



# CHAKR INNOVATION

Materializing a cleaner Reality

[www.chakr.in](http://www.chakr.in)

# About Our Company

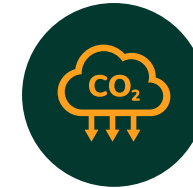
## Redefining Cleantech for a Greener Tomorrow



- **Chakr Innovation:** A cleantech technology company founded in 2016 by IIT Delhi graduates.
- **Mission:** Driving sustainability with innovative and adaptable solutions.
- **Focus:** Delivering sustainable solutions tailored for user needs and environmental impact reduction.
- **Flagship Product:** Chakr Shield (launched in 2017), designed to control diesel generators emissions effectively.
- **User-Centric:** Modular design-Snap fitted, easy to install , with no impact on Diesel Generators performance
- **Type Approved :** India's First Type Approved RECD For Diesel Generators For CPCB-I and II. Certified for reliable performance and compliance.



**34 Patents filed (6 granted)**



**25 Lakh+ tonnes of CO<sub>2</sub> equivalent reduced till 2024**



**650+ Skilled Professionals**



**60+ IIT Graduates**



**15+ PhD Scholars**



**Presence across 3 countries**



# Our Leadership

Innovators in Clean Tech through Material Science



**Kushagra Srivastava**  
*Co- Founder & CEO*



**Parth Sarthi**  
*Head-New Product Initiatives*



**Anmol Khandelwal**  
*Executive Director- CEO (Emission Control Business)*



**Vikram Qanungo**  
*Chief Finance Operation*



**Swati Devi**  
*Assistant General Manager- AI Air*



**Abhijit Datta**  
*Assistant General Manager- AI Air*



**Vinod Bhoir**  
*General Manager- Production*



**Raman Kukreja**  
*Sr. Manager AI-Air*



**Abison Scaria**  
*Sr. Manager AI-Air*



**Alisha Agrawal**  
*Head of GTM Strategy*



**Elayaraja Nagarajan**  
*SGM Engineering*



**Sushant Aneja**  
*Vice President- After Sales Service*



**Arunaksh Bhandari**  
*Head of Sales Ops*



**Mohit Singhvi**  
*Assistant Vice President- Corporate Affairs*



**Sanghamitra Lodh**  
*Head of Marketing*



**Shruti Sinha**  
*Chief of Staff (Emission Control Business)*



**Rohan Gujar**  
*Head of Projects*



# From Vision To Impact

## Becoming Green Leaders In Cleantech



**2016**

- Founded in **2016** by young IIT visionaries.
- **Patent Applied** for Chakr Shield technology for DG sets.

**2017**

- Secured a grant of **INR 25 million** from Indian Oil Corporation.
- Completed the **first installation** of Chakr Shield 1.0. Commissioned the **first development workshop in Delhi**.



**2018**

Raised **INR 25 million** from **IDFC PARMAPARA** early-stage Fund.

**2019**

- Established our first **manufacturing facility in Pune**.
- Raised **INR 135 million** in Series A funding from IAN Fund, ONGC, and other investors.

**2020**

- Started **R&D on AI-AIR technology**.
- Launched Chakr **DeCoV** with IIT Delhi to decontaminate **N95 masks** during **COVID-19**.

**2021**

- Developed Chakr Shield, transitioning to **catalyst-based technology**.
- Raised **INR 500 million** in Series B funding from **SBI Capital Ventures**.



**2022**

- First Company in India To Receive Type Approval.
- Launched **Dual Fuel Kit**, becoming the first company to offer end to end solutions.
- Developed the world's **first aluminium-powered two-wheeler**.

**2023**

- Established a manufacturing facility in Gurugram for **AI-AIR technology**.
- Set up **2nd manufacturing facility in Gurugram** for Chakr Shield.
- Piloted the **third generation** of **aluminum-air powered two-wheelers**.
- **SBI Capital Ventures** doubled their **investment to INR 1 Billion in the total investment now**.
- Secured **INR 180 million** in debt financing from EXIM.



**2024**

- Secured **INR 550 million in funding** from **British International Investment (BII)**.
- Successfully completed over **4000 installations** of the Chakr Shield across India.
- Gained a **client base** of more than **1500**.



# Reward & Recognition

## Celebrating Excellence




 Champions of Change



RT. Andrew Mitchell, Minister of State UK- Visit to Chakr Innovation HO



 UN Young Champions of Earth



Forbes 30 UNDER 30 2018



 nasscom

## Media Coverage

-  WWF
-  Forbes <sup>INDIA</sup>
-  nasscom
-  Discovery
-  ET THE ECONOMIC TIMES
-  Business Standard
-  Business India
-  THE TIMES OF INDIA
-  THE HINDU



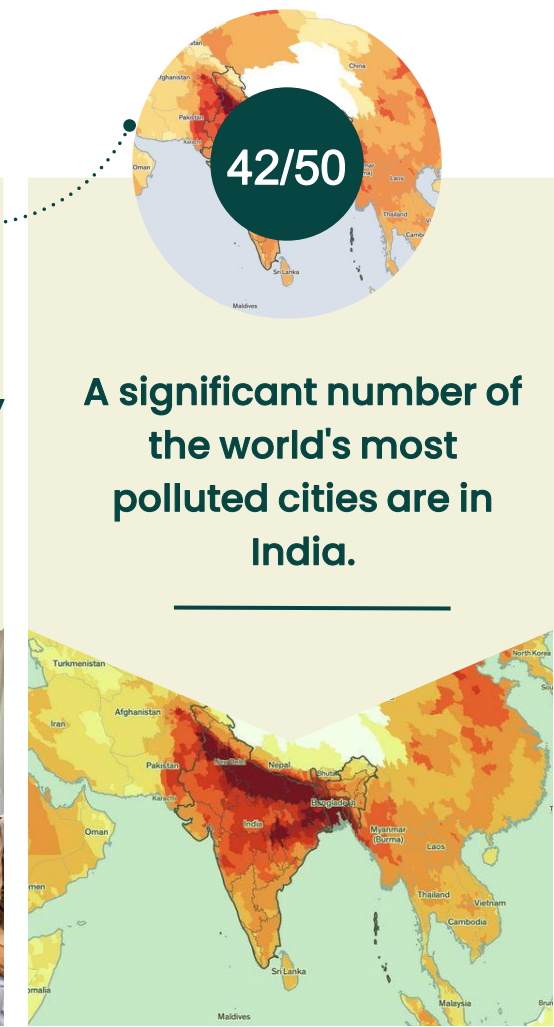
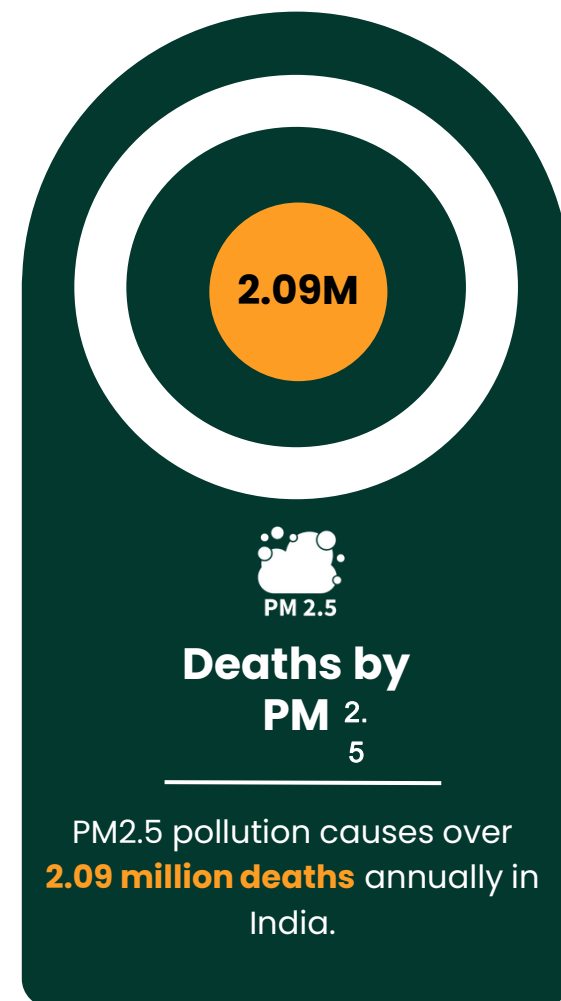
# Air Pollution

## A Growing threat to India's Health, Economy & Global Standing

**AIR POLLUTION**  
accounted for nearly  
**18%**  
**of all deaths**

in India in 2021.

Considered separately, outdoor particulate matter (PM 2.5) ranked as the second leading risk factor for deaths.



**Air Pollution is Responsible for**



39%  
of stroke deaths



20%  
of diabetes deaths



38%  
of ischemic heart disease deaths



67%  
of COPD deaths



31%  
of lower- respiratory infection deaths



38%  
of lung cancer deaths

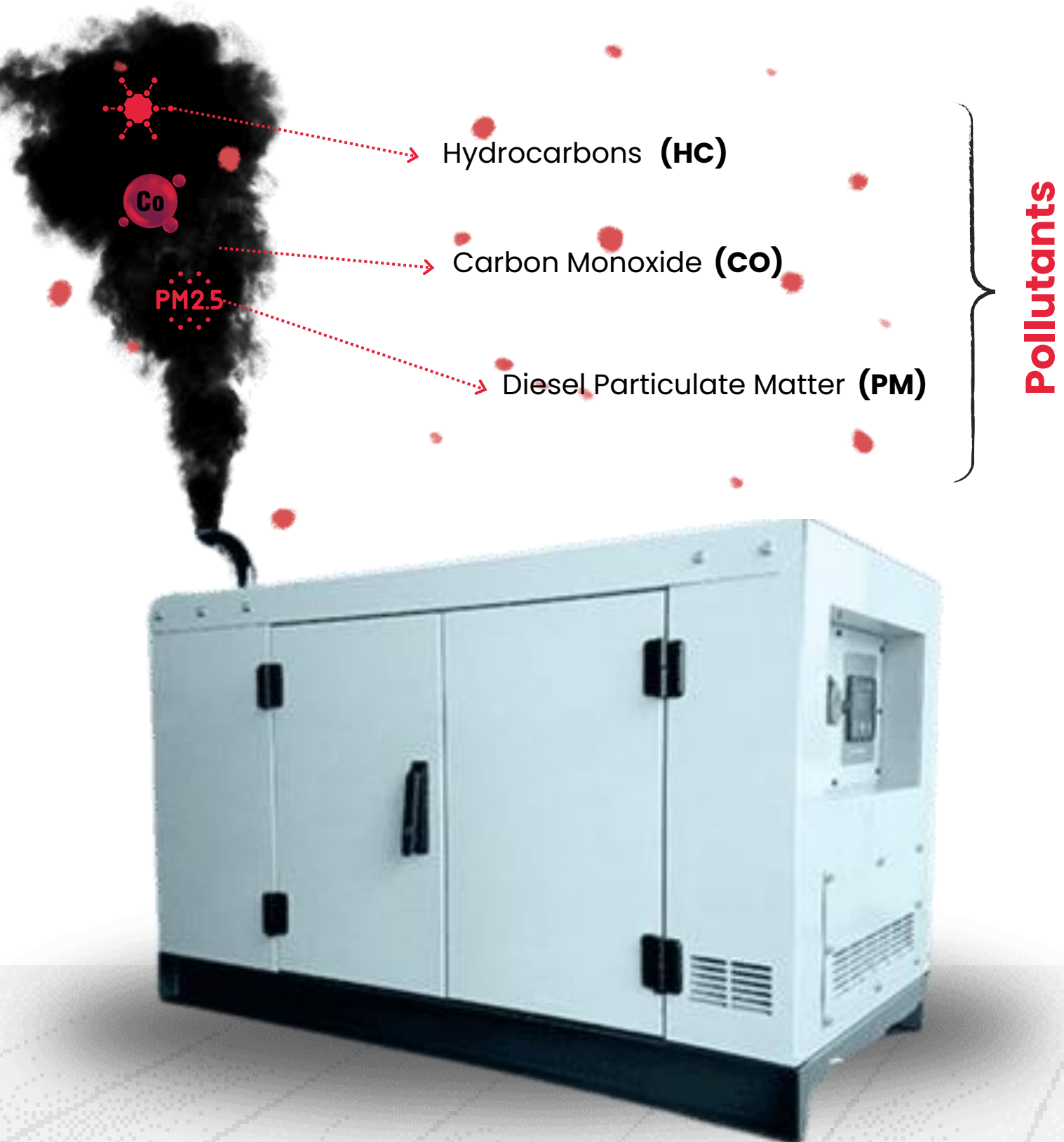


33%  
of neonatal deaths



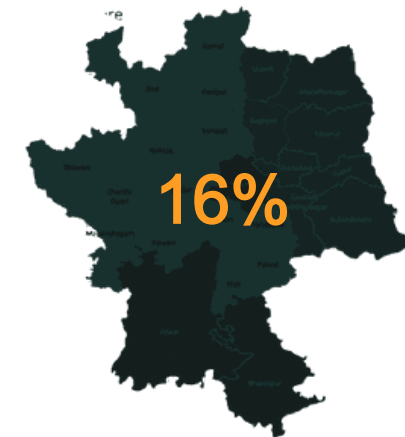
# Diesel Generators

Major Contributors upto **18%** of Urban Air Pollution in Indian Cities

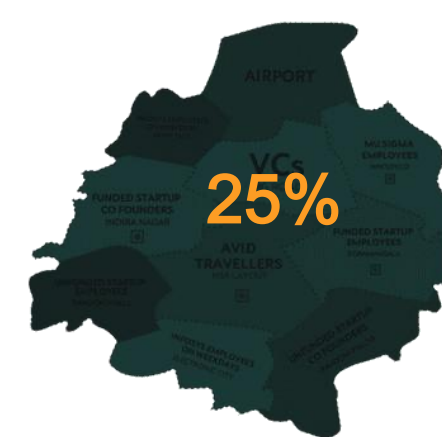


Global Warming potential for PM is **460** times that of CO<sub>2</sub>

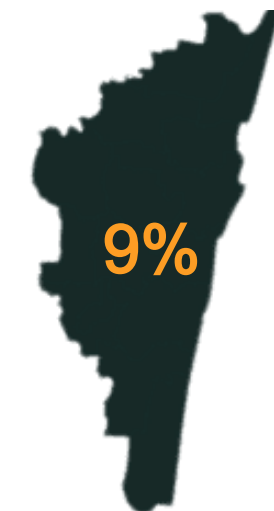
## Impact of Diesel Generators on PM2.5 Levels



Delhi NCR



Bangalore



Chennai



# Government Measures

## Expanding Access to Cleaner Energy Resources

GOOD NEWS!

The Ministry of Environment, Forest and Climate Change, Government of India, launched the National Clean Air Programme (NCAP) on 31<sup>st</sup> December 2018.

Following this, the National Green Tribunal mandated using a Retrofit Emission Control Device (RECD) to reduce air pollution from diesel generators.

Sl. No.	Component/Activities	Level for Funding	Level For Implementation	Agencies	Timeline (Year)
1.8.9	For the DG sets already operational, ensure usage of either of the two options:  (i) Use of retrofitted emission-control equipment with a minimum specified PM-capturing efficiency of at least 70%, type approved by one of the five CPCB-recognized labs.  (ii) Shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage.	State	City/State	SPCB, CPCB	2022

20. We note that the air pollution caused by DG Sets needs to be part of the action plans which may, if necessary, require retrofitting of emission-control devices on generators already in use. CPCB may consider this aspect. The NCAP itself provides following action points:

1. Introduction of gaseous fuels and enforcement of new and stringent SO<sub>2</sub>- NO<sub>x</sub> /PM<sub>2.5</sub> standards for industries using solid fuels.
2. Stricter enforcement of standards in large industries through continuous monitoring.
3. Full enforcement of zig-zag brick technology in brick kilns.
4. Elimination of DG set usage by provision of 24x7 electricity.
5. Control by innovative end of pipe control technologies.
6. Evolve standards and norms for in-use DG sets below 800 KW category.
7. For DG Sets already operational, ensure usage of either of the two options: (a) use of retrofitted emission control equipment having a minimum specified PM capturing efficiency of at least 70%, type approved by one of the 5 CPCB recognized labs; or (b) shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage
8. Utilize the Gujarat case study for a compelling case for other states to adopt third-party audits for polluting industries for enhancing implementation(States)."

Thus, DG Sets should also be covered by the action plans for all the States/UTs.





# Compliance Assured

India's First Type Approved RECD For Diesel Generators For CPCB-I and II

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**TYPE APPROVAL CERTIFICATE**  
FOR  
Retro-fit Emission Control Devices (RECD) Compliance

Date: 13<sup>th</sup> December 2023

Cert	Report	Specs	Org	Total
05	10	131	14	160 pgs

1. Based on the verification of documents & tests conducted on RECD model 'DOFFIOC: HCT02-100800' (Family designation: C1-R5) for India registered manufacturer and it is verified that the following RECD model complies with the provisions of Type Approval of CPCB System Procedure for Retro-fit Emission Control Devices (RECD) Compliance to Diesel Power Generating Set (DPGS) up to Gross Mechanical Power 800kW as per NGT Order dated 08.08.2019 or until further amendment in the MoEFCC rules, whichever is earlier.

Documental Reference	RECD Manufacturer
Current Certificate	M/s Chakr Innovation Pvt. Ltd., Survey No. 236, Hissa No. 7 and Survey No. 237 Hrijevadi, Muli, Pune, Maharashtra - 411057 Plant: Hrijevadi, Pune

RECD Family Designation	Engine Manufacturer	Tested Engine Model
C1-R5	M/s Mahindra Heavy Engines Limited	125KVA MECH CPCB II

RECD Model	Engine Cubic Capacity	Gross Engine Power
DOFFIOC: HCT02-100800	7200 cm <sup>3</sup>	114.7 kW @ 1500 rpm

Engine Baseline emissions	CPCB Stage-II	Class of RECD	Class II	Engine Manufacturing Date
				April 2017

S. No.	Item Description	Parent RECD Type
		Annexure-II

2. RECD suitable for Phase I Certified Diesel Generator engine / engine families: Annexure-III

2. Validity of the Certificate

This Type Approval Certificate is valid for Genest engine CPCB Stage-II effective from 01.07.2014 to 30.06.2023.

a. As per System and procedure for Emission Compliance of Retro-fit Emission Control Devices (RECD) for Diesel Power Generating Set Engines up to Gross Mechanical power 800kW as per NGT Order report filed in O.A. No. 8810218 dated 08.08.2019 or until further amendment in the MoEFCC rules, whichever is earlier.

b. No change in specified RECD technical specification.

3. It is certified that the above RECD Model (Details listed in Annexure-I) comply with the emission limits for Retro-fit Emission Control Devices (RECD) to Diesel Power Generating Set Engines having Gross Mechanical Power 75kW to 114.7kW, as prescribed under the following rules, notified by Ministry of Environment, Forest and Climate Change (MoEFCC), Govt. of India:

Rule No.	Description	Date
CPCB-PCL/S/12/2021-22	System and procedure for Emission Compliance of Retro-fit Emission Control Devices (RECD) for Diesel Power Generating Set Engines up to Gross Mechanical power 800kW as per NGT Order report filed in O.A. No. 8810218 dated 08.08.2019	01.02.2022

4. COP: COP shall be completed by 30.06.2024 as per CPCB Procedure, for details refer COP Annexure-I.

**AUTHORISED SIGNATORY**

SITARAM KASHYAP DEPUTY GENERAL MANAGER	SAURABH DALELA DIRECTOR

Page 1 of 5

Office Address: Centre-I: Plot No.-26, Sector-3, HSIDC, IMT-Manesar, Gurugram-122050, Haryana (India)  
Centre-II: Plot No.-01, Sector-M-11, HSIDC, IMT-Manesar, Gurugram-122051, Haryana (India)  
Phone: 0124-4586111, Fax: +91-124-2290005, E-mail: team@icat.in, Website: www.icat.in  
(An ISO 9001, ISO 14001 and ISO 45001 certified, scope wise NABL accredited and BIS recognised Test House)

62.5-125kVA

[Click to Check 62.5-125kVA Certificate](#)

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Current Certificate	M/s Chakr Innovation Pvt. Ltd., Survey No. 236, Hissa No. 7 and Survey No. 237 Hrijevadi, Muli, Pune, Maharashtra - 411057 Plant: Hrijevadi, Pune

RECD Family Designation	Engine Manufacturer	Tested Engine Model
C1-R5	M/s Mahindra Heavy Engines Limited	125KVA MECH CPCB II

RECD Model	Engine Cubic Capacity	Gross Engine Power
DOFFIOC: HCT02-100800	7200 cm <sup>3</sup>	114.7 kW @ 1500 rpm

Engine Baseline emissions	CPCB Stage-II	Class of RECD	Class II	Engine Manufacturing Date
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2. RECD suitable for Phase I Certified Diesel Generator engine / engine families: Annexure-III

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b. No change in specified RECD technical specification.

3. It is certified that the above RECD Model (Details listed in Annexure-I) comply with the emission limits for Retro-fit Emission Control Devices (RECD) to Diesel Power Generating Set Engines having Gross Mechanical Power 75kW to 114.7kW, as prescribed under the following rules, notified by Ministry of Environment, Forest and Climate Change (MoEFCC), Govt. of India:

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(An ISO 9001, ISO 14001 and ISO 45001 certified, scope wise NABL accredited and BIS recognised Test House)

140-320kVA

[Click to Check 140-320kVA Certificate](#)

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C1-R5	M/s Mahindra Heavy Engines Limited	125KVA MECH CPCB II

RECD Model	Engine Cubic Capacity	Gross Engine Power
DOFFIOC: HCT02-100800	7200 cm <sup>3</sup>	114.7 kW @ 1500 rpm

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320-500kVA

[Click to Check 320-500kVA Certificate](#)

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625-910kVA

[Click to Check 625-910kVA Certificate](#)



# Regulations

## Mandates 3 States in North India

**Government of Jammu and Kashmir**  
**J&K Pollution Control Committee**

**ORDER NO. 09-JKPC/2021**  
**DATED: 13-12-2021**

**Subject: Retrosiding of Emission Control Devices / Equipments in DG Sets with capacity of 125 KVA and above in Jammu and Kashmir.**

Whereas, Central Pollution Control Board in the State Board for all the Union Territories to initiate powers and perform functions under the Air (Prevention & Control of Pollution) Act, 1981;

Whereas, Central Pollution Control Board has delegated all its powers and functions under Air (Prevention and Control of Pollution) Act, 1981 in respect of Jammu and Kashmir to Jammu and Kashmir Pollution Control Committee vide notification no. C-603/30A/PC/1981 dt. 23-03-2011.

Whereas, the Jammu and Srinagar cities have been identified as Non-Attainment Cities in J&K, which do not meet the standards prescribed for Ambient Air Quality.

Whereas, Hon'ble NOT vide order dated 08-10-2018, in O.A. no. 481/2018 directed that DG sets already operational, have to choose either of the two options: (a) Use of certified emission control equipment having a minimum specified Particulate Matter capturing efficiency of at least 70%, type approved by one of the five CPCB recognized labs or; (b) Shifting to gas-based Generator by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage.

Whereas, there is a plan for the national-level target of 20-30% reduction of PM 2.5 and PM 10 concentration in air pollution by 2024 under the National Clean Air Programme (NCAP) of the Govt. of India, which has been notified in O.A. 48/2019 in O.A. 48/2019 has observed that the directive to reduce air pollution by 20-30% by 2024 needs to be further relaxed and the target of reduction needs to be increased, having regard to adverse effect on public health, observing further that the air pollution caused by DG sets shall also be included in the action plan.

Whereas, the MoEF&CC, Govt. of India, has launched the National Clean Air Programme (NCAP) for the prevention, control and abatement of air pollution level in the country at urban and regional level. The Govt. of India recognizes significant sources of air pollution such as vehicles, DG sets, construction dust etc. As per the National Clean Air Programme, Govt. of India, Diesel Generators are a significant source of air pollution in Indian cities and states.

Whereas, recognizing the fact that the air has no boundaries and having regard to overall air quality of J&K, the Air Quality Monitoring Committee (AQMC) in its meeting held on 21-09-2021 decided to request J&KPCB under no. 29-JKPCB/2021 dt. 07-02-2020 regarding Retrosiding of DG sets for partial gas usage.

Page 1 of 2

**Emission Control Devices / Equipments in DG Sets with capacity of 125 KVA and above, from Non-Attainment cities of Jammu / Srinagar to whole of Jammu and Kashmir.**

Now, therefore in exercise of powers vested in the JK Pollution Control Committee, under Sec. 17(1) read with Sec. 31(A) of Air (Prevention and Control of Pollution) Act, 1981 and Sec. 5 of the Environment (Protection) Act 1986, all establishments operating DG sets of capacity 125 KVA and above within territorial limits of Union Territory of J&K, are hereby directed to:-

- Retroside all in operating DG sets of capacity of 125 KVA and above, with Emission Control Devices / Equipments having a minimum specified Particulate Matter capturing efficiency of at least of 70% in 5 mode DG cycle and the type of Emission Control Equipments/Devices must be approved by one of the five Central Pollution Control Board (CPCB), Govt recognized / approved laboratories, given as below:-
  - Automotive Research Association of India, Pune (Maharashtra);
  - International Centre for Automotive Technology, Manesar (Haryana);
  - Jalson (Oil Corporation, Research & Development Centre, Faridabad (Haryana);
  - Indian Institute of Petroleum, Dehradun (Uttarakhand);
  - Public Research Development Establishment, Ahmednagar (Maharashtra).
- OR
- Shift to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage.

Whereas, the above directions are to be complied by all the establishments on or by 30<sup>th</sup> June 2022 within the territorial limits of Jammu and Kashmir, and this timeline for compliance shall also apply mutatis mutandis to establishments operating DG sets within the limits of Jammu / Srinagar Non-Attainment cities, irrespective of order no. 29-JKPCB/2021 dt. 07-02-2020.

Non-compliance with the above directions shall attract penal action as per the provisions of the Air (Prevention and Control of Pollution) Act, 1981 and the Environment (Protection) Act, 1986 without further reference.

Issued with the approval of Competent Authority.

No. JKPC/NCAP/AM/2021/31-57  
 Dt. 13-12-2021

Copy to:-

- Commissioner / Secretary to Govt., Department of Forest, Ecology and Environment, Civil Secretariat, Jammu for information.
- Regional Director, Pollution Control Committee, Jammu/Kashmir for information and necessary action.
- Deputy Commissioner, for information and necessary action.
- Commissioner Municipal Corporation, Jammu/Srinagar for information and necessary action.
- Director, Industries and Commerce Department, Jammu / Kashmir for information and necessary action.

Page 2 of 2

**HARYANA STATE POLLUTION CONTROL BOARD**  
 C-11, SECTOR-6, PANCHKULA  
 Ph-0172-577979-73, E-mail: hspcbseof@gmail.com

**Office Order**

Whereas, the Ministry of Environment, Forest and Climate Change (MoEF & CC) has relaxed the National Clean Air Program (NCAP) to tackle air pollution and bring down concentration of particulate matter by 30% by 2024. The NCAP recognizes stationary DG sets as a major source of Pollution, contributing upto 18% of the total Pollution in cities.

Whereas, the Hon'ble National Green Tribunal, in O.A. No. 681/2018 vide order dated 06.08.2019 has noted that the air pollution caused by DG sets in (non-attainment Cities) needs to be part of the action plans which may, if necessary, require retrofitting of emission-control devices on generators already in use. CPCB may consider this aspect. The NCAP itself provides following action points:-

"A. Evolve standards and norms for in-use DG sets below 800 KW category. 7. For DG Sets already operational, ensure usage of either of the two options: (a) use of retrofitted emission control equipment having a minimum specified PM capturing efficiency of at least 70%, type approved by one of the 5 CPCB recognized labs; or (b) shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage."

Whereas, the matter regarding DG sets has been placed in TAC meeting held on 27.05.2020 and after deliberation, it recommended to implement the action points as prescribed in NCAP regarding retrofitting of emission control equipments having a minimum specified PM capturing efficiency of at least 70%, type approved by one of CPCB recognized labs, at all DG sets in operation with capacity 500 KVA and above, or shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage within 03 months initially in five districts of NCR area i.e. Faridabad, Gurgaon, Bahadurgarh, Sonapat & Panipat.

Therefore, in view of the above, it is hereby intimated that all DG sets in operation with capacity 500 KVA and above are required either to retrofit the emission control equipments having a minimum specified PM capturing efficiency of at least 70%, type approved by one of CPCB recognized labs, or, shifting to gas-based generators by employing new gas-based generators or retrofitting the existing DG sets for partial gas usage within 03 months initially in five districts of NCR area i.e. Faridabad, Gurgaon, Bahadurgarh, Sonapat & Panipat. All the concerned Regional Officers will comply the directions and submit action taken report to their respective Branch In-Charges at Head office on the same.

These orders shall come into force with immediate effect.

Dated Panchkula, the  
 27<sup>th</sup> June, 2020

Encl. No. HSPCB/SSC/2020/11302-149  
 Dated: 25/6/2020

A copy of the above is forwarded to the following for information and immediate necessary action please:-

- All action In-charges in Head Office of the Board.
- All Regional Officers of the Board in the field.

Nodal officer (IT) for uploading the order on the website of the Board.

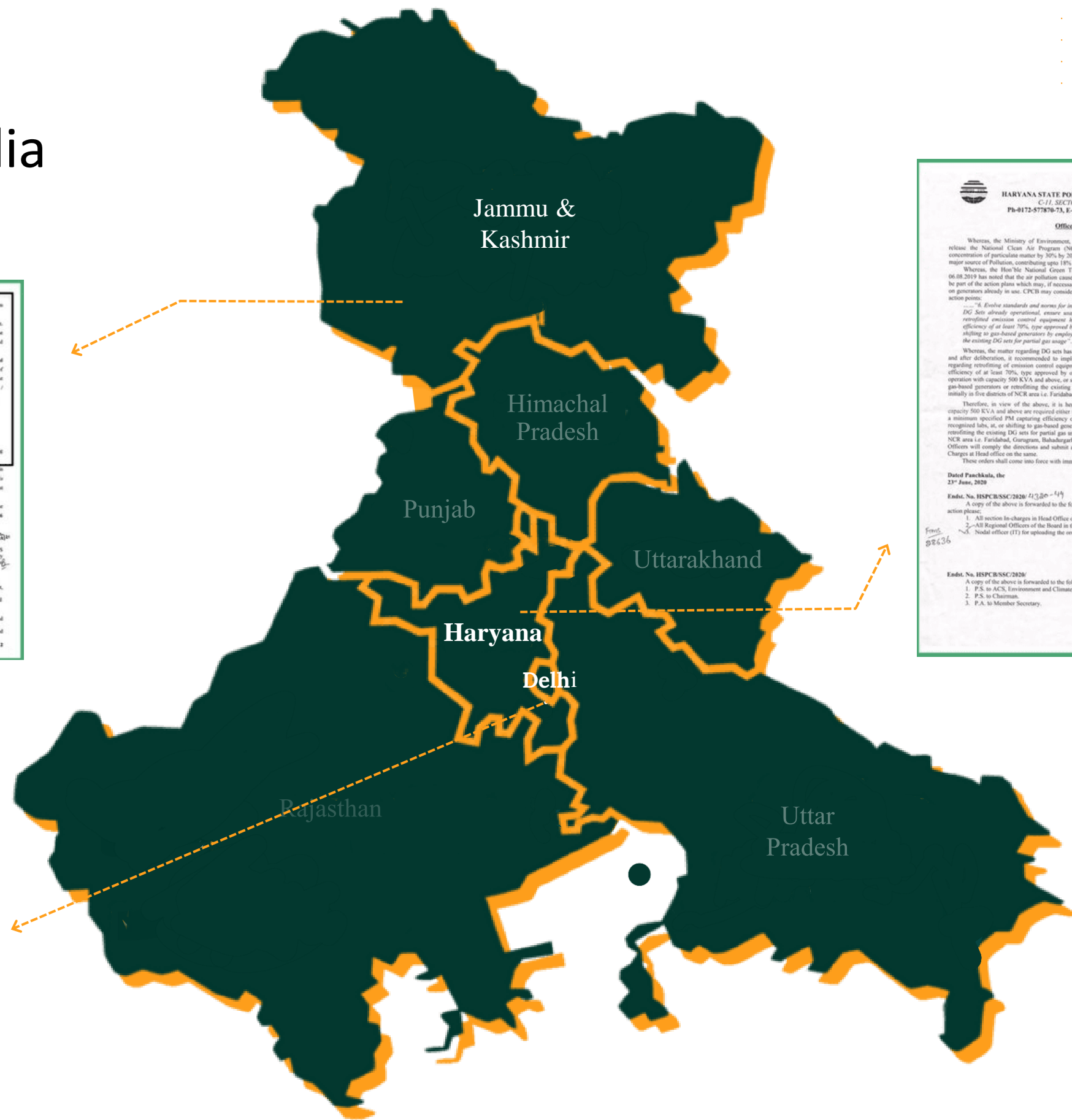
Encl. No. HSPCB/SSC/2020  
 Dated:-

- P.S. to ACS, Environment and Climate Change Department, Govt. of Haryana.
- P.S. to Chairman.
- P.A. to Member Secretary.

Ashtok Khaterpal  
 Chairman

Sr. Scientist (HQ)  
 For Chairman

Sr. Scientist (HQ)  
 For Chairman



Division No. 77

**COMMISSION FOR AIR QUALITY MANAGEMENT IN NATIONAL CAPITAL REGION AND ADJOINING AREAS**  
 17th Floor, Jawahar Vigyan Bhawan (37C Building) Tollygunge Marg, New Delhi-110001

No. A-1100/01/2021/CAQM/77-102 Dated: 06.10.2021

**Subject: Directions under Section 13 of Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2001 - Revised Schedule of Greater Response Action Plan (GRAP) for NCR.**

WHEREAS, high level of air pollution in the National Capital Region has been a matter of serious concern and particularly with reference to specific cities in the form of air pollution, implementation of a Graded Response Action Plan (GRAP) was notified by the Ministry of Environment, Forest and Climate Change in January 2017 based on the recommendations of the CPCB.

WHEREAS, keeping in view the developments over the years, which related to assessment of air pollution in NCR and preventive / remedial measures based on the GRAP to address the adverse air quality generally prevailing in the region during winter, it was considered necessary by the Commission to revise the Schedule and contents of the Graded Response Action Plan (GRAP) and evolve the identified actions/measurements in advance, based on a prescribed AQI based.

WHEREAS, the GRAP schedule was accordingly revised by the Commission in 2022 and notified on December 09, 09 dated 07 August, 2022, to come into force with effect from 01.10.2022.

WHEREAS, based on the experience and learning through implementation of the GRAP during the winter season of 2022-23 and further deliberations held by the Sub-Committee on GRAP on 28.06.2023, the GRAP schedule was further revised and issued vide Division No. 77 dated 27.07.2023, which also includes a schedule for regulated operations of DG sets across all sectors in the NCR including industrial, commercial, residential, office establishments etc. in accordance with the detailed

Division No. 76

**COMMISSION FOR AIR QUALITY MANAGEMENT IN NATIONAL CAPITAL REGION AND ADJOINING AREAS**  
 17th Floor, Jawahar Vigyan Bhawan (37C Building) Tollygunge Marg, New Delhi-110001

F. No. A-1100/01/2021/CAQM/76-102 Dated: 29.09.2023

**Subject: Directions under Section 13 of the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2001 - Review of regulations for use of DG sets in NCR.**

WHEREAS, Ministry of Environment, Forest and Climate Change, Government of India, in exercise of the powers conferred under Section 3 of the Commission for Air Quality Management in National Capital Region and Adjoining Areas Act, 2001, has constituted the Commission for Air Quality Management in National Capital Region and Adjoining Areas (hereinafter referred to as the Commission);

WHEREAS, under Section 12 (1) of the Act, the Commission is vested with powers to take all such measures, issue directions, etc., as it deems necessary or expedient for the purpose of protecting and improving the quality of the air in the National Capital Region and Adjoining Areas;

WHEREAS, Section 12 (2) (a) of the Act empowers the Commission to issue directions in writing to any person, officer, or any authority and such person, officer or authority shall be bound to comply with such directions;

WHEREAS, Section 12(2)(b) of the Act empowers the Commission to lay down parameters for discharge of emissions from various sources whatsoever that have implications on the air quality in the region;

3. 800 kW and above	Any emission control mechanism, strictly subject to compliance of emission standards as indicated below.	No restrictions during periods under GRAP.
4. 125 kW to less than 800 kW	Dual fuel mode OR Retrosided ECAs through certified vendors / agencies	No restrictions during periods under GRAP.
5. 15 kW to less than 125 kW	Dual fuel mode	No restrictions during periods under GRAP. DG Sets not working in a dual fuel mode, only using non-availability of gas infrastructure and supply, shall be permitted only for emergency services as stipulated in this direction.
6. Portable DG sets (below 15 kW)	Priority in specific zones of emission control are available in this category / capacity range of DG sets.	No restrictions during periods, other than restrictions under GRAP. Not to be generally permitted during periods of restrictions under GRAP. These shall, however, be permitted during periods under GRAP only for emergency services as stipulated in this direction.



# Regulations

## Mandates 4 States in South India

**KARNATAKA STATE POLLUTION CONTROL BOARD**  
 NOTIFICATION  
 Subject: Mandatory Retrofitting of Emission Control Devices (ECD) Equipment to DG sets with Capacity of 125 KVA and above in the State of Karnataka.

The Ministry of Environment, Forest and Climate Change (MoEFCC) launched National Clean Air Programme (NCAP) in January 2019 with an aim to improve air quality in 131 cities across the country and million plus cities in 24 States and UTs by engaging all stakeholders. Further, the Hon'ble National Green Tribunal (NGT) in the matter of O.A. 481/2018, dated 4.8.2019 issued an order for the remedial measures to be adopted to enforce the Ambient Air Quality Standards with reference to the Air (Prevention and Control of Pollution) Act, 1986 and the Environment (Protection) Act, 1986 in cities classified as "Non-Attainment Cities" (NACs) based on monitoring of the Ambient Air Quality.

In exercise of powers under sub-section 1(3) of the Air (Prevention & Control of Pollution) Act 1986, the State Government has declared the entire State of Karnataka as Air pollution control Area. In line with the same, the Board had issued an order No. ASP/REG/ND/AN/DO/RETROFITTING/2020/2021-22/287, dated 17/09/2021 regarding mandatory retrofitting of emission control device/equipment in DG sets with capacity of 125 KVA and above in the State of Karnataka.

The Hon'ble National Green Tribunal (NGT) had directed for installation of Particulate Matter (PM) control by using diesel powered generator sets. The Hon'ble National Green Tribunal (NGT) directed Central Pollution Control Board (CPCB) after referred to as "CPCB" to develop & evolve the standards and norms for use of Retrofitting Emission Control Device/ Equipment (ECD).

Accordingly, CPCB formulated procedure for certification of the RECD namely "System and procedure for emission compliance testing of RECD for in-use diesel power generating set engines up to gross mechanical power of 800 KW" on 12.02.2022. This is with the objective for reduction of Particulate Matter (PM) by using Retrofitting Emission Control Devices (RECD) for in-use diesel powered internal combustion engines upto 800 KW or 1000 KVA. The details of compliance and testing procedures developed by CPCB is available in their web site and the same may be referred to.

The CPCB for the purpose of type approval and conformity of production verification compliance process, may revise the procedure from time to time. The currently approved test agencies for Certificate of type approval are as follows:

1. Automotive Research Association of India (ARAI Pune)
2. International Centre for Automotive Testing (ICAT, Mysore)
3. Indian Institute of Petroleum (IIP, Dehradun)
4. Vehicle Research Development Establishment (VRDE, Ahmed Nagar)

However, all Industries, Establishments, Projects, Buildings, Utilities, Airports, Railway Stations or any other places operating DG sets of capacity 125 KVA and above, within the jurisdiction of the State of Karnataka, are directed to:

- 1) Retrofit all operational DG sets of capacity with an Emission Control Device/Equipment. For diesel power generating set engines upto gross mechanical power 800 KW or 1000KVA, the emission control device has to be type approved as per CPCB system and procedure for emission compliance Testing of Retrofit Emission control Devices (RECD).
- 2) For diesel power generating set engines above gross mechanical power of 800 KW or 1000KVA, the emission control device has to be tested for minimum 70% reduction in Carbon Monoxide, Particulate Matter and Hydrocarbon emissions. The Emission Control Device has to be tested in terms of 5-Minute Constant Speed Cycle/4r per 82 Steady State alternate mode test cycle specified in ISO-8178 Part 4. The equivalent KVA is considered if either the rated power or swept volume of the test engine is in the range of >22% of the rated power or swept volume of the engine for which the device is being used.

OR

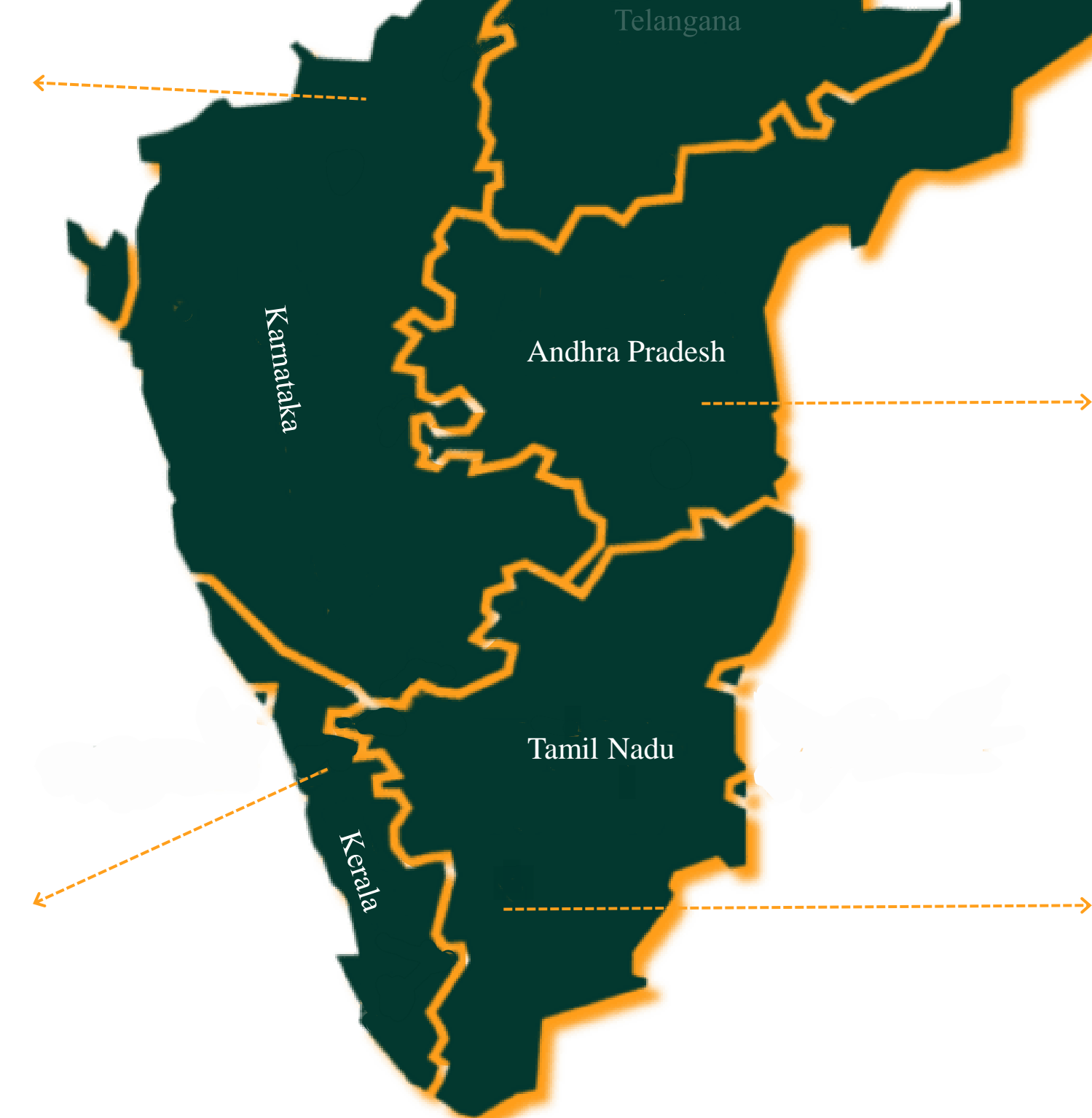
3) Shift to gas-based generators by replacing new gas-based generators or retrofitting the existing DG sets for partial gas usage.

Further, all the Industries, Establishments, Projects, Buildings, Utilities, Airports, Railway Stations or any other places operating DG sets of capacity 125 KVA and above, shall ensure that Retrofitting of Emission Control Devices under it in accordance with the CPCB document EN/610/2022 mentioned in Para(1) of this notification.

This order supersedes all other previously issued orders and same shall be complied within six months from the date of issue of this Notification, failing which the Board is contemplated to initiate action under the provisions of the Air (Prevention and Control of Pollution) Act, 1986.

**CHAIRMAN**  
 Karnataka State Pollution Control Board

To  
 All Concerned Industries, Establishments & Organizations.



**ANDHRA PRADESH POLLUTION CONTROL BOARD**  
 REGIONAL OFFICE, ANANTHAPURAM  
 D.No.6-6-147-147-147, Revenue Ward No.8, Annamalai, Anantapur - 515004  
 Tel: 08574 220466, Email: apcpb@apcpb.ap.gov.in

**NOTICE**  
 D.No.174/APC/B/2022/2021 Date: 22.11.2021

Sub: APCB - RG - ATP Retrofitting of Emission Control Devices/Equipment in DG sets with a capacity of 125 KVA and above in the state of Andhra Pradesh - Non-Compliance of the directions issued by APCB vide Order dated 05.11.2020 - Notice issued - Reg.

Ref: 1. APCB Order No. APCB/REG/01 of 2018/2020 dated 05.11.2020  
 2. E-mail dated 09.11.2020 from Board Office, Vijayawada.

WHEREAS the Particulate Matter emissions due to operation of Generators have also been identified as one of the major sources of emissions in the National Clean Air Programme and by the Honorable National Green Tribunal, in Original Application No. 481/2018.

WHEREAS, the Government of India, MoEFCC has launched the National Clean Air Programme for the prevention, control and abatement of air pollution level in the country at an urban and regional level. The Government of India recognizes significant sources of air pollution such as vehicles, DG sets, construction dust etc. As per the National Clean Air Programme, Gen. Diesel Generators are a significant source of air pollution in Indian cities and towns.

WHEREAS, there is a plan for the national level target of 30% reduction of PM<sub>10</sub> and PM<sub>2.5</sub> concentration in the ambient air under the National Clean Air Programme, Government of India, whereas the Hon'ble NGT vide order dated 04/08/2019 in O.A. No. 481/2018 has observed that the timeline to reduce the air pollution by 30% needs to be reduced, and the target of reduction needs to be increased, having regard to the adverse effect on public health and in view of the constitutional mandate of fundamental right to breathe clean air. It further states that the air pollution caused by DG sets needs to be a part of the action plan which may require retrofitting of Emission Control Devices/Equipment on generators already in use.

WHEREAS vide reference 1<sup>st</sup> cited above the APCB issued directions under Section 31 (A) of Air (Prevention and Control of Pollution) Act, 1986 and section 5 of the Environment (Protection) Act 1986 to all the industries and establishments operating DG sets of capacity 125 KVA and above, within the jurisdiction of the state of Andhra Pradesh to:

1. Retrofit all operational DG sets of capacity 125 KVA and above with an Emission Control Device/Equipment having a minimum specified Particulate Matter capturing efficiency of atleast 70% tested as per 5 mode DG cycle. The Emission Control Device/Equipment must be tested over ISO-8178 5 mode DG cycle for equivalent KVA rating by any one of the five Central Pollution Control Board, Govt of India, recognized/approved laboratories as given below:

1. Automotive Research Association of India, Pune (Maharashtra)
2. International Centre for Automotive Technology, Mysore (Karnataka)
3. Indian Oil Corporation, Research and Development Centre, Faridkot (Punjab)
4. Indian Institute of Petroleum, Dehradun (Uttarakhand)
5. Vehicle Research Development Establishment, Ahmednagar (Maharashtra)

OR

2. Shift to gas-based Generators by employing new gas-based generators.

WHEREAS vide reference 2<sup>nd</sup> cited above the APCB has directed all the industries and establishments having DG sets of capacity 125 KVA and above for Retrofitting of emission control devices and equipment in DG sets and to comply with the directions within 120 Days. However, the APCB has not received any compliance report from you till now.

Hence, you are hereby directed to carry out Retrofitting of emission control devices and equipment in DG sets as per the directions issued by the Board vide Order dated 05.11.2020 and to furnish the compliance report within 15 Days from the date of receipt of this notice, failing which action as warranted under the provisions of Environment (Protection) Act, 1986 and Air (Prevention and Control of Pollution) Act, 1986 shall be initiated.

**MCCONA BALA**  
 SHIVANBARAO  
 ENVIRONMENTAL ENGINEER

**KERALA STATE POLLUTION CONTROL BOARD**  
 NOTIFICATION  
 Subject: Kerala PCB - Retrofitting of Emission Control Devices/Equipment in DG sets with Capacity of 750 KVA and above in the State of Kerala

The Ministry of Environment, Forest and Climate Change (MoEFCC) launched National Clean Air Programme (NCAP) in January 2019 with an aim to improve air quality in 131 cities across the country and million plus cities in 24 States and UTs by engaging all stakeholders. Further, the Hon'ble National Green Tribunal (NGT) in the matter of O.A. 481/2018, dated 4.8.2019 issued an order for the remedial measures to be adopted to enforce the Ambient Air Quality Standards with reference to the Air (Prevention and Control of Pollution) Act, 1986 and the Environment (Protection) Act, 1986 in cities classified as "Non-Attainment Cities" (NACs) based on monitoring of the Ambient Air Quality.

In exercise of powers under sub-section 1(3) of the Air (Prevention & Control of Pollution) Act 1986, the State Government has declared the entire State of Kerala as Air pollution control Area. In line with the same, the Board had issued an order No. ASP/REG/ND/AN/DO/RETROFITTING/2020/2021-22/287, dated 17/09/2021 regarding mandatory retrofitting of emission control device/equipment in DG sets with capacity of 125 KVA and above in the State of Karnataka.

The Hon'ble National Green Tribunal (NGT) had directed for installation of Particulate Matter (PM) control by using diesel powered generator sets. The Hon'ble National Green Tribunal (NGT) directed Central Pollution Control Board (CPCB) after referred to as "CPCB" to develop & evolve the standards and norms for use of Retrofitting Emission Control Device/ Equipment (ECD).

Accordingly, CPCB formulated procedure for certification of the RECD namely "System and procedure for emission compliance testing of RECD for in-use diesel power generating set engines up to gross mechanical power of 800 KW" on 12.02.2022. This is with the objective for reduction of Particulate Matter (PM) by using Retrofitting Emission Control Devices (RECD) for in-use diesel powered internal combustion engines upto 800 KW or 1000 KVA. The details of compliance and testing procedures developed by CPCB is available in their web site and the same may be referred to.

The CPCB for the purpose of type approval and conformity of production verification compliance process, may revise the procedure from time to time. The currently approved test agencies for Certificate of type approval are as follows:

1. Automotive Research Association of India (ARAI Pune)
2. International Centre for Automotive Testing (ICAT, Mysore)
3. Indian Institute of Petroleum (IIP, Dehradun)
4. Vehicle Research Development Establishment (VRDE, Ahmed Nagar)

However, all Industries, Establishments, Projects, Buildings, Utilities, Airports, Railway Stations or any other places operating DG sets of capacity 125 KVA and above, within the jurisdiction of the State of Karnataka, are directed to:

- 1) Retrofit all operational DG sets of capacity with an Emission Control Device/Equipment. For diesel power generating set engines upto gross mechanical power of 800 KW or 1000KVA, the emission control device has to be type approved as per CPCB system and procedure for emission compliance Testing of Retrofit Emission control Devices (RECD).
- 2) For diesel power generating set engines above gross mechanical power of 800 KW or 1000KVA, the emission control device has to be tested for minimum 70% reduction in Carbon Monoxide, Particulate Matter and Hydrocarbon emissions. The Emission Control Device has to be tested in terms of 5-Minute Constant Speed Cycle/4r per 82 Steady State alternate mode test cycle specified in ISO-8178 Part 4. The equivalent KVA is considered if either the rated power or swept volume of the test engine is in the range of >22% of the rated power or swept volume of the engine for which the device is being used.

OR

3) Shift to gas-based generators by replacing new gas-based generators or retrofitting the existing DG sets for partial gas usage.

Further, all the Industries, Establishments, Projects, Buildings, Utilities, Airports, Railway Stations or any other places operating DG sets of capacity 125 KVA and above, shall ensure that Retrofitting of Emission Control Devices under it in accordance with the CPCB document EN/610/2022 mentioned in Para(1) of this notification.

This order supersedes all other previously issued orders and same shall be complied within six months from the date of issue of this Notification, failing which the Board is contemplated to initiate action under the provisions of the Air (Prevention and Control of Pollution) Act, 1986.

**CHAIRMAN**  
 Kerala State Pollution Control Board

To  
 All Concerned Industries, Establishments & Organizations.

**TAMIL NADU POLLUTION CONTROL BOARD**  
 NOTIFICATION No. TNPCB/REG/2022/2021, dated 25.06.2022

**ORDER**

Sub: TNPCB - Retrofitting of emission control devices/equipment in DG sets with capacity of 125 KVA and above in Tamil Nadu - Extension of time limit - reg.

Ref: 1. NOT Order O.A.No.681/2018 dated 06.08.2019.  
 2. Notification No. TNPCB/Ltda/CO/1/2015/10019 dated 10.08.2020, even dated: 15.10.2020 & dated 21.10.2021.

The Hon'ble NGT vide order O.A. No.681 dated 06.08.2019 has observed that "The timeline to reduce the air pollution by 30% needs to be reduced and the target of reduction needs to be increased, having regard to adverse effect on public health and in view of constitutional mandate of fundamental right to breathe clean air". It further states that the "air pollution caused by DG sets need to be a part of the action plan, which may, if necessary, require retrofitting of Emission Control Devices/ Equipment on generators already in use."

In this regard, TNPCB Board has issued a notification regarding retrofitting of emission control device/equipment in DG sets with capacity of 125 KVA and above on 10.08.2020, issued another notification on 15.10.2020 and another notification on 21.10.2021 for extension of time limit up to 31.03.2022. The emission control device has to be tested for equivalent KVA rating of the DG set by one of the 5 CPCB recognized/approved labs over ISO-8178 5 mode DG cycle. The equivalent KVA is considered if either the rated power or swept volume of the test engine is in the range of >25% of the rated power or swept volume of the engine for which the device is being used.

Several requests have been made by various industries and other organizations and seeking extension of time limits citing several reasons including the fact that to comply with the type approval of RPO devices by the RPOC manufacturing following

the procedures laid down by CPCB report dated 01.02.2022 namely "System and procedure for emission compliance testing of RPOC for diesel power generating set engines up to gross mechanical power of 800KW", it would require more time. Hence considering the above, the deadline to comply with the conditions for retrofitting of emission control devices in DG sets with capacity of 125 KVA and above by all the industries and commercial establishments within the jurisdiction of the State of Tamil Nadu except the cities of non attainment cities of Chennai UA, Madurai UA, Thiruvallur UA and Thoothukudi is further extended to 31.03.2022. The deadline for the industries and the commercial establishments in the non attainment cities of Chennai UA, Madurai UA, Thiruvallur UA and Thoothukudi for complying with the conditions for retrofitting of emission control devices for DG sets is extended upto 30.06.2022.

(Forwarded by order)

**Sri: A. Lathyan**  
 CHAIRMAN

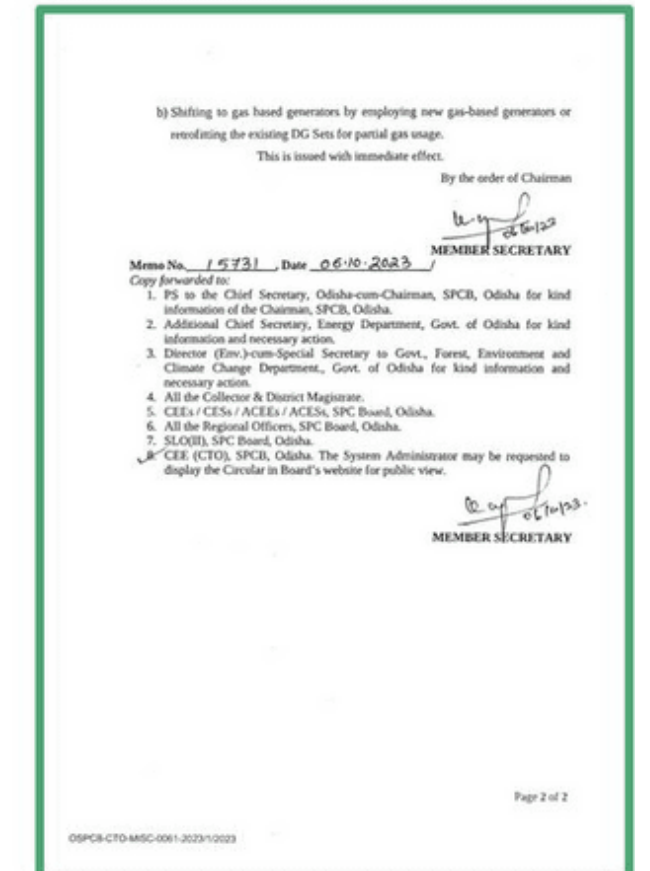
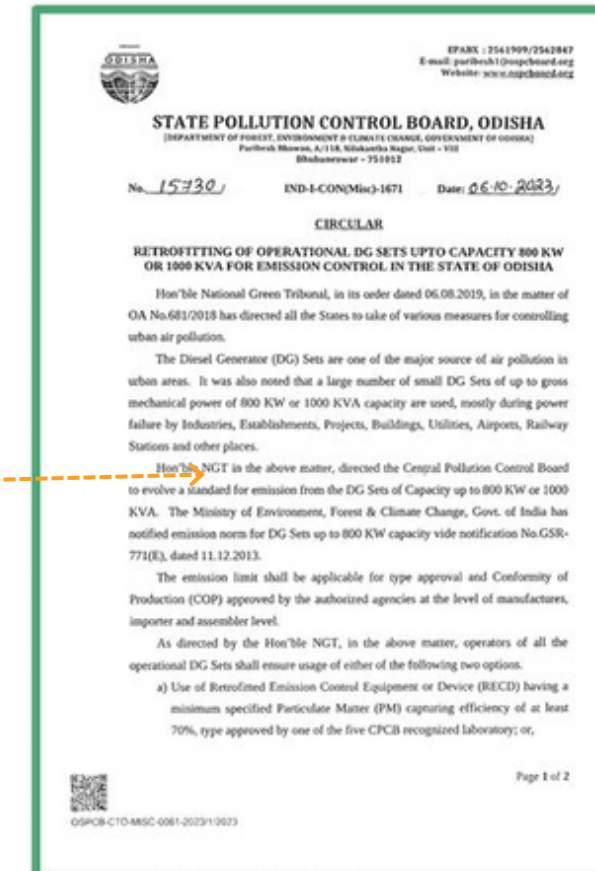
To

1. The Joint Chief Environmental Engineer, (Monitoring), TNPCB, Chennai, Coimbatore, Cuddalore, Madurai, Salem, Tirunelveli, Thiruvallur and Villupuram.
2. All the District Environmental Engineers, TNPCB.
3. All head of the laboratories, TNPCB.
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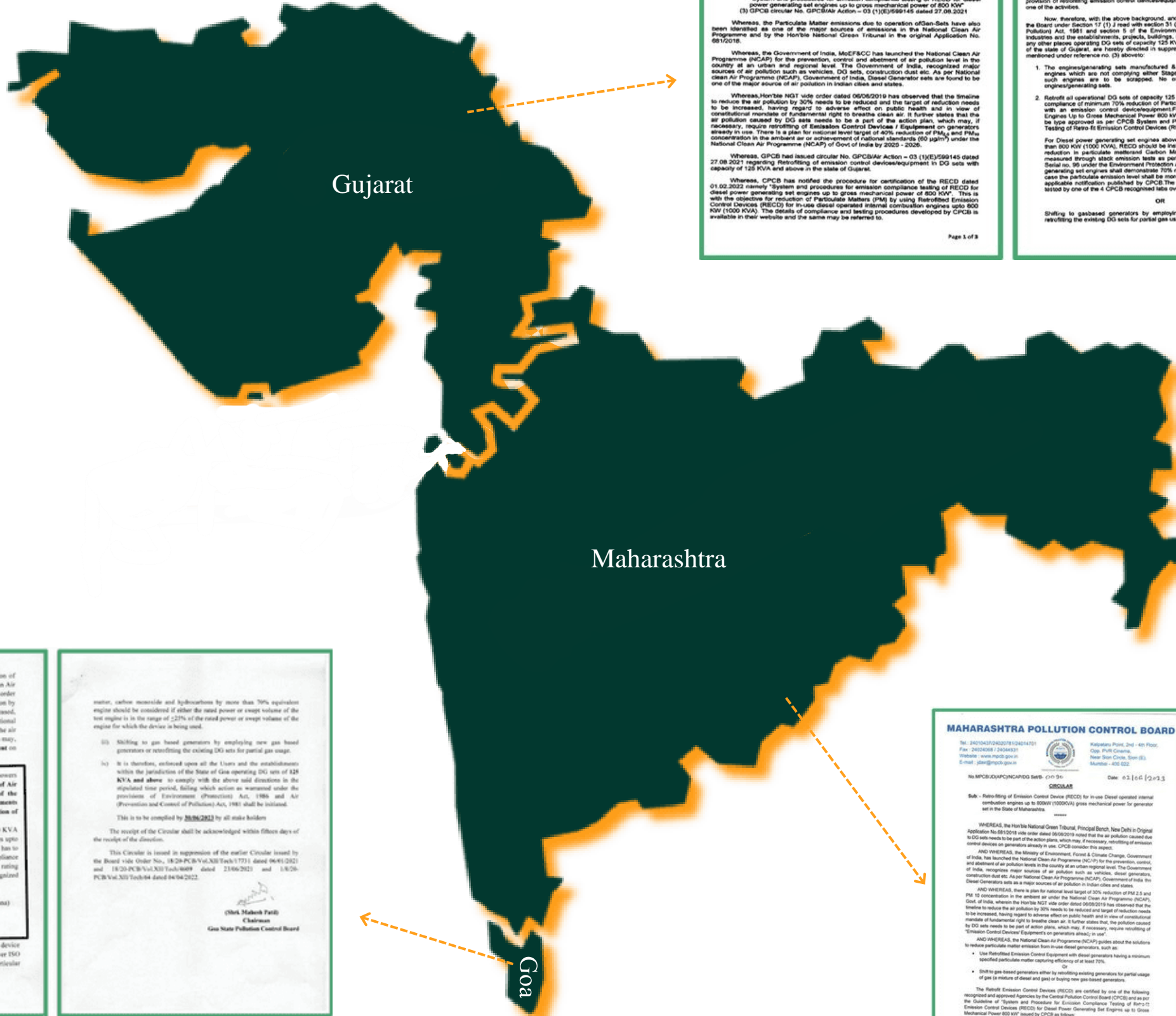
# Regulations

Mandates 1 State in East India



# Regulation

## Mandates 3 States in Western India



**Gujarat Pollution Control Board**  
Head Office, "Prayara@Heres"  
Sector 16-A, Gandhinagar.

**CIRCULAR**

**Sub:** Retrofitting of emission control device/equipment in DG Sets with capacity of 125 KVA and above in state of Gujarat-reg.

**Ref:** (1) Honourable NGT Directions in CA 681/2018 dated 06/08/2019  
(2) CPCB procedure for certification of the RECCD dated 01.02.2022 namely "System and procedure for emission compliance testing of RECCD for diesel power generating set engines up to gross mechanical power of 800 KW"  
(3) CPCB circular No. GPCB/Air Action - 03 (1)(E)/589145 dated 27.08.2021

Whereas, the Particulate Matter emissions due to operation of DG-Sets have also been identified as one of the major sources of emissions in the National Clean Air Programme and by the Hon'ble National Green Tribunal in the original Application No. 681/2018.

Whereas, the Government of India, MoEF&CC has launched the National Clean Air Programme (NCAP) for the prevention, control and abatement of air pollution level in the country at an urban and regional level. The Government of India, recognized major sources of air pollution such as vehicles, DG sets, construction dust etc. As per National Clean Air Programme (NCAP), Government of India, Diesel Generator sets are found to be one of the major source of air pollution in Indian cities and states.

Whereas, Hon'ble NGT vide order dated 06/08/2019 has observed that the timeline to reduce the air pollution by 30% needs to be reduced and the target of reduction needs to be increased, having regard to adverse effect on public health and in view of constitutional mandate of fundamental right to breathe clean air. It further states that the air pollution caused by DG sets needs to be a part of the action plan, which may, if necessary, require retrofitting of Emission Control Devices / Equipment on generators already in use. There is a plan for national level target of 40% reduction of PM<sub>10</sub> and PM<sub>2.5</sub> concentration in the ambient air or achievement of national standards (80 µg/m<sup>3</sup>) under the National Clean Air Programme (NCAP) of Govt of India by 2025 - 2026.

Whereas, CPCB has issued circular No. GPCB/Air Action - 03 (1)(E)/589145 dated 27.08.2021 regarding Retrofitting of emission control device/equipment in DG sets with capacity of 125 KVA and above in the state of Gujarat.

Whereas, CPCB has notified the procedure for certification of the RECCD dated 01.02.2022 namely "System and procedure for emission compliance testing of RECCD for diesel power generating set engines up to gross mechanical power of 800 KW". This is with the objective for reduction of Particulate Matter (PM) by using Retrofitting Emission Control Devices (RECCD) for in-use diesel operated internal combustion engines upto 800 KW (1000 KVA). The details of compliance and testing procedures developed by CPCB is available in their website and the same may be referred to.

Page 1 of 3

Whereas, CPCB for the purpose of type approval and conformity of production verification compliance procedure has currently approved 04 test agencies for Certificate of type approval as follows. However, CPCB may revise the procedure from time to time.

1. Automotive Research Association of India, Pune (Maharashtra)
2. International Centre for Automotive Technology, Manesar (Haryana)
3. Indian Institute Petroleum, Dehradun (Uttarakhand)
4. Vehicle Research Development Establishment, Ahmednagar (Maharashtra)

Whereas, State Action Plan for Gujarat State on Clean Air is prepared and process of retrofitting emission control device/equipment in DG set is also included as one of the activities.

Now, therefore, with the above background, and in exercise of powers vested with the Board under Section 17 (1) i read with section 31 (A) of Air (Prevention and Control of Pollution) Act, 1981 and section 5 of the Environment (Protection) Act, 1986, all the industries and the establishments, projects, buildings, utilities, airports, railway stations or any other places operating DG sets of capacity 125 KVA and above within the jurisdiction of the state of Gujarat, are hereby directed in suppression to the earlier issued circular mentioned under reference no. (3) above:

1. The engine/generating sets manufactured & installed before 17.2024 or the engines which are not complying with Stage I and/or Stage II emission limits, such engines are to be scrapped no one shall subvert/turn the above engine/generating set.
2. Retrofit all operational DG sets of capacity 125 KVA and above shall establish the compliance of minimum 70% reduction of Particulate Matter by using the retrofitting with an emission control device/equipment for Diesel Power Generating Set Engines up to Gross Mechanical Power 800 kW, the emission control device must be type approved as per CPCB System and Procedure for Emission Compliance Testing of RECCD for Emission Control Devices (RECCD).

For Diesel power generating set engine above Gross Mechanical Power greater than 800 KW (1000 KVA), RECCD should be installed demonstrating minimum 70% reduction in particulate matter, Carbon Monoxide (CO) from existing levels measured through static emission tests as per GRI 48(8) dated 07 July, 2002. Static test, 30 under the Environment Protection Act, 1986 and Emission Characterization generating set engines shall demonstrate 70% reduction in existing levels but in no case the particulate emission level shall be more than the limit as prescribed under applicable notification published by CPCB. Emission control device has to be used by one of the 4 CPCB recognized labs over ISO-9178 5 mode D2 cycle.

OR

Switching to gas based generators by employing new gas based generators or retrofitting the existing DG sets for natural gas usage.

Page 2 of 3

This is to be complied within a period of 120 days from the date of issuance of this order by all stakeholders and shall submit the time bound action plan within 60 days.

It is therefore, enforced upon all the industries and establishments, projects, buildings, utilities, airports, railway stations or any other places operating DG sets of capacity 125 KVA and above within the jurisdiction of the State of Gujarat to comply with the above said directions in the stipulated time period, failing which action as warranted under the provisions of Environment (Protection) Act, 1986 and Air (Prevention and Control of Pollution) Act, 1981 shall be initiated.

The receipt of the circular shall be acknowledged within fifteen days of the receipt of the circular.

For: **Prayara@Heres**  
(D. M. Thakkar)  
Member Secretary

Date: 26 OCT 2023

No: GPCB/Air Action Plan-03 757/15

To, All Industries and the establishments, projects, buildings, utilities, airports, railway stations or any other places operating DG sets of capacity 125 KVA and above.

Copy To:

1. The Regional Officer, Ahmedabad (City), Ahmedabad (East), Ahmedabad (Rural), Anand, Arkeswar, Bhanuch, Bharuval, Godhra, Gandhinagar, Himmatnagar, Jamnagar, Junagadh, Kutch (East), Mehsana, Palanpur, Rajkot, Surendranagar, Vadodra, Vapi, Japur, Kutch (West), Morbi, Nadiad, Navsari, Porbandar, Sarigan.
2. The Unit Head, Ahmedabad (City), Ahmedabad (East), Ahmedabad (Rural), Anand, Arkeswar, Bhanuch, Bharuval, Godhra, Gandhinagar, Himmatnagar, Jamnagar, Junagadh, Kutch (East), Mehsana, Palanpur, Rajkot, Surendranagar, Vadodra, Vapi, Japur, Kutch (West), Morbi, Nadiad, Navsari, Porbandar, Sarigan.
3. Unit Head - IT cell ..... For upload this office order on GPCB and XPN website.
4. Unit Head - Legal Branch ..... For information.
5. Selected file.

**GOA STATE POLLUTION CONTROL BOARD**  
गोंय राज्य प्रदूषण नियंत्रण मंडळ  
(As ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 Certified Board)

**CIRCULAR**

**Sub:** Retrofitting of emission control device/equipment in DG Sets with capacity of 125 KVA upto 1000 KVA in State of Goa - reg.

**Ref:** 1. 18/20-PCB/Vol.XIII/Tech/1731 dated 06/01/2021  
2. 18/20-PCB/Vol.XIII/Tech/4089 dated 23/06/2021  
3. 18/20-PCB/Vol.XIII/Tech/4 dated 04/04/2022

Whereas, the Government of Goa, Department of Science, Technology & Environment in Official Gazette Series 1 No. 40 dated 02/01/1992, had extended the entire area within the State of Goa as Air Pollution Control Area for the purpose of Air (Prevention and Control of Pollution) Act, 1981 as amended.

Whereas, the emission including Particulate Matter due to operation of DG Sets have also been identified as one of the sources of air pollution.

Whereas, the Government of India, MoEF&CC has launched the National Clean Air Programme (NCAP) for the prevention, control and abatement of air pollution level in the Country at an urban and regional level. The Government of India, recognized major sources of air pollution such as vehicles, DG sets, construction dust etc. As per National Clean Air Programme (NCAP), Government of India, Diesel Generator sets as a major source of air pollution in Indian cities and states.

Whereas, there is a plan for national level target of 30% reduction of PM<sub>10</sub> and PM<sub>2.5</sub> concentration in the ambient air under the National Clean Air Programme (NCAP), Govt. of India, wherein the Hon'ble NGT vide order dated 06/08/2019 has observed that the timeline to reduce the air pollution by 30% needs to be reduced and the target of reduction needs to be increased, having regard to adverse effect on public health and in view of constitutional mandate of fundamental right to breathe clean air. It further states, that the air pollution caused by DG sets needs to be a part of the action plan, which may, if necessary, require retrofitting of Emission Control Devices / Equipment on generators already in use."

Now, therefore, with the above background, and in exercise of powers vested with the Board under Section 17 (1) i read with section 31 (A) of Air (Prevention and Control of Pollution) Act, 1981 and section 5 of the Environment (Protection) Act, 1986, all the industries and the establishments operating DG sets of capacity 125 KVA and above within the jurisdiction of the state of Goa, are hereby directed as:

- 1) Retrofit all operational DG sets of capacity 125 KVA upto 1000 KVA, with an Emission Control Device for diesel power generating set engines upto gross mechanical power 800 KW (1000 KVA), the emission control device has to be type approved as per CPCB system & procedure for emission compliance testing of retrofit emission control devices (RECCD) for equivalent KVA rating by one of the four Central Pollution Control Board, Govt. of India, recognized approved laboratories as given below:
  - a. Automotive Research Association of India, Pune (Maharashtra)
  - b. International Centre for Automotive Technology, Manesar (Haryana)
  - c. Indian Institute of Petroleum, Dehradun (Uttarakhand)
  - d. Vehicle Research Development Establishment, Ahmednagar (Maharashtra)

3) For DG set above 1000 KVA, the retrofitting emission control device/equipment should be tested by one of the four CPCB approved labs over 1503 1178 5 mode D2 cycle for equivalent KVA rating for reduction of particulate

matter, carbon monoxide and hydrocarbons by more than 70% equivalent engine should be considered if either the rated power or swept volume of the test engine is in the range of <25% of the rated power or swept volume of the engine for which the device is being used.

4) Switching to gas based generators by employing new gas based generators or retrofitting the existing DG sets for natural gas usage.

5) It is therefore, enforced upon all the Users and the establishments within the jurisdiction of the State of Goa operating DG sets of 125 KVA and above to comply with the above said directions in the stipulated time period, failing which action as warranted under the provisions of Environment (Protection) Act, 1986 and Air (Prevention and Control of Pollution) Act, 1986 shall be initiated.

This is to be complied by 26/10/2023 by all stake holders

The receipt of the Circular shall be acknowledged within fifteen days of the receipt of the circular.

This Circular is issued in suppression of the earlier Circular issued by the Board vide Order No. 18/20-PCB/Vol.XIII/Tech/1731 dated 06/01/2021 and 18/20-PCB/Vol.XIII/Tech/4089 dated 23/06/2021 and 18/20-PCB/Vol.XIII/Tech/4 dated 04/04/2022.

(Shri. Mahesh Paril)  
Chairman  
Goa State Pollution Control Board

**MAHARASHTRA POLLUTION CONTROL BOARD**

**CIRCULAR**

**Sub:** Retrofitting of Emission Control Device (RECCD) for in-use Diesel operated internal combustion engines up to 800KW (1000KVA) gross mechanical power for generator set in the State of Maharashtra.

WHEREAS, the Hon'ble National Green Tribunal, Prasad, Bench, New Delhi in Original Application No. 681/2018 vide order dated 06/08/2019 has observed that the air pollution caused by DG sets needs to be a part of the action plan, which may, if necessary, require retrofitting of emission control devices on generators already in use. CPCB hereby the request.

AND WHEREAS, the Ministry of Environment, Forest & Climate Change, Government of India, has launched the National Clean Air Programme (NCAP) for the prevention, control and abatement of air pollution level in the country at an urban regional level. The Government of India, recognized major sources of air pollution such as vehicles, diesel generators, construction dust etc. As per National Clean Air Programme (NCAP), Government of India, the Diesel Generator sets as a major source of air pollution in Indian cities and states.

AND WHEREAS, there is a plan for national level target of 30% reduction of PM<sub>10</sub> and PM<sub>2.5</sub> concentration in the ambient air under the National Clean Air Programme (NCAP), Govt. of India, wherein the Hon'ble NGT vide order dated 06/08/2019 has observed that the timeline to reduce the air pollution by 30% needs to be reduced and the target of reduction needs to be increased, having regard to adverse effect on public health and in view of constitutional mandate of fundamental right to breathe clean air. It further states that, the pollution caused by DG sets needs to be a part of action plan, which may, if necessary, require retrofitting of Emission Control Devices (RECCD) for in-use diesel operated internal combustion engines upto 800 KW (1000 KVA). The details of compliance and testing procedures developed by CPCB is available in their website and the same may be referred to.

AND WHEREAS, the National Clean Air Programme (NCAP) guidelines about the solutions to reduce particulate matter emissions from in-use diesel generators, such as:

- Use Retrofitting Emission Control Devices (RECCD) on generators having a minimum specified particulate matter capturing efficiency of at least 70%.
- Switch to gas based generators after by retrofitting existing generators by natural usage of gas in mixture of diesel and gas or using new gas based generators.

The Retrofit Emission Control Devices (RECCD) are notified by one of the following recognized and approved Agencies by the Central Pollution Control Board (CPCB) and are:

1. Automotive Research Association of India (ARI), Pune
2. International Centre for Automotive Technology (ICAT), Manesar
3. Indian Institute of Petroleum (IIP), Dehradun
4. Vehicle Research Development Establishment (VRDE), Ahmednagar

For DG Sets above 1000 KVA retrofit emission control device/ equipment should be tested by one of the above CPCB approved labs over ISO 11718 5 mode D2 cycle for equivalent KVA rating for reduction of particulate matter, Carbon Monoxide and hydro carbons by more than 70% equivalent engine should be considered if either the rated power or swept volume of the test engine is in the range of < 25% of the rated power or swept volume of the engine for which the device is being used.

AND WHEREAS, the above guideline provided Exhaust Emission Limits, Applicability and Requirement to Retrofit Emission Control Devices (RECCD) to be installed on all the Phase-I & Phase-II engine/engine families as mentioned below, which have completed five years from the date/month of engine manufacturing.

**Phase-I Engines:** The engines complying to emission limits as specified in CPCB Stage-I GSR- 371 dated 17th May 2002 and the diesel/gas engines manufactured/imported on or after 17.2024 shall establish the compliance of minimum 70% reduction of Particulate Matter by using the retrofitting after treatment device without adversely affecting any other emission parameters.

**Phase-II Engines:** The engines complying to emission limits as specified in CPCB Stage-II GSR 771(S) dated 11th Dec 2012 and its amendment vide GSR 232(S) dated 31-Mar-2014, and the diesel/gas engines manufactured/imported on or after 17.2024 shall establish the compliance of minimum 70% reduction of Particulate Matter by using the retrofitting after treatment device without adversely affecting any other emission parameters.

AND WHEREAS, the engine/generating sets manufactured & installed before 17.2024 or the engines which are not complying with either Stage I and/or Stage II emission limits, such engines are to be scrapped. No one shall subvert/turn the above engine/generating sets.

NOW THEREFORE, enforce upon all the industries, establishments, projects, buildings, utilities, airports, railway stations or any other places in the State of Maharashtra, where, Diesel Generator sets of capacity upto 800 KW (1000KVA) are in use shall comply with the said Circular within a period of 120 days from the date of issuance of this circular, which please note.

Copy submitted to:

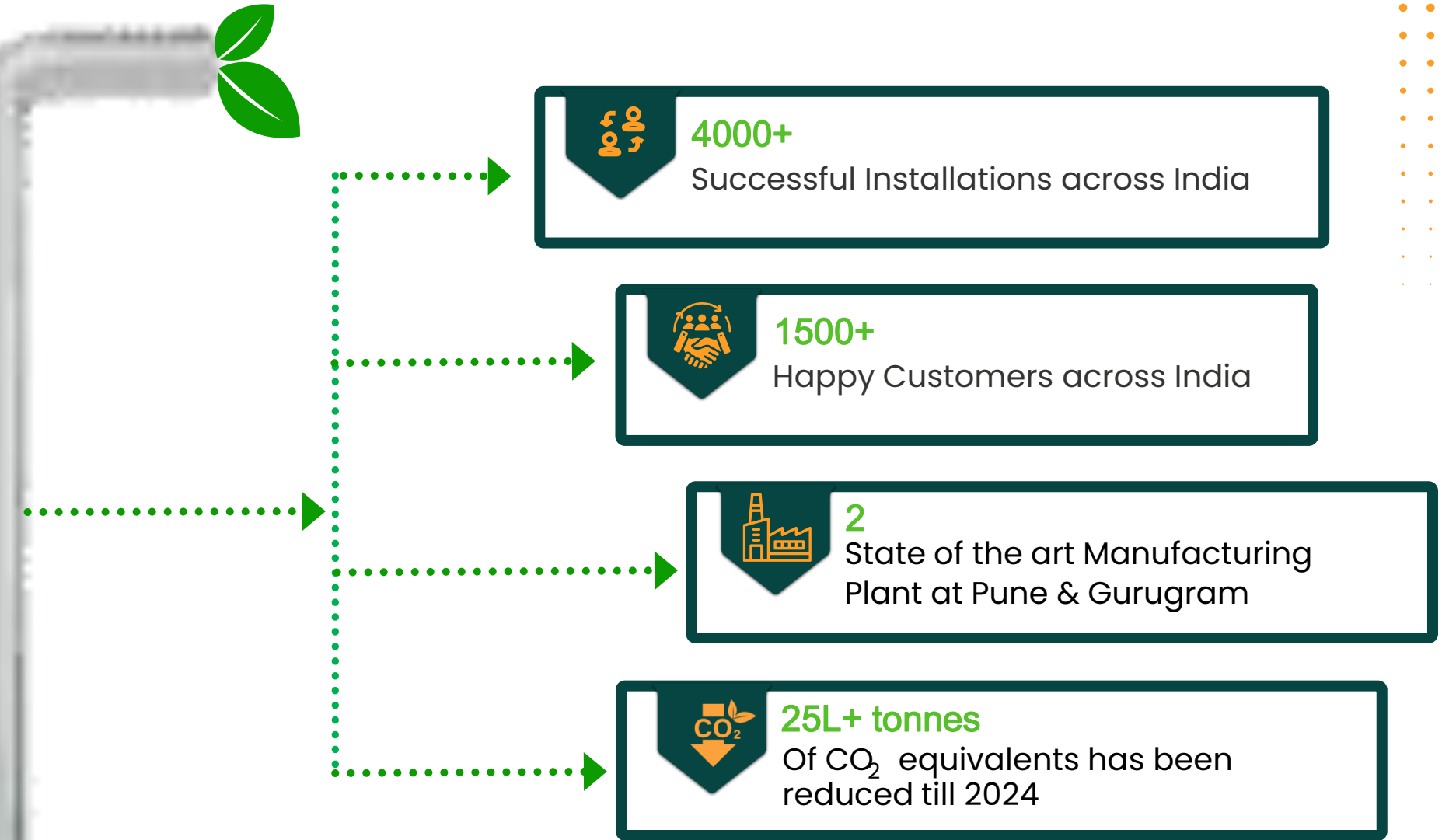
1. Hon'ble Chairman, MPCB, Goa, Member - for favour of information.
2. PSD UD-APC / JD-WPC AST / RD-HQ, MPC Board - for information.
3. All Regional Office/Sub-Regional Offices, MPCB - They are directed to circulate the said circular to all the establishments/units in their jurisdiction and submit Action Taken Report.
3. EC-For testing on MPCB Website.



# Chakr Shield

Retrofit Emission Control Device (RECD)

 **Powerup  
Without  
Polluting  
Down**



-  **Low Maintenance**
-  **Modular & Compact**
-  **Long Product Life**
-  **No by Product**
-  **No Adverse Impact on Engine**



# Chakr Shield

## Working Principle, An Innovative Technology for Cleaner Air

### Stage 1

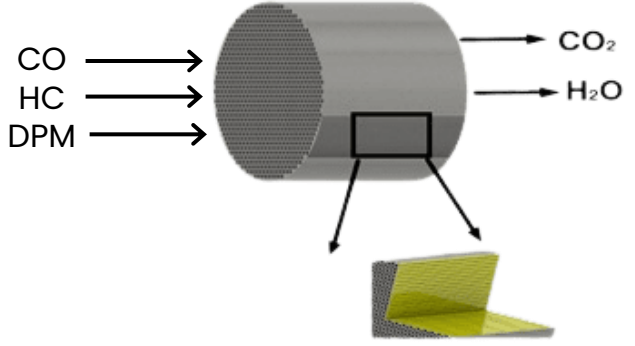
#### ● Uniformity Generator

The design has been developed using extensive Computational Fuel Dynamics. Achieves high uniformity index while minimizing pressure drop.

### Stage 2

#### ▲ Oxidation

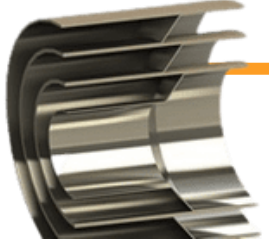
A substrate with proprietary catalytic material accelerates reactions, converting them into Cleaner air.



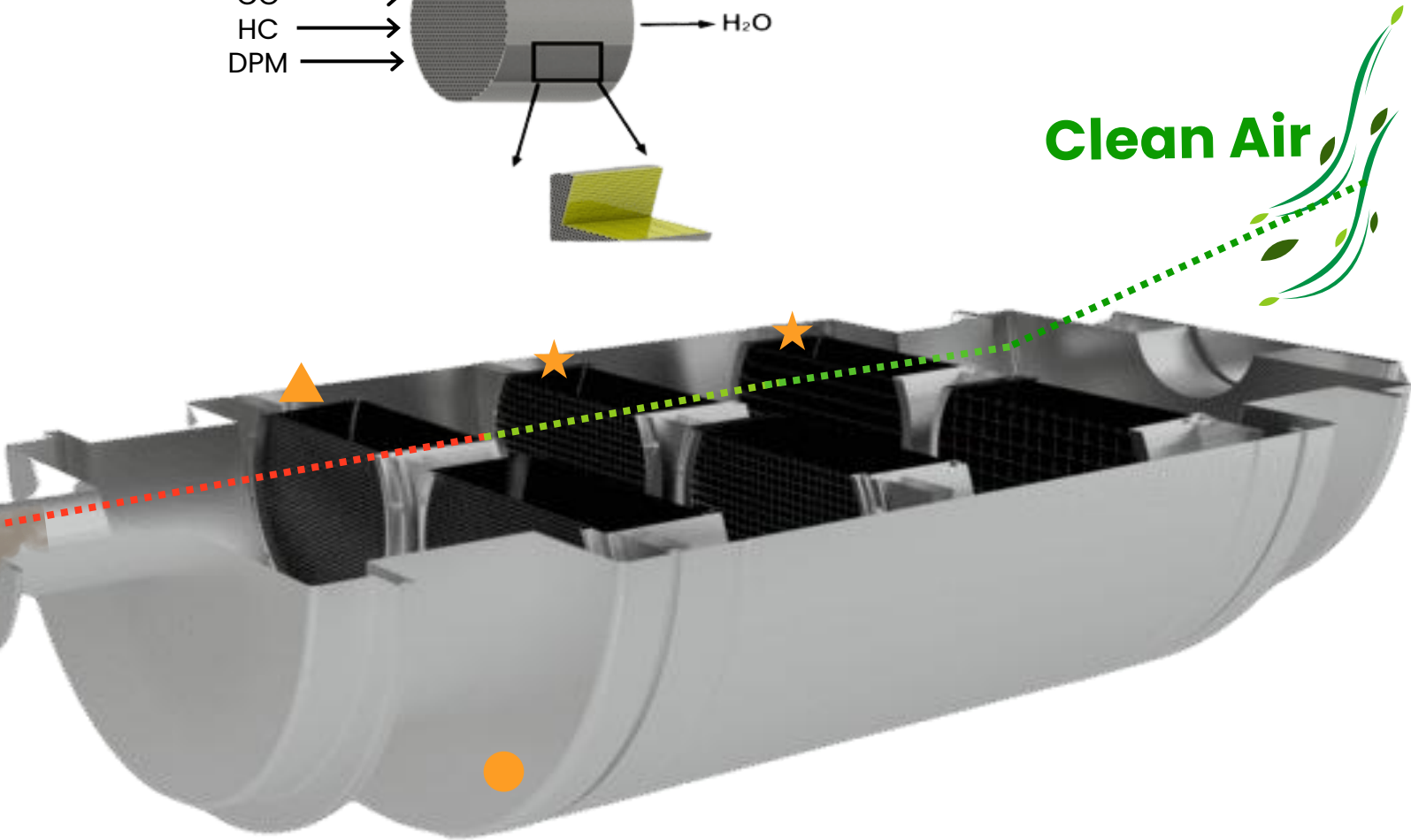
### Stage 3

#### ★ Particulate Regenerative Trap

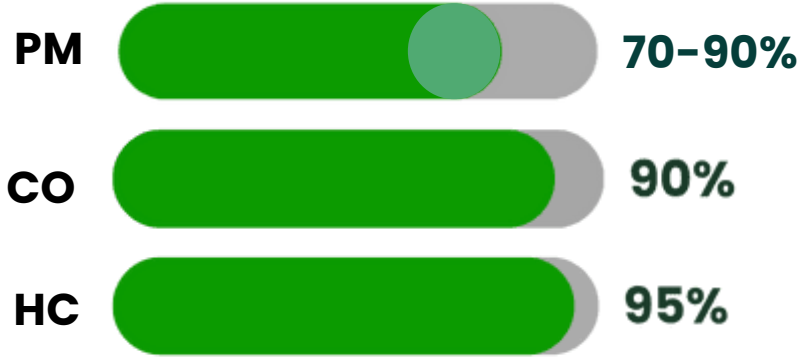
The substrate-based PRT traps over 90% of PM, passively regenerating via an anisotropic catalyst.



Carbon Monoxide (CO)  
Particulate Matter (PM)  
Hydrocarbon(HC)



### Chakr Shield: Reduction in Emissions



# Salient Features

Transforming Emission Control with Superior Features



## Energy Free Operations

Revolutionary power-free technology



## Clean and Green

No secondary Pollution



## Low Maintenance

No moving parts for long-lasting performance



## Design

Modular & Customizable, Adaptive for any site



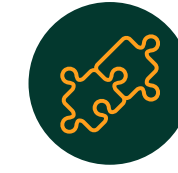
## Noise Decibel

<75 DB equivalent performance as a muffler



## No Consumables

No consumables for continuous & reliable operation



## Adaptable

Integrated engineered design compatible with a wide range of DG Sets



## No Engine Stress

Maintains back pressure within permissible limits



## Durable & Robust

Consistent performance for a long-lasting solution



## Smart Tech

IoT diagnostics with predictive maintenance





# Technological Advantages

Setting the Standard in Emission Control Technology

Technology	PM Reduction Efficiency	Capital Cost	Operational Cost	Impact on Engine	Ease Of Maintenance	Back Pressure
<b>Chakr Shield: The most feasible and adaptable technology, backed by superior metrics.</b>						
1 Chakr Shield	70-90%	Moderate	Negligible	Negligible	Preventive Maintenance	Low
2 Diesel Oxidation Catalyst	15%	Moderate	Negligible	Low -Due to face choking	Preventive Maintenance	Medium
3 Diesel Particulate Filter (DPF)	>70%	High	Negligible	High(due to frequent filter choking)	High (Ash Cleaning Soot Removal)	High
4 Wet Scrubber	15%	Moderate	High (Wash fluid & Chemical Replenishment)	Low	Complex & Frequent Service	Low
5 Electrostatic Precipitator Technology	>70%	Moderate	Very High Due To Extreme Voltages	Low	Complex & Frequent Service	Low



# Chakr Shield

Transforming Emissions On-Site



# Chakr Shield In Action

Revolutionizing air quality at the Indian Army headquarters, Leh

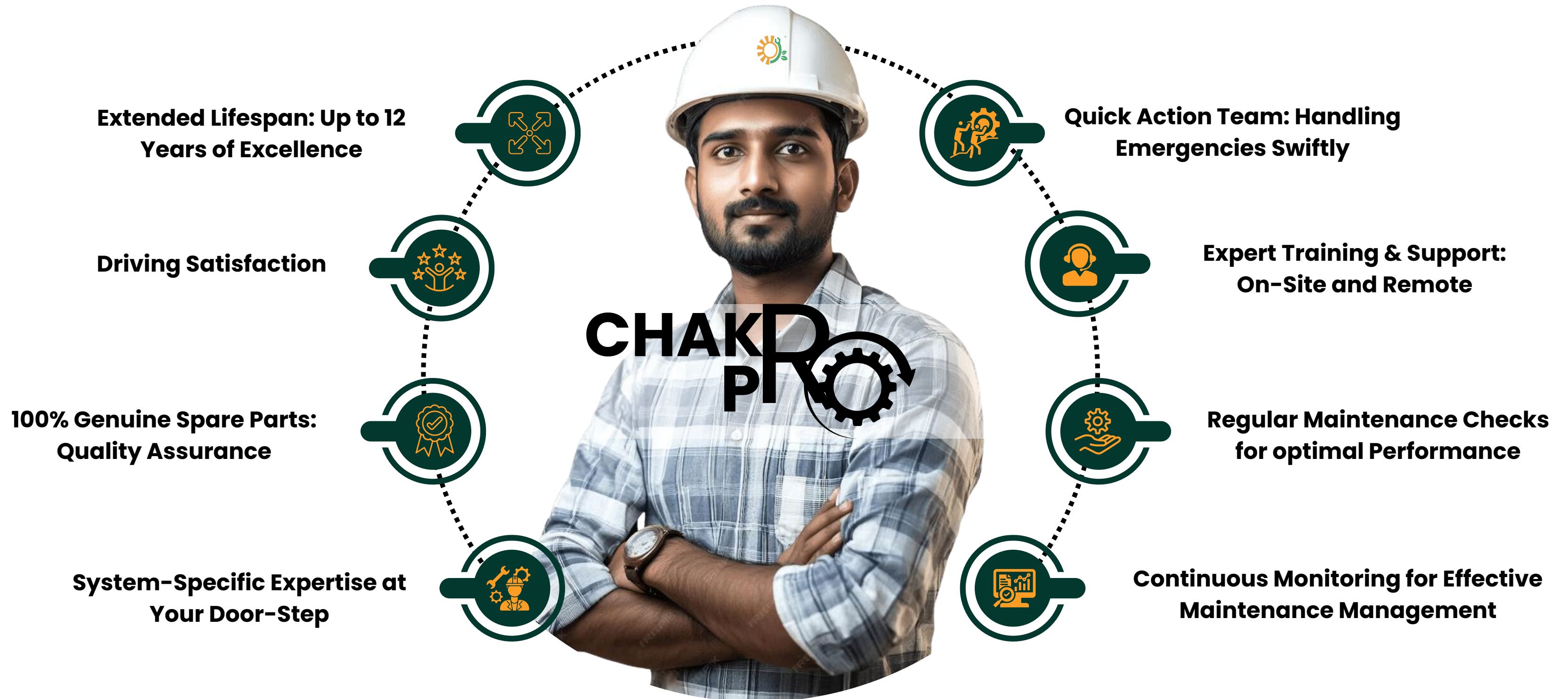


<https://youtu.be/GjnFnQ0Y-VY>



# Beyond Installation

Pan India After-Sales Support- To Maximize your Investments

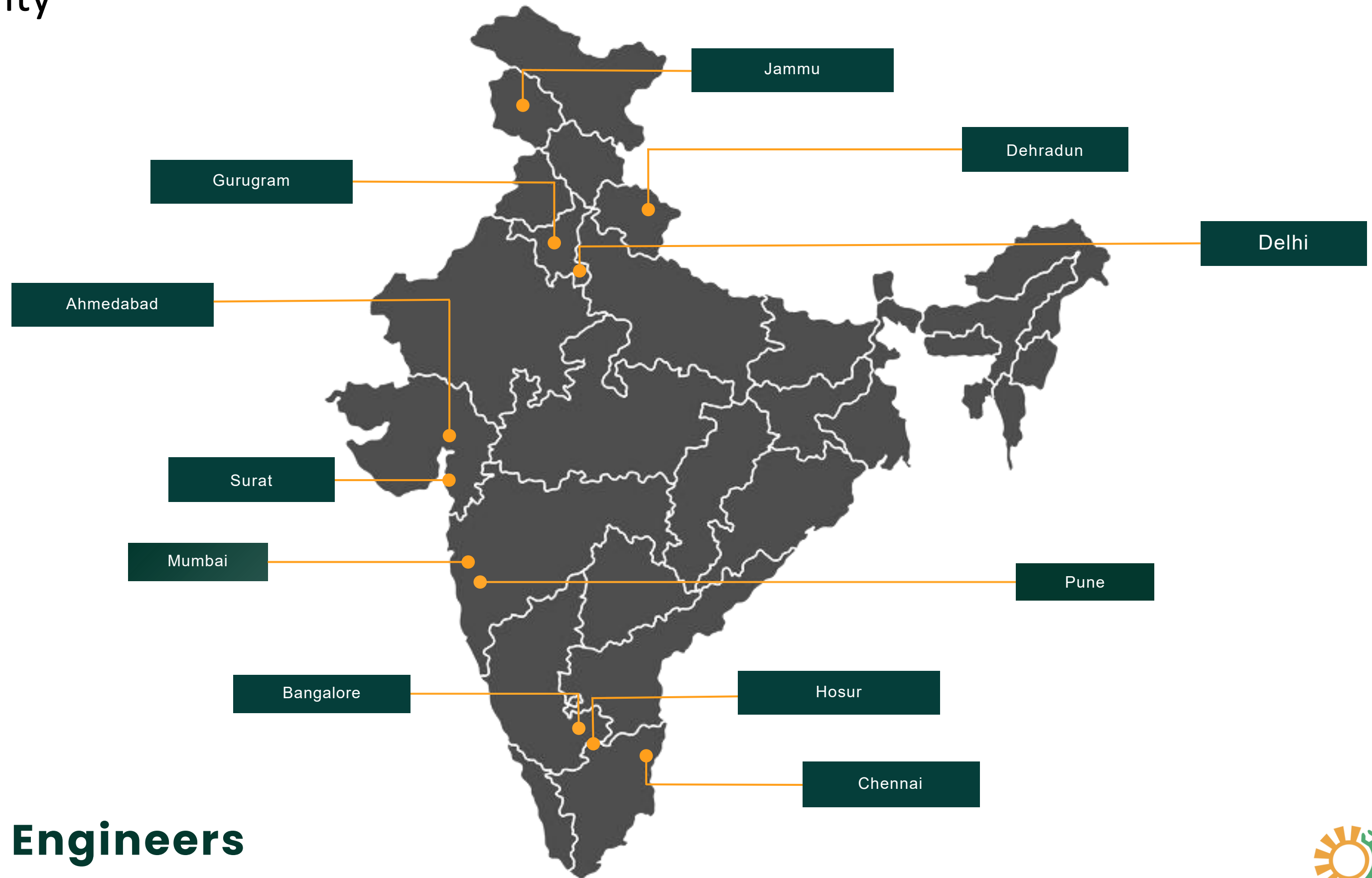


For assistance, contact Customer Service at 1800-203-8001 or WhatsApp us at +91 9266775553



# Our Service Footprint Nationwide

Your Time, Our Priority



**Pan India Service Available**

**40+ Expert Service Engineers**



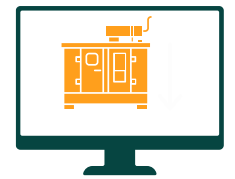
# What's New?

## IoT- Powered DG Monitoring

A New Era of Efficiency & Cost Savings



**Real-Time DG Monitoring**



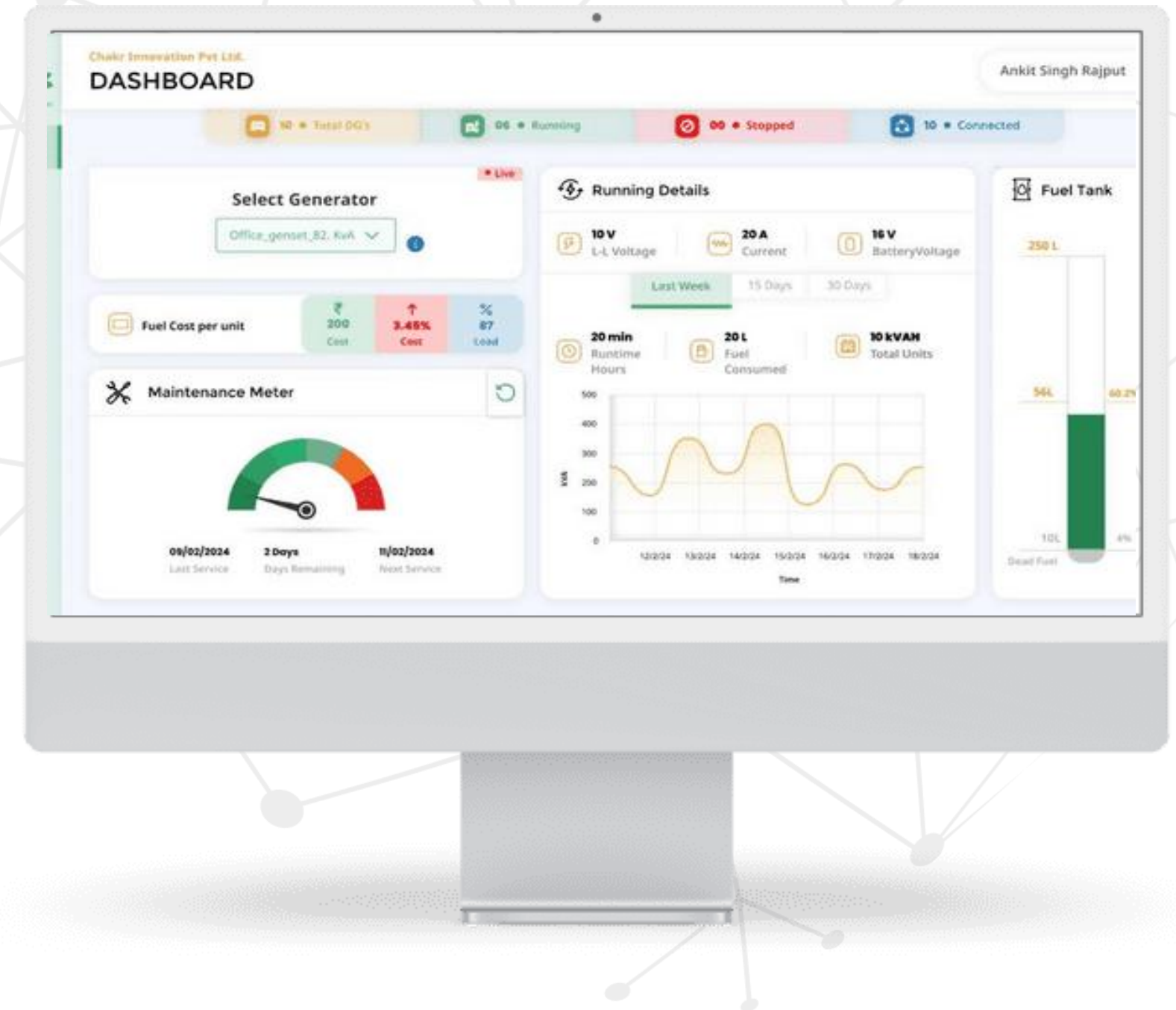
**Reduction In Diesel Pilferage**



**Predictive Maintenance Indicator**

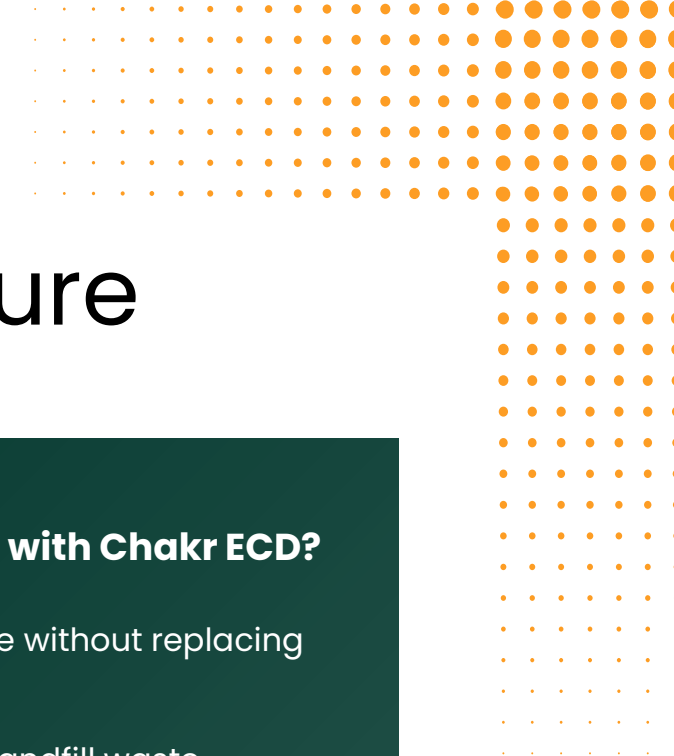


**Enhance Efficiency and Reduction In OpEx Costs (up to 20%)**



# Our Product Portfolio

## Emission Control Technology: New Initiatives for a Sustainable Future



### Railway Diesel Generators

#### Why Emission Control Devices (ECD) for Railway Diesel Engines?

**Reduce Harmful Emissions:** This Reduces harmful pollutants like Particulate matter (PM) from diesel locomotives, tackling pollution.

**Sustainability Leadership:** Railways can lead green initiatives and contribute to India's clean energy transition.

**Adaptive Technology:** Modular emission solution avoids the high costs of upgrades, delivering cleaner operations without major investments.

#### Impact

**Cleaner Air:** Significant emission reductions improve air quality around railways and stations, supporting public health.

**Enhanced Reputation:** Positions railways as innovators in sustainability, boosting public trust and green credentials.



### Marine Engines

#### Why Retrofit Marine Vessels with ECD?

**Improve Air & Water Quality:** Cleaner air near ports and less ocean acidification for healthier marine ecosystems.

**Support Sustainability:** Reduce emissions to fight climate change and transition to sustainable shipping.

**Beyond Conventional:** Retrofit existing ships to meet IMO MARPOL Annex VI standards without costly replacement.

#### Impact

**Cleaner Oceans & Air:** Reduces harmful emissions, protecting human health and marine life.

**Regulatory Compliance:** Ships stay compliant with global emission standards, ensuring smooth operations worldwide.



### Commercial Vehicle

#### Why Retrofit Commercial Vehicles with Chakr ECD?

**Avoid Scrappage Costs:** Extend vehicle life without replacing fleets.

**Eco-Friendly:** Cut emissions, and reduce landfill waste.

**Future Ready:** Prepares for future emission norms with compatibility for Emission Control Device.

**Easy Adaptation:** Lower upfront cost than full fleet upgrades.

#### Impact

**Cleaner Air:** Reduced emissions for a healthier environment.

**Better Brand Image:** Show leadership in sustainability.



**Snap Fit Technology:** Simplifies retrofitting by enabling easy installation without major modifications, ensuring minimal downtime and disruption.

**Advanced Emission Reduction Technology:** Supports substantial carbon emission reductions, contributing to cleaner air and a sustainable future across industries.

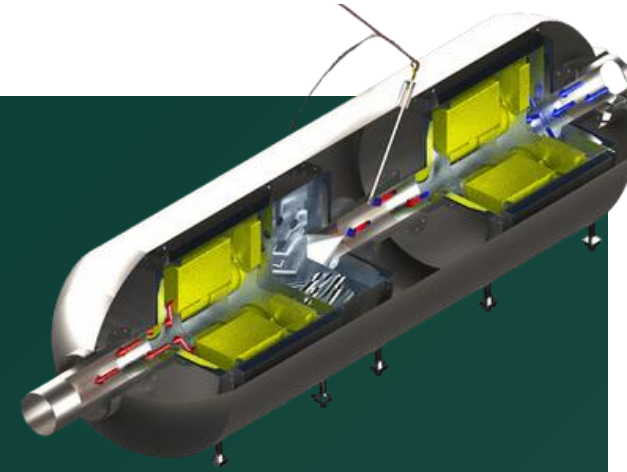


# Our Product Portfolio

## Emission Control Technology: New Initiatives for a Sustainable Future

### DeNOx

Nitrogen Oxides (NOx) from Diesel and Gas engines pose a severe threat to public health and economic progress. Chakr DeNOx technology offers a cutting-edge solution to reduce these harmful emissions, making it a necessity for a sustainable future.



#### Why Chakr DeNOx?

- Proven Results:** Reduces NOx emissions by over 80% for diesel and gas engines.
- Indigenous Innovation:** 100% locally developed catalyst, mixer, and filter design.
- Compact Fit:** Requires only 75% of the silencer volume for installation or half of Chakr Shield.
- Cost-Effective:** Lower exhaust back pressure, minimizing fuel economy impact (<1%).
- Unique Additives:** Prevents crystallization and enhances catalyst stability.

#### Key USPs:

- Non-PGM Catalyst for affordability.
- Patented mixer for superior mixing efficiency.
- High heat retention for performance in Indian conditions.
- Optimized for adverse duty cycles.

### Al-Air

Introducing Chakr Aluminium-Air Activator, the world's most advanced aluminium-powered energy solution. Designed to deliver unmatched performance and sustainability, this innovative technology turns abundant, recyclable aluminium into clean, reliable power for mobility and energy needs.



#### Key Features:

- Extended Runtime:** Over 4x the range of lithium-ion batteries.
- Fast Swapping:** 2-5 minute aluminium plate replacement – no downtime.
- Cost-Effective:** Lower CapEx than lithium-ion and OpEx than IC engines.
- 100% Safe:** Non-flammable, ensuring reliable performance in all conditions.
- Eco-Friendly:** Fully recyclable aluminium with no hazardous disposal needs.
- Indigenous Materials:** Powered by India's abundant aluminium reserves, aligning with Make in India and reducing lithium dependency.

#### Certifications:

- Applus IDIADA (Spain):** European testing and homologation expertise.
- ARAI:** Premier Indian R&D and testing institute.
- ICAT:** World-class automotive certification provider under GOI.
- IIT-Bombay:** Validation by India's leading technology institution.

#### Applications:

- Electric Mobility:** Extended range with reduced operational costs.
- Material Heavy Equipment:** 4x more run time in warehouses & manufacturing locations.
- Backup Power:** Lightweight, efficient energy for critical systems.
- Grid Stability:** Enhances power reliability for smart grids.





# United For A Cleaner Future

Partnering In Their Greener Journey

## HITACHI

“ We installed the Chakr Shield at our Hitachi Astemo Fie P Limited facility in Bawal to reduce particulate matter emissions from our diesel generators. The entire process, from understanding the device to installation, was seamless. After monitoring the system for 4 months, we're fully satisfied with its performance. The maintenance was prompt, and the Chakr Innovation team was responsive and professional throughout. We're pleased to see young IIT-Delhi innovators addressing air pollution and look forward to more installations in the future. ”



“ Thank you very much for commissioning the Chakr Shield at our Gurgaon site and sharing the third-party test reports. We're quite pleased to see the positive results, and hope to see this performance continue during the pilot run. Once again, we appreciate your innovative product which is already cutting down our PM emissions, thereby protecting our environment and people in the vicinity. Looking forward to more such installations in the future to sustainably reduce the impact of our activities on the environment. ”



“ The Chakr Shield has shown consistent and gratifying performance without having any negative impact on DG set's efficiency. "I am glad to see such an abled team of innovators to create a positive change in the society. ”

### Corporates



### Infrastructure



### Government & PSU



### Hospitality



### Tech



# Inspiring Voices Worldwide

Global Reflections on the Impact of Clean Air



**Rt. Andrew Mitchell**  
*Minister of State UK*

"An inspiring visit and a most extraordinary and visionary opportunity for the future of UK - India partnership and indeed for the future of the world"



**Amitabh Kant**  
*Retd. IAS, G20 Sherpa*

"Chakr is innovative, cutting edge, green and sustainable and disruptionist! The future belongs to Chakr"



**Nick O'Donohoe**  
*CEO of British International Investment*

"It is so impressive to meet a group of Indian Entrepreneurs and Scientists seeking to find solutions to some of Worlds most important and pressing problems"



**Sandeep Chakraborty**  
*Indian Ambassador to Indonesia*

"Admirable vision, tenacity and the motivation to do something for the country with cutting edge technology"



# Connect Us

Your Path to Cleaner Air Starts Here...



## Corporate Office

535, Udyog Vihar Phase V, Udyog Vihar,  
Sector 19 Gurugram, Haryana 122016


## Manufacturing Plants

**Gurugram:** Sector 35, Narsinghpur Industries Area, Gurugram,  
Haryana – 122004

**Pune:** Survey no 236-237, Rajiv Gandhi Infotech Park, Phase-I,  
Hinjawadi, Pimpri-Chinchwad, Pune, Maharashtra 411057

## Contact Us

 +91 – 9667017998

 1800- 203-8001

 [marketing@chakr.in](mailto:marketing@chakr.in)

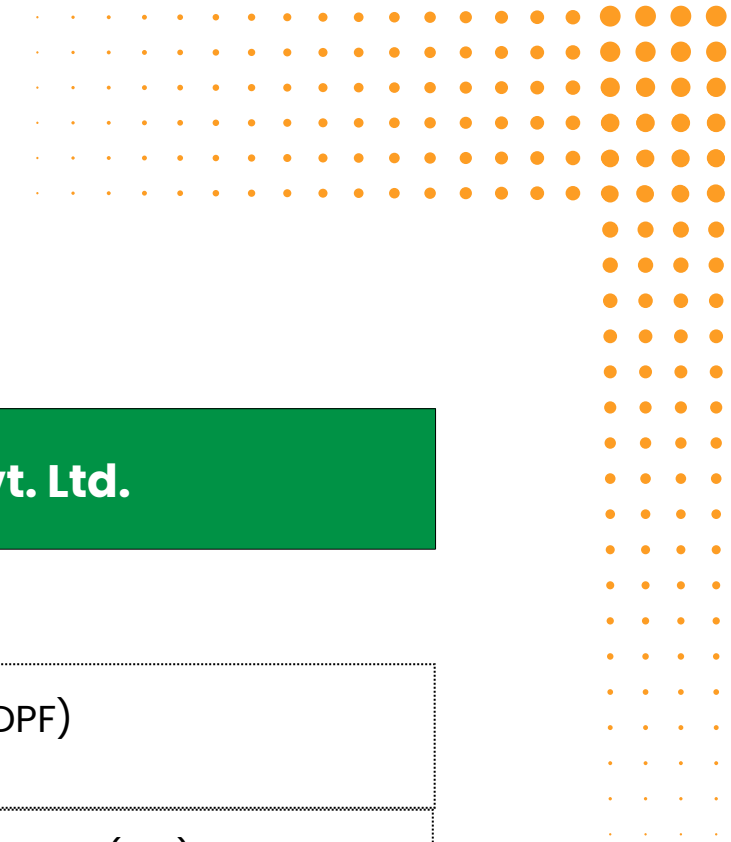
 [www.chakr.in](http://www.chakr.in)



# **ANNEXURE**

# Chakr Shield

Optimizing Ownership Cost Through Engineering Innovation



Factors	Chakr Innovation Pvt. Ltd.	Platino Automotive Pvt. Ltd.
1 Technology Overview	Passive Regenerative Trap (patented)	Diesel Particulate Filter(DPF)
2 Emission Reduced	Particulate Matter(PM), Hydrocarbon(HC), Carbon Monoxide(CO)	Particulate Matter(PM), Hydrocarbon(HC), Carbon Monoxide(CO)
3 Safety Issues	No Safety Issues	High Safety Issues over running hours (Very high backpressure, can be detrimental to the DG)
4 % of DG Set Energy Consumed	<1%	<1%
5 Type Approval Received	Across entire range from 62.5-1000kVA(CPCBI and II)	Across entire range from 62.5-1000kVA(Only CPCB- II)
6 Compliance (>1000 kVA)	Complies with the regulation	Complies with the regulation
7 Engine OEM Partnerships	Kirloskar, Mahindra & MTU Rolls Royce	None
8 Patents Granted	9 Patents filed in emission control, 4 Granted	Not Available



# Chakr Shield- PRT Technology

PRT/DPF/ESP

Factors	Chakr Shield- (PRT Technology)	Diesel Particulate Filter (DPF)	Electrostatic Precipitator (ESP)
1 Targeted Pollutants	Reduction of HC & CO and PM	Reduction of HC & CO and PM	PM only
2 Regeneration	Continuous Regeneration at Lower Exhaust Temperatures due to proprietary catalyst	Occurs at Higher Exhaust Temperatures	No Continuous Regeneration Available
3 Exhaust Back Pressure	Low	High	Low
4 Thermal Rundown	No Risk due to PRT design   Patented Technology	Very High Risk	NA
5 Face Choking	No Risk due to filter cell level design	Very High Risk	NA
6 Exhaust Back Pressure Vs Regeneration	Well within OEM limit at all operating conditions	Risk of Exponential increase in back pressure due to poor regeneration	Within OEM Limit
7 Product Life	~40,000 hours	~ 10,000 hours	~ 5,000 hours



# Chakr Shield- PRT Technology

## PRT/DPF/ESP

Factors	Chakr Shield- (PRT Technology)	Diesel Particulate Filter (DPF)	Electrostatic Precipitator (ESP)
8 Noise Level Limit	Within 75db without silencer due to specially designed noise attenuation CFD driven contours	No Feature Available	No Feature Available
9 Power Required	None	None	Very High Voltage (>1000kVA)
10 Safety Risk	None	Potential of Thermal Rundown	High Voltage Shock
11 Space Required	Compact	Compact	Same as DG size
12 Design for Indian DG Market	Specially design and patented technology fit for Indian DG market	Traditional Technology more suitable for vehicles	Traditional Technology more suitable for boilers

