15 December 2017
New Delhi

The Secretary
Ministry of Environment, Forest & Climate Change
Jor Bagh Road, New Delhi – 110003

Subject: Comments & Suggestions on the Draft Notification Environment (Protection) Amendment Rules, 2017 (Draft TPP Standards)

Ref: S.O. 3337 (E) dated 16th October 2017 - Notification by MoEF&CC

Dear Sir

EIA Resource and Response Centre (ERC) is a national level voluntary organization, keeping a watch on EC and FC processes. ERC regularly engages with MoEF&CC and its expert committees providing comments and suggestions on important proposals under consideration for clearances as well as on policy and law issues.

Here we are sending few comments and suggestions on the Draft TPP Standards (S.O.3337).

Background

On 16th October, 2017, the Ministry of Environment, Forests and Climate Change (MoEF&CC) released a new Draft Notification to further amend the Environment (Protection) Rules, 1986. The proposed amendment has come out with major changes in water consumption and effluent and emission standard for coal fired thermal power plants.

The major changes that have been proposed through this Notification involve (i) increase in water consumption from 2.5 m^3/MWh to 3.0 m^3/MWh for new plants installed after the 1st January, 2017; (ii) No bar on water consumption and no mandate for zero wastewater discharge for the thermal power plants using sea water and (iii) change in stack height for thermal power plants with FGD for 100MW or less than 100 MW capacity power plant.

The implications of the proposed amendment are explained herewith.

Amendment Proposed

> 2. "(a) against serial number 5A, in column 4, for item III, the following item shall be substituted, namely:—

"III. Specific water consumption shall not exceed maximum of 3.0 m^3/MWh for new plants installed after 1st January, 2017 and these plants shall also achieve zero waste water discharge."

Implications on Environment

1. *Introduced Standards Relaxed for the Plants & Contradicts Global Practices*

The water consumption limit for existing power plants at 3.5 m^3/MWh is extremely lax with the Central Electricity Authority in its report published in 2012, on minimisation of water use at thermal power plant, stating that even sub-critical plants (the technology used by most existing TPPs) can achieve a specific consumption of 3.0 m^3/MWh. So setting the same limit of 3 m^3/MWh for the plants coming up post 1st January, 2017 which will be based on supercritical technology (mandated by Policy decision of GoI[1]) essentially defeats the purpose of attempting to reduce water consumption by the thermal power plants.

While the consumptive water use for a power plant (including coal-fired thermal power plants) is primarily dependent on the steam cycle efficiency (i.e., the greater the efficiency, the less the consumptive water use, as a general rule), as well as whether plants use every opportunity to reuse water (such as using boiler and cooling tower blow down water for bottom and fly ash sluicing, etc.), it is obviously more expensive to lower water usage for the operator. But these expenses are modest especially when viewed in relation to the societal and environmental benefits of using less water. Nonetheless, the GOI has not provided whether it considered any societal or environmental costs in allowing the 20% increase in consumptive water usage while simply providing relief to power plant owners and operators.

Global example taken from existing, operating plants in China shows even the worst performers like subcritical 600 MW plant with wet cooling tower can operate with 1.96 cubic meters per MWh; or the subcritical 300 MW plant with wet cooling tower can run on 2.31 cubic meters per MWh[2], which are below the GOI's 2015 standard of 2.5 cubic meters per MWh, and well below the proposed relaxed standard of 3.0 cubic meters per MWh. There is no basis to believe that consumptive water use levels in China cannot also be achieved in India.

An example of consumptive water usages in South Africa shows, even the worst performer in South Africa (Hendrina) had a consumptive water use rate of 2.327 cubic meters per MWh[3]. It is worth noting here that many of these plants are quite old. Newer units would have better performance.

Clearly, comparable countries such as China and South Africa are able to build and operate coal-fired thermal power plants with actual water consumption rates that are below (and, in many cases, well below) the 2015 GOI standard of 2.5 cubic meters per MWh of generation.

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[1] Point No (iii) in the Press Note of Ministry of Power, dated 12 March 2015, accessed on http://pib.nic.in/newsite/PrintRelease.aspx?relid=116893

[2] Ying Qin et al., China's energy-water nexus – assessment of the energy sector's compliance with the "3 Red Lines" industrial water policy, Energy Policy, Volume 82, July 2015, Pages 131-143 (https://doi.org/10.1016/j.enpol.2015.03.013), also available at https://www.sciencedirect.com/science/journal/03014215

[3] Delgado, A., et al., A Simple Model to Help Understand Water Use at Power Plants, MIT Energy Initiative, available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjs4Oz9XAhXDLmMKHVKzAX0QFggpMAA&url=https%3A%2F%2Fsequestration.mit.edu%2Fpdf%2F2012_AD_HJH_WorkingPaper-WaterUse_at_PowerPlants.pdf&usg=AOvVaw3jkT966KxTx5GKnOjXrtUW

Thus, there is no justification for relaxing this requirement, given the vast water needs, across sectors, in India.

2. *Implications of the Water Consumption Increase*

One of the key changes introduced in the Draft Notification was the increase in water consumption limit for the new power plants to be established after 1st January, 2017, from 2.5 m^3/MWh (mandated by the 2015 Notification for Thermal power Plants) to 3 m^3/MWh. This essentially means allowing an increase of 0.5 m^3/MWh for the TPPs being established after 1st January, 2017, which leads to an increase of 250 m^3/hour[4] of water consumption for a 500 MW TPP. This means that, for a 500 MW Thermal Power Plant, the allowance of water consumption has been increased by about 21,90,000 m^3/year. The average domestic water consumption under normal conditions as per the IS:1172-19635 is about 135 litres/day/capita which measures about 49,275 litres/year/capita, that is, 49.275 m^3/year/capita. Therefore, the increased amount of water usage to the tune of 21,90,000 m^3/year by a 500 MW power plant can meet the domestic demand of about 44000 people. This shows the significance of the increase in the water consumption limit.

In a country like India where continuous water stress has caused dwindling in power generation[6] and led to the shutdown of many thermal power plants[7], increasing the water usage limit further may be termed as impractical.

Amendment Proposed

2. "(b) after serial number 5A and the entries relating thereto, the following serial number and entries shall be inserted, namely:—

S. No.	Industry	Parameter	Standards
1	2	3	4
"5B.	Thermal Power Plant (water consumption limit) using sea water	Water Consumption	Item I to III in Column 4 in serial number 5A above shall not be applicable to the Thermal Power Plants using sea water"

Implications on Environment

1. *Impact on marine ecosystem ignored*

Excluding sea water based thermal power plant from any mandate of limiting water consumption would adversely impact the environment. It is a well established fact that, cooling water intake structure adversely impacts the environment by causing death of fishes through impingement and entrainment. U.S. EPA has also stated the same, as according to

[4] For a power plant having 500 MW installed capacity, the calculation of per hour water intake has been calculated as follows: 1 MW PP uses = 0.5 m3/hr of incremental water; Thus, 500 MW PP uses = 0.5X500 m3/hr of incremental water = 250 m3/hr of incremental water

[5] https://www.slideshare.net/bibhabasumohanty/water-requirements

[6] https://thewire.in/116859/water-scarcity-behind-decline-thermal-power-generation-india/

[7] http://www.financialexpress.com/india-news/water-crisis-shut-down-many-thermal-power-plants-in-india-piyush-goyal/249006/

them, cooling water intake structures cause adverse environmental impact by pulling large numbers of fish and shellfish or their eggs into a power plant's or factory's cooling system[8].

- Organisms may be killed or injured by heat, physical stress, or by chemicals used to clean the cooling system.
- Larger organisms may be killed or injured when they are trapped against screens at the front of an intake structure

It is also important to mention here that, the extent of harm is directly proportional to the quantity of water extracted and used and therefore the unlimited extraction of water will proportionately increase the damage volume.

In the absence of any cap on the water consumption by the coastal-based power plant will therefore adversely damage the ecosystem of the source water (herein marine ecosystem).

2. *Closed Cycle Re-circulating Cooling System should be Promoted*

Since the damage on marine ecosystem is directly proportional to the quantity of water intake by cooling water intake structures, the focus must shift from the allowed unlimited water usage to closed cycle re-circulating cooling system. The design and construction of cooling water intake structure should be such that it ensures reduction in water intake capacity to the level, which can sustain closed cycle-based recirculating cooling.

3. *Impact of the "no ZLD" norm*

In the proposed draft, the Ministry has also omitted the mandate for Zero Liquid Discharge (ZLD) for the seawater-based thermal power plants – a condition which remains mandatory for the power plants located elsewhere. The impact of this will be two-fold.

Since the seawater-based thermal power plants require desalination plants in the vicinity to meet their fresh water requirement[9], the discharge of extremely concentrated brine from the desalination plants will happen uncontrolled which has severe environmental implications on the environment of receiving water bodies, which include but are not limited to, substantial increase in salinity and temperature, accumulation of metals, hydrocarbons and toxic anti-fouling compounds, claimed by a study titled "*Impacts of desalination plant discharges on the marine environment*"[10]. The brine also adversely impacts the marine environment since marine species are not equipped to adjust to the immediate change in salinity caused by this release of brine into the area, often leading to their suffocation due to reduced oxygen levels in the water[11].

Further, the discharge water would be significantly warmer when sent back to the receiving water body. The environmental impact of this higher thermal discharge is often adverse and the GOI has simply provided no consideration or analysis of this impact.

Apart from the adversities caused by discharge of concentrated brine into the sea, desalination plants are also known to be a source of carbon monoxide, nitrous oxides, sulphur oxides and unburnt hydrocarbons, thus contributing to climate change, a leading factor of the droughts and water shortages.

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[8] https://www.epa.gov/cooling-water-intakes

[9] http://cornerstonemag.net/supplying-water-to-power-plants-with-desalination-technology/

[10] https://www.ncbi.nlm.nih.gov/pubmed/20633919

[11] https://sciencing.com/disadvantages-desalination-5961767.html

According to a study[12], the USEPA has stated that, in general, the intake structures of the desalination plants kill at least 3.4 billion fish and other marine organisms annually, with the entire process of desalination causing fishermen to lose at least 165 million pounds of fish a year today and 717.1 million pounds of potential future catch. This shows the huge amount of economic loss endured by the fishermen across the world. The study further claims that removing salt from large volumes of water takes nine times as much energy as surface water treatment and 14 times as much energy as groundwater protection.

Apart from this the discharge of effluent from the thermal power itself has severe impacts as it introduces several heavy metals like mercury, cadmium and radioactive constituents into the receiving water. The severe implications of thermal power plant discharge into the water-body may be seen from a case study[13] of the Ennore Creek in Chennai by the North Chennai Thermal Power Station (NCTPS).

The CPCB Guidelines for coal-based thermal power plants[14] clearly mandates that the discharge points of the power plants to be located in coastal areas using seawater, should not be permitted in the estuaries or near ecologically sensitive areas such as mangroves, coral reefs, spawning/breeding grounds of the aquatic flora and fauna. The proposed Draft clearly contradicts these Guidelines by not mandating zero liquid discharge with respect to the location sensitivity of the discharge points.

Given this backdrop, in no way, the coastal based power plants can be allowed to go without ensuring ZLD.

4. Internationally acclaimed and accepted best practices ignored

The draft notification seems to have ignored the globally accepted and acclaimed practices. The Supreme Court of Chile (Rol No. 9852-2013 , Supreme Court of Chile (2014) (decided on 9 January 2014, revised 6 November 2014)) ordered the operator of a coal-fired power plant to take measures necessary to ensure that the operation of the power plant does not harm or threaten marine species because the demonstrated impacts on marine life caused by the intake and discharge of seawater for its cooling system threaten the plaintiffs' and the wider community's constitutional environmental right. The corresponding environmental law enforcement authority even ordered for temporary suspension and monetary penalties to that power plant post Supreme Court order.

Under U.S. Law, all new plants must reduce water consumption to a level "attained by a closed-cycle recirculating cooling water system." There is no relaxation of the standards for coastal-based thermal power plants using seawater for cooling[15].

Amendment Proposed

2. "(d) after serial number 33 and the entries relating thereto, the following serial number and entries shall be inserted, namely:—

S. No	Industry	Parameter	Standards
1	2	3	4
"33A.	Thermal Power Plants with Flue	Stack Height/Limit in	Power generation capacity:

[12] https://www.foodandwaterwatch.org/sites/default/files/Desalination%20Report%20Feb%202009.pdf
[13] http://nopr.niscair.res.in/bitstream/123456789/34462/1/IJMS%2043%287%29%201415-1421.pdf
[14] http://www.cpcb.nic.in/divisionsofheadoffice/pci2/ThermalpowerPlants.pdf
[15] 40 CFR, Part 125, Subpart I; 40 CFR125.84, accessed on https://www.ecfr.gov/cgi-bin/text-idx?SID=3db2b7a8e35e77adbc3bb12b64a9ac31&mc=true&node=pt40.24.125&rgn=div5#sp40.24.125.i

	Gas Desulphurisation (FGD)	meters	- 100 MW and above $H=6.902(QX0.277)^{0.555}$ or 100 m whichever is more - Less than 100 MW $H=6.902(QX0.277)^{0.555}$ or 30 m whichever is more"; Q = Emission rate of SO_2 in kg/hr H = Physical stack height in meter."

Implications on Environment

1. *Stack Height reduction questionable?*

The new draft has proposed stack height of 100m for 100 MW and above capacity power plants and 30m or the value calculated as per the above formula for less than 100 MW power plant, having Flue Gas Desulphurisation (FGD).

It appears from the proposed draft, that the stack height of 275 meter (which is the current standard across India) will be reduced by the proposed draft. It is important to note here that, the current approach of 275 meter stacks on thermal power plants is entirely ineffective in minimizing pollution impacts from those plants, as tall stacks simply disperse the mass of emissions over a much larger volume of ambient air, resulting in much larger impact area, as compared to shorter stack. Therefore the reduced stack height proposal for thermal power plants with FGDs is a step in the right direction, so long as the other concerns are addressed as part of finalizing any such proposal.

FGD is used as an add-on air pollution control device to remove sulfur dioxide (SO_2) present in the exhaust gases. Depending on their design, FGDs can also remove certain acid gases like hydrochloric acid (HCl) and hydrofluoric acid (HF), filterable particulate matter, particular forms of mercury present in the exhaust gases. However, FGDs can not remove nitrogen oxides (NOx) or many other air toxic compounds, such as volatile organic compounds, that are present in the exhaust of such plants.

FGD is not able to control pollutants such as NOx and several other air toxics, thus, the effect of the shorter stack will be to (a) move the point of maximum impact closer to the unit; and (b) increase the maximum concentration, as seen from the dispersion model SCREEN 3[16]. As the stack height is lowered from 275 meters to 65 meters, the distance to the point of maximum impact decreases from 1309 meters to 1209 meters – while the maximum concentration increases from 0.4076 µg/m^3 to 0.5464 µg/m^3 – an increase of 34%.[17]

Since shorter stacks will result in higher ambient impacts, closer to the plant, it is important therefore to ensure that the power plant installs (and continuously operates) all of the best available air pollution control technologies in order to minimize the mass emissions of all pollutants. Therefore the proposal should be modified to ensure that such FGDs are continuously operated. In addition, the proposal should be modified to also include installation and continuous operation of Selective Catalytic Reduction (SCR) controls for

[16] As EPA's website notes, "SCREEN3 is a single source Gaussian plume model which provides maximum ground-level concentrations for point, area, flare, and volume sources…" See https://www.epa.gov/scram/air-quality-dispersion-modeling-screening-models

[17] The emission impactsof the proposed Khurja plant would, in reality, be significantly higher than identified in this paragraph, as the plant is proposed to have an emission rate of 66 grams per second even if FGD is installed and operated, while the analysis presented here uses an emission rate of only 1 gram per second.

NOx emissions, and bag-houses for PM emissions. Only then will the full benefits of the proposed shorter stacks be realized. Without requiring the best controls, shorter stacks will simply result in higher ambient impacts closer to plants.

Mercury Standards Ignored

Some factors which were ignored in the 2015 Notification for thermal power plants goes ignored once again.

The mercury standard prescribed in the 2015 Notification was 0.03 mg/Nm^3 (30 µg/Nm^3), whereas the Indian power plants emit much less compared to that. An average from three power plants' emission found mercury concentration in the flue gas at 10.19 µg/Nm^3, as given in the UNEP study titled "Assessment of the Mercury Content in Coal fed to Power Plants and study of Mercury Emissions from the Sector in India"[18]. This is extremely relaxed in nature as it paves the way for the power plants to go for much higher emission than what they are currently doing. While comparing with international standard, US Environment Protection Agency (USEPA) has set the standard at 0.003 lb/GWh (pounds per Giga Watt Hour) which translates into 0.00041 mg/ Nm^3 (0.41 µg/Nm3).[19]

Proposed Amendment lacks Justification & Reasoning

The proposed amendment seriously lacks justification behind such dilution of norms. The proposed draft does not contain any preamble to justify the amendments nor has it given any reasoning with substantial scientific papers for bringing about the change. This shows the lackadaisical approach on part of the MoEF&CC, in diluting the norms without considering the consequences of the proposed amendment.

We are sure, MoEF&CC would take into account the suggestions made and let us know of the action taken.

Thanks and with regards

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[18] Page 9 of https://wedocs.unep.org/bitstream/handle/20.500.11822/11447/REPORTFINAL19March2014.pdf?sequence=1&isAllowed=y

[19] https://vindhyabachao.org/embeds/coal/Comments-Draft_Notification_TPP_Debadityo_Sinha.pdf