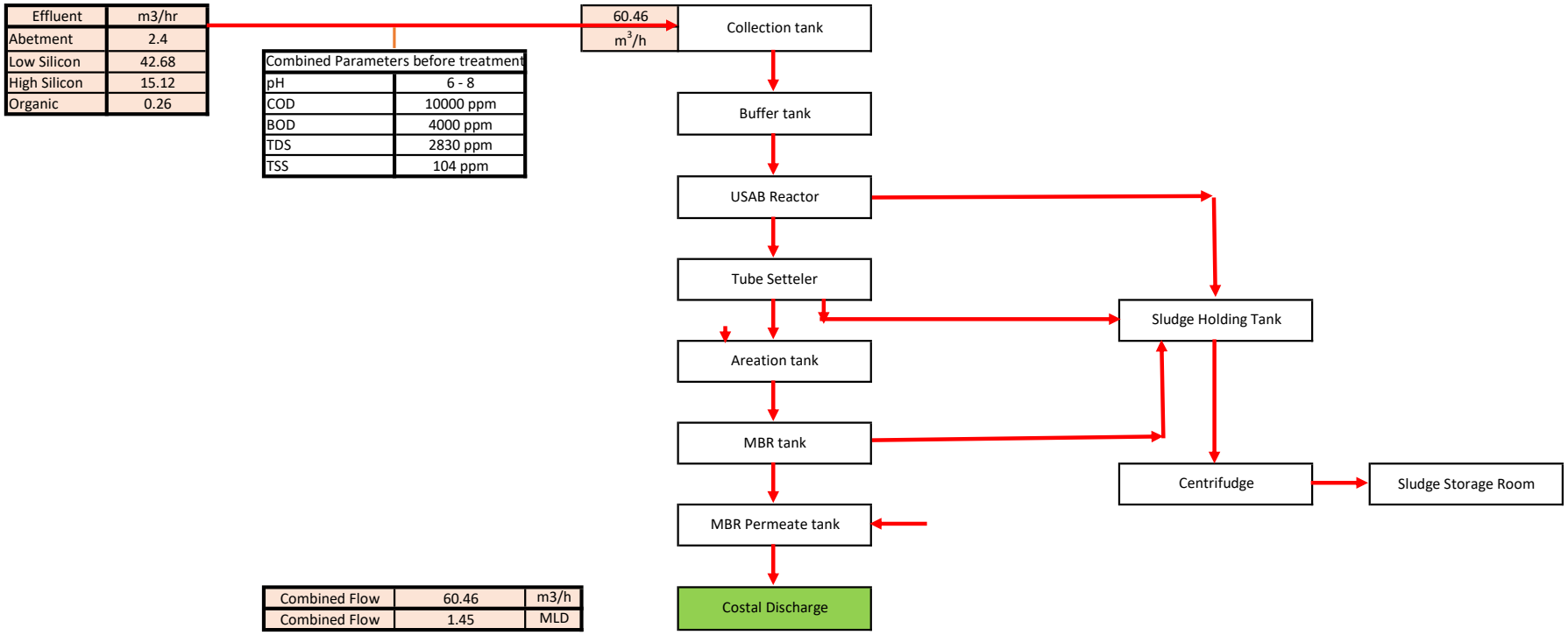
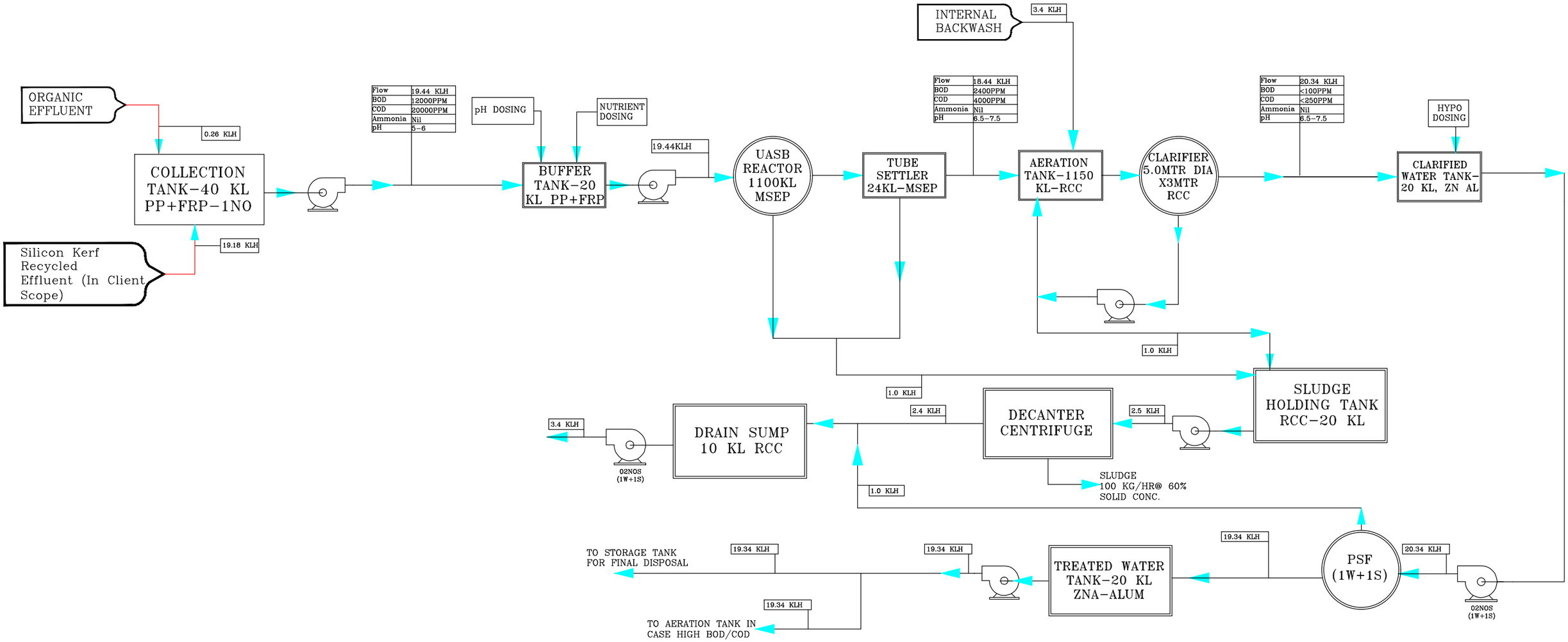


Fig 2.8 Schematic Diagram of Simplified Module Production Process


Effluent
m3/hr
Rinse Acid
62.94
Rinse Alkali
29.66
Conc Acid
1.47
Conc Alkali
7.45
Combined Parameters before treatment
pH
5
COD
30
BOD
5 ppm
TDS
4687 ppm
TSS
64 ppm
Fluoride
1700 ppm
109.96 m3/h
Reaction-1A
Reaction-1B
Reaction-1C
HRSCC-1
Lime, CaCl2, Acid Dosing
Coagulant Dosing
Flocculant Dosing
Filter Press Filtrate, MGF BW
Cooling Tower
37.5 m3/h
Reaction-2A
Reaction-2B
Reaction-2C
HRSCC-2
Lime, CaCl2, Acid Dosing
Coagulant Dosing
Flocculant Dosing
Sludge Holding Tank
Sludge Holding Tank
Filter Tress
Sludge Storage Room
Clarified Water Tank
PUW Reject
38 m3/h
MGF
Reaction Tank 2A
Storage Tank
Testing of COD, BOD, pH, TSS
Costal Discharge
Combined Flow M3/Hr.
185.59
Combined Flow MLD
4.45


Effluent
m3/hr
Abetment
2.4
Low Silicon
42.68
High Silicon
15.12
Organic
0.26
Combined Parameters before treatment
pH
6 - 8
COD
10000 ppm
BOD
4000 ppm
TDS
2830 ppm
TSS
104 ppm
60.46
m3/h
Collection tank
Buffer tank
USAB Reactor
Tube Setteler
Sludge Holding Tank
Areation tank
MBR tank
Centrifudge
Sludge Storage Room
MBR Permeate tank
Costal Discharge
Combined Flow
60.46
m3/h
Combined Flow
1.45
MLD

PROCESS FLOW DRAWING FOR ETP PLANT (SILICON KERF RECYCLED EFFLUENT)



REV.NO.	DATE	REVISION DESCRIPTION	DRAWN	CHKD.	APPR.

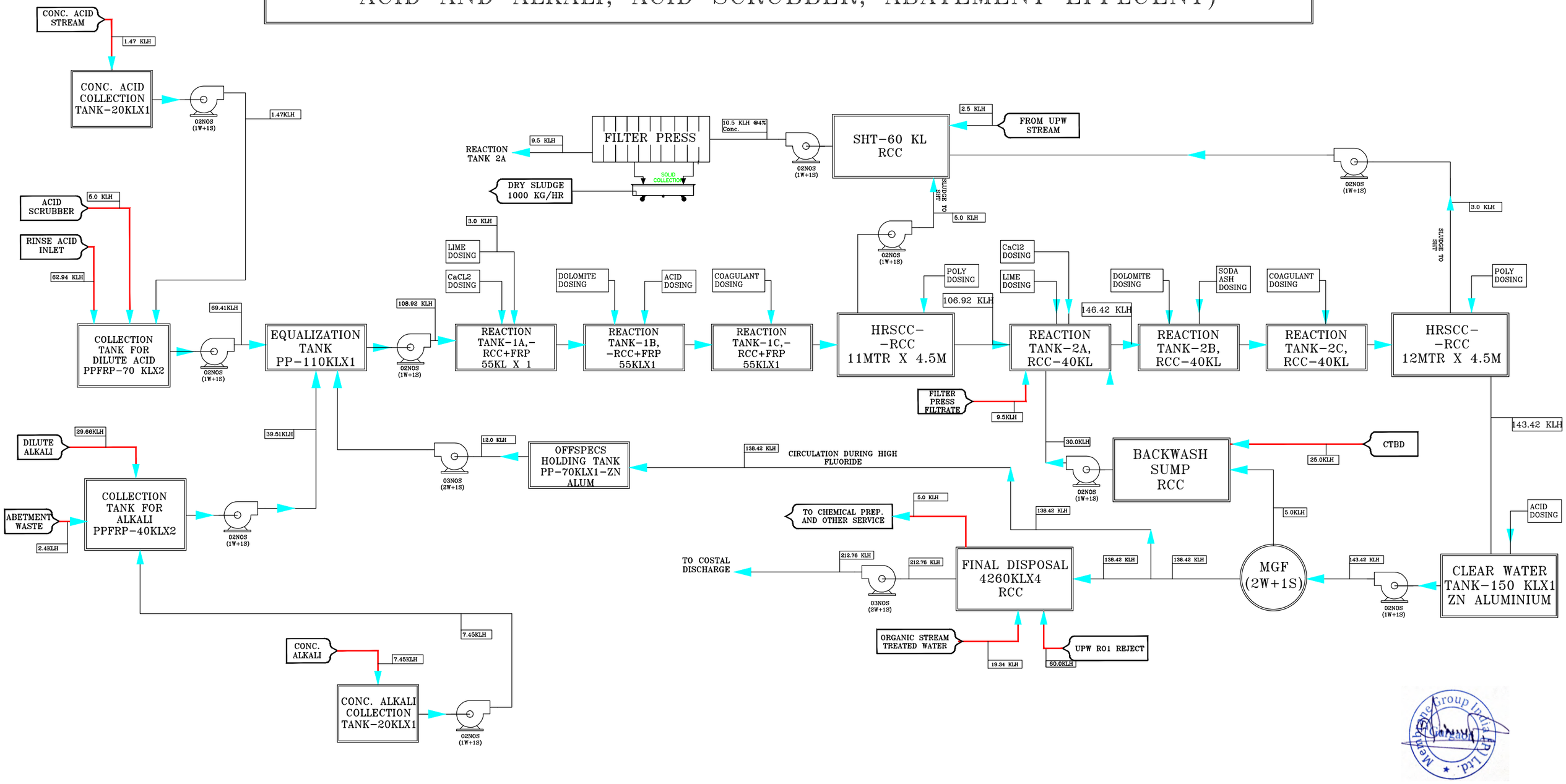
RELEASED FOR

CHECKING	
TENDER / PROPOSAL	
APPROVAL	
CONSTRUCTION	
INFORMATION	
AS BUILT	

CLIENT	M/s INDOSOL SOLAR PVT LTD	PROJECT NO.	MG-24/25-023
PROJECT	UPW & ETP PACKAGE	SHEET NO.	3 OF 3
DWG. TITLE	WATER BALANCE DRAWING	SCALE	NTS
DRAWING NO.	ISPL-PFD-SBETP-001	FINAL REV. NO.	R14

MWM We Support Life.
Membrane Group India (P) Ltd.
Generating Life from Waste Water
Plot No 217, Udhyog Vihar,
Phase IV, Gurgaon, Haryana -122015,
info@membranegroupindia.com

PROCESS FLOW & MASS BALANCE FOR ETP(RINSE ACID & ALKALI,CONC. ACID AND ALKALI, ACID SCRUBBER, ABATEMENT EFFLUENT)



NOTE: In the ETP plant, we have considered a margin of 12 m3/hr considering the system failure once a week. The effluent from Emergency tank will be transferred to the equalization tank with a flow rate of 12 m3/hr. The Capacity of Emergency tank is designed on a 7 day HRT Basis

REV.NO.	DATE	REVISION DESCRIPTION	DRAWN	CHKD.	APPR.

RELEASED FOR: CHECKING | TENDER / PROPOSAL | APPROVAL | CONSTRUCTION | INFORMATION | AS BUILT

CLIENT	INDOSOL SOLAR PVT. LTD.	PROJECT NO.	MG-24/25-023
PROJECT	UPW & ETP PACKAGE	SHEET NO.	2 OF 3
DWG. TITLE	WATER BALANCE DRAWING	SCALE	NTS
DRAWING NO.	ISPL-PFD-DETP-001	FINAL REV. NO.	R14

MVVM We Support Life..
Membrane Group India (P) Ltd.
Generating Life from Waste Water
Plot No 217, Udhyog Vihar,
Phase IV, Gurgaon, Haryana -122015,
info@membranegroupindia.com

GOVERNMENT OF ANDHRA PRADESH
ABSTRACT

Water Resources Department – Industrial Water Supply – Allocation of 7 MLD of water from Chevuru tank and Chennayapalem Lakes to M/s Indosol Solar Pvt. Ltd. (ISPL) for setting up an Integrated Solar PV Module Manufacturing facility along with In-House Float Glass Manufacturing facility at Ramayapatnam, SPSR Nellore District. - Orders – Issued.

WATER RESOURCES (REFORMS) DEPARTMENT

G.O.MS.No. 18 Dated: 13-04-2025

Read the following:-

1. Govt.Memo.No.2772/Reforms/A2/2015-1, W.R. (Reforms) Dept., Dt 30.09.2015.
2. G.O.M.s.No.16, W.R.(Reforms) Dept., Dated: 21.02.2023.
3. The CEO, AP Maritime Board Letter Dt. 17-2-2025 forwarded by the Secy to Govt, I&I (Ports) Dept vide U.O. Note Dt. 8-3-2025
4. Govt.Memo No. ICD01-COOR0MISC/40/2025-REFORMS, Dated 20-03-2025.
5. From the Engineer-in-Chief (I), WRD., Vijayawada Lr.No.ENC(I)/ EE/ DEE1/AEE2/IWS/(Indosol Solar Pvt.Ltd.) Dt: 05-04-2025 received through E File ICD05-13021(35)/9/2025-DEE1-EE-ENCI (Computer No. 2781843).

****

O R D E R:

In the reference 3rd read above, the CEO, AP Maritime Board requested the Government for Allocation of 7 MLD of fresh water to M/s INDOSOL SOLAR Pvt. Ltd., from both Chevuru and Chennayapalem Lakes and Right of Way for laying pipelines for Water drawl at the following locations of the Port Road by Micro Tunneling method (HDPE Pipeline of 400 mm dia. and length 3.415 km with Row 5 m and total land area Ac 4.20 Cents)

2. In the reference 5th read above, the Engineer-in-Chief (Irrigation), Water Resources Department recommended to the Government for allocation of 7 MLD of fresh water to M/s INDOSOL SOLAR Pvt. Ltd., and Port Operation from Chevuru tank and Chennayapalem Lakes to set up Vertically Integrated Solar PV Module Manufacturing Plant at Ramayapatnam, Ulavapadu (M), SPSR Nellore District subject to the following terms and conditions:

1. Raw water will be spared by the WRD subject to the availability of water in the source and this permission is valid for 5 Years from date of approval.

2. Water Resources Department no way responsible for non-supply of water during maintenance period or any other reason whats so ever that are beyond the scope of Department.

3. Under any circumstances, the consumptive utilization should not exceed the quantum of water allotted by the Government.

4. This permission is valid for this source only, the Agency /Firm should not draw water other than permitted.

5. Water will be supplied only after already committed demands (Irrigation, drinking etc.,) are fulfilled under the source specified by Industry/Firm.

6. The Industry/Firm should not construct any structure that will obstruct water way/ River Course.

7. The Industry /Firm should have all mandatory permissions/ clearances that are required from competent Authority.

8. Most of the Streams/Rivers or seasonal and flow will be only during monsoon, hence Agency has to arrange necessary storage facilities in their premises and capacity keeping in view of the period of in flow in rivers/Streams.

9. The Industry/Firm should make alternative arrangements for summer storage in their premises only and to conclude agreements accordingly.

10. The Industry/Firm should pay the water rate at the existing rates and subject to revision by the Government from time to time. In case of failure to pay water rate/royalty the permissions to draw water shall stands cancelled.
11. The Industry/Firm shall pay security deposit at 5% on 10 years water charges for which permission is granted.
12. The Industry/Firm shall pay one year water charges as advance and any amount due to the department before entering in to agreement with Superintending Engineer concerned.
13. The Industry/Firm has to pay the water charges for the estimated quantity in advance as the start of the financial year i.e. before 10th April every year as per Revenue Board Standing Orders (BSO).
14. Log book shall be maintained by Agency and should be made available as and when necessary for dept officers during inspection.
15. The entire cost of construction of intake well, pump house, pipelines excavation etc., should be borne by the industry only.
16. Water meters or suitable measuring devices should be installed by the industry at their own cost to measure the water consumed and should be made available to the department authorities and the representatives of the users shall be present at all time of inspection. The water meter shall be periodically calibrated and kept sealed. The period of calibration will be specified by the department

17. The Water Resources Department is no way responsible for non-supply of water due to any reasons.
18. The permission does not confer any riparian right to the Industry/Firm
19. The proposed drawl for this plant should not affect Lower riparian rights (LRR) and Upper riparian rights(URR) in any manner.
20. The Industry/Firm shall abide by R.C. Act-1884 and any other condition laid down by the Government Department from time to time.
21. The Industry/Firm has to produce the relevant records for department verification
22. The Industry/Firm shall obtain the prior concurrence from concerned departments for laying pipelines and for crossing etc., where ever necessary.
23. The Industry/Firm should make their own arrangements to dispose the treated effluents as per norms of A.P Pollution Control Board in their premises only and should obtain prior permission if any needed from Government to dispose treated effluents in their natural sources. Necessary clearance from the A.P. Pollution Control Board and other statutory bodies shall be obtained in this regard by the firm before drawl of water from the source
24. The Water Resources Department reserves the right for cancellation of the permission without assigning any reasons thereof.
25. The Department is no way responsible for any damages that may occur to the off-take point/other structure constructed due to floods or any other reasons.
26. In case Industry/Firm not apply permission for renewal within 3 months and also in case industry closed, then the allocation will be automatically cancelled.
27. In case industry closed, then the allocation will be automatically cancelled.
28. The Industry/Firm has to lay CC(1:4:8) before laying the pipeline and CC(1:2:4) over the pipeline refill the pipeline with proper soils and consolidate the banks as directed by the Department.
29. The firm has to obtain separate permission duly enclosing the drawings of pipelines and lease amounts to be paid for the Government Land to be leased as per the prevailing Norms.
30. No field bodhi or pipeline shall be taken through or along with Government land without approval of Government and if permission accorded by the Government the lease should be paid as fixed by Government only.
31. The Industry shall abide by any other conditions laid down by the Government Department from time to time.
32. The concerned Executive Engineer will be responsible for enforcing the conditions.
33. The water in to the intake structure should be allowed 1.0m above the highest sill level of sluices.
34. Water supply will be permitted only after fulfilling the above conditions. Non-adherence to any of the above condition by the industry will entail cancellation of the permission.

35. The agency has to draw the allocated water only and the source of water i.e., the tanks remain under Water Resources Department control.

3. After careful examination of the matter, Government hereby accord permission to M/s INDOSOL SOLAR PRIVATE LIMITED (ISPL) for the allocation of 7 MLD of Fresh Water from both Chevuru and Chennayapalem lakes for setting up an Integrated Solar PV Module Manufacturing facility along with In-House Float Glass Manufacturing facility at Ramayapatnam, SPSR Nellore District, subject to the terms & conditions as mentioned at para-2 above.

4. The Engineer-in-Chief (Irrigation), Water Resources Department, Vijayawada, the Chief Engineer, NTR TGP, Tirupati and the Collector & District Magistrate of SPSR Nellore District shall take necessary action accordingly.

(BY ORDER AND IN THE NAME OF THE GOVERNOR OF ANDHRA PRADESH)

G. SAI PRASAD

SPECIAL CHIEF SECRETARY TO GOVERNMENT

To
The Engineer-in-Chief (Irrigation), Water Resources Department,
Andhra Pradesh, Vijayawada.
The Chief Engineer, NTR TGP, Tirupati.
The Collector & District Magistrate, SPSR Nellore District.
The Managing Director, A.P. Pollution Control Board, A.P, Vijayawada.
M/s INDOSOL SOLAR PRIVATE LIMITED (ISPL), SPSR Nellore (Dist).
Copy to:
The P.S. to the Hon'ble Minister for Water Resources Department.
The P.S.to the.Spl.Chief Secretary to Government, Water Resources Department.
The P.S. to the Secretary to Government Industries Department.
SF/SC (2759071)

//FORWARDED::BY ORDER//

SECTION OFFICER

Specific safety measures for handling Hazardous Chemicals.

Specific Safety Measures - Liquids

S. NO.	CHEMICALS NAME	HAZARDS IDENTIFICATION	ACCIDENTAL RELEASE MEASURES	FIRST AID MEASURES
1	**Hydrogen Peroxide (31%)**	**Emergency Overview** Color: colorless Physical state: liquid Odor: pungent **Classification of the substance or mixture:** Oxidizing liquids, Category 2, H272 Oral: Acute toxicity, Category 4, H302 Serious eye damage, Category 1, H318 Specific target organ toxicity - single exposure, Category 3, H335 Chronic aquatic toxicity, Category 3, H412 *For the full text of the H-Statements mentioned in this Section, see Section 16. **Precautionary statements:** **Prevention:** P210 : Keep away from heat. P220 : Keep/Store away from clothing/ combustible materials. P221 : Take any precaution to avoid mixing with combustibles. P261 : Avoid breathing gas/mist/vapours/spray. P264 : Wash skin thoroughly after handling. P270 : Do not eat, drink or smoke when using this product.	**In case of spill or leak:** Prevent further leakage or spillage if you can do so without risk. Evacuate area of all unnecessary personnel. Ventilate the area. Eliminate all ignition sources. Avoid generation of vapors. Avoid contact with cellulose, paper, sawdust or similar substances. Risk of self-ignition or promotion of fires. Combustible materials exposed to hydrogen peroxide should be rinsed immediately with large amounts of water to ensure that all the hydrogen peroxide is removed. Contain and collect spillage with non-combustible absorbent material such as clean sand, earth, diatomaceous earth or non-acidic clay and place into suitable properly labeled containers for prompt disposal. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Consult a	1.**Inhalation:**If inhaled, remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. 2.**Skin:**In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. 3. **Eyes: In** case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately 4.**Ingestion:**If swallowed, DO NOT induce vomiting unless directed to do so by medical personnel. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person. Rinse mouth. 5. **Notes to physician:** Exposure to material may cause delayed lung injury resulting in pulmonary

		P271 : Use only outdoors or in a well-ventilated area. P273 : Avoid release to the environment. P280 : Wear protective gloves/ eye protection/ face protection. **Response:** P301 + P312 : IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell. P304 + P340 : IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for .	regulatory specialist to determine appropriate state or local reporting requirements, for assistance in waste characterization and/or hazardous waste disposal and other requirements listed in pertinent environmental permits	edema and pneumonitis. Exposed individuals should be monitored for 72 hours after exposure for the onset of delayed respiratory symptoms.
2	**Hydrochloric acid 32% (HCl)**	**Classification according to Regulation (EC) No 1272/2008** Corrosive to Metals (Category 1), H290 Skin corrosion (Sub-category 1B), H314 Serious eye damage (Category 1), H318 Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335 For the full text of the H-Statements mentioned in this Section, see Section 16. **Label elements** Labelling according Regulation (EC) No 1272/2008 Pictogram Signal word Danger Hazard statement(s) H290 May be corrosive to metals. H314 Causes severe skin burns and eye damage. H335 May cause respiratory irritation. Precautionary statement(s)	**1.Personal precautions, protective equipment and emergency procedures** Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Evacuate the danger area, observe emergency procedures, consult an expert. For personal protection see section 8. **2. Environmental precautions** Do not let product enter drains. **3. Methods and materials for containment and cleaning up** Cover drains. Collect, bind, and pump off spills.Observe possible material restrictions. Take up with liquid-absorbent and neutralising material (e.g.	**Description of first-aid measures** **1.General advice** First aiders need to protect themselves 2.**If inhaled** After inhalation: fresh air. Call in physician. 3.**In case of skin contact** In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately. 4.**In case of eye contact** After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses. 5.**If swallowed** After swallowing: make victim drink water (two glasses at most),

		P234 Keep only in original packaging. P261 Avoid breathing dust/ fume/ gas/ mist/ vapors/ spray. P271 Use only outdoors or in a well-ventilated area. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection/ hearing protection. P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **Other hazards** This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.	Chemizorb® H^+, Merck Art. No. 101595). Dispose of properly. Clean up affected area.	avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise. 6.**Most important symptoms and effects, both acute and delayed** The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11
3	**Hydrofluoric Acid (45-46%)**	Classification Section Hazard class Category Hazard class and category Hazard statement **Section Class** 2.16 substance or mixture	**Personal precautions, protective equipment and emergency procedures** **For non-emergency personnel** Remove persons to safety. Ventilate affected area. Do not get in eyes, on skin, or on	**General notes** Self-protection of the first aider. Remove victim out of the danger area. Take off immediately all contaminated clothing. Symptoms may develop several

		corrosive to metals 3.1O acute toxicity (oral) 2 Acute Tox. 2 H300 3.1D acute toxicity (dermal) 1 Acute Tox. 1 H310 3.1I acute toxicity (inhal.) 2 Acute Tox. 2 H330 3.2 skin corrosion/irritation 1A Skin Corr. 1A H314 3.3 serious eye damage/eye irritation 1 Eye Dam. **The most important adverse physicochemical, human health and environmental effects** Skin corrosion produces an irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis. Spillage and fire water can cause pollution of watercourses. **Hazard statements** **H290** May be corrosive to metals. **H300+H310+H330** Fatal if swallowed, in contact with skin or if inhaled. **H314** Causes severe skin burns and eye damage. Precautionary statements **P234** Keep only in original container. **P261** Avoid breathing mist/vapours/spray. **P280** Wear protective gloves/protective clothing/eye protection/face protection. **P301+P330+P331** IF SWALLOWED:	clothing. Do not breathe dust/fume/gas/mist/ vapours/spray. Wearing of suitable protective equipment (including personal protective equipment referred to under Section 8 of the safety data sheet) to prevent any contamination of skin, eyes and personal clothing. **For emergency responders** Wear breathing apparatus if exposed to vapours/dust/spray/ gases. Warning and evacuating people in the neighbourhood. **Environmental precautions** In case of formation of gases/vapours/mists suppress with water spray Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. If substance has entered a water course or sewer, inform the responsible authority. **Methods and material for containment and cleaning up** **Advices on how to clean up a spill** Collect spillage.	hours following exposure; medical observation therefore necessary for at least 48 hours. In all cases of doubt, or when symptoms persist, seek medical advice. In case of unconsciousness place person in the recovery position. Never give anything by mouth. Hydrofluoric acid 40 - 45% United Kingdom: en Page: 3 / 19 **Following inhalation** Provide fresh air. Mouth to mouth resuscitation should be avoided. Use alternative methods, preferably with oxygen or compressed air driven apparatus. If breathing is irregular or stopped, immediately seek medical assistance and start first aid actions. **Following skin contac**t After contact with skin, take off immediately all contaminated clothing, and wash immediately with plenty of water and soap. Rub with a gel containing calcium gluconate. Call a physician immediately. Causes poorly healing wounds. **Following eye contact**

		Rinse mouth. Do NOT induce vomiting. **P303+P361+P353** IF ON SKIN (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower. **P304+P340** IF INHALED: Remove person to fresh air and keep comfortable for breathing **P305+P351+P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P310** Immediately call a POISON CENTER/doctor.	Absorbent material (e.g. sand, diatomaceous earth, acid binder, universal binder, sawdust, etc.). **Appropriate containment techniques** Neutralisation techniques. Use of adsorbent materials. **Other information relating to spills and releases** Place in appropriate containers for disposal. Ventilate affected area.	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Remove contact lenses, if present and easy to do. Continue rinsing. Rinse copiously with a calcium gluconate solution. **Following ingestion** Rinse mouth immediately and drink plenty of water. Do NOT induce vomiting. 1%ige Calciumgluconat-Lösung in kleinen Schlucken trinken lassen (wenn nicht verfügbar: ersatzweise Milch oder Kreideaufschwemmung, sonst Wasser). Call a physician in any case. **Most important symptoms and effects, both acute and delayed** Nausea, Vomiting. Causes poorly healing wounds. Fatal if swallowed, in contact with skin or if inhaled. Causes severe skin burns and eye damage.
4	**Nitric Acid (69%)**	**Classification of the substance or mixture** **Classification according to Regulation (EC) No 1272/2008** Oxidizing liquids (Category 3), H272 Corrosive to metals (Category 1), H290 Skin corrosion (Category 1A), H314	**1.Personal precautions, protective equipment and emergency procedures** Evacuate personnel to safe areas. Do not breathe vapors or spray mist. Wear a positive-pressure supplied-air	**Description of first aid measures** **General advice** Show this safety data sheet to the doctor in attendance. **Inhalation** Move to fresh air in case of accidental inhalation of vapors. Keep patient warm. In case

		Hazard statement(s) **H272** May intensify fire; oxidizer. **H290** May be corrosive to metals. **H314** Causes severe skin burns and eye damage. **EUH071** Corrosive to the respiratory tract. Precautionary statement(s) **P210** Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. **P220** Keep away from clothing and other combustible materials. **P234** Keep only in original packaging. **P260** Do not breathe fume/gas/mist/vapours/spray. **P264** Wash hand thoroughly after handling. **P280** Wear protective gloves/protective clothing/eye protection/face protection. **P301 + P330 + P331** IF SWALLOWED: Rinse mouth. Do NOT induce vomiting	respirator, flame retardant antistatic protective clothing. Shut off leaks if without risk. Keep people away from and upwind of spill/leak. **2. Environmental precautions** Contain or absorb leaking liquid with sand or earth, consults an expert. Prevent liquid entering sewers, basements and workpits. If substance has entered a water course or sewer or contaminated soil, advise police. **3. Methods and materials for containment and cleaning up** Spillage : soak up with inert absorbent material (e.g. sand, silica gel). Prevent liquid entering sewers, basements and workpits; vapor may create explosive atmosphere. Transfer to covered drums. Dispose of promptly.	of shortness of breath, give oxygen. Apply artificial respiration only if patient is not breathing or under medical supervision. No artificial aspiration mouth to mouth or mouth to nose. Use suitable instruments/apparatus. **Skin contact** Remove contaminated clothing and wash affected skin with soap and water. Dab with polyethylene glycol 400. If signs of poisoning appear, treat as for inhalation. Obtain medical attention. Wash contaminated clothing before reuse. **Eye contact:** If the substance has got into the eyes, immediately wash out with plenty of water at least 15 minutes. Obtain medical attention. **Ingestion** Rinse mouth. Do not induce vomiting. Keep patient warm. In case of shortness of breath, give oxygen. Apply artificial respiration only if patient is not breathing or under medical supervision. No artificial aspiration mouth to mouth or mouth to nose.

				Use suitable instruments/apparatus. Obtain medical attention. Never give anything by mouth to an unconscious person. **Indication of any immediate medical attention and special treatment needed** After swallowing: make victim drink water (two glasses at the most), avoid vomiting, risk of perforation. Immediately call in physician. Do not attempt to neutralize.
5	**Potassium Hydroxide (40%)**	**Classification of the substance or mixture** Classification according to Regulation (EC) No 1272/2008 Skin irritation (Category 1A), H314 Acute oral toxicity (Category 4), H302 Hazard statement(s) H314 Causes severe skin burn and eye damage. H302 Causes serious eye irritation. Precautionary statement(s) P280 Wear protective gloves, protective clothing, eye protection, face protection. P260 Do not breathe dust, fume, gas, mist, vapours, spray. P264 Wash thoroughly after handling. **P270** Do not eat, drink or smoke when using this product.	**Personal precautions, protective equipment and emergency procedures** For emergency responders: Equip cleanup crew with proper protection. Ventilate area. For non-emergency personnel: Evacuate unnecessary personnel. **Environmental precautions** Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters. **Methods and materials for containment and cleaning up** Clean up methods: Soak up spills with inert solids, such as clay or diatomaceous earth as soon as	**General advice** Consult a physician. Show this safety data sheet to the doctor in attendance. **If inhaled** Immediately call a POISON CENTER or doctor. Remove to fresh air and keep at rest in a position comfortable for breathing. **In case of skin contact** Immediately call a POISON CENTER or doctor. Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing. **In case of eye contact** Rinse cautiously with water for

		P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. **P305 + P351 + P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **P304 + P340** IF INHALED : Remove to fresh air and keep at rest in a position comfortable for breathing. **P303 + P361 + P353** IF ON SKIN (or hair) : Remove immediately all contaminated clothing. Rinse skin with water/ shower. **P405** Store locked up. **P501** Dispose of this material and its container to hazardous or special waste collection point, in accordance with local, regional, national and/ or international regulation.	possible. Collect spillage. Store away from other materials.	several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor. **If swallowed** Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor. **Most important symptoms and effects, both acute and delayed** Symptoms relating to use : Causes severe skin burns and eye damage. Swallowing a small quantity of this material will result in serious health hazard. **Indication of any immediate medical attention and special treatment needed** Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).
6	**Sodium Hydroxide (48%)**	**Classification of the substance or mixture** **Classification acc. to GHS** **Section Hazard class Category** 2.16 Substance or mixture corrosive to metals 1 Met. Corr. 1 H290 3.2 Skin corrosion/irritation 1A Skin Corr. 1A H314 3.3 Serious eye damage/eye	**Personal precautions, protective equipment and emergency procedures** For non-emergency personnel Use personal protective equipment as required. Avoid contact with skin, eyes and clothes. Do not breathe vapour/spray. **Environmental precautions**	**General notes** Take off immediately all contaminated clothing. Self-protection of the first aider. **Following inhalation** Provide fresh air. In all cases of doubt, or when symptoms persist, seek medical advice. **Following skin contact** After contact with skin, wash

		irritation 1 Eye Dam. 1 H318 **The most important adverse physicochemical, human health and environmental effects** Skin corrosion produces an irreversible damage to the skin; namely, visible necrosis through the epidermis and into the dermis. **Precautionary statements** **Precautionary statements - prevention** P260 Do not breathe dusts or mists P280 Wear eye protection/face protection **Precautionary statements - response** **P303+P361+P353** IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower **P305+P351+P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing **P390** Absorb spillage to prevent material damage **Precautionary statements - disposal** P501 Dispose of contents/container to industrial combustion plant **Hazardous ingredients for labelling:** Sodium hydroxide	Keep away from drains, surface and ground water. Retain contaminated washing water and dispose of it. **Methods and material for containment and cleaning up** Advice on how to contain a spill Covering of drains. **Advice on how to clean up a spill** Absorb with liquid-binding material (sand, diatomaceous earth, acid- or universal binding agents). **Other information relating to spills and releases** Place in appropriate containers for disposal.	immediately with plenty of water. Immediate medical treatment required because corrosive injuries that are not treated are hard to cure. **Following eye contact** In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist. Protect uninjured eye. **Following ingestion** Rinse mouth immediately and drink plenty of water. Call a physician immediately. If swallowed danger of perforation of the esophagus and the stomach (strong corrosive effects). **Most important symptoms and effects, both acute and delayed** Corrosion, Cough, Breathing difficulties, Gastric perforation, Risk of serious damage to eyes, Risk of blindness.

Specific Safety Measures – Gases

S. No.	GAS NAME	HAZARDS IDENTIFICATION	ACCIDENTAL RELEASE MEASURES	FIRST AID MEASURES
1	Silane	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas PYROPHORIC GASES - Category 1 ACUTE TOXICITY (inhalation) - Category 4 **Signal word / Hazard statements -** Danger Extremely flammable gas. Catches fire spontaneously if exposed to air. Contains gas under pressure; may explode if heated. Harmful if inhaled. May displace oxygen and cause rapid suffocation. May form explosive mixtures with air. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel" **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for**	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To

		when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution. **Prevention** - Wear protective gloves. Wear protective clothing. Wear eye or face protection. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid breathing gas. **Response** - Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. IF INHALED: Call a POISON CENTER or doctor if you feel unwell. IF ON SKIN: Immerse in cool water or wrap in wet bandages. **Storage** - Protect from sunlight. Store in a well-ventilated place.	**containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
2	Ammonia	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** FLAMMABLE GASES - Category 2 GASES UNDER PRESSURE - Liquefied gas	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated

		ACUTE TOXICITY (inhalation) - Category 4 SKIN CORROSION - Category 1 SERIOUS EYE DAMAGE - Category 1 AQUATIC HAZARD (ACUTE) - Category 1 **Signal word / Hazard statements -** Danger Flammable gas. May form explosive mixtures with air. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. Harmful if inhaled. Causes severe skin burns and eye damage. Very toxic to aquatic life. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution. **Prevention** - Wear protective gloves. Wear eye or face protection. Wear	area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage. **Methods and materials for containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use	promptly by a physician. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately. Call medical doctor or poison control center immediately. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. Get medical attention

		protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing gas. Wash hands thoroughly after handling. **Response** - Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. **Storage** - Store locked up. Protect from sunlight. Store in a well-ventilated place.	spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	immediately. Call medical doctor or poison control center immediately. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

		Disposal - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.		
3	Nitrous Oxide	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas SPECIFIC TARGET ORGAN TOXICITY (SINGLE EXPOSURE) (Narcotic effects) - Category 3 **Signal word / Hazard statements -** Danger May cause or intensify fire; oxidizer. Contains gas under pressure; may explode if heated. May cause drowsiness or dizziness May displace oxygen and cause rapid suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If necessary, call a poison center or physician. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or

		children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service. Always keep container in upright position. **Prevention** - Keep away from clothing and other combustible materials. Keep reduction valves, valves and fittings free from oil and grease. Use only outdoors or in a well-ventilated area. Avoid breathing gas. **Response** - Call a POISON CENTER or doctor if you feel unwell. In case of fire: Stop leak if safe to do so. **Storage** - Store locked up. Store in a well-ventilated place. Keep container tightly closed. Protect from sunlight. **Disposal** - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - : In addition to any other important health or physical hazards, this	equipment. **Methods and materials for containment and cleaning up (Small Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact**: No known significant effects or critical hazards. **Inhalation**: Can cause central nervous system (CNS) depression. May cause drowsiness or dizziness. **Skin contact**: No known significant effects or critical hazards. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Can cause central nervous system (CNS) depression. As this product is a gas, refer to the inhalation section. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The

		product may displace oxygen and cause rapid suffocation.		exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
4	Trimethylaluminum	**2.1 Classification of the substance or mixture** Classification according to Regulation (EC) No 1272/2008 Flammable liquids (Category 2), H225 Pyrophoric liquids (Category 1), H250 Substances and mixtures which in contact with water emit flammable gases (Category 1), H260 Skin corrosion (Sub-category 1B), H314 Serious eye damage (Category 1), H318 Reproductive toxicity (Category 2), H361d Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336	**Personal precautions, protective equipment and emergency procedures** - Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition. Evacuate the danger area, observe emergency procedures, and consult an expert. **Environmental precautions** - Do not let product enter drains. Risk of explosion. **Methods and materials for containment and cleaning up** - Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions. Take up carefully with	**General advice** - First aiders need to protect themselves. Show this material safety data sheet to the doctor in attendance. **If inhaled** - After inhalation: fresh air. Call in physician. **In case of skin contact** - In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Call a physician immediately. **In case of eye contact** - After eye contact: rinse out with plenty of water. Immediately call in ophthalmologist. Remove contact lenses. **If swallowed** - After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of

		Specific target organ toxicity - repeated exposure (Category 2), Central nervous system, H373 Aspiration hazard (Category 1), H304 Long-term (chronic) aquatic hazard (Category 3), H412 **Signal Word** - Danger **Hazard statement(s) -** H225 Highly flammable liquid and vapor. H250 Catches fire spontaneously if exposed to air. H260 In contact with water releases flammable gases which may ignite spontaneously. H304 May be fatal if swallowed and enters airways. H314 Causes severe skin burns and eye damage. H336 May cause drowsiness or dizziness. H361d Suspected of damaging the unborn child. H373 May cause damage to organs (Central nervous system) through prolonged or repeated exposure. H412 Harmful to aquatic life with long lasting effects. **Precautionary statement(s)** - P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. P231 + P232 Handle and store contents under inert gas. Protect from	liquid-absorbent material (e.g. Chemizorb®). Dispose of properly. Clean up affected area.	perforation). Pulmonary failure possible after aspiration of vomit. Call a physician immediately. Do not attempt to neutralise.

		moisture. P280 Wear protective gloves/ protective clothing/ eye protection/ face protection. P301 + P330 + P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. P303 + P361 + P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. P304 + P340 + P310 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. **Supplemental Hazard information (EU)** EUH014 Reacts violently with water.		
5	Phosphene Hydrogen Mixture (8%PH3/92% H2)	**Classification according to Regulation** **Physical hazards** - Flammable gases, Category 1 H220 Gases under pressure : Liquefied gas H280 Skin corrosion/irritation, Category 2 H315 Serious eye damage/eye irritation,	**Personal precautions, protective equipment and emergency procedures** - Avoid breathing vapours, spray mists or gases Provide adequate ventilation Eliminate ignition sources Evacuate personnel to a safe place Beware of vapours that accumulate	**General advice** - See a doctor. Show the safety data sheet to the attending physician **In case of inhalation** - In case of inhalation, remove the person from the contaminated area. **In case of respiratory arrest** - give artificial respiration. See a doctor **In case of skin contact** - Remove

		Category 1 H319 Acute toxicity (inhalation: gas) Category 2 H330 Specific target organ toxicity - Single exposure, Class 3, Respiratory tract irritation H335 **Signal word** - Danger **Hazard statements** - H220 Extremely flammable gas H280 Contains gas under pressure; may explode if heated H315 Causes skin irritation H319 Causes serious eye irritation H330 Fatal if inhaled H335 May cause respiratory irritation **Precautionary statements** - P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking P260 Do not breathe gas, vapours P280 Wear protective gloves, protective clothing, eye protection, face protection P302+P352+P315 IF ON SKIN: Wash with plenty of soap and water. Get immediate medical advice/attention P304+P340+P315 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Get immediate medical advice / attention P305+P351+P338+P315 IF IN EYES: Rinse cautiously with water for	forming explosive concentrations. Vapours may accumulate in low areas **Personal protective equipment** - Goggles, Face Shield & Protective Gloves **Environmental precautions** - Try to stop the leak **Methods and material for containment and cleaning up** - Ventilate the area Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost)	contaminated clothing and shoes immediately. Wash with soap and plenty of water. Take victim immediately to hospital. See a doctor **In case of eyes contact** - Rinse thoroughly with plenty of water for at least 15 minutes and consult a doctor **In case of ingestion** - Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. See a doctor **Most important symptoms and effects, both acute and delayed** - At high concentrations can cause asphyxiation. Symptoms may include loss of mobility/consciousness. The victim may not be aware of the asphyxia May cause corneal irritation (with temporary visual disturbance) May cause skin irritation. May cause respiratory tract irritation, sneezing, coughing, burning throat, constricted larynx and difficulty breathing **Indication of any immediate medical attention and special treatment needed** - Consult a doctor immediately

		several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice / attention P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely P381 In case of leakage, eliminate all ignition source P410+403 Protect from sunlight. Store in a well-ventilated place P405 Store locked up		
6	Boron Trichloride	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas ACUTE TOXICITY (inhalation) - Category 3 SKIN CORROSION - Category 1 SERIOUS EYE DAMAGE - Category 1 **Signal word / Hazard statements -** Danger Contains gas under pressure; may explode if heated. Toxic if inhaled. Causes serious eye damage. Causes severe skin burns and eye damage **Precautionary statements - General** - Read and follow all Safety	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with	**Eye contact** - Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. **Inhalation** - Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be

		Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. **Prevention** - Wear protective gloves. Wear eye or face protection. Wear protective clothing. Use only outdoors or in a well-ventilated area. Avoid breathing gas. Wash hands thoroughly after handling. **Response** - IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. IF IN EYES: Rinse cautiously with water for	accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in the respective MSDS.	dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Chemical burns must be treated promptly by a physician. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an

		several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or physician. **Storage** - Store locked up. Protect from sunlight. Store in a well-ventilated place. **Disposal** - Dispose of contents and container in accordance with all local, regional, national and international regulations. **Hazards not otherwise classified** - Liquid can cause burns similar to frostbite.		unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Causes serious eye damage. Liquid can cause burns similar to frostbite. **Inhalation** : Toxic if inhaled. **Skin contact** : Causes severe burns. Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : Adverse symptoms may include the following:, pain, watering, redness, frostbite **Inhalation** : No specific data. **Skin contact** : Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur, frostbite **Ingestion** : Adverse symptoms may include the following:, frostbite,

				stomach pains. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
7	Nitrogen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas SIMPLE ASPHYXIANTS **Signal word / Hazard statements -** Warning Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. May displace oxygen and cause rapid	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest

		suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. **Prevention** - Not applicable. **Response** - Not applicable **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : At very high concentrations, can displace the normal air and cause suffocation from lack of

				oxygen. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
8	Oxygen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or**	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10

		mixture: OXIDIZING GASES - Category 1 GASES UNDER PRESSURE - Compressed gas **Signal word / Hazard statements -** Danger May cause or intensify fire; oxidizer. Contains gas under pressure; may explode if heated. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Open valve slowly. Use only with equipment cleaned for Oxygen service. **Prevention** - Keep away from clothing and other combustible materials. Keep reduction valves, valves and fittings free from oil and grease.. **Response** - In case of fire: Stop leak if safe to do so. **Storage** - Protect from sunlight. Store	personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use	minutes. Get medical attention. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : No known significant effects or critical hazards.

		in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - None known.	spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
9	Argon	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). **Classification of the substance or mixture:** GASES UNDER PRESSURE - Compressed gas	**For non-emergency personnel** - No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Avoid breathing gas. Provide adequate	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

		SIMPLE ASPHYXIANTS **Signal word / Hazard statements -** Warning Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. **Precautionary statements - General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. **Prevention** - Not applicable **Response** - Not applicable. **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk.** **Methods and materials for containment and cleaning up (Large Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** - **Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite.

				Inhalation : No known significant effects or critical hazards. Acts as a simple asphyxiant. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
10	Hydrogen	**OSHA/HCS status -** This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).	**For non-emergency personnel** - Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or	**Eye contact** - Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses.

		Classification of the substance or mixture: FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Compressed gas **Signal word / Hazard statements -** Danger Extremely flammable gas. Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. Burns with invisible flame. May form explosive mixtures with air. **Precautionary statements -** **General** - Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Approach suspected leak area with caution. **Prevention** - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. **Response** - Leaking gas fire: Do not	without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment. **For emergency responders** - If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel". **Environmental precautions** - Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). **Methods and materials for containment and cleaning up (Small Spill) - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.** **Methods and materials for containment and cleaning up (Large**	Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs. **Inhalation** - Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. **Skin contact** - Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse. **Ingestion** - As this product is a gas, refer to the inhalation section. **Most important symptoms/effects, acute and delayed (Potential acute health effects)** -

		extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. **Storage** - Protect from sunlight. Store in a well-ventilated place. **Disposal** - Not applicable **Hazards not otherwise classified** - In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.	**Spill)** - Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal in MSDS.	**Eye contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Inhalation** : No known significant effects or critical hazards. **Skin contact** : Contact with rapidly expanding gas may cause burns or frostbite. **Frostbite** : Try to warm up the frozen tissues and seek medical attention. **Ingestion** : Ingestion of liquid can cause burns similar to frostbite. **Over-exposure signs/symptoms** - **Eye contact** : No specific data. **Inhalation** : No specific data. **Skin contact** : No specific data. **Ingestion** : No specific data. **Notes to physician** - Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled. **Protection of first-aiders** - No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Kindly process our application for CFE at the earliest

Thanking you,
Yours Sincerely,
Pothireddy Manoj Kumar Reddy
(EA to CMD)
Indosol Solar Pvt. Ltd.
Hyderabad Knowledge City,
TSIIC Raidurg, Hitech City Road,
Hyderabad, Telangana 50008

Annexure - VIII

ANDHRA PRADESH POLLUTION CONTROL BOARD
Paryavaran Bhavan, APIIC Colony Road, Gurunanak Colony,
Autonagar, Vijayawada- 520007.
Website: www.pcb.ap.gov.in

CONSENT TO ESTABLISH (CTE) ORDER

Order.No. 302/PCB/CTE/RO-NLR/HO/2025- Dt:01-06-2025

Sub: APPCB – CTE - **M/s. Indosol Solar Pvt. Ltd,** Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District, A.P. **– Consent to Establish (CTE)** of the Board under Sec.25 of the Water (Prevention and Control of Pollution) Act, 1974 and under Sec.21 of the Air (Prevention and Control of Pollution) Act, 1981 – **Orders - Issued** - Reg.

Ref:
1. CTE application received by the Board through APOCMMS on 03.06.2024.
2. SEE, ZO: Tirupati reports received on 25.09.2024 & 25.04.2025.
3. T.O. Letter dt: 20.10.2024 & 22.05.2025.
4. CTE Committee meeting held on 14.10.2024 & 01.05.2025
5. Project Proponent submitted the information in APOCMMS Portal on 23.04.2025 & 26.05.2025.

***

1) M/s. Indosol Solar Pvt. Ltd, vide reference 1st cited, submitted an application to the Board seeking **Consent to Establish (CTE)** to establish unit to manufacture the following products with installed capacities as mentioned below, with an investment of Rs. 2,000 Crores.

S.No.	Name of the Products	Quantity
1	Solar Photovoltaic (PV) modules	9,09,091 Nos./annum
2	Solar Photovoltaic (PV) Cells	14,02,59,740 Nos./annum
3	Solar Photovoltaic (PV) Wafers	14,72,72,727 Pcs/annum

Raw material and chemicals used:

S.No.	Name of the Raw Materials	Quantity (Tons/Day)
1.	Polysilicon Virgin big size	3,88,218 Kg/Annum
2.	Polysilicon Virgin size small	21,99,900 Kg/Annum
3.	Nitric Acid	20,41,354 Lts/Annum

4.	Hydrofluoric Acid	3,40,226 Lts/Annum
5.	Wafer	14,72,72,727 Pcs/Annum
6.	Solar Cells	7,01,29870 Pcs/Annum

2) As per the application, the above activity is to be located at Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, Chevuru Village, Gudluru Mandal, SPSR Nellore District, Andhra Pradesh, in an area of 1,98,500 Sq.m.

3) The above site was inspected by the Senior Environmental Engineer, Zonal Office, Tirupati and Environmental Engineer, Regional Office, Tirupati, A.P Pollution Control Board on 09.08.2024 and observed that the site is surrounded by

North	Agricultural lands
South	Agricultural lands
East	Vacant land followed by Donka road
West	Agriculture canal adjacent to the proposed site

4) The Board, after careful scrutiny of the application and verification report of SEE, Zonal Office: Tirupati and recommendations of CTE Committee, hereby issues **CONSENT TO ESTABLISHMENT** to the Project under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under. This order is issued to manufacture the products as mentioned at para (1) only.

5) The industry shall comply with the following conditions:

a. All the units of the ETP & STP shall be constructed above ground and shall be impervious to prevent ground water pollution.
b. The industry shall provide digital flow meters with totalizers at the inlet and outlet of treatment systems and maintain records. The industry shall also provide magnetic flow meters with totalizers at inlet of MEE and ATFD, RO permeate & RO rejects and the same shall be connected to APPCB website.
c. The industry shall install online real time monitoring system at outlet of ETP units and web camera facilities and connect to APPCB / CPCB websites as per CPCB directions.
d. The industry shall adopt Zero Liquid discharge system and the treated water shall be reused in the process & makeup water streams.
e. The industry shall avoid the handling of drums for storage of solvents/ raw materials shall use the tankers only.
f. The industry shall implement adequate measures to control all fugitive emissions from the plant.
g. Greenbelt of 33% of the total project area shall be developed within plant premises with at least (5-10m) wide greenbelt on all along the periphery of the project area, in downward direction, and along road sides etc. Selection of

plant species shall be as per the CPCB guidelines in consultation with the DFO.

6) This Consent Order now issued is subject to the conditions mentioned in Annexure.

7) This order is issued from pollution control point of view only. Zoning and other regulations are not considered.

8) This order is valid for a period of 7 years from the date of issue.

Encl: Annexure.

S SRI SARAVANAN
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8,
592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2,
2B, 3B, 4A, 4B, 5A, 5B,
Chevuru Village, Gudluru Mandal,
SPSR Nellore District, Andhra Pradesh.
Email: manoj@indosolsolar.com

Copy to:
1. The SEE, Z.O: Tirupati for information.
2. The E.E., R.O: Nellore for information and necessary action.

ANNEXURE

1) The proponent shall obtain Consent to Operation (CTO) from APPCB, as required under Sec.25/26 of the Water (P&C of P) Act, 1974 and under sec. 21/22 of the Air (P&C of P) Act, 1981, before commencement of the activity.

2) The applicant shall provide separate energy meters for Effluent Treatment Plant (ETP)/ Sewage Treatment Plant (STP) and Air pollution Control equipment to record energy consumed. An alternative electric power source sufficient to operate all pollution control systems shall be provided.

3) The industry shall construct separate storm water drains. No effluents shall be discharged in to the storm water drains

Water:

4) The Project Proponent obtained permission from the Water Resources Department vide G.O.Ms.No.18 dt:13.04.2025 for allocation of 7.0 MLD of water from both Chevuru and Chennayapalem lakes to M/s. Indosol Solar Private Limited, for setting up and integrated Solor PV Module manufacturing facility along with In-House Float Glass Manufacturing facility at **Ramayapatnam,** SPSR Nellore District. The Project Proponent shall ensure that the maximum permitted water consumption shall not exceed the capacity mentioned below:-

S.No.	Purpose	Quantity (KLD)		
		Fresh	Recycled	Total
1	Process & Washings	394.08	3448.70	3842.78
2	Scrubbing	132.23	107.77	240.00
3	Cooling Tower make up	396.47	750.73	1147.20
4	DM Plant	1119.77	646.63	1766.40
5	Domestic	206.40	--	206.40
6	Gardening	163.20	95.00	258.20
	Total	**2412.14**	**5048.84**	**7460.98**

- Separate meters with necessary pipe-line shall be provided for assessing the quantity of water used for each of the purposes mentioned above.

5) The maximum waste water generation shall not exceed the following:

S.No.	Source	Quantity (KLD)
1	Process & Washings	3446.78
2	Scrubber	96.00
3	Cooling Tower blow down	573.60
4	DM Rejects	1766.40
5	Domestic	100.00
	Total	**5982.78**

Treatment & Disposal:

Effluent source	Treatment system provided	Mode of final disposal
Trade effluents (Process & Washings, boiler blow down, Cooling tower bleed-off, FGD Waste water)	Zero Liquid Discharge (ZLD) system including Effluent Treatment Plant (6028 KLD) followed by RO systems (8 Nos.), MEE (300 KLD) & ATFD (39 KLD).	After treatment, RO permeate shall be reused for utilities make-up. • RO Rejects to MEE • MEE concentrate to ATFD • MEE & ATFD Condensate to Biological treatment plant followed by RO. • ATFD Salts to TSDF landfill. The industry shall maintain ZLD.
Domestic effluents	Sewage Treatment Plant (120 KLD)	After treatment, shall be utilized for on-land for gardening purpose.

6) All the units of the ETP & STP shall be above ground and impervious to prevent ground water pollution. The Effluent Treatment Plant (ETP) and STP shall be operated regularly.

7) The domestic effluents shall be treated to the on land for irrigation standards, as stipulated under Schedule-VI of Environment (Protection) Rules, 1986, notified by Ministry of Environment and Forests, Government of India vide G.S.R.422 (E), dt.19.05.1993 and its amendments thereof.

8) The industry shall provide digital flow meters with totalizers at the inlet and outlet of treatment systems and maintain records. The industry shall provide magnetic flow meters with totalizers at inlet of MEE and ATFD, RO permeate & RO rejects and the same shall be connected to APPCB website.

9) The industry shall install online real time monitoring system at outlet of ETP units and web camera facilities and connect to APPCB / CPCB websites as per CPCB directions.

10) The industry shall adopt Zero Liquid discharge system and the treated water shall reuse in the process & makeup water streams.

11) Floor washings shall be admitted into the effluent collection system only and they shall not be allowed to find their way in storm drains or open areas. All pipe valves, sewers, drains shall be leak proof.

12) Under any circumstances, the industry shall not discharge the treated/ untreated waste water/ contaminated runoff outside the premises or into any water bodies or aquifers.

13) The industry shall construct rain water runoff tank for collection of first flush of storm water and to channelize to ETP for treatment.

14) The industry shall implement adequate measures to curtail spillages at source and any discharges into storm water drains to prevent contamination of run-off.

Air:

15) The Air pollution Control equipment shall be installed along with the commissioning of the activity and shall comply with the following for controlling air pollution.

Sl. No	Details of Stack	Stack – 1	Stack – 2	Stack - 3
a)	Attached to	Common stack attached to Cell, Ingot & Wafer Manufacturing Equipment	D G Set	D G Set
b)	Capacity	--	1250 KVA	1500 KVA
c)	Name of the Fuel:	--	HSD	HSD
d)	Stack height above ground (m.)	30 m	30 m	30 m
e)	Details of Air pollution control equipment	Scrubbers -5 Nos.	Acoustic enclosures	Acoustic enclosures

16) A sampling port with removable dummy of not less than 15 cm diameter shall be provided in the stack at a distance of 8 times the diameter of the stack from the nearest constraint such as bends etc. A platform with suitable ladder shall be provided below 1 meter of sampling port to accommodate three persons with instruments. A 15 AMP 250 V plug point shall be provided on the platform.

17) The industry shall properly operate and maintain VOC monitoring system with auto recording facility and connect to APPCB website.

18) The industry shall properly operate and maintain the monitoring system to all the stacks / vents in the plant. Regular monitoring shall be carried out and report shall be submitted to the Regional officer.

19) The industry shall implement adequate measures to control all fugitive emissions from the plant and solvent storage tank farms.

20) Ambient Air Quality monitoring stations shall be setup in the down wind direction as well as where maximum ground level concentration of PM2.5, PM10 SO2, NOx & HCL (methane & non-methane) are anticipated in consultation with concerned Regional Office.

21) The industry shall take appropriate measures to control odour nuisance in the surroundings and details shall be reported to Concerned Regional office of PCB before applying for CFO.

22) The generator shall be installed in a closed area with a silencer and suitable noise absorption systems. The ambient noise level shall not exceed 75 dB (A) during day time and 70 dB (A) during night time.

Hazardous / Solid Waste:

23) The industry shall comply with the following:

S. No	Details of waste	Quantity	Method of disposal
1	ETP sludge (Inorganic)	36.44 TPD	Shall be sent to TSDF/ Authorised Recyclers
2	ETP sludge (Organic)	16.80 TPD	
3	Evaporation Salts	15.84 TPD	
4	Silica recovered from ETP	44.00 TPD	Shall be sent to reuse
5	STP Sludge	0.3 TPD	Shall be used as manure/ Horticulture
6	Oily waste	1.0 TPA	Shall be sent to Authorized Agencies/ Recyclers/ Vendors
7	Waste oils & Grease	500 KLPA	
8	Detoxified containers & bags	300 Nos./month	
9	Used PPE	0.5 TPM	
10	E-Waste including production reject	321.5 TPA	
11	Plastic Waste	10 TPA	
12	Metal Scrap	20.0 TPM	
13	Used / Discarded RO Membranes Cartridge	4.0 TPA	Shall be sent to TSDF
14	Spent Resin	6.0 TPA	
15	Spent Anthracite	0.5 TPA	
16	Discorded / Broken Solar Cells/ wafers	0.5% of production	Shall be sent to authorised re-cyclers, as per E-Waste (Management) Rules, 2022.

24) Proper handling, storage, utilization and disposal of all the solid waste should be ensured and regular report regarding toxic metal content in the waste material and its composition, end use of solid / hazardous waste shall be submitted to the Regional office.

25) Industry shall register with Andhra Pradesh Environment Management Corporation Ltd (APEMCL) for disposal of hazardous and other wastes before applying for CTO of the Board and shall comply with Hazardous Waste Management Rules, 2016.

26) The industry shall provide closed shed on elevated platform, leachate collection & odour extraction/scrubbing system for storage of Hazardous waste.

27) The following rules and regulations notified by the MoEF& CC, GoI shall be

implemented:

a. Regulation of Persistent Organic Pollutants Rules, 2018.
b. Hazardous waste and other wastes (Management and Transboundary Movement) Rules, 2016 and amendments thereof.
c. Plastic Waste Management Rules, 2016.
d. Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989
e. Batteries (Management & Handling) Rules, 2010.
f. E-Waste (Management) Rules, 2016.
g. Construction and Demolition waste Management Rules, 2016.
h. Solid Waste Management Rules, 2016.
i. Public Liability Insurance Act, 1991 and its amendments thereof.
j. Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996
k. Ozone Depleting Substances (ODS) Rules of 2000.

Other Conditions:

28) The industry shall maintain ZLD system for treatment of effluents.

29) The industry shall install three stage scrubbers and connect all vents to the scrubbers to the process emissions.

30) The industry shall avoid the handling of drums for storage of solvents/ raw materials shall use the tankers only.

31) The industry shall submit a copy of the NOC issued by the Andhra Pradesh State Disaster Response and Fire Service Dept., (APSDRFSD) at concerned Regional Office, APPCB.

32) The industry shall obtain policy under PLI Act before applying for CTO of the Board.

33) The industry shall prepare risk assessment report covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system**.**

34) The proponent shall display online data outside the main factory gate on quantity and nature of hazardous chemicals being used in the plant, water & air emissions and solid waste generated within the factory premises.

35) The industry shall submit risk assessment report covering worst scenario clearly describing impact within the industry premises and outside the industry premises and emergency response system.

36) The industry shall prepare a safety report and carry out an independent safety audit report of the respective industrial activities including chemical storages / isolated storages by an expert not associated with such industrial activity as required under Rule 10 of MSIHC Rules, 1989 and get it approved by the Factories

Dept., and submit the compliance along with copy of the safety report, safety audit report and safety certificate at concerned Regional Office, APPCB.

37) Greenbelt of 33% of the total project area shall be developed within plant premises with at least (5-10m) wide greenbelt on all the periphery of the project area. Selection of plant species shall be as per the CPCB guidelines in consultation with the DFO.

38) The industry shall identify major accident hazard chemicals & list out the hazardous chemicals endangered to human health & environment and the details shall be furnished to the Factories Department and to the Regional Office, APPCB time to time duly certifying the same by the industry. Further the industry shall extend training to the working personnels while handling hazardous chemicals for prevention of accidents and necessary antidotes to ensure the safety, as per the MSIHC Rules, 1989.

39) The industry shall carryout calibration of safety equipments and leak detection systems at regular intervals and shall certify the same with the Factories Department. That certified copy shall be submitted to the APPCB, Regional Office. The industry shall install fluorescent Wind Vane at the highest point in the industry premises.

40) The proponent shall ensure that there shall not be any change in the process technology and scope of working without prior approval from the Board.

41) The proponent shall comply with all the directions issued by the Board from time to time.

42) The industry shall submit compliance to the conditions stipulated in the CTE orders to the concerned Regional Officer of APPCB every six months and shall upload the same at APPCB website viz., https://pcb.ap.gov.in/UI/Submission_Compliance_of__CTE_CFO_Direction.aspx.

43) Concealing the factual data or submission of false information / fabricated data and failure to comply with any of the conditions mentioned in this order attracts action under the provisions of relevant pollution control Acts.

44) The Board reserves its right to modify above conditions or stipulate any additional conditions including revocation of this order in the interest of environment protection.

45) Notwithstanding anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec. 27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under sSec.21 (4) of Air (Prevention and Control of Pollution) Act, 1981 to revoke the order, to review any or all the conditions imposed herein and to make such modifications as deemed fit and stipulate any additional conditions.

46) The proponent shall comply with the Technical suggestions at Chapter No. 7.3

& 7.4 for Hazardous Chemical handling industries by High Power Committee (HPC) of Govt. of Andhra Pradesh. The HPC report is available at www.ap.gov.in.

47) Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate Authority) constituted under Section 28 of Water (Prevention and Control of Pollution)Act,1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.

S SRI
SARAVANAN
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Sy. Nos. 584/9, 10, 11, 585/2, 3, 4, 5, 6, 7, 8,
592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2,
2B, 3B, 4A, 4B, 5A, 5B,
Chevuru Village, Gudluru Mandal,
SPSR Nellore District, Andhra Pradesh.
Email: manoj@indosolsolar.com

Annexure - IX

o/c

ANDHRA PRADESH POLLUTION CONTROL BOARD
Paryavaran Bhavan, APIIC Colony Road, Gurunanak Colony,
Autonagar, Vijayawada- 520007.
Website: www.pcb.ap.gov.in

LiFE Lifestyle for Environment

CONSENT TO ESTABLISH(NOC) ORDER

Order No.302/APPCB/CTE/RO-NLR/HO/2025 - 6 **Dt. 23-08-2025**

Sub: APPCB – CTE – M/s. Indosol Solar Pvt. Ltd., Chevuru Village, Gudluru Mandal, SPSR Nellore District – Consent to Establish of the Board CTE (NOC) for Development of marine outfall to discharge 6 MLD of treated effluent into sea under Sec.25 of Water (P&C of P) Act, 1974 and Under Sec.21 of Air (P&C of P) Act, 1981 - Issued - Reg.

Ref:
1. Industry's request letter to the Board on 05.07.2025.
2. The EE, RO: Nellore inspection report dt. 15.07.2025.
3. CTE Committee meeting held on 07.08.2025.

25.08.2025 DISPATCHED

1. M/s. Indosol Solar Private Limited has submitted an application vide reference 1st cited, to the Board seeking CTE (NOC) for development of marine outfall for discharge of effluents from the industry manufacturing Solar Photovoltaic Modules, Cells and Wafers unit located at Chevuru Village, Gudluru Mandal, SPSR Nellore District under CRZ Rules for the following project.

The details are given below:

S. No.	Name of the product	Applied Capacity
1.	Proposed marine outfall to discharge 6 MLD of treated effluent into sea	6 MLD

Development of treated effluent discharge through marine outfall system of M/s. Indosol Solar Pvt. Ltd as follows:

a. Laying of outfall pipeline to discharge 6 MLD treated effluent to a distance of 8062.29 m on land from plant guard pond to LFP and 1000m into the sea from LFP to outfall diffuser location at offshore.
b. Crossing of effluent pipeline in the Buckingham canal as indicated in the CRZ map.
c. Construction of outfall diffuser in sea at a depth of 8.5 m w.r.t Chart Datum to discharge of 6 MLD treated effluent with diameter 400 mm into the Sea, upto outfall diffuser.
d. The outfall diffuser is proposed at 1.75 km south of existing break water placed with multi-port arrangement of 4 nos. of 140 mm diameter.
e. Pipeline will cross the CRZ zone in CRZ-IVB (Buckingham Canal), CRZ-III(NDZ), CRZ-IB (intertidal zone) and CRZ-IV A (LTL to 12 Nautical mile) as per CRZ Notification 2011
f. Nandemmapuram village is existing at a distance of about 680m towards West direction from the Land fall point and Peddapattapupalem village is existing at a distance of about 980m towards South-west direction from the Land fall point.

g. Hatchery is existing at a distance of about 850m towards North -west direction from the Land fall point.
h. The proposed effluent pipeline crosses Buckingham Canal at 15^0 0' 42.91"- N & 80^0 2' 40.93"- E and 15^0 0' 42.88"- N & 80^0 2' 42.30"- E.

2. The project proponent submitted Environmental Impact Assessment Study for obtaining CRZ clearance for releasing 6 MLD treated water into sea at Ramayapatnam, Andhra Pradesh. It is reported that the geo-coordinates of Land Fall Point LFP & Outfall diffuse into the Sea are as follows:

Location	Latitude	Longitude
LFP	14^0 59' 26.0" N	80^0 03' 23.2" E
Outfall diffuser	14^0 59' 26.6" N	80^0 03' 56.6" E

3. The Board, after careful scrutiny of the application, verification report of Regional Officer: Nellore and recommendations of the CTE Committee hereby issues NOC for obtaining CRZ clearance for development of marine outfall for the industry under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made there under. This order is issued to the activity as mentioned at para (1) only.

4. This order is subject to the conditions mentioned in the annexure.

5. This order is issued from pollution control point of view only. Zoning and other regulations are not considered.

6. This order is valid for a period of 7 years from the date of issue.

Encl: Annexure

S SRISARAVANAN IFS
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Chevuru Village, Gudluru Mandal,
SPSR Nellore District

Copy to: 1. The JCEE(FAC), Z.O., Tirupati for information and necessary action.
2. The E.E., R.O, Nellore for information and necessary action.

Annexure

1. The proponent shall not start any construction activity without obtaining CTE of the Board.
2. Effluents shall not be discharged onland or into any surface water bodies or aquifers under any circumstances.
3. The proponent shall regularly monitor the flora and fauna of the marine aquatic life. The trend analysis of the monitoring reports shall be compared with the base line data. If it is found any negative impacts, immediate restorative measures shall be implemented duly submitting a report to Board.
4. The proponent shall provide continuous online effluent monitoring system for Flow, pH, TSS, COD, BOD, TOC, Ammonia and oil & grease at the outlet marine disposal system. It shall be connected to the website of CPCB and APPCB.
5. The industry shall apply CTE for the project including marine outfall along with copies of CRZ clearance, before starting the construction of the project.
6. The proponent shall provide magnetic flow meter with the digital totalizer with recording facility for the purpose of quantification of treated effluent discharged through marine outfall.
7. The facility shall comply with all the SOPs issued by APPCB w.r.t. marine outfalls.
8. Guard ponds, monitoring facilities, etc. of adequate capacity shall be provided. The treated wastewater shall be stored in the guard ponds, after conforming to the marine discharge standards notified by the MoEF&CC, GoI, New Delhi, shall be discharged through marine outfall into the Bay of Bengal under the supervision of APPCB officials.
9. The proponent shall comply with all the directions issued by the Board from time to time.
10. Concealing the factual data or submission of false information / fabricated data and failure to comply with any of the conditions mentioned in this order may result in withdrawal of this order and attracts action under the provisions of relevant pollution control Acts.
11. Notwith standing anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec.27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under Sec.21(4) of Air (Prevention and Control of Pollution) Act, 1981 to review any or all the conditions imposed herein and to make such alternation as deemed fit and stipulate any additional conditions by the Board.

12. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate Authority) constituted under Section 28 of Water (Prevention and Control of Pollution)Act,1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.

S SRISARAVANAN IFS
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Chevuru Village, Gudluru Mandal, SPSR Nellore District.

Digitally signed by
SHANMUGAM SRISARAVANAN
Date: 23-08-2025 13:49:54

Annexure - X

2025 INSC 961

REPORTABLE

IN THE SUPREME COURT OF INDIA
CIVIL ORIGINAL JURISDICTION

WRIT PETITION (C) NO. 166 OF 2025

VANASHAKTI **...APPELLANT**

VERSUS

UNION OF INDIA **...RESPONDENT**

J U D G M E N T

B.R. GAVAI, CJI

1. The present petition challenges the notification dated 29th January, 2025 bearing number S.O. 523(E) issued by the Ministry of Environment, Forest and Climate Change (hereinafter referred to as 'the MoEF&CC') and the Office Memorandum dated 30th January, 2025 issued by the MoEF&CC.

2. We have heard Shri Gopal Sankaranarayanan, learned senior counsel appearing on behalf of the petitioner and Shri P.V. Dinesh, learned senior counsel appearing on behalf of the intervenor(s), supporting the case of the petitioner.

3. We have also heard Ms. Aishwarya Bhati, learned Additional Solicitor General of India appearing for the Union of India (MoEF&CC), Shri Tushar Mehta, learned Solicitor General of India appearing for the State of Maharashtra, Shri Mukul Rohatgi and Shri Atmaram Nadkarni, learned senior counsel appearing for the intervenor(s) and other learned counsel.

4. Shri Gopal Sankaranarayanan, learned senior counsel, submits that the impugned notification dated 29th January, 2025 (hereinafter referred to as 'the impugned notification') totally changes the regime, which was provided by the notification dated 14th September, 2006 issued by the Ministry of Environment and Forests (hereinafter referred to as 'the 2006 notification'). Shri Sankaranarayanan, learned senior counsel, submits that the Union of India has been making consistent efforts to dilute the provisions contained in the 2006 notification by issuing notifications dated 22nd December, 2014 (hereinafter referred to as 'the 2014 notification'), 9th December, 2016 (hereinafter referred to as 'the 2016 notification') and 14th and 15th November, 2018

(hereinafter referred to as 'the 2018 notification'). It is submitted that 2014 notification was quashed and set aside by the High Court of Kerala *vide* judgment and order dated 6th March, 2024. Similarly, it is submitted that the 2016 notification issued by the MoEF&CC was quashed and set aside by the National Green Tribunal, Principal Bench, New Delhi *vide* judgment dated 8th December, 2017. He further submits that the 2018 notification has been stayed by the High Court of Delhi by an order dated 26th November, 2018.

5. It is submitted by the learned senior counsel that the preamble of the 2025 notification does not refer to the judgment of the learned NGT and the order of the Delhi High Court. It is, therefore, submitted that the impugned notification suffers from suppression of material facts.

6. Shri Sankaranarayanan, learned senior counsel, further submits that under the 2006 notification, the General Conditions were applicable to the projects covered under Entry 8(a) and 8(b) of the Schedule. He submits that under the General Conditions, any project or activity within 10 kms. from the boundary of:

(i) Protected areas notified under the Wild Life (Protection) Act, 1972,

(ii) Critically polluted areas as identified by the Central Pollution Control Board from time to time,

(iii) Eco-sensitive areas as notified under Section 3 of the Environment (Protection) Act, 1986, such as Mahabaleshwar Panchgani, Matheran, Panchmarhi, Dahanu, Doon Valley and

(iv) Inter-State boundaries and international boundaries,

are to be examined only by the MoEF&CC and not by the State Environment Impact Assessment Authority (for short, 'SEIAA'). He fairly concedes that the said restriction of 10 kms., has been subsequently brought down to 5 kms., by a subsequent notification.

7. Shri Sankaranarayanan, learned senior counsel, submits that having failed in its repeated attempts to dilute the restrictions as provided in 2006 notification, the MoEF&CC has come with the impugned notification which has the effect of nullifying the judgments passed by the High Court of Kerala and the NGT.

8. Shri Sankaranarayanan, learned senior counsel, further submits that the judgment and order passed by the learned NGT is challenged by way of an appeal before this Court. It is submitted that a coordinate Bench of this Court, after hearing the matter at length, on 23rd April, 2025 has reserved the matter for judgment. He, therefore, submits that as a matter of propriety this Court should refrain from deciding the issue in order to avoid any conflicting judgments.

9. *Per contra*, Ms. Aishwarya Bhati, learned Additional Solicitor General of India, submits that right from inception, the General Conditions were never made applicable to the projects or activities covered by Entry 8 of the Schedule. She submits that the perusal of the Schedule of the 2006 notification would show that wherever it was intended that the General Conditions would apply, it has been specifically mentioned in column 5 thereof that the General Conditions would be applicable. She submits that wherever some other conditions were to be made applicable, column 5 specifically notes as to what are the conditions which would be applicable to such activity/project. She submits that, however, in order

to bring clarity and in view of some of the orders passed by the learned NGT which required the notification to be issued after following the procedure prescribed by law, the impugned notification came to be notified.

10. Shri Mukul Rohatgi, learned senior counsel appearing for the intervenor(s), submits that the 2025 notification was brought by the Union of India, in view of the judgment of this Court in the case of ***In Re: Construction of Park at Noida near Okhla Bird Sanctuary***[1]. It is submitted that though this Court has recorded the submission that for the activity/project in Entry 8(a) and 8(b) general conditions are not applicable, this Court has opined that certain clarity needs to be given to the issues so as to put any controversy at rest.

11. Shri Atmaram Nadkarni, learned senior counsel appearing for the intervenor(s), submits that in Maharashtra alone 700 projects are pending consideration before SEIAA, which, on account of stay order granted by this Court could not be considered.

12. It is submitted by all the counsel for the respondent(s)

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[1] (2011) 1 SCC 744

that MoEF&CC is not equipped with the machinery to consider the entire projects from all the State/Union Territories in the country and therefore the 2006 notification itself provides for the projects which could be considered by the SEIAA.

13. It is, therefore, submitted that the stay on impugned notification has caused irreparable damage to the developmental activities throughout the country, inasmuch as all the projects stand stalled on account of non-consideration by SEIAA.

14. For considering the rival submissions, it will be appropriate to refer to the particulars of the schedule to the 2006 Notification, which is extracted hereinbelow.

"**SCHEDULE**
LIST OF PROJECTS OR ACTIVITIES REQUIRING PRIOR ENVIRONMENTAL CLEARANCE

<table>
<tr><th colspan="2">Project or Activity</th><th colspan="2">Category with threshold limit</th><th>Conditions if any</th></tr>
<tr><td colspan="2" rowspan="2">(1)</td><td>A</td><td>B</td><td></td></tr>
<tr><td colspan="3">Mining, extraction of natural resources and power generation (for a specified production capacity)</td></tr>
<tr><td>(1)</td><td>(2)</td><td>(3)</td><td>(4)</td><td>(5)</td></tr>
</table>

15. It can thus be seen that the Schedule has five columns. In the first column, serial number of the project or activity is

mentioned. In the second column the details of the activity are mentioned. In the third column the projects which are approved by the MoEF&CC are mentioned. In the fourth column, the projects which are approved by the SEIAA are mentioned and the fifth and the last column deals with the conditions, if any, which would be applicable.

16. The projects with which we are concerned in the present *lis* are at Entry 8 of the Schedule, which reads thus:-

Project or Activity		**Category with threshold limit**		**Conditions if any**
(1)		A	B	
		Mining, extraction of natural resources and power generation (for a specified production capacity)		
(1)	(2)	(3)	(4)	(5)
8		Building/Construction projects/Area Development projects and Townships		
8(a)	Building and Construction projects		≥20000 sq. mtrs and <1,50,000 sq.mtrs. of built-up area#	#(built up area for covered construction; in the case of facilities open to the sky, it will be the activity area)
8(b)	Townships and Area Development projects		Covering an area ≥ 50 ha and or built up area ≥1,50,000 sq. mtrs++	++All projects under item 8(b) shall be appraised as Category B1

17. If we compare column 5 of Entry 8 to Entry 1(a) which deals with mining of minerals and slurry pipelines (coal lignite and other ores) passing through national parks/sanctuaries/coral reefs/ecologically sensitive areas, Entry 1(c) which deals with river-valley projects, Entry 1(d) which deals with the Thermal Power Plants, Entry 2(a) which deals with Coal washeries, Entry 2(b) which deals with Mineral beneficiation, Entry 3(a) which deals with Metallurgical industries (ferrous & non-ferrous), Entry 3(b) which deals with Cement plants, Entry 4(b) which deals with Coke oven plants, Entry 4(d) which deals with Choir-alkali industry, Entry 4(f) which deals with Leather/skin/hide processing industry, Entry 5(d) which deals with manmade fibers manufacturing, Entry 5(e) which deals with petrochemical based processing, Entry 5(f) which deals with synthetic organic chemicals industry, Entry 5(g) which deals with distilleries, Entry 5(h) which deals with integrated paint industry, Entry 5 (i) which deals with pulp & paper industry, Entry 5(j) which deals with sugar industry, Entry 6(b) which deals with isolated storage

and handling of hazardous chemicals, Entry 7(c) which deals with industrial estates/parks, complexes/areas, Export Processing Zones (EPZs), Special Economic Zones (SEZs), Biotech parks, leather complexes, Entry 7(d) which deals with common hazardous waste treatment, storage and disposal facilities, Entry 7(e) which deals with ports, harbours, break waters, dredging, Entry 7(f) which deals with highways, Entry 7(g) which deals with Aerial ropeways, Entry 7(h) which deals with common effluent treatment plants, Entry 7(i) which deals with common municipal solid waste management facility, column 5 specifically provides that General Conditions shall apply.

18. It is thus clear that wherever the delegated legislation required the General Conditions should be applied, the notification specifically provided for the same.

19. It can clearly be seen that Entry 8(a) and 8(b) of the Schedule do not provide for applicability of General Conditions, however, they provide for some other conditions as can be seen from the 2025 notification.

Project and Activity		**Category with threshold limit**		**Conditions, if any**
		A	B	
(1)	(2)	(3)	(4)	(5)
"8	Building or Construction projects or Area Development Projects and Townships			
8(a)	Building and Construction projects		≥ 20,000 sq.m. and < 1,50,000 sq. m. of built up area	The term "built up area" for the purpose of this notification is defined as the built up or covered area on all floors put together, including its basement and other service areas, which are proposed in the building or construction projects. Note 1. The projects or activities shall not include industrial shed, school, college, hostel for educational institution, but such buildings shall ensure sustainable environmental management, solid and liquid waste management, rain water harvesting and may use recycled materials such as fly ash bricks. Note 2. "General Conditions" shall not apply.
8(b)	Townships and Area Development Projects		Covering an area ≥ 50 ha and/or built up area ≥ 1,50,000 sq. m.	A project of Township and Area Development Projects covered under this item shall require an Environment Impact Assessment report and be appraised as Category 'B1' Project. Note. "General Conditions" shall not apply.

20. Insofar as 2014 notification is concerned, the same, as fairly accepted by Shri Shankaranarayan, learned senior counsel appearing on behalf of the petitioner, was quashed and set aside by the Kerala High Court on 06th March, 2024 in WP(C) No. 3097 of 2016 on a technical ground, since the procedural formalities for publication of the notification was not found in consonance with the final notification.

21. Insofar as the judgment and order of the learned NGT dated 08th December, 2017 is concerned, what has been set aside is (i) clause 14(8) of the 2016 notification which provided for establishment of the Environmental Cell at the level of State Governments or local authorities, (ii) the provisions relating to exclusion of Consent to Operate and Consent to Establish under Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 in clause 14 of 2016 notification and (iii) Appendix-XVI to the said notification relating to constitution and functioning of the said Environmental Cell.

22. It is thus clear that the issue that arises for consideration in the present *lis* was not an issue for consideration before the

learned NGT. In any case, the Environmental Cell at the level of a municipal body cannot be equated with SEIAA, which is a statutory body constituted by the Central Government under a statute namely the Environment (Protection) Act, 1986. The learned NGT was, therefore, justified in holding that an important task of granting environmental clearances cannot be entrusted to a body at the municipal level. However, at the cost of repetition, it is observed that the SEIAA is a statutory body comprising of experts.

23. Insofar as the order dated 26th November, 2018 passed by the Delhi High Court granting stay is concerned, the said order considered the 2018 notifications dated 14th and 15th November, 2018 *vide* which the area of 20,000 sq.mtr., was increased to 50,000 sq.mtr for Building or Construction projects or Area Development projects and Townships and from 20,000 sq.mtr to 1,50,000 sq.mtr for industrial sheds, educational institutions, hospitals and hostels for educational institutions.

24. By the impugned notification, however, there is no variation with regard to the built-up area of 20,000 sq.mtr.

and 1,50,000 sq.mtr for Building and Construction projects and with regard to Townships and Area Development projects having an area of 50 ha. to 1,50,000 sq.mtr which was provided in the 2006 notification.

25. Insofar as the second judgment of the learned NGT dated 9th August, 2024 is concerned, no doubt that the learned members of the NGT have referred to the General Conditions, we, however, find that the learned NGT has not considered the 2006 notification in its correct perspective.

26. It is a settled principle of law that while interpreting any legislation including a subordinate legislation, the first principle that has to be adopted is the literal rule of interpretation. Applying literal interpretation to the 2006 notification, it would be clear that said notification does not provide for applicability of the General Conditions to projects in Entry 8(a) and 8(b) of the Schedule. As already observed hereinabove, wherever the delegated legislation wanted the General Conditions to be made applicable it has been specifically provided in column 5 of the projects/activities.

27. At the cost of repetition, we observe that insofar as the

projects/activities at Entries 8(a) and 8(b) are concerned, General Conditions have not been provided for right from the 2006 notification.

28. It is further to be noted that the judgment dated 09th August, 2024 passed by the learned NGT did not have the benefit of considering the 2025 notification.

29. We, therefore, see no reason to accept the request of the learned senior counsel for the petitioner to keep the present matter pending in order to await the judgment of the coordinate Bench.

30. In any case, the validity of 2025 notification is not being considered by the Coordinate Bench.

31. No doubt that the courts have consistently insisted upon protecting environment and consistently held that the natural resources are held in trust by the present generation for the future generations. However, at the same time, the courts have also consistently taken into consideration the need for developmental activities.

32. A country cannot progress unless the development takes place. As such, this Court in a catena of decisions has adopted

the principle of sustainable development. Some of the notable decisions of this Court are ***Vellore Citizens' Welfare Forum v. Union of India and Others***[2], ***Jagannath v. Union of India and Others***[3], ***Consumer Education & Research Society v. Union of India and Others***[4], ***Intellectuals Forum, Tirupathi v. State of A.P. and Others***[5], ***Tata Housing Development Company Limited v. Aalok Jagga and Others***[6] and ***State of Uttar Pradesh and Others v. Uday Education and Welfare Trust and Others***[7].

33. A reference in this respect can also be made to the recent judgment of this Court rendered ***In Re: Zudpi Jungle Lands***[8], wherein all the earlier judgments of this Court have been considered by a coordinate bench, to which one of us (B.R. Gavai, CJI.) was a party. It would be apposite to refer to paragraphs 117, 118 and 119 of the said judgment:

> "**117.** Another aspect that needs to be considered is the balance between environmental protection and the need for

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2 (1996) 5 SCC 647 : 1996 INSC 952
3 (1997) 2 SCC 87 : 1996 INSC 1466
4 (2000) 2 SCC 599 : 2000 INSC 81
5 (2006) 3 SCC 549 : 2006 INSC 101
6 (2020) 15 SCC 784 : 2019 INSC 1203
7 (2022) SCC OnLine SC 1469 : 2022 INSC 1129
8 2025 INSC 754

sustainable development. It will be apt to refer to paras 87-88 of the judgment of this Court in the case of *State of Uttar Pradesh* v. *Uday Education and Welfare Trust* (*2022 SCC OnLine SC 1469)*, which read thus:

> "87. It cannot be disputed that Section 20 of the NGT Act itself directs the learned Tribunal to apply the principles of sustainable development, the precautionary principle and the polluter pays principle. Undisputedly, it is the duty of the State as well as its citizens to safeguard the forest of the country. The resources of the present are to be preserved for the future generations. However, one principle cannot be applied in isolation of the other.
>
> 88. It is necessary that, while protecting the environment, the need for sustainable development has also to be taken into consideration and a proper balance between the two has to be struck."

118. Much prior to that, this Court, in the case of *Vellore Citizens' Welfare Forum* v. *Union of India and others (1996) 5 SCC 647 : 1996 INSC 952,* had an occasion to consider the conflict between the development and ecology. This Court observed thus:

> "10. The traditional concept that development and ecology are opposed to each other is no longer

acceptable. "Sustainable Development" is the answer. In the international sphere, "Sustainable Development" as a concept came to be known for the first time in the Stockholm Declaration of 1972. Thereafter, in 1987 the concept was given a definite shape by the World Commission on Environment and Development in its report called "Our Common Future". The Commission was chaired by the then Prime Minister of Norway, Ms G.H. Brundtland and as such the report is popularly known as "Brundtland Report". In 1991 the World Conservation Union, United Nations Environment Programme and Worldwide Fund for Nature, jointly came out with a document called "Caring for the Earth" which is a strategy for sustainable living. Finally, came the Earth Summit held in June 1992 at Rio which saw the largest gathering of world leaders ever in the history — deliberating and chalking out a blueprint for the survival of the planet. Among the tangible achievements of the Rio Conference was the signing of two conventions, one on biological diversity and another on climate change. These conventions were signed by 153 nations. The delegates also approved by consensus three non-binding documents namely, a Statement

> on Forestry Principles, a declaration of principles on environmental policy and development initiatives and Agenda 21, a programme of action into the next century in areas like poverty, population and pollution. During the two decades from Stockholm to Rio "Sustainable Development" has come to be accepted as a viable concept to eradicate poverty and improve the quality of human life while living within the carrying capacity of the supporting ecosystems. "Sustainable Development" as defined by the Brundtland Report means "Development that meets the needs of the present without compromising the ability of the future generations to meet their own needs". We have no hesitation in holding that "Sustainable Development" as a balancing concept between ecology and development has been accepted as a part of the customary international law though its salient features have yet to be finalised by the international law jurists."

119. The principle of *Sustainable Development* as a balancing concept between ecology and development has been accepted as a part of the Customary International Law by this Court in various judgments including *S. Jagannath* v. *Union of India (1997) 2 SCC 87 : 1996 INSC 1466*, *Consumer*

Education & Research Society v. *Union of India and Others (2000) 2 SCC 599 : 2000 INSC 81*, *Intellectuals Forum, Tirupathi* v. *State of A.P. (2006) 3 SCC 549: 2006 INSC 101* and *Tata Housing Development Company Limited* v. *Aalok Jagga (2020) 15 SCC 784 : 2019 INSC 1203.*"

34. It is thus clear that the courts have taken a view that while development is permitted to be undertaken, it is also required that a precaution is needed to be taken so that the least damage is caused to the environment and ecology. The courts have also insisted upon the mitigation and compensatory measures so as to compensate the loss which is caused to the environment and ecology on account of the damage that would be caused by the developmental activities.

35. As already submitted by the learned Additional Solicitor General of India, it is not possible for the MOEF&CC to consider the projects from all the states of the country. We are in agreement with the same. In any case, we are of the considered opinion that the SEIAA is a body of experts constituted/appointed by the Central Government itself and it is better equipped to undertake study *qua* environmental impact of proposed projects in the respective state/union

territory.

36. We, therefore, see no reason as to why the SEIAA should not be permitted to consider the proposal pertaining to the respective States/Union Territories, if it is a properly constituted body in accordance with the statute.

37. As a matter of fact, the 2006 notification itself provides for the constitution and appointment of members of SEIAA. From paragraph 3 of the said notification it can be seen that the SEIAA consists of three members out of which one shall be the Member Secretary, who is required to be a serving officer of the concerned State Government or Union Territory administration familiar with environmental laws and other two members shall either be a professional or expert fulfilling the eligibility criteria given in Appendix VI to the notification; one of them who is an expert in the Environmental Impact Assessment process, shall be the Chairman of the SEIAA. The procedure as to how the SEIAA shall conduct impact assessment and arrive at a decision is also prescribed under the said notification.

38. Another reason that is given for issuance of 2025

notification is that the 2006 notification was somewhat ambiguous with regard to the built up area as was observed by this Court in the case of ***In Re: Construction of Park at Noida near Okhla Bird Sanctuary.***

39. Accordingly, in the 2025 notification, the "built up area" has been specifically defined to be the built up or covered area on all floors put together including the basement and other service areas, which are proposed in the building or construction project.

40. While we are inclined to uphold the impugned notification, we are of the considered view that the exemption of applicability of 2006 notification, by way of Note 1 in column 5 of Entry 8(a) of the impugned notification, to the projects or activities for industrial shed, school, college and hostel for educational institution does not appear to be in tune with the purpose for which the Environment Protection Act has been enacted.

41. Ms. Bhati, learned Additional Solicitor of India, submits that the detailed guidelines have been provided so as to ensure that the industrial shed, school, college and hostel for

educational institution shall adhere to the environmental aspects. Moreover, we find that no mechanism like the impact assessment to be done by an expert body like SEIAA has been provided in the said guidelines.

42. It cannot be gainsaid that if any construction activity for an area of more than 20,000 sq. mtr. is to be carried out, it will naturally have an effect on the environment and ecology, even if the building is for industrial shed or for educational purpose, including hostels etc. There is neither any rational nexus with the object to be achieved by excluding such buildings from the rigors of the notification. We, therefore, see no reason to discriminate the other buildings with the buildings constructed for industrial or educational purposes.

43. It is by now common knowledge that education is no more exclusively a service oriented activity and that it has in fact become a flourishing and thriving industry. We, therefore, see no reason behind the exemption of 2006 notification to the industrial or educational buildings by way of Note 1 in Column 5 of the 2025 notification.

44. Insofar as the clarification by O.M. dated 30th January,

2025, is concerned, it only clarifies that the 2025 notification would also be applicable to the State of Kerala.

45. It can thus be seen that the clarificatory O.M. dated 30th January, 2025, which has also been impugned in the present petition, rather than being adverse to the environmental interest is conducive to the environmental interest, inasmuch as it also makes the conditions applicable to the State of Kerala.

46. Therefore, while upholding the impugned notification dated 29th January, 2025, we hold that Note 1 to Entry 8(a) is arbitrary and liable to be quashed and set aside.

47. In the result, we pass the following order:

i. The Writ Petition is partly allowed;

ii. The notification dated 29th January, 2025 excluding Note 1 to Entry 8(a) is upheld;

iii. Note 1 to Entry 8(a) of the notification dated 29th January, 2025 is quashed and set aside;

iv. The O.M. dated 30th January, 2025 issued by the MoEF&CC is also upheld; and

v. In the facts and circumstances, no orders as to costs.

48. We express our deep appreciation for the valuable assistance provided by Shri Gopal Sankarnarayanan ably assisted by Shri Vanshdeep Dalmia, Ms. Aishwarya Bhati, learned Additional Solicitor General, Shri Tushar Mehta, learned Solicitor General of India, Shri Mukul Rohtagi and Shri Atmaram Nadkarni, learned senior counsel.

49. All the applications for impleadment/intervention are disposed of.

50. Pending application(s), if any, shall stand disposed of.

.....CJI
(B.R. GAVAI)

.....J
(K. VINOD CHANDRAN)

NEW DELHI;
AUGUST 05, 2025

Annexure XI

F. No. IA3-3/16/2025-IA.III [E 259511]

Government of India

Ministry of Environment, Forest and Climate Change

(Impact Assessment Division)

*****

Indira Paryavaran Bhawan
Aliganj, Jorbagh Road
New Delhi-110 003

Dated: 25th August, 2025

OFFICE MEMORANDUM

Subject: Circulation of the Judgement dated 05.08.2025 of Hon'ble Supreme Court in W.P(C) 166/2025 in the matter of Vanashakti vs. Union of India. – regarding.

The Ministry, after following due process, issued a Notification dated 29/01/2025 for amending the item 8 of the schedule of EIA Notification 2006 in furtherance of the liberty granted by the Hon'ble High Court of Kerala, Ernakulam, vide its order dated 06/03/2024, in WP (C) No. 3097 of 2016 titled One Earth One Life vs. the Ministry of Environment, Forest and Climate Change and Anr. In continuation, an Office Memorandum dated 30/01/2025 was also issued to clarify the applicability of the notification dated 29/01/2025.

2. However, the Hon'ble Supreme Court vide order dated 24/02/2025 in W.P.(C) No. 166/2025 titled Vanashakti vs Union of India, imposed a stay on the operation and implementation of the above mentioned Notification dated 29/01/2025 and OM dated 30/01/2025.

3. Subsequently, the Hon'ble Supreme Court, vide its judgment dated 05/08/2025 in W.P(C) 166/2025 in the matter of Vanashakti vs. Union of India has upheld the notification dated 29/01/2025 and O.M. dated 30/01/2025. However, Note 1 to Entry 8(a) of the notification dated 29/01/2025 has been quashed and set aside.

4. The copy of the order which is self-explanatory is enclosed herewith for necessary action and compliance.

5. This is issued with the approval of the Competent Authority.

(Dr. J.D. Marcus Knight)
Scientist E

Encl: *As above.*

To

1. The Chief Secretaries of all the States / UTs
2. Chairman/Member Secretary, CPCB.

3. Chairperson/ Member Secretaries of all Expert Appraisal Committees
4. Chairperson/Member Secretaries of all SEIAAs/SEACs
5. Chairpersons/Member Secretaries of all SPCBs/ UTPCCs
6. All Officers of IA Division

Copy for information to

1. PS to Hon'ble MEF&CC
2. PS to Hon'ble MoS, EF&CC
3. PPS to Secretary, EF&CC
4. PPS to AS (AG)/JS (RA)
5. Website, MoEF&CC /Guard file

Annexure - XII

ANDHRA PRADESH POLLUTION CONTROL BOARD
Paryavaran Bhavan, APIIC Colony Road, Gurunanak Colony,
Autonagar, Vijayawada- 520007.

CONSENT TO ESTABLISHMENT (CTE) & CTE AMENDMENT ORDER

Order No.302/APPCB/CTE/RO-NLR/HO/2026 Dt.19-03-2026

Sub: APPCB – CTE – **M/s. Indosol Solar Pvt. Ltd.,** Chevuru Village, Gudluru Mandal, SPSR Nellore District – **Consent to Establishment (CTE)** order to establish 6 MLD Marine outfall discharge through pipe-line into sea for laying of pipeline into Sea and Amendment to Consent to Establishment (CTE) order dt.01.06.2025 of the Board under Sec.25 of Water (P&C of P) Act, 1974 and under Sec.21 of Air (P&C of P) Act, 1981 -Order- Issued - Reg.

Ref:
1. CTE order dt.01.06.2025.
2. CTE (NOC) order dt.23.08.2025.
3. MoEF&CC, GoI order dt.12.12.2025 for releasing 6 MLD treated effluent into sea at Ramayyapatnam, Nellore District.
4. Industry's CTE application dt. 29.12.2025.
5. ZO: Tirupati report dt.18.02.2026.
6. CTE Committee meeting held on 20.02.2026.
7. APPCB Board office lr dt.06.03.2026.
8. Industrys reply lr dt.09.03.2026.
9. CTE Committee meeting held on 11.03.2026.
10. Industrys reply lr dt.12.03.2026.
11. CTE Committee meeting held on 13.03.2026.

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1. **M/s. Indosol Solar Private Limited.,** vide ref 1st cited, had obtained CTE of the Board vide dt.01.06.2025 for manufacturing of Solar Photovoltaic (PV) modules - **9,09,091 Nos./annum**; Solar Photovoltaic (PV) Cells- **14,02,59,740 Nos./annum** & Solar Photovoltaic (PV) Wafers - **14,72,72,727 Pcs/annum** at Sy. Nos. 584/9, 10,11, 585/2, 3, 4, 5, 6, 7, 8, 592/1, 2, 593/1, 2, 3, 594/1A, 1B, 2A, 2B, 595/2, 2B, 3B, 4A, 4B, 5A, 5B, 585/2, 585-5, 593-2A, Chevuru Village, Gudluru Mandal, Prakasam District (Erstwhile SPSR Nellore District) with an investment of Rs.2000 Crores with a condition that

"The effluent generation in the process shall be treated in ETP, RO, MEE followed by ATFD to meet ZLD for treatment and disposal of trade effluents".

2. Subsequently, the industry vide ref 2nd cited, has obtained CTE (NOC) for development of marine outfall for discharge of effluents from the industry manufacturing Solar Photovoltaic Modules, Cells and Wafers unit located at Chevuru Village, Gudluru Mandal, SPSR Nellore District under CRZ Rules for the following project. The details are given below:

S. No.	Name of the product	Applied Capacity
1.	Proposed marine outfall to discharge 6 MLD of treated effluent into sea	6 MLD

Development of treated effluent discharge through marine outfall system of M/s. Indosol Solar Pvt. Ltd as follows:

a. Laying of outfall pipeline to discharge 6 MLD treated effluent to a distance of 8062.29 m on land from plant guard pond to LFP and 1000m into the sea from LFP to outfall diffuser location at offshore.
b. Crossing of effluent pipeline in the Buckingham canal as indicated in the CRZ map.
c. Construction of outfall diffuser in sea at a depth of 8.5 m w.r.t Chart Datum to discharge of 6 MLD treated effluent with diameter 400 mm into the Sea, upto outfall diffuser.
d. The outfall diffuser is proposed at 1.75 km south of existing break water placed with multi-port arrangement of 4 nos. of 140 mm diameter.
e. Pipeline will cross the CRZ zone in CRZ-IVB (Buckingham Canal), CRZ-III(NDZ), CRZ-IB (intertidal zone) and CRZ-IV A (LTL to 12 Nautical mile) as per CRZ Notification 2011
f. Nandemmapuram village is existing at a distance of about 680m towards West direction from the Land fall point and Peddapattapupalem village is existing at a distance of about 980m towards South-west direction from the Land fall point.
g. Hatchery is existing at a distance of about 850m towards North -west direction from the Land fall point.
h. The proposed effluent pipeline crosses Buckingham Canal at 15^0 0' 42.91"- N & 80^0 2' 40.93"- E and 15^0 0' 42.88"- N & 80^0 2' 42.30"- E.

The geo-coordinates of Land Fall Point LFP & Outfall diffuse into the Sea are as follows:

Location	Latitude	Longitude
LFP	14^0 59' 26.0" N	80^0 03' 23.2" E
Outfall diffuser	14^0 59' 26.6" N	80^0 03' 56.6" E

3. Later, the proponent has obtained CRZ from APCZMA issued by the MoEF&CC, GoI vide dt.12.12.2025 for releasing 6 MLD treated effluent through marine outfall into sea at Ramayyapatnam, Nellore District.
4. Now, the proponent vide ref 4th cited, has applied for CTE to establish 6 MLD Marine outfall discharge through pipe-line into sea for laying of pipeline into Sea (*about 8 Km with diameter of 400 mm to Land Fall Point (LFP) from the industry and about 1 Km with diameter of 400 mm into Sea*) with an additional investment of Rs.6 Cr and Amendment to CTE order dt.01.06.2025 issued by the Board for changing the details of Water consumption, Waste water generation & disposal and Solid waste generation & its disposal. The ZO: Tirupati submitted report on 18.02.2026 vide ref 5th cited.

A. The source water from **Chevuru Lake-4 MLD & Chennayapalem -3 MLD** obtain **permission** from Irrigation department.
B. **Water consumption details: -**

S.N.	Purpose	Quantity as per CTE order dt.01.06.2025 (KLD)			Proposed Quantity in CTE Amendment (KLD)
		Fresh	Recycled	Total	
1	Process & Washings	394.08	3448.70	3842.78	3911 KLD
2	Scrubbers	132.23	107.77	240.00	240 KLD
3	Cooling	396.47	750.73	1147.20	1560 KLD

4	DM plant	1119.77	646.63	1766.40	912 KLD
5	Domestic	206.40	---	206.40	120 KLD
6	Green belt	163.20	95.00	258.20	212 KLD
	Total	**2412.14**	**5048.84**	**7460.98**	6955.0

C) Waste Water Generation: (Proposed)

Sl. No	Source	Quantity	Mode of disposal
1	Process & Washings	3911 KLD	The industry has proposed to establish an Effluent Treatment Plant (ETP) consisting of an Inorganic ETP with a capacity of 4.37 MLD and an Organic ETP with a capacity of 1.45 MLD for pre-treatment of industrial effluents. After pre-treatment, the industry proposes to lay a pipeline of approximately 8 km length with 400 mm diameter from the industry premises to the Land Fall Point (LFP) at the seashore. Further, a marine outfall pipeline of 1000 m length with 400 mm diameter is proposed to be laid into the sea up to the outfall diffuser at a depth of 8.5 m, for discharge of treated effluent with a total marine outfall capacity of 6 MLD.
2	Scrubbers	96 KLD	
3	Cooling tower	900 KLD	
4	PUW	912 KLD	
5	Domestic	100 KLD	Sewage Treatment Plant of 120 KLD proposed to provide. After treatment, shall be recycled back into process.

D. Solid/Hazardous Waste and its disposal:

S. No	Source of solid waste	As per CTE order dt. 01.06.2025	After CTE Amendment	Method of disposal
1	ETP sludge (Inorganic)	36.44 TPD	2.62 TPD	Shall be sent to TSDF/Authorised Recyclers
2	ETP sludge (Organic)	16.80 TPD	0.73 TPD	
3	Evaporation Salts	15.84 TPD	---	
4	Silica recovered from ETP	44.00 TPD	44.00 TPD	Shall be sent to reuse
5	STP Sludge	0.3 TPD	0.3 TPD	Shall be used as manure/Horticulture
6	Oily waste	1.0 TPA	1.0 TPA	Shall be sent to Authorized Agencies/Recyclers/Vendors
7	Waste oils & Grease	500 KLPA	500 KLPA	
8	Detoxified containers & bags	300 Nos./month	300 Nos./month	
9	Used PPE	0.5 TPM	0.5 TPM	
10	E-Waste including production reject	321.5 TPA	321.5 TPA	
11	Plastic Waste	10 TPA	10 TPA	
12	Metal Scrap	20.0 TPM	20.0 TPM	
13	Used / Discarded RO Membranes Cartridge	4.0 TPA	4.0 TPA	Shall be sent to TSDF
14	Spent Resin	6.0 TPA	6.0 TPA	
15	Spent Anthracite	0.5 TPA	0.5 TPA	

16	Discorded / Broken Solar Cells/ wafers	0.5% of production	0.5% of production	Shall be sent to authorised re-cyclers, as per E-Waste (Management) Rules, 2022.

5. Earlier, the issue was placed before the CTE Committee meeting held on 20.02.2026**.** After detailed discussions, the Committee recommended to seek clarification from the project proponent on the certain points. In this regard, a letter was communicated to the industry vide dt.06.03.2026. The industry has submitted the information vide lr dt.09.03.2026.
6. The issue was again placed before the CTE Committee meeting held on 11.03.2026**.** After detailed discussions, the Committee recommended to seek clarification from the project proponent on the certain points. The project proponent has submitted the information on 12.03.2026. The issue was again placed before the CTE Committee meeting held on 13.03.2026. After detailed discussions, **the Committee recommended to issue CTE amendment for laying of pipeline to the project with the following conditions:** *1. To obtain EC from SEIAA to the entire project before applying for CTO of the Board. 2. Shall comply with the outcome of Hon'ble NGT directions in matter of OA No. of 22 of 2026.*
7. The Board, after careful scrutiny of the application, verification report of Zonal Office: Tirupati, based on the recommendations of the CTE Committee & information submitted by the industry, hereby issues:

   i . Consent to Establishment (CTE) to establish 6 MLD Marine outfall discharge through pipe-line into sea for laying of pipeline into Sea and
   ii. Amendment to Consent to Establishment (CTE) order dt.01.06.2025 for changing the Water consumption, Waste water generation & disposal and Solid waste generation & its disposal.

   under Section 25 of Water (Prevention & Control of Pollution) Act 1974 and Section 21 of Air (Prevention & Control of Pollution) Act, 1981 and the rules made thereunder. This order is issued to the activity as mentioned at para (4) only.
8. **The industry shall obtain EC from SEIAA to the entire project before applying for CTO of the Board.**
9. **The industry shall comply with the outcome of Hon'ble NGT directions in matter of OA No. of 22 of 2026.**
10. All the other conditions mentioned in CTE order dt: 06.01.2025 & CTE (NOC) order dt.23.08.2025 shall remains the same.
11. This Consent Order now issued is subject to the conditions mentioned in the Annexure.
12. This order is issued from pollution control point of view only. Zoning and other regulations are not considered.
13. **This order is valid for a period of 7 years from the date of issue.**

Encl: Annexure

S SRISARAVANAN, I.F.S
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Chevuru Village, Gudluru Mandal,

Prakasam District (Erstwhile SPSR Nellore District)

Copy to: 1. The SEE, Z.O., APPCB, Tirupati for information and necessary action.
2. The E.E., R.O, APPCB, Nellore for information and necessary action.

Annexure

1. **The industry shall obtain EC from SEIAA to the entire project before applying for CTO of the Board.**
2. **The industry shall comply with the outcome of Hon'ble NGT directions in matter of OA No. of 22 of 2026.**
3. All the other conditions mentioned in CTE order dt: 06.01.2025 & CTE (NOC) order dt.23.08.2025 shall remains the same.
4. The proponent shall obtain Consent to Operate (CTO) from APPCB, as required Under Sec.25/26 of the Water (P&C of P) Act, 1974 and under sec. 21/22 of the Air (P&C of P) Act, 1981.
5. Effluents shall not be discharged onland or into any surface water bodies or aquifers under any circumstances.
6. The proponent shall regularly monitor the flora and fauna of the marine aquatic life. The trend analysis of the monitoring reports shall be compared with the base line data. If it is found any negative impacts, immediate restorative measures shall be implemented duly submitting a report to Board.
7. The proponent shall provide continuous online effluent monitoring system for Flow, pH, TSS, COD, BOD, TOC, Ammonia and oil & grease at the outlet marine disposal system. It shall be connected to the website of CPCB and APPCB.
8. The proponent shall provide magnetic flow meter with the digital totalizer with recording facility for the purpose of quantification of treated effluent discharged through marine outfall.
9. The facility shall comply with all the SOPs issued by APPCB w.r.t. marine outfalls.
10. **Guard ponds, monitoring facilities, etc. of adequate capacity shall be provided. The treated wastewater shall be stored in the guard ponds, after conforming to the marine discharge standards notified by the MoEF&CC, GoI, New Delhi, shall be discharged through marine outfall into the Bay of Bengal under the supervision of APPCB officials.**
11. The proponent shall comply with all the directions issued by the Board from time to time.
12. Concealing the factual data or submission of false information / fabricated data and failure to comply with any of the conditions mentioned in this order may result in withdrawal of this order and attracts action under the provisions of relevant pollution control Acts.
13. Notwithstanding anything contained in this conditional letter or consent, the Board hereby reserves its right and power Under Sec.27(2) of Water (Prevention and Control of Pollution) Act, 1974 and Under Sec.21(4) of Air (Prevention and Control of Pollution) Act, 1981 to review any or all the conditions imposed herein and to make such alternation as deemed fit and stipulate any additional conditions by the Board.
14. Any person aggrieved by an order made by the State Board under Section 25, Section 26, Section 27 of Water Act, 1974 or Section 21 of Air Act, 1981 may within thirty days from the date on which the order is communicated to him, prefer an appeal as per Andhra Pradesh Water Rules, 1976 and Air Rules,1982, to such authority (hereinafter referred to as the Appellate

Authority) constituted under Section 28 of Water (Prevention and Control of Pollution)Act,1974 and Section 31 of the Air (Prevention and Control of Pollution) Act, 1981.

S SRISARAVANAN, I.F.S
Member Secretary

To
M/s. Indosol Solar Pvt. Ltd.
Chevuru Village, Gudluru Mandal,
Prakasam District (Erstwhile SPSR Nellore District)