

# Quarterly Roundup: Renewable Energy

JANUARY TO MARCH 2023

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# Regulatory Updates

JANUARY 2023

## The Energy Conservation (Amendment) Act, 2022 was notified

The Energy Conservation (Amendment) Bill, 2022 was passed by the Rajya Sabha on December 12, 2022, received the assent of the President on December 19, 2022, and was subsequently published for general information by the Ministry of Law and Justice.<sup>1</sup> In January 2023, the Ministry of Power (“**MoP**”) released the notification for enforcement of the Energy Conservation (Amendment) Act, 2022 (the “**EC Amendment**”).<sup>2</sup> Among other things, the EC Amendment amends the Energy Conservation Act, 2001 to empower the central government to specify a carbon credit trading scheme. Designated consumers and other obligated entities may be required to meet a proportion of their energy needs from non-fossil sources. A new building code called, called the Energy Conservation and Sustainable Building Code, will apply to office and residential buildings which have a connected load of 100 kilowatts (“**KW**”) or above. Further, energy consumption standards may be specified for vehicles and ships. The failure to comply with such standards will be punishable with a penalty of up to INR 1 million. Non-compliance in case of industrial units or vessels will attract an additional penalty of up to twice the price of oil equivalent of energy consumed above the prescribed norm. Vehicle manufacturers in violation of fuel consumption norms will be liable to pay a penalty per unit of vehicles sold at INR 25,000 (for non-compliance up to 0.2 liter per 100 km) and INR 50,000 (for non-compliance exceeding 0.2 liter per 100 km).

The central government notified that all the provisions of the EC Amendment will come into force with effect from January 1, 2023.

<sup>1</sup> See [here](#).

<sup>2</sup> See [here](#).

<sup>3</sup> See [here](#) and [here](#).

<sup>4</sup> See [here](#).

## The Union Cabinet approved the National Green Hydrogen Mission<sup>3</sup>

In a press release dated January 4, 2023, India’s Ministry of New and Renewable Energy (“**MNRE**”) announced that the Union Cabinet had approved the National Green Hydrogen Mission (“**NGHM**”).<sup>4</sup> MNRE, the nodal ministry in this regard, remains responsible for overall coordination and implementation of such mission. The overarching objective is to make India a global hub for the production, use, and export of green hydrogen (“**GH**”) along with its derivatives, thus enabling the country to achieve a globally significant role with regard to GH in terms of both technology and market share.

### Background: India’s Energy Transition through GH

A transition to GH and green ammonia (“**GA**”)<sup>5</sup> has been identified as one of the major requirements for India to reduce emissions. For instance, in a report published in June last year by NITI Aayog (the “**NITI Aayog Report**”),<sup>6</sup> it was emphasized that GH will be crucial for achieving India’s decarbonization goals, especially in the harder-to-abate sectors such as those related to fertilizers, refining, methanol, maritime shipping, iron & steel, and transport. The NITI Aayog Report had concluded that with emerging global momentum on hydrogen (“**H2**”), the country can leverage this opportunity to strive towards energy security and economic development.

### GHP

The Indian government has considered various policy measures to facilitate the transition away from fossil fuels, where GH can be used both as an energy carrier and a chemical feedstock. In that regard, in August 2021, India had announced the launch of its ‘National Hydrogen Mission’ (“**NHM**”) to scale up GH production and align India’s energy transition with global best practices in technology, policy, and regulation. The NHM aimed to support the government’s efforts in meeting climate targets

<sup>5</sup> GA will be made by combining nitrogen with hydrogen using renewable energy sources. GA can be used by the fertilizer industry or as a fuel or as a means of transporting hydrogen.

<sup>6</sup> Available [here](#).

and making India a GH hub. Further, a little more than a year ago (in February 2022), the Ministry of Power (“**MoP**”) had announced the Green Hydrogen Policy (“**GHP**”) as the first tranche of instruments to bolster efforts in this direction.

The GHP includes the following key understandings:

- GH and GA will be defined as such H2 and ammonia (“**NH3**”), respectively, which is produced through water electrolysis using renewable energy (“**RE**”) – including stored/banked RE – and will include H2/NH3 produced from biomass as well.
- Inter-state transmission charges will be waived for a period of 25 years for producers of GH and GA in respect of projects commissioned before June 30, 2025.
- GH/GA can be manufactured by a developer by using RE which is:
  - i. utilized from a co-located RE plant; or
  - ii. sourced from a remotely located RE facility – whether the latter is set up by the same developer or by a third party; or
  - iii. procured from a power exchange.
- GH/GA plants will be granted ‘open access’ to source RE within 15 days of receipt of a complete application in this regard. The charges for open access will be calculated and levied pursuant to corresponding rules.

The open access rules of 2022 in respect of green energy (the “**Open Access Rules**”)<sup>7</sup> were notified by the MoP in June last year. The Open Access Rules, *inter alia*, seek to increase both the ease and scale of consumer access to green energy.<sup>8</sup> In the pre-open access era, Indian consumers could procure power mainly from state-owned electricity distribution companies (“**discoms**”). Over time, the government has allowed consumers with a minimum load requirement to buy electricity directly from

<sup>7</sup> The Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 (the “**Open Access Rules**”), notified on June 6, 2022

<sup>8</sup> See Press Release “Ministry of Power notifies ‘Green Energy Open Access’ Rules to accelerate ambitious renewable energy programmes,” PIB, New Delhi, July 19, 2022; available at: <https://pib.gov.in/PressReleaseSelfFramePage.aspx?PRID=1842737#:~:text=The%20Green%20Open%20Access%20is,of%20Green%20Power%20from%20Discoms>

<sup>9</sup> While a system of multiple suppliers is not new, such suppliers were previously not required to allow new participants to openly access their network. However, new distribution licensees will now be permitted to use the existing network (upon payment of

power producers. Importantly, the new rules now seek to further democratize the regime (where large users can pick a supplier of choice among multiple options) by enabling increased private participation in the distribution business.<sup>9</sup>

- RE may be banked for a period of 30 days, as long as such RE is used for making GH or GA. The charges for banking will be fixed by the appropriate state electricity regulatory commission (“**SERC**”). However, such charges cannot exceed the cost differential between: (1) the average tariff of RE bought by the distribution licensee during the previous year; and (2) the average market clearing price (“**MCP**”) in the Day-ahead Market’ (“**DAM**”)<sup>10</sup> during the month in which such RE is banked.
- The Electricity (Transmission system planning, development and recovery of Inter State Transmission charges) Rules, 2021 prioritize the granting of approvals related to the connectivity between: (1) power generation and GH/GA manufacture (on the one hand), and (2) inter-state transmission services for such RE, as established for the purpose of manufacturing GH/GA (on the other hand).
- Land in RE parks can be allotted for the manufacture of GH/GA. The Indian government proposes to set up manufacturing zones in this regard. Accordingly, GH/GA plants can be set up in any of such manufacturing zones.
- Further, GH/GA manufacturers will be permitted to set up bunkers near ports for storing GA for the purpose of export and/or use by shipping. The land for such storage will be provided by the respective port authorities at applicable charges.

applicable charges). In other words, while the extant (Indian) Electricity Act, 2003, as amended, already allows multiple discoms to operate in the same supply area, it still requires them to distribute electricity through their own network. Now, a new Electricity Bill (see below) does away with such requirement. Instead, a discom will now need to extend access to all other discoms operating in the same area to its own network. Thus, the existing monopoly that discoms hitherto enjoyed in respect of both area and supply appears to be drawing to a close.

<sup>10</sup> See “Discussion Paper on Market Based Economic Dispatch of Electricity: Re-designing of Day-ahead Market (DAM) in India,” CERC, December 2018 (the “**MBED Discussion Paper**”); available at: [https://cercind.gov.in/2018/draft\\_reg/DP31.pdf](https://cercind.gov.in/2018/draft_reg/DP31.pdf)

- The RE consumed for the production of GH/GA will count towards renewable purchase obligations (“RPO”) of the consuming entity. The RE consumed by the power producer beyond such requirement under India’s RPO regime will count towards RPO compliance of the area-specific discom – based on the location of such project.

Pursuant to Section 86(1)(e) of the (Indian) Electricity Act, 2003, as amended from time to time (the “**Electricity Act**”), certain categories of ‘obligated entities’ (such as discoms, open access consumers, captive power producers) are required to purchase a minimum percentage of electricity from RE sources as a mandatory share of their total power consumption. Such obligations are known as RPOs. In addition, a legislative bill that seeks to amend the Electricity Act (the Electricity (Amendment) Bill, 2022) was introduced in Parliament last August (the “**Electricity Bill**”). The Electricity Bill imposes penalties for non-compliance with RPOs.

- Distribution licensees may also procure and supply RE to GH/GA manufacturers in their respective states. In such cases, however, the distribution licensee concerned can only charge the cost of procurement, along with applicable wheeling charges and a small margin, as determined by the corresponding SERC in this regard.
- The MNRE will establish a single portal for all statutory clearances and permissions required for the manufacture, transportation, storage, and distribution of GH/GA. The concerned agencies/authorities will be requested to provide the clearances and permissions within a specific deadline, preferably within a period of 30 days from the date of application.
- In order to achieve competitive prices, the MNRE may aggregate demand from different sectors and conduct a mixed auction, inviting consolidated bids for GH/GA procurement through any of the designated implementing agencies.

## NGHM

The intended outcomes of NGHM<sup>11</sup> by the end of the decade include the following:

- Development of an annual production capacity of at least 5 million metric tonnes (“MMT”) of GH, with an associated RE capacity addition of 125 gigawatts (“GW”)
- Over INR 8 trillion in investments
- Creation of over 0.6 million jobs
- A cumulative reduction in fossil fuel imports of over INR 1 trillion
- An abatement of nearly 50 MMT of annual greenhouse gas emissions.

In addition, the expected benefits from NGHM involve: (i) the creation of export opportunities for GH and its derivatives; (ii) decarbonization of the industrial, mobility, and energy sectors, respectively; (iii) a reduced dependence on imported fossil fuels and feedstock; (iv) the development of indigenous manufacturing capabilities; (v) the creation of ancillary employment opportunities; and (vi) the development of cutting-edge technology.

## Components of NGHM

The initial financial outlay for NGHM will involve an aggregate amount of approximately INR 200 billion (about USD 2.2 billion), including components such as: (i) strategic interventions for a transition to GH (the “**SIGHT**” program), involving the bulk of the outlay (INR 175 billion); (ii) pilot projects involving INR 15 billion; (iii) INR 4 billion for research and development (“**R&D**”); and (iv) another INR 4 billion for miscellaneous components of the mission. The MNRE will formulate such schemes and guidelines as necessary to facilitate the implementation of each such individual component.

The SIGHT program involves financial incentive mechanisms targeting both domestically produced electrolyzers and GH. The pilot projects are expected to be undertaken in emerging end-use sectors and production pathways. Further, regions capable of supporting large scale production and/or utilization of H2 will be identified and developed as GH hubs.

<sup>11</sup> Available [here](#).



## SIGHT

Initially (*i.e.*, until 2029-30), the SIGHT program will consist of two distinct financial incentive mechanisms: (i) incentives for manufacturing of electrolyzers; and (ii) incentives for GH. Depending upon markets and technology development, specific incentive schemes and programs will continue to evolve as the NGHM progresses.

In order to ensure both quality and performance of the underlying equipment, the eligibility criteria related to participation in competitive bidding for procurement of GH will require projects to utilize only such equipment as approved by the Indian government, pursuant to pre-specified parameters.

### Pilot Projects

The pilot projects under NGHM involve sector-specific projects related to (i) low carbon steel; (ii) long-range heavy mobility; as well as (iii) ports and shipping. Other areas of focus include decentralized energy applications, hydrogen production from biomass, H2 storage technologies, etc.

### GH Hubs

The NGHM will identify and develop regions capable of supporting large-scale production and/or utilization of H2 as GH hubs. In addition, the development of necessary and appurtenant infrastructure in connection with such hubs will be supported under the mission.

### Necessary Frameworks

In light of the above, an enabling policy framework will be developed by the government for the purpose of establishing a viable GH ecosystem. Further, a robust framework of standards and regulations is also expected to be formulated soon. In addition, a framework of public-private partnerships (“PPP”) for R&D will be facilitated under NGHM under the so-called Strategic Hydrogen Innovation Partnership (“SHIP”).

R&D projects related to NGHM are expected to be scaled up appropriately on an ongoing basis for the purpose of developing globally competitive technologies. Relatedly, a coordinated skill

development program will be undertaken under the auspices of the NGHM.

Given India’s present focus on GH, all concerned ministries, departments, agencies, and public institutions connected with its central and state governments have been instructed to undertake concrete measures in coordination with each other in order to ensure better compliance with the NGHM’s objectives.

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## Review of the competitive bidding mechanism for procurement of power from wind power projects

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A notification dated January 9, 2023 was issued by the wind energy division of the MNRE pursuant to its review of the competitive bidding mechanism for procurement of power from wind power projects (the “**Wind Notification**”).<sup>12</sup>

Previously, the MNRE had constituted a committee to examine proposals for ensuring faster capacity addition in the wind sector. This committee had submitted its report and the recommendations were examined by the MNRE. Pursuant to its consideration of such report, the MNRE has decided as follows:

Bids for a cumulative capacity of about 8 GW would be issued each year from January 1, 2023 until 2030. In order to ensure that wind energy capacity increases in all 8 ‘windy’ Indian states, every bid will be required to be a composite bid – *i.e.*, comprising state-specific sub-bids for each of such windy states. The power generated from the capacity established in each of the state sub-bids would be required to be in accordance with the Electricity (Amendment) Rules, as notified.

The bid process, bid mechanism, technical pre-qualification process, preparatory phase, methodology for tariff pooling across all state bids, were annexed to the Wind Notification. Necessary amendment(s) to the ‘Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects’ (the “**Wind Bidding Guidelines**”) will be separately notified for the purpose of the Wind Notification.

<sup>12</sup> Available [here](#).

## Draft Electricity (Amendment) Rules

Pursuant to a notification dated January 19, 2023 issued by the Ministry of Power,<sup>13</sup> the draft Electricity (Amendment) Rules, 2023 were forwarded to select stakeholders for comments. Among other proposed changes to the Electricity Rules, 2005, the draft amendment prescribes and/or clarifies rules related to licensees.

### Background

Previously, pursuant to a gazette notification dated December 29, 2022, the central government had notified the Electricity (Amendment) Rules, 2022 – making significant amendments to the Electricity Rules, 2005,<sup>14</sup> including with respect to various provisions related to renewable energy in general, and specifically in connection with dispute resolution, the surcharge payable by consumers seeking open access, timely recovery of power purchase costs by distribution licensees, subsidy accounting, resource adequacy, development of hydropower, energy storage systems, and the implementation of uniform RE tariffs for a central pool. RE implementing agencies are required to compute such uniform tariffs pursuant to a specified methodology. Further, a separate methodology has been provided with respect to computations of

<sup>13</sup> Available [here](#).

<sup>14</sup> See [here](#).

<sup>15</sup> See [here](#).

<sup>16</sup> It was clarified that the SGrBs would be issued to eligible investors through a ‘uniform price’ auction. Under this method, competitive bids offered with rates up to and including the maximum rate of yield, or the prices up to and including the minimum offer price, as determined by the RBI, would be accepted at the maximum rate of yield or at the minimum offer price so determined. Bids which are quoted higher than the maximum rate of yield or lower than the minimum price (as determined by the RBI in consultation with the Indian government) would be rejected.

<sup>17</sup> Under Indian law, for the purpose of encouraging wider participation, a non-competitive bidding facility has been made available for retail investors in select auctions of government securities. See [here](#). Accordingly, 5% of the aggregate nominal amount of the SGrB issuance would be reserved for retail investors – which category may include any individual, firm, company, corporate body, institution, provident fund, trust, or any other person/entity prescribed by the RBI. Nevertheless, to qualify as an eligible participant in the auctions on a non-competitive basis, a retail investor would need to satisfy certain stipulated requirements. See [here](#).

<sup>18</sup> Primary dealers (“PDs”) – including scheduled commercial banks that undertake PD business departmentally – could engage in underwriting with regard to the SGrB auction. Further, the RBI

necessary adjustments related to fuel and power purchase surcharges.

## RBI’s auction of Sovereign Green Bonds

Pursuant to a press release dated January 6, 2023 issued by the the Reserve Bank of India (“RBI,” and such press release, the “**January 6 Press Release**”),<sup>15</sup> it was announced that as part of its overall market borrowings, the Government of India would be issuing ‘Sovereign Green Bonds’ (“SGrBs”) for mobilizing resources for green infrastructure. Further, the January 6 Press Release specified that the proceeds from such bond issuance would be deployed in public sector projects that might help in reducing the carbon intensity of the Indian economy. Accordingly, in consultation with the Government of India, and through such press release, the RBI notified the indicative calendar for issuance of the SGrBs for the fiscal year 2022-23. In that respect, the January 6 Press Release provided the issuance calendar for such bonds comprising two auction dates – January 25 and February 9, 2023, respectively. Further, certain salient features of the SGrB issuance were provided, including in respect of issuance method;<sup>16</sup> reservation for retail investors under a non-competitive bidding facility;<sup>17</sup> underwriting;<sup>18</sup> investment by non-residents;<sup>19</sup> along with eligibility for: (i) repurchase transactions (“Repo”), (ii) statutory liquidity ratio (“SLR”),<sup>20</sup> (iii)

stipulated (i) a minimum underwriting commitment (“MUC”) for each PD, and (ii) the amount for which an additional competitive underwriting (“ACU”) auction would be held.

<sup>19</sup> Investments in the SGrBs could be made by: (i) any person resident in India – including firms, companies, corporate bodies, institutions, state governments, provident funds and trusts, non-resident Indians (“NRIs”), overseas citizens of India (“OCIs”), foreign portfolio investors (“FPIs”) registered with the Securities and Exchange Board of India (“SEBI”) and approved by the RBI; as well as (ii) any other person not resident in India, as specified by the RBI with the prior approval of the Indian government in this regard. Foreign Central Banks (“FCBs”) were also be eligible to invest in the SGrBs subject to certain terms and conditions, as stipulated by the RBI in consultation with the Indian government. Nevertheless, an investment made by a person resident outside India or by a company which is incorporated outside India (or by a branch of such a company) would remain subject to the provisions of the Foreign Exchange Management Act, 1999, as amended from time to time (“FEMA”), along with applicable regulations framed under FEMA – in addition to other provisions of law which are generally applicable to Indian government securities.

<sup>20</sup> The SGrBs would be considered as eligible investments for the purpose of Statutory Liquidity Ratio (“SLR”) obligations and repurchase transactions (“Repo”) in banks. All regulated entities, listed corporates, unlisted companies which have been issued special securities by the Indian government using only such special securities as collateral, all-India financial institutions (“FIs”) constituted through parliamentary legislation (such as Exim

'when-issued' trading, (iv) trading in the secondary market,<sup>21</sup> and (v) transferability.<sup>22</sup> In particular, it was clarified that the SGrBs would be designated as specified securities under the so-called 'Fully Accessible Route' ("FAR") for investment in government securities by non-residents.

Further, pursuant to a subsequent press release dated January 19, 2023 issued by the RBI (the "**January 19 Press Release**"),<sup>23</sup> it was stated that the Government of India had announced the sale (issue) of two SGrBs for a notified amount further to details specified.<sup>24</sup> The SGrBs would be issued to eligible investors through a 'uniform price' auction.<sup>25</sup> Operational guidelines for the auction and other related details were provided in the annex to the January 19 Press Release.

On January 25, 2023, the RBI announced the results of underwriting auctions conducted that day with regard to additional competitive underwriting ("ACU") in respect of the SGrBs (the "**January 25 Press Release**").<sup>26</sup>

Bank, the National Bank for Agriculture and Rural Development ("NABARD"), National Housing Bank ("NHB"), and the Small Industries Development Bank of India ("SIDBI"), as well as any other entity approved by the RBI, were eligible to participate in Repo transactions involving the SGrBs. While such Repo transactions were required to be undertaken for at least a day's period and at most a year's (see [here](#)), they would be tradeable on any recognized stock exchange or RBI-authorized electronic trading platform – or even in the over-the-counter ("OTC") market – albeit with prior RBI approval in each case. Further, such transactions could employ any trading process, as long as such process was mutually agreed upon.

<sup>21</sup> While the SGrBs would be eligible for trading in the secondary market – since July 2018, the eligible participant base and entity-wise limits in respect of transactions in the 'when, as and if issued' ("When Issued," or "WI") market in government securities have been liberalized and relaxed, respectively. Of particular interest was the fact that the SGrBs would be eligible for WI trading. A WI security is one which has been authorized for issuance but has not yet been issued. Thus, WI trading occurs between: (i) the time a government security is announced for issuance, and (ii) the time such security is finally issued. Predictably, all WI transactions are on an 'if' basis, i.e., they are settled if and when the security is subsequently issued. Generally speaking, all entities which are eligible to participate in the primary auction of central government securities may undertake both net long and short positions in the WI market. This applies for new securities as well as for reissuances. Although such eligibility conditions would extend to the SGrB issuance as well, resident individuals, Hindu Undivided Families ("HUFs"), NRIs, and OCIs would be permitted to take only long positions. Further, entities other than scheduled commercial banks and PDs would be required to close their short positions, as applicable, by the close of trading on the date of auction. All WI transactions for all trade dates were required to be contracted for settlement on the date of issue. Finally, if the auction was cancelled for any reason, all WI trades would be deemed null and void.

## Background

Last year, in India's Union Budget for the financial year 2022-23, the country's finance minister had announced<sup>27</sup> that the RBI would issue SGrBs for the purpose of mobilizing resources for green infrastructure, and the proceeds from such bond issuance would be deployed in public sector projects to reduce the carbon intensity of the economy. Accordingly, the framework (the "**SGrB Framework**")<sup>28</sup> and indicative issuance calendar<sup>29</sup> with regard to the SGrBs were released on November 9, 2022 and January 6, 2023, respectively.

India's debut sovereign issuance in green bonds involved INR 160 billion (USD 1.9 billion), offered in two tranches of INR 80 billion each – in five and ten-year tenors – through auctions scheduled for January 25 and February 9, 2023, respectively. The issuance was categorized under the FAR for the benefit of foreign investors.

The FAR was introduced with effect from April 1, 2020 as a separate channel for non-resident investment in 'dated' securities issued by the Indian

<sup>22</sup> The SGrBs could be renewed, sub-divided, consolidated, converted, and transferred in accordance with, and subject to the restrictions stipulated under, applicable law. See [here](#). Transfers by NRIs, FPIs and FCBs would be subject to regulations framed under FEMA and guidelines issued by the RBI. In addition, transfer of the SGrBs by FPIs would be subject to applicable SEBI regulations in respect of FPIs, as modified from time to time.

<sup>23</sup> See [here](#).

<sup>24</sup> The January 19 Press Release clarified that the SGrB auction would be conducted on the basis of yield for new security, and on the basis of price for securities which were re-issued. In the event of re-issuance made on the basis of price, the coupon would be pre-determined. Accordingly, bidders would need to quote the price (per INR 10,000 – stocks will be issued for a minimum amount of INR 10,000 (nominal) and in multiples of INR 10,000 thereafter) at which they wished to purchase the SGrBs. Alternatively, when the issuance was made on the basis of yield, the coupon of the SGrBs would be decided in an auction conducted by the RBI. The SGrBs would carry the same coupon rate until maturity.

<sup>25</sup> Under this method, competitive bids offered with rates up to and including the maximum rate of yield, or the prices up to and including the minimum offer price, as determined by the RBI, would be accepted at the maximum rate of yield or at the minimum offer price so determined. Bids which were quoted higher than the maximum rate of yield or lower than the minimum price (as determined by the RBI in consultation with the Indian government) would be rejected.

<sup>26</sup> See [here](#).

<sup>27</sup> See [here](#).

<sup>28</sup> See [here](#).

<sup>29</sup> See [here](#).

government (i.e., carrying a fixed or floating interest rate, paid on the face value on a half-yearly basis, with a tenor of at least 5 years) – where eligible investors can participate without any investment ceilings. Accordingly, certain specified categories of government securities can be made fully accessible for non-resident investors, i.e., without any restrictions, apart from being available to domestic investors as well. Such specified securities, once so designated, remain eligible for investment under the FAR until maturity.

The sale of the SGrBs commenced on January 25, 2023, and the first tranche was fully subscribed.

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### Draft guidelines to promote the development of PSP

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Pursuant to a notification dated January 15, 2023 issued by the Ministry of Power (“MoP”) (in consultation with the MNRE),<sup>30</sup> draft guidelines to promote the development of pump storage projects (“PSP”) were released seeking comments from both public and private stakeholders.

#### Background

India’s proposed energy transition involves an increasing presence of renewable energy sources in the country’s energy mix (such as solar and wind energy), which, in turn, tend to be variable and intermittent. On account of such inherent variability, various challenges arise at the grid level. Addressing such challenges requires the incentivization of technologies with attributes that offer storage and ancillary services.

In this regard, PSP is a large-scale, domestically available, time-tested, and globally acceptable technology which can suitably address the country’s requirements with respect to storage and ancillary services. Further, PSP is a clean and safe technology which neither produces toxic or harmful by-products, nor poses problems of disposal.

Accordingly, in light of the significant advantages offered by PSP – including with respect to grid stabilization and meeting peak power demands –

there appeared to exist sufficient reasons to formulate a separate set of guidelines to promote PSP, especially to direct developmental initiatives in this regard. It is in this context that the draft guidelines on PSP were issued.

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### Amended green energy open access rules

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Pursuant to a gazette notification dated January 27, 2023, the MoP notified the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Amendment Rules, 2023 (the “**OA Amendment**”).<sup>31</sup> The OA Amendment amends the Electricity (Promoting Renewable Energy Through Green Energy Open Access) Rules, 2022 (the “**Open Access Rules**”).<sup>32</sup>

The MoP had notified the Open Access Rules in June 2022 with the aim to promote the generation, purchase, and consumption of green energy, including energy from waste-to-energy plants.<sup>33</sup> In general, the Open Access Rules seek to increase both the ease and scale of consumer access to green energy. The OA Amendment introduces changes related to consumers, banked energy, and leviable charges – including in respect of surcharge and standby charges.

## FEBRUARY 2023

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### Renewable and Green Energy identified as one of the seven key priorities in the Union Budget<sup>34</sup>

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The Union Budget of India (the “**Budget**”) for financial year 2023-24, as presented by the Indian finance minister on February 1, 2023,<sup>35</sup> identified renewable energy as one of the seven pillars of the Budget. In an initiative to strengthen India’s green energy initiatives and a ‘net-zero’ future, the Budget proposed the following:

- A ‘priority’ capital investment of INR 350 billion (approx. USD 4.3 billion) for a transition to green energy, zero emissions, and energy security, including through targeted hydrogen production, has been proposed;

<sup>30</sup> Available [here](#).

<sup>31</sup> Available [here](#).

<sup>32</sup> See [here](#).

<sup>33</sup> See [here](#) and [here](#).

<sup>34</sup> See [here](#).

<sup>35</sup> See [here](#).



- For the purpose of boosting e-mobility, reducing input costs, deepening value addition, promoting export competitiveness, and correcting inverted duty structures to boost domestic manufacturing, basic customs duty (“BCD”) <sup>36</sup> exemptions have been proposed until March 31, 2024 on, *inter alia*, specified capital goods/machinery for the manufacture of lithium-ion cells for use in e-vehicle (“EV”) batteries;
- Further, certain conditional exemption rates in respect of BCD have been reviewed and extended for another year (up to March 31, 2024) for certain items, including the following:
  - catalysts for the manufacture of cast components of wind-operated electricity generator
  - resin for the manufacture of cast components of wind-operated electricity generators;
  - toughened glass for solar thermal collectors or heaters;
  - forged steel rings for the manufacture of special bearings for use in wind-operated electricity generators;
  - flat copper wires for use in the manufacture of photovoltaic ribbons for solar cells and modules;
  - batteries for EV, including two and three-wheeler EVs; and
  - active energy controllers (“AEC”) for use in the manufacture of renewable power system (“RPS”) inverters;<sup>37</sup>
- In addition, in terms of changing the end-date of exemptions without a change in effective rate of duty, certain items have been specified, including the following:
  - lithium-ion cell for use in the manufacture of battery or battery pack of EVs or hybrid motor vehicles (5%, up to March 31, 2024);
  - specified inputs for use in the manufacture of ethylene vinyl acetate (“EVA”) sheets or back sheets used in the manufacture of solar cells or modules (nil, up to March 31, 2024);
  - solar tempered glass for use in the manufacture of solar cells or solar modules (nil, up to March 31, 2024);
  - raw materials and component parts for the manufacture of wind-operated electricity generators, including permanent magnets (“PM”) for the manufacture of PM synchronous generators above 500 kilowatts (“KW”) for use in wind-operated electricity operators (5%, up to March 31, 2025).
- Furthermore, certain changes in BCD (without any change in the effective rate of customs duties) have been proposed. Accordingly, while the BCD on coal has been increased to 2.5% from 1%, it remains exempt from the Agriculture Infrastructure and Development Cess (“AIDC”).<sup>38</sup>
- For the purpose of spurring domestic production, increased customs duties on imports of semi-knocked down and built EV units have been proposed;
- Further, coastal shipping will be promoted as an energy-efficient and low-cost mode of transport, both for passengers and freight, through public-private partnership (“PPP”) models with viability gap funding.
- Replacing old polluting vehicles remains an important priority. Accordingly, pursuant to the vehicle scrapping policy mentioned in the Budget of 2021-22, adequate funds have been allocated to scrap old vehicles of the central government. States will also be supported in their efforts to replace old vehicles and ambulances;
- To avoid the cascading of taxes on blended compressed natural gas, exemptions have been proposed for central excise duty on GST-paid compressed biogas contained in such natural gas;
- Battery energy storage projects with a capacity of 4,000 megawatt-hours (“MWh”) will be supported with viability gap funding. A detailed framework for pumped storage projects will also be formulated;
- The inter-state transmission system for evacuation and grid integration with respect to

<sup>36</sup> BCD means the customs duty levied under the Customs Act, 1962.

<sup>37</sup> See ‘Memorandum Explaining the Provisions in the Finance Bill,’ available [here](#).

<sup>38</sup> AIDC means a duty of customs that is levied under Section 124 of the Finance Act, 2021.

13 GW of renewable energy from Ladakh will be constructed with an investment of INR 207 billion, including central support of INR 83 billion;

- A 'Green Credit Program' under the Environment (Protection) Act, 1986, as amended, has been proposed to promote sustainable initiatives by companies, individuals, and local bodies for additional resources;
- Further, the targets (5 MMT)<sup>39</sup> and financial outlay (about INR 200 billion)<sup>40</sup> in connection with the NGHM were reiterated;
- The "PM Programme for Restoration, Awareness, Nourishment and Amelioration of Mother Earth" ("**PM-PRANAM**") will be launched to incentivize states and union territories to promote the use of alternative fertilizers, as well as the balanced use of chemical fertilizers;
- 500 new 'waste to wealth' plants under the 'Galvanizing Organic Bio-Agro Resources Dhan ("**GOBARdhan**")' scheme will be established to promote a circular economy. Such new 'waste to wealth' plants will involve 200 compressed biogas ("**CBG**") plants, including 75 plants in urban areas, and 300 community or cluster-based plants. The total proposed investment in this regard is INR 100 billion. In due course, a 5% CBG mandate will be introduced for all organizations that market natural and biogas. Further, appropriate fiscal support will be provided for the collection of biomass, as well as for the distribution of bio-manure.
- States will be encouraged to undertake urban planning reforms to transform existing cities into futuristic and sustainable ones, including through the involvement of efficient use of land resources, adequate resource allocation for urban infrastructure, transit-oriented development, as well as enhanced availability and affordability of urban land.

<sup>39</sup> One of the main intended outcomes of NGHM by the year 2030 includes the development of an annual production capacity of at least 5 MMT of GH.

<sup>40</sup> The initial financial outlay for NGHM will involve an aggregate amount of approximately INR 200 billion (about USD 2.2 billion).

<sup>41</sup> FAME II aims at providing incentives to: (i) buyers in the form of upfront reduction in the purchase price of EVs (including under

- Further, through property tax governance reforms and ring-fencing user charges on urban infrastructure, cities will be incentivized to improve their creditworthiness for the purpose of issuing municipal bonds.

Further, the government has almost doubled its budgetary allocation for the second phase of the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles in India scheme ("**FAME II**") to subsidize the purchase of EVs.<sup>41</sup> In addition, a number of details related to financial outlays, budgetary allocations, as well as outputs and outcomes related to government schemes have been updated in the outcome budget.<sup>42</sup>

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### CERC issued new guidelines to supplement the DSM Regulations 2022

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Pursuant to an order dated February 6, 2023 (the "**Order**"),<sup>43</sup> the Central Electricity Regulatory Commission ("**CERC**") issued new directions ("**Directions**") with respect to grid security for the purpose of supplementing the Central Electricity Regulatory Commission (Deviation Settlement Mechanism and Related Matters) Regulations, 2022 ("**DSM Regulations**").<sup>44</sup> Through such Directions, the CERC:

- Specified new norms and a ceiling rate for the normal rate of charges for deviations with respect to a time block;
- Clarified the applicable payment by way of over-injection and under-injection for deviation with respect to frequencies under 49.95 Hz, and over 50.03 Hz, respectively.

The Directions came into effect from February 8, 2023. The Order states that it is proposed to be an interim measure in the interest of grid security, and the CERC will amend the DSM Regulations separately, as deemed appropriate pursuant to further analysis.

income tax), and (ii) support demand for a specified number of EVs across categories. See [here](#).

<sup>42</sup> See [here](#).

<sup>43</sup> See [here](#).

<sup>44</sup> The DSM Regulations, available [here](#), entered into force with effect from December 5, 2022.

## Background

While market participants adjusted to the DSM Regulations, in light of continued and significant fluctuations in grid frequency, the CERC found it necessary to intervene in the interest of grid security. Accordingly, based on its own monitoring of the situation, and pursuant to feedback from, and consultations with, various stakeholders, the CERC decided to temporarily relax Regulations 7 (dealing with the normal rate of charges for deviations) and 8 (dealing with charges for deviation) of the DSM Regulations.

## IREDA has proposed to establish an office in Gujarat's GIFT City to finance Renewable Energy projects in foreign currency

In a press release dated February 24, 2023,<sup>45</sup> it was announced that the Indian Renewable Energy Development Agency Limited (“IREDA”), a Government of India enterprise, plans to establish an office in India's first international financial services center (“IFSC”) under the auspices of the Gujarat International Finance Tec-city (“GIFT City”), located between Ahmedabad and Gandhinagar, to finance renewable energy projects in foreign currency. IREDA's office at GIFT City will be classified as an overseas office to avoid foreign exchange hedging costs. In the press release it was highlighted, among other things, that:

- Having a green taxonomy will be important for the purpose of raising funds. Currently, the aim is to raise approximately INR 25 lakh crores for green energy projects by 2030;
- Insurance and superannuation funds were proposed to invest 2% of their assets under management in green bonds to finance green energy projects; and
- Major multilateral and bilateral agencies such as the World Bank and the Asian Development Bank (“ADB”) preferred to channel their funds through IREDA for renewable energy (“RE”) projects in India, making IREDA an important vehicle for RE funding in the country.

<sup>45</sup> See [here](#).

<sup>46</sup> See [here](#).

<sup>47</sup> See [here](#).

<sup>48</sup> The ‘multi-modal connectivity’ referred to in the NMP is expected to provide integrated and seamless connectivity for the

## Approval for pre-investment activities with respect to India's largest hydropower project near the China border

The Cabinet Committee on Economic Affairs approved an investment of INR 1,600 crores for pre-investment activities for a 2,880 MW hydropower/multipurpose project in Dibang, Arunachal Pradesh – the country's largest hydropower project until date (the “Project”), to be developed by NHPC Limited, a Government of India enterprise (“NHPC”). Overall, the Government of India has allocated INR 319 billion (USD 3.9 billion) for the Project, which is estimated to take nine years to build. Back in March 2019, India's Union Cabinet had decided to classify large hydropower projects as renewable energy.<sup>46</sup> As such, the government views hydropower as pivotal with regard to the country's proposed transition away from coal to help manage the inherent power fluctuations caused by variability in the supply of solar and wind energy. The approved investment for the Project includes an amount of INR 67.2 billion towards government support for flood moderation and enabling infrastructure, such as roads and bridges connecting the construction site.

According to the NHPC website, the Project is under construction. Further, the location of the project has strategic importance, given its proximity to India's border with China.

## PM Gati Shakti National Master Plan related to Renewable Energy

Pursuant to an order dated February 15, 2023 issued by the ‘Gati Shakti’ cell of the MNRE,<sup>47</sup> it was announced that renewable energy (“RE”) projects with a capacity of 50 MW or higher are required to be mapped on the portal associated with the ‘Prime Minister's Gati Shakti National Master Plan’ for multi-modal<sup>48</sup> connectivity (“NMP”).<sup>49</sup> Accordingly, RE projects undertaken by implementation agencies, including in respect of solar and wind energy, will be mapped on the NMP by the Gati Shakti cell. In addition, RE projects

movement of people, goods, and services from one mode of transport to another. In sum, it is aimed to facilitate ‘last mile’ connectivity with respect to infrastructure and reduce travel time.

<sup>49</sup> See [here](#) and [here](#).

undertaken further to state schemes and tenders will be mapped by such states themselves on their respective official portals with links to the NMP.

In this regard, the Gati Shakti will upload resource maps related to solar radiation and wind speed on the NMP. Meanwhile, state transmission utilities will map intra-state transmission infrastructure on state portals in coordination with the Power Ministry.

### Background

The portal associated with NMP aims to showcase key details of high-impact power transmission projects, especially those which are located in states with abundant RE resources. Accordingly, the NMP portal seeks to provide a ‘one-click’ comprehensive overview in this regard to simplify the planning and implementation process related to power transmission projects, including by improving logistical efficiency through a single digital platform.<sup>50</sup>

### Tamil Nadu announced its new EV policy<sup>51</sup>

The state government of Tamil Nadu unveiled its new policy on electric vehicles (“EVs”) in February 2023 (“TNEVP 2023”). With a focus on promoting investment in the EV sector and creating a more conducive ecosystem for the industry, TNEVP 2023 seeks to promote research and development with respect to EVs, ensure the creation of a pool of skilled workers, generate new jobs, and make Tamil Nadu a destination of choice for EVs and component manufacturers. With a four-pronged approach in respect of this objective, the TNEVP 2023 involves thrust areas across the supply side, demand side, charging infrastructure,<sup>52</sup> and ecosystem development. The state government has also encouraged a circular economy with respect to EV batteries by promoting the re-use and recycling of such batteries through recycling stations, as set up by EV manufactures.

<sup>50</sup> See [here](#).

<sup>51</sup> See [here](#).

<sup>52</sup> For instance, legislative amendments are proposed to be made to existing building and construction laws to ensure the integration of charging infrastructure into all new constructions and buildings

### Other states also launched EV initiatives

#### Punjab

Pursuant to a notification dated February 21, 2023,<sup>53</sup> the transport department of the Punjab state government announced the initiation of its 2022 EV policy for a period of 3 years, pursuant to the approval of such policy by the state’s council of ministers on February 3, 2023.

#### Himachal Pradesh

Last year, the state government of Himachal Pradesh had formulated an EV policy.<sup>54</sup> According to media reports, in February 2023, the state’s transport department announced that it would convert its entire fleet of petrol- and diesel-powered official vehicles to EVs.<sup>55</sup>

### BRSR Core: Consultation Paper on ESG disclosures, ratings, and investing

On February 20, 2023, the Securities and Exchange Board of India (“SEBI”) released a consultation paper on disclosures, ratings, and investing related to Environmental, Social, and Governance (“ESG”) parameters for the purpose of seeking comments from the public (“Consultation Paper 1”).<sup>56</sup> According to Consultation Paper 1, among other things, SEBI soon plans to introduce an assurance-based reporting regime based on key ESG attributes – referred to, and appended in Annexure 1 to Consultation Paper 1, as “BRSR Core”. The BRSR Core format comprises select essential indicators across various principles which may become the foundation of the proposed assurance process.

By design, BRSR Core has been formulated on the basis of quantifiability and ‘reasonable assurance’ mandate (similar to an audit verification) with respect to ESG data across key performance indicators (“KPIs”). The thrust on quantifiable (*i.e.*, measurable) and outcome-oriented ESG metrics, as well as SEBI’s focus on coherent methodologies

across cities. Further, TNEVP 2023 also provides for revision of power tariffs for public charging stations.

<sup>53</sup> See [here](#).

<sup>54</sup> See [here](#).

<sup>55</sup> For example, see [here](#), [here](#), and [here](#).

<sup>56</sup> Available [here](#).



related to data verification by assurance providers on the basis of a 'reasonable' standard (as opposed to 'limited' assurance, which is easier to implement, and consequently yields lower confidence levels), appear to be a deliberate feature of BRSR Core – including for the purpose of facilitating better comparisons and greater market reliance, respectively, as well as to reduce compliance costs.

BRSR Core, as it currently stands, may apply in a staggered trajectory (termed the 'glide path approach'): for instance, subject to future changes stemming from stakeholder consultation, the mandatory applicability of reasonable assurance in respect of its KPIs may extend to the top 250 listed companies in India (by market capitalization) from FY 2023-24, and subsequently, to the top 500 and 1,000 such companies by FY 2024-2025 and 2025-2026, respectively.

KPIs in the BRSR Core include internationally comparable parameters such as intensity ratios (e.g., related to waste generation or greenhouse gases ("GHG")) based on revenue and volume. Some such disclosures are already required under the general BRSR framework. Now, SEBI has proposed that certain requirements (such as intensity ratios) should be adjusted for purchasing power parity ("PPP") in the energy markets, since such ratios are used by global investors and global ESG ratings providers.<sup>57</sup> Accordingly, in the first phase, intensity ratios may be rationalized according to country-level PPP, subject to finalization.

Further, Consultation Paper 1 contemplates the enhancement of BRSR Core disclosures in relation to corporate supply chains. Given the convoluted supply chain structure in India, comprising mostly small and medium enterprises, SEBI has proposed that ESG disclosures be introduced for supply chains in a phased manner. Thus, in the first phase (FY 2024-25), the top 250 listed companies (by market capitalization) may be required to provide ESG disclosures on a "comply or explain" basis, where assurance will not be mandatory. However, from FY 2025-26, such companies may be under an obligation to provide assurances in this regard. SEBI's proposal includes 15 parameters that "have an Indian context," which ESG rating providers need

to factor in while assigning corresponding ratings to Indian companies. SEBI has indicated that, once finalized, KPIs in BRSR Core, to the extent that those are not incorporated already in the general BRSR framework, will be included in an updated version of the latter.

### Background

As the name suggests, BRSR Core is intended to be a focused subset of the wider Business Responsibility and Sustainability Reporting ("BRSR") framework, which, in turn, SEBI had introduced almost two years ago (in May 2021)<sup>58</sup> as an ESG-based voluntary disclosure regime in lieu of the erstwhile Business Responsibility Reporting ("BRR") paradigm.<sup>59</sup> The main motivation behind introducing the BRSR framework was to ensure quantitative, standardized disclosures on ESG-linked parameters from large, listed companies.

Until now, *i.e.*, until the financial year ("FY") 2021-22, the top 1,000 listed companies in India by market capitalization (the "BRSR Companies") could make ESG disclosures pursuant to the BRSR framework on a voluntary basis. However, such disclosures are now compulsory for the same BRSR Companies, *i.e.*, from FY 2022-23. Accordingly, the mandated entities need to file their BRSR reports electronically, and in addition, such entities are required to integrate these reports with other corporate filings, as made on the 'MCA21' portal, *i.e.*, the website maintained by the Indian Ministry of Corporate Affairs ("MCA").

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### Consultation Paper on Regulatory Framework for ESG Rating Providers

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On February 22, 2023, SEBI released a separate consultation paper on the regulatory framework for ESG rating providers ("ERPs") in the securities market ("**Consultation Paper 2**").<sup>60</sup>

Among other things in Consultation Paper 2, it was proposed that ERPs may register with SEBI under the SEBI (Credit Rating Agencies) Regulations, 1999 (the "**CRA Regulations**"). Accordingly, SEBI suggested that the CRA Regulations will be amended to include a chapter for ERPs.

<sup>57</sup> Also see [here](#).

<sup>58</sup> See [here](#).

<sup>59</sup> See [here](#).

<sup>60</sup> Available [here](#).

Nevertheless, public comments were sought in respect of the proposed regulatory framework for ERPs, which has been detailed in Annexure I of the paper. In essence, SEBI has proposed an amendment in the CRA Regulations, a draft of which was annexed to Consultation Paper 2.

While regulators in certain jurisdictions have opted for a voluntary code of conduct for ERPs, SEBI has proposed an enforceable regulatory and supervisory framework for ERPs in light of its own experience with credit rating agencies. SEBI regulations with respect to credit rating agencies came into effect in 1999.

In context of the proposed BRSR Core framework, it was proposed that ERPs may provide a 'Core ESG Rating' based on assured indicators. It was further proposed that while Core ESG ratings must necessarily be based on assured and/or verified data, ERPs may be permitted to provide additional commentary on data that may not be assured/verified.

### Background

On January 24, 2022, SEBI had published a consultation paper on ERPs for the securities market ("**Previous Paper**").<sup>61</sup> The Previous Paper had contained proposals on the regulation and/or accreditation of ERPs. Accordingly, it had sought public comments on various issues, including in respect of the scope of regulations, eligibility of entities to act as ERPs, conditions for accreditation, ESG rating products, standardization of ESG rating scales, transparency, governance, and business models of ERPs.

Based on responses received from, and discussions held with, various stakeholders with respect to the Previous Paper, as well as in light of global regulatory developments, SEBI proposed to introduce a regulatory framework for ERPs. In May 2022, SEBI constituted an advisory committee on ESG matters in the securities market (the "**Advisory Committee**"),<sup>62</sup> the auspices under which ESG disclosures, investing, and ratings were deliberated upon. Pursuant to the recommendations of the Advisory Committee along with its internal

deliberations, SEBI's proposed approach with respect to ESG ratings and ERPs was detailed in Consultation Paper 2.

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### Quality Control Manual for Grid-Connected Rooftop Solar PV Systems and Solar PV Water Pumping Systems

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Pursuant to an office memorandum dated February 25, 2023<sup>63</sup> issued by a division within the MNRE that deals with grid-connected solar photovoltaic ("**PV**") systems (the "**Quality Control Memo**"), a draft manual was released for stakeholder comments.

### Background

The MNRE supports initiatives related to the installation of grid-connected rooftop solar systems, as well as installations of standalone solar pumps – including with respect to the solarization of existing grid-connected agriculture pumps under the MNRE's schemes and programs. Accordingly, for the purpose of ensuring the quality of such installations, as well as establishing a structured mechanism for the monitoring of such installations, the MNRE proposes to bring out quality-control manuals for the following:

- Grid-connected rooftop solar PV systems (the draft quality control manual in this regard was included within the Quality Control Memo as Annexure A);
- Standalone solar PV water pumping systems and solarization of existing individual agricultural pumps (the draft quality control manual in this regard was included within the Quality Control Memo as Annexure B).

## MARCH 2023

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### ICRA upgraded IREDA's rating to 'AAA' from 'AA+'

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Pursuant to a press release dated March 7, 2023,<sup>64</sup> the Indian Renewable Energy Development Agency Limited ("**IREDA**") announced that ICRA Limited, the credit rating agency ("**ICRA**"), had upgraded the rating associated with the long-term bonds program

<sup>61</sup> Available [here](#).

<sup>62</sup> See [here](#).

<sup>63</sup> See [here](#).

<sup>64</sup> See [here](#).

of IREDA to 'AAA' (Outlook: Stable) from 'AA+' (Outlook: Positive).

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### MNRE keeps ALMM in abeyance till FY24 – commissioned projects to be exempted from procuring requirements<sup>65</sup>

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Pursuant to a circular dated March 10, 2023,<sup>66</sup> the grid solar power division of the MNRE clarified that the Approved Models and Manufacturers of Solar Photovoltaic Modules (Requirements for Compulsory Registration) Order, 2019, as amended and modified (the “ALMM Order”), would be held in abeyance for one financial year, *i.e.*, until the end of FY 2023-24. It was further clarified that projects commissioned until March 31, 2024 would be exempted from the requirement of procuring solar photovoltaic modules (pursuant to the ALMM Order) from the approved list of models and manufacturers (“ALMM”).

Further, pursuant to an office memorandum dated March 22, 2023<sup>67</sup> issued by the grid solar power division of the MNRE with respect to guidelines for enlistment under the ALMM Order, certain erstwhile provisions were modified and/or recast.

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### MNRE signed agreements with Australia, Finland, Germany, and UAE for promotion of bilateral cooperation in renewable energy<sup>68</sup>

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According to a press release dated March 14, 2023,<sup>69</sup> the MNRE has entered into the following agreements since 2022:

- A Letter of Intent (“LoI”) on ‘New and Renewable Energy Technology cooperation’ was signed with Australia on February 15, 2022.
- A Memorandum of Understanding (“MoU”) with respect to cooperation in the field of renewable energy was signed with the Republic of Finland on April 19, 2022.
- A Joint Declaration of Intent (“JDI”) on the Indo-German Green Hydrogen Task force was signed with the Germany on May 2, 2022.

- A JDI with respect to a ‘Renewable Energy Partnership’ was signed with Germany on May 2, 2022.
- An MoU to promote discussion and cooperation between the parties in potential areas of cooperation within the spectrum of GH development and investments in India and the United Arab Emirates (“UAE”) was signed on January 13, 2023.

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### Power Ministry notified a 40% Renewable Generation Obligation

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Through a gazette notification dated March 2, 2023,<sup>70</sup> a resolution dated February 27, 2023 adopted by the Ministry of Power (“MoP”) related to a renewable generation obligation (“RGO”) pursuant to the revised Tariff Policy of 2016, was notified. According to the RGO mandate, it was decided that any generating company establishing a coal/lignite-based thermal generating station with a project commercial operation date (“COD”) on or after April 1, 2023 will be required to establish a renewable energy (“RE”) generating capacity (in MW), *i.e.*, have an RGO, of a minimum of 40% of the capacity of such coal/lignite-based thermal generating station, or procure and supply RE equivalent to such capacity.

On the other hand, a coal/lignite-based thermal generating station with a project COD between April 1, 2023 and March 31, 2025 will be required to comply with the RGO of 40% by April 1, 2025, and any other coal/lignite-based thermal generating station with a project COD after April 1, 2025 will be required to comply with such RGO of 40% by the COD.

Further, a captive coal/lignite-based thermal generating station will be exempt from RGO requirements subject to fulfilment of its renewable purchase obligations (“RPO”) as notified by the central government.

In other words, upcoming thermal power plants will have to produce a minimum of 40% of the total power generated at their plant through renewable

<sup>65</sup> See [here](#) and [here](#).

<sup>66</sup> Available [here](#).

<sup>67</sup> Available [here](#).

<sup>68</sup> See [here](#).

<sup>69</sup> See [here](#).

<sup>70</sup> See [here](#).

sources – either on their own or by procuring energy from other sources. Meanwhile, power plants which begin commercial operations from April 1, 2023, to March 31, 2025, will have to ensure compliance with the new RGO norms by the end of April 1, 2025. New thermal power plants coming into operation after April 1, 2025 will have to comply with the RGO requirement as they begin operations. Captive thermal power plants, however, have been kept outside the purview of the RGO framework.

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### Seabed leasing for offshore wind projects

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According to media reports from March 2023,<sup>71</sup> India's first tender for seabed leasing with respect to offshore wind projects may be out soon.<sup>72</sup> Such reports appear to have been confirmed by representatives from the National Institute of Wind Energy (“**NIWE**”) – the government body that will issue the tender.

#### Background

In November 2022, the MNRE and NIWE had issued a draft tender document<sup>73</sup> along with corresponding contractual documents to certain wind power developers in connection with the proposed leasing of seabed areas for the purpose of carrying out studies, surveys, and the subsequent development of offshore wind projects under open access/captive/third party sale. To facilitate appropriate stakeholder consultations, comments to the draft tender document had been sought through the issuance of a circular dated November 14, 2022 which contained a ‘request for selection (“**RfS**”)’ document for the eventual selection of offshore wind power developers in respect of projects off the coast of Tamil Nadu. Developers would be expected to assume responsibility for the development and installation of grid connections for such windfarms. Energy generated from the proposed offshore wind projects are intended to be consumed in a captive mode or sold to third parties under the open access framework, or even sold through merchant sales or via power exchanges.

<sup>71</sup> For instance, see [here](#).

<sup>72</sup> Also see [here](#). MNRE may be planning to release finalized tender documents soon.

<sup>73</sup> See [here](#).

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### Draft carbon credit trading scheme released

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On March 27, 2023, the MoP issued a letter along with a draft carbon credit trading scheme (the “**Draft Scheme**”)<sup>74</sup> as part of its process to establish a carbon credit market in India. Pursuant to such release, the MoP has sought views from stakeholders on the proposals contained in the Draft Scheme by April 14, 2023. The Energy Conservation (Amendment) Act, 2022 (the “**EC Amendment**”)<sup>75</sup> passed by Parliament last year in December, had included provisions about a market for carbon credits.

The EC Amendment amended the Energy Conservation Act, 2001.<sup>76</sup> Specifically, one key provision of the EC Amendment empowered the central government to specify a carbon trading scheme in consultation with Bureau of Energy Efficiency (“**BEE**”).

Accordingly, a key element of the Draft Scheme is the structure of the proposed Indian carbon market for both voluntary trading and compliance. As per the Draft Scheme, a governing board, comprising secretaries and joint secretaries of the environment, power, renewable energy, steel, coal, and oil ministries, among others, would be formed to administer the Indian carbon market. The proposed board would also recommend procedures and rules for the market. Further, such board would frame the methodologies for voluntary carbon credit trading and guidelines regarding the sale of carbon credit certificates to overseas buyers.

#### Background

The EC Amendment had clarified that a carbon credit trading scheme would involve a scheme for reduction of carbon emissions as notified by the central government. Entities, including designated consumers, could be registered for such scheme. The central government, or any agency authorized by it, may issue carbon credit certificates to registered entities that comply with the requirements

<sup>74</sup> See [here](#).

<sup>75</sup> Available [here](#).

<sup>76</sup> See [here](#).



of the carbon credit trading scheme. In turn, registered entities will be entitled to purchase or sell carbon credit certificates in accordance with the scheme.

Accordingly, the Draft Scheme adheres to such broad stipulations. In addition, the BEE will specify a procedure, including in terms of eligibility criteria, for agency accreditations in respect of functioning as ‘accredited carbon verifiers’ with the approval of a proposed governing board related to the Indian carbon market (“ICMGB”). ICMGB and other specified authorities will later develop a detailed procedure for operationalizing the Indian carbon market along with its various underlying mechanisms.

The Draft Scheme proposes a compliance mechanism pursuant to which obligated entities will be required to comply with prescribed greenhouse gas (“GHG”) emission norms, as notified by the central government with respect to carbon credit trading. Such obligated entities will include those registered entities which are notified under the proposed compliance mechanism.

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### Bidding trajectory for renewable energy projects

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Pursuant to an office memorandum dated March 31, 2023 issued by the grid solar power division of the MNRE,<sup>77</sup> a bidding trajectory was prescribed for renewable energy (“RE”) in respect of power bids to be issued by RE implementation agencies – given India’s climate-related targets by 2030, as well as in light of the time required for commissioning RE power projects.

Accordingly, it was stated in the memorandum that bids for RE capacity of 50 GW per year, with at least 10 GW of wind energy per year, will be issued annually from FY 2023-24 until FY 2027-28. A quarterly timeline for FY 2023-24 was also prescribed, and such RE projects may comprise vanilla solar and wind, solar-wind hybrid, round-the-clock RE, with or without storage, or any other combination – pursuant to market conditions and governmental directions.

Going forward, annual targeted bid capacities will be allocated among RE implementation agencies by the government. Bids are required to be floated pursuant to government-issued standard bidding guidelines, along with the MNRE’s advice related to tenders for RE projects.

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<sup>77</sup> See [here](#).

# Building Bonds: The Mechanics of India's Debut Sovereign Green Issuance

JANUARY 24, 2023

## INTRODUCTION

Last year, in India's Union Budget for the present fiscal, the country's finance minister had announced<sup>78</sup> that the Reserve Bank of India ("RBI") would issue 'sovereign green bonds' ("SGrBs") for the purpose of mobilizing resources for green infrastructure, and the proceeds from such bond issuance would be deployed in public sector projects to reduce the carbon intensity of the economy. Accordingly, the framework (the "SGrB Framework")<sup>79</sup> and indicative issuance calendar<sup>80</sup> with regard to the SGrBs were released on November 9, 2022 and January 6, 2023, respectively. Consistent with global practice, India's SGrB Framework is based on the green bond principles ("GBPs") of the International Capital Market Association ("ICMA"), as updated through June 2022.<sup>81</sup>

## The Significance of Green Bonds

Green bonds are a type of thematic bonds – a category which includes blue, social, gender, sustainability, and sustainability-linked bonds as well. Designed to provide borrowers with alternative financial solutions for accessing private sector financing in order to address specific challenges, thematic bonds are fixed-income securities to raise financing for projects and activities related to a specific theme – such as climate change, education, housing, ocean and marine conservation, or the Sustainable Development Goals adopted by the United Nations (SDGs).<sup>82</sup> Green, social, and sustainability bonds are usually referred to as use-

of-proceeds bonds, given that resources raised through these securities are earmarked for specific projects designed to generate intended impacts. Standard green use-of-proceeds bonds involve an unsecured debt obligation with full recourse to the issuer alone.

Green bonds have emerged as the preferred option when it comes to thematic bonds, representing almost two-thirds of the aggregate outstanding amount. Further, according to a 2020 report published by the International Finance Corporation (IFC),<sup>83</sup> green bond issuances were projected to reach USD 100 billion annually by 2023 in emerging markets alone (the estimate was revised upwards by a whopping USD 50 billion in just two years)<sup>84</sup> – although such markets currently constitute only 15% of the total. Furthermore, while sovereigns represent less than a tenth of the aggregate thematic bond market, interest in sovereign instruments has grown significantly in recent times. In fact, an increasing number of emerging market sovereigns have started issuing thematic bonds in local currency,<sup>85</sup> moving away from past practice where such issuances were denominated in currencies such as USD, Euro, and the Japanese yen.

Since investors, shareholders, and regulators are increasingly clamoring for concrete action to address the potentially cataclysmic consequences of climate change, the global demand for thematic bonds is poised to continue its current trajectory of rapid growth. Further, as policymakers around the world continue to enact new rules and regulations on sector-specific reporting and risk management obligations for climate-related issues, financial institutions will likely continue to robustly engage with such thematic instruments. In addition, since shareholders today demand that corresponding investees transition to 'net-zero' status and focus on sustainability, such financial institutions will remain under pressure to seek thematic assets. This present momentum offers a significant opportunity for issuers in emerging markets – such as India and Indian corporates. A strong demand for India's SGrBs can diversify the country's investor base,

<sup>78</sup> See [here](#).

<sup>79</sup> Available [here](#).

<sup>80</sup> See [here](#).

<sup>81</sup> See [here](#).

<sup>82</sup> See [here](#).

<sup>83</sup> Available [here](#).

<sup>84</sup> See [here](#).

<sup>85</sup> Ibid.

signal commitment to local sustainability goals, and achieve better pricing in the future.

According to some commentators,<sup>86</sup> sovereign green bond issuances may lead to an overall improvement in the quality and frequency of offering, as well as in marketability, of similar instruments across such sovereign's wider economy. Thus, the SGrBs might provide a welcome template for Indian companies to follow and aspire to, including in respect of enjoying the benefits of enhanced credibility to counter potential allegations of greenwashing.<sup>87</sup>

### The Significance of the GBPs

The GBPs, under the auspices of ICMA, provide voluntary process guidelines for the issuance of green bonds. They outline best practices that promote transparency and disclosure, thereby underpinning the integrity of global debt markets towards financing environmental and social sustainability.

Pursuant to ICMA's vision, the four main components of the GBPs have been reflected in the SGrB Framework, including in respect of the following: (i) use of proceeds, (ii) project evaluation and selection, (iii) management of proceeds, and (iv) reporting. Indeed, the content, format, and procedural blueprint (including with regard to external review) of the SGrB Framework – along with its stated mission – all follow international precedent, such as the frameworks designed by Italy,<sup>88</sup> Poland,<sup>89</sup> Ireland,<sup>90</sup> etc. for their respective sovereign green bond issuances in the past.

According to insights based on World Bank surveys of public debt management offices and international investors in respect of sovereign thematic bonds,<sup>91</sup> investors remain concerned about the issuance framework itself, as well as about second-party opinion confirming alignment with ICMA's vision. Purportedly, investors also focus on governance, eligibility evaluation processes, and robust standards of transparency in respect of annual allocations and impact reports. Significantly, each

investor may have its own ESG integration criteria, where they could screen out certain sovereign issuers, such as those which have exposure to certain blacklisted industries or those that receive negative media attention.

While the alignment of India's sovereign issuance with the core components of ICMA's recommendations are well-explained in the SGrB Framework itself, the GBPs do not mandate legal documentation – as long as the underlying issue details are made available in an easy-to-access format. Nevertheless, the GBPs neither constitute specific advice nor create any rights or liabilities themselves. Thus, issuers – including sovereigns – implement the GBPs independently and remain responsible for their own decision to issue green bonds. If a conflict arises between an applicable law and the GBPs, the relevant local statutes and regulations will prevail.

### INDIA'S SGRB ISSUANCE

India's debut sovereign issuance in green bonds involve INR 160 billion (USD 1.9 billion), offered in two tranches of INR 80 billion each – in five and ten-year tenors – through auctions scheduled for January 25 and February 9, 2023, respectively. The issuance has been categorized under the so-called 'Fully Accessible Route' ("FAR") for the benefit of foreign investors.

### FAR

The FAR was introduced with effect from April 1, 2020 as a separate channel for non-resident investment in 'dated' securities issued by the Indian government (*i.e.*, carrying a fixed or floating interest rate, paid on the face value on a half-yearly basis, with a tenor of at least 5 years) – where eligible investors can participate without any investment ceilings. Accordingly, certain specified categories of government securities can be made fully accessible for non-resident investors, *i.e.*, without any restrictions, apart from being available to domestic investors as well. Such specified securities, once so

<sup>86</sup> See [here](#).

<sup>87</sup> 'Greenwashing' refers to a misleading or false set of claims or action by an organization about the positive impact that its actions or services has on the environment.

<sup>88</sup> Available [here](#).

<sup>89</sup> See [here](#).

<sup>90</sup> Available [here](#).

<sup>91</sup> Available [here](#).

designated, remain eligible for investment under the FAR until maturity.

## The Auction

The SGrB auction will be conducted on the basis of yield for new security and on the basis of price for securities which are re-issued.<sup>92</sup> In the event of re-issuance made on the basis of price, the coupon will be pre-determined. Accordingly, bidders will need to quote the price (per INR 10,000)<sup>93</sup> at which they wish to purchase the SGrBs. Alternatively, when the issuance is made on the basis of yield, the coupon of the SGrBs will be decided in an auction conducted by the RBI. The SGrBs will carry the same coupon rate until maturity.

An applicant may submit multiple bids at the same or different rates of yield or price, pursuant to separate applications for each bid. The aggregate amount of bids submitted by a person for an individual bond should not exceed the aggregate amount of the SGrBs offered for sale, plus any additional amount that may be retained under the 'green shoe' option, if any, that the Indian government chooses to exercise. This means that the RBI may accept excess subscriptions up to a specified extent – as prescribed in the specific notification related to the SGrB issuance – and make allotments accordingly. Ultimately, albeit in consultation with the Indian government, it is the RBI that will have the ultimate discretion to accept or reject any or all applications, either wholly or in part, without assigning any reason.

On the basis of bids received, the RBI, in consultation with the Indian government, will determine the maximum rate of yield or the minimum price offered – as applicable – at which offers for the purchase of the SGrBs will be accepted. In the absence of a price-based auction, the maximum rate of yield, as determined, will be the coupon rate per annum in respect of the SGrBs sold at such auction.

## Uniform Price

The SGrBs will be issued to eligible investors through a 'uniform price' auction. Under this method, competitive bids offered with rates up to and

including the maximum rate of yield, or the prices up to and including the minimum offer price, as determined by the RBI, will be accepted at the maximum rate of yield or at the minimum offer price so determined. Bids which are quoted higher than the maximum rate of yield or lower than the minimum price (as determined by the RBI in consultation with the Indian government) will be rejected.

## Who can Invest in the SGrBs?

Investments in the SGrBs may be made by: (i) any person resident in India – including firms, companies, corporate bodies, institutions, state governments, provident funds and trusts, non-resident Indians ("NRIs"), overseas citizens of India ("OCIs"), foreign portfolio investors ("FPIs") registered with the Securities and Exchange Board of India ("SEBI") and approved by the RBI; as well as (ii) any other person not resident in India, as specified by the RBI with the prior approval of the Indian government in this regard.

Foreign Central Banks ("FCBs") will also be eligible to invest in the SGrBs subject to certain terms and conditions, as stipulated by the RBI in consultation with the Indian government. Nevertheless, an investment made by a person resident outside India or by a company which is incorporated outside India (or by a branch of such a company) will remain subject to the provisions of the Foreign Exchange Management Act, 1999, as amended from time to time ("FEMA"), along with applicable regulations framed under FEMA – in addition to other provisions of law which are generally applicable to Indian government securities.

## What about Retail Investors?

Under Indian law, for the purpose of encouraging wider participation, a non-competitive bidding facility has been made available for retail investors in select auctions of government securities.<sup>94</sup> Accordingly, 5% of the aggregate nominal amount of the SGrB issuance will be reserved for retail investors – which category may include any individual, firm, company, corporate body, institution, provident fund, trust, or any other person/entity prescribed by the RBI. Nevertheless, to qualify as an eligible participant in

<sup>92</sup> See [here](#).

<sup>93</sup> Stocks will be issued for a minimum amount of INR 10,000 (nominal) and in multiples of INR 10,000 thereafter.

<sup>94</sup> See [here](#).



the auctions on a non-competitive basis, a retail investor needs to satisfy certain stipulated requirements.<sup>95</sup>

### How does one Apply for the SGrBs?

Both competitive and non-competitive bids for the auctions related to the SGrB issuance need to be submitted in electronic format on the RBI's 'Core Banking Solution' (E-Kuber) system on the day of the auction, until the closing time of such auctions, as prescribed by the RBI. Bids in physical form will not be accepted except in extraordinary circumstances, such as network/system failure.<sup>96</sup> FPIs and NRIs, however, are required to submit their applications through bank branches of designated authorized dealers (ADs).<sup>97</sup>

## SALIENT FEATURES OF THE SGRBS

The SGrBs will be considered as eligible investments for the purpose of Statutory Liquidity Ratio (SLR) obligations and repurchase transactions ("Repo") in banks.

### Repo

Indeed, all regulated entities, listed corporates, unlisted companies which have been issued special securities by the Indian government using only such special securities as collateral, all-India financial institutions (FIs) constituted through parliamentary legislation (such as Exim Bank, the National Bank for Agriculture and Rural Development (NABARD), National Housing Bank (NHB), and the Small Industries Development Bank of India (SIDBI)), as well as any other entity approved by the RBI, will be eligible to participate in Repo transactions involving the SGrBs. While such Repo transactions must be undertaken for at least a day's period and at most a year's,<sup>98</sup> they will be tradeable on any recognized stock exchange or RBI-authorized electronic trading platform – or even in the over-the-counter (OTC) market – albeit with prior RBI approval in each case. Further, such transactions can employ any trading

process, as long as such process has been mutually agreed upon.

### Underwriting

Primary dealers ("PDs") – including scheduled commercial banks that undertake PD business departmentally – may engage in underwriting with regard to the SGrB auction. The RBI stipulates (i) a minimum underwriting commitment ("MUC") for each PD, and (ii) the amount for which an additional competitive underwriting ("ACU") auction will be held. At present, the minimum bidding requirement for each PD in the ACU auction is equal to the amount of the MUC.<sup>99</sup>

The MUC of each PD will be computed to ensure that at least 50% of each issue is mandatorily covered by the aggregate of all MUCs. The MUC must be uniform for all PDs, irrespective of their capital or balance sheet. For the SGrB auction, a PD should bid for an amount which is equal to, or more than, the successful amount in the ACU and MUC.

### WI Trading

While the SGrBs will be eligible for trading in the secondary market – since July 2018, the eligible participant base and the entity-wise limits in respect of transactions in the 'when, as and if issued' ("When Issued," or "WI") market in government securities have been liberalized and relaxed, respectively. Of particular interest is the fact that the SGrBs will be eligible for WI trading.

A WI security is one which has been authorized for issuance but has not yet been issued. Thus, WI trading occurs between: (i) the time a government security is announced for issuance, and (ii) the time such security is finally issued. Predictably, all WI transactions are on an 'if' basis, *i.e.*, they are settled if and when the security is subsequently issued.

Generally speaking, all entities which are eligible to participate in the primary auction of central government securities may undertake both net long

<sup>95</sup> See [here](#).

<sup>96</sup> Such physical bids should be submitted to the Public Debt Office, Mumbai in the prescribed form, which can be obtained from the RBI website, before the auction ends.

<sup>97</sup> See sub-paragraph (i) of paragraph 2.3 ("Procedure for Application") of the General Notification F.No.4(2)-W&M/2018 on

'Sale of Government of India Securities' dated March 27, 2018, available [here](#).

<sup>98</sup> See [here](#).

<sup>99</sup> See [here](#).

and short positions in the WI market. This applies for new securities as well as for reissuances. Although such eligibility conditions will extend to the SGrB issuance as well, resident individuals, Hindu Undivided Families (HUFs), NRIs, and OCIs will be permitted to take only long positions. Further, entities other than scheduled commercial banks and PDs will be required to close their short positions, as applicable, by the close of trading on the date of auction. All WI transactions for all trade dates are required to be contracted for settlement on the date of issue. Finally, if the auction is cancelled for any reason, all WI trades will be deemed null and void.

Requirements in the event of re-issuance, default settlement mechanisms under the Clearing Corporation of India Limited (CCIL), open position limits, trading venues, and miscellaneous reporting obligations have also been prescribed in directions issued by the RBI.<sup>100</sup>

### Transferability

The SGrBs can be renewed, sub-divided, consolidated, converted, and transferred in accordance with, and subject to the restrictions stipulated under, applicable law.<sup>101</sup> Transfers by NRIs, FPIs and FCBs will be subject to regulations framed under FEMA and guidelines issued by the RBI. In addition, transfer of the SGrBs by FPIs will be subject to applicable SEBI regulations in respect of FPIs, as modified from time to time.

### Tax and Dispute Settlement

Existing Indian tax laws will apply for the purpose of determining the liability of investors/holders in respect of the SGrBs. Any dispute relating to the SGrBs will be subject to the jurisdiction of Indian courts.

## CONCLUSION

The SGrB issuance comes at a time of increased ESG adoption in the country, especially given certain important developments in this regard, such as the RBI's discussion paper on climate risk and

sustainable finance.<sup>102</sup> In addition, pressure exerted by sectoral regulators on institutional investors – such as on the Life Insurance Corporation of India (LIC) and the Employees' Provident Fund Organisation (EPFO) – to incorporate ESG considerations in their respective portfolios may further drive up domestic demand for the SGrBs,<sup>103</sup> including on account of SEBI's guidance on disclosures with regard to ESG practices under its business responsibility and sustainability reporting framework.<sup>104</sup>

Nevertheless, with regard to retail investors in the domestic market, the absence of tax concessions might dampen demand. Moreover, as the RBI Deputy Governor lamented last month, India still lacks a green taxonomy<sup>105</sup> – *i.e.*, a classification system establishing a list of green economic activities – which, in effect, provides companies, investors, and policymakers with an appropriate definition for what constitutes 'green'.<sup>106</sup> Even though a list of permissible activities has been laid down in the SGrB Framework, the process for evaluating environmental impact and its appurtenant risks remains unclear – according to the 'CICERO Shades of Green' second party opinion (the "**Second Opinion**").<sup>107</sup> The Second Opinion further claims that: (i) the principles for selecting green projects remain (too) general in the SGrB Framework; and (ii) the broadly defined project categories – on account of the absence of quantified thresholds – create uncertainty about which type of expenditure might be financed.

Such important caveats notwithstanding, prior global experience suggests that sovereign green bonds contribute towards creating a conducive ecosystem, which, in turn, fosters greater capital inflow into the green sector. Further, the SGrB issuance may represent an excellent opportunity for India to develop skills in measurement, assurance, and ratings in respect of a green taxonomy.

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<sup>100</sup> See [here](#).

<sup>101</sup> See [here](#).

<sup>102</sup> See [here](#).

<sup>103</sup> See [here](#).

<sup>104</sup> See [here](#).

<sup>105</sup> See [here](#).

<sup>106</sup> For example, see [here](#).

<sup>107</sup> See [here](#).

# E-Vroom! An Overview of the Electric Vehicle (EV) Sector in India

FEBRUARY 9, 2023

## INTRODUCTION

The road transportation sector accounts for a significant proportion of global emissions, making electric vehicles (“EVs”) a key focus area, including in India’s union budget announced a few days ago (the “**Budget**”). Meanwhile, the Indian government remains committed to its national mission on transformative mobility and battery storage (the “**E-Mobility Mission**”).<sup>108</sup> Over the last few years, a plethora of EV-related policies and laws has been introduced, spanning several discrete pivots, such as in respect of: (1) local manufacturing, (2) emissions and waste reduction, and (3) charging infrastructure and batteries. Accordingly, this note aims to highlight some of the key initiatives undertaken by the government in the Indian EV sector, along with existing concerns and future opportunities in such sector.

## MANUFACTURING

The National Electric Mobility Mission Plan 2020 (“**NEMMP**”) was launched in 2013<sup>109</sup> to achieve national fuel security by promoting hybrid vehicles and EVs in India. At the time, the government aimed to provide (i) fiscal and monetary incentives to encourage the nascent technology, as well as (ii) monetary support to potential buyers for the purpose of purchase. Accordingly, the NEMMP aspired to establish a roadmap for increased adoption of EVs in India, including in respect of sales targets.

<sup>108</sup> See [here](#) and [here](#).

<sup>109</sup> See [here](#).

<sup>110</sup> See [here](#).

<sup>111</sup> See [here](#).

<sup>112</sup> Section 80EEB of the Income Tax Act, 1961, as amended, provides tax deductions of up to INR 1,50,000 on the interest paid on loan amounts in respect of EV purchases. Such deduction is available for individuals alone, albeit both for personal and/or business purposes until loan repayment.

In 2015, the Ministry of Heavy Industries (“**MHI**”) launched Faster Adoption and Manufacturing of Hybrid and Electric Vehicles in India scheme I (“**FAME 1**”),<sup>110</sup> which focused on creating demand, technology platforms, pilot projects, and charging infrastructure related to EVs. However, even after substantial funds had been utilized over four years, an independent consultant evaluated FAME 1 along unfavorable lines, including on account of suboptimal performance in key targeted parameters – such as in respect of saving fuel and reducing carbon dioxide.<sup>111</sup> Accordingly, the MHI notified FAME 2.

Now extended until 2024, FAME 2 aims at providing incentives to: (i) buyers in the form of upfront reduction in the purchase price of EVs (including under income tax),<sup>112</sup> and (ii) support demand for a specified number of EVs across categories.<sup>113</sup> As per the last Budget, the government has almost doubled its budgetary allocation for FAME 2.

For the purpose of availing incentives provided under FAME 2, manufacturers need to increase their local sourcing of EV components as per phased manufacturing program (“**PMP**”) targets.<sup>114</sup> In addition, the last Budget further increased the already-high customs duties on imports of semi-knocked down and built EV units, presumably to spur domestic production.

In 2021, the government approved the Production Linked Incentive (“**PLI**”) scheme for (i) the automotive sector (which includes EVs),<sup>115</sup> and (ii) the manufacture of advanced chemistry cells (“**ACCs**”).<sup>116</sup> ACCs are a relatively new technology with the potential to replace lithium-ion in EV battery production. Accordingly, pending further developments with respect to green hydrogen technologies, this PLI scheme aims to reduce both import dependence and battery prices, and ultimately, EV costs.<sup>117</sup> In addition to incentives provided by the central government, several Indian

<sup>113</sup> See [here](#).

<sup>114</sup> Ministry of Heavy Industries, “Phased Manufacturing Programme to promote indigenous manufacturing of Electric Vehicles, its assemblies / sub-assemblies and parts / sub-parts / inputs of the sub-assemblies”, February 11, 2022, available [here](#).

<sup>115</sup> See [here](#).

<sup>116</sup> See [here](#).

<sup>117</sup> See [here](#).

states have introduced EV-related manufacturing policies which include subsidies, exemptions, and other miscellaneous incentives.<sup>118</sup>

## EMISSIONS AND WASTE

The Draft National Auto Policy of 2018<sup>119</sup> (the “**Draft NAP**”) had proposed making provisions for the banking and trading of carbon dioxide (“**CO2**”) credits by vehicle manufacturers, where such credits awarded to a manufacturer may be: (i) used to compensate against debits, or (ii) traded/transferred among companies. The Draft NAP had also suggested that manufacturers should be allowed to form a pool to jointly meet their CO2 emission targets.

The Energy Conservation Act, 2001 (the “**EC Act**”) was recently amended to improve upon the current framework for regulating energy consumption. Among other changes to the EC Act, the central government has now been empowered to specify a carbon credit trading scheme. Further, the scope of the EC Act has been expanded to include emissions by vehicles, as defined under the Motor Vehicles Act, 1988. Pursuant to the amendment, a failure to comply with prescribed standards will be punishable with a penalty of up to INR 10 lakh. Vehicle manufacturers in violation of fuel consumption norms will be liable to pay an additional penalty of up to INR 50,000 per unit sold.

Given the above, energy consumption standards may be specified for vehicles by the Bureau of Energy Efficiency (“**BEE**”), along with a carbon credit system for compliance with fuel economy regulations. Recent media reports<sup>120</sup> suggest that a national framework for trading in carbon is poised for a rollout this year. A draft blueprint for such a market,<sup>121</sup> prepared by the BEE, was released for stakeholder consultations in late 2021. In the future, charging systems could earn carbon credits for providing renewable energy to run EVs. Owners of EV charging stations (“**EVCS**”) could then generate additional revenue from this parallel income stream.

Meanwhile, the Battery Waste Management Rules, 2022 (the “**BWM Rules**”),<sup>122</sup> replacing an erstwhile legislation,<sup>123</sup> were notified last year by the Ministry of Environment, Forest and Climate Change. Under the new BWM Rules (which cover EV batteries), producers, sellers, and importers (collectively, “**producers**”) are required to collect and recycle/refurbish those batteries which they introduce into the market with ‘extended producer responsibility’ (“**EPR**”) obligations. To meet such EPR obligations, producers may themselves engage or authorize any other entity. Further, the BWM Rules aim to provide for an exchange of EPR certificates between producers and recyclers/refurbishers to comply with such obligations.

Moreover, the BWM Rules are intended to (i) encourage the setting up of new industries and (ii) promote new business opportunities and entrepreneurship with respect to: (1) the collection and recycling/refurbishment of waste batteries, as well as (2) using recovered material from such waste to make new batteries. By prescribing a minimum percentage of recovery, the BWM Rules hope to attract new technologies and investments in the recycling and refurbishment industry.

## CHARGING INFRASTRUCTURE AND BATTERY SWAPPING

About a year ago, the Ministry of Power consolidated and issued revised guidelines/standards in respect of EV charging infrastructure,<sup>124</sup> last amended in November 2022.<sup>125</sup> The private sector is already investing in the manufacture and installation of EV-related supply equipment (“**EVSE**”), including with regard to charging and battery swapping technology. The Ministry of Housing & Urban Affairs amended the model building bylaws of 2016 to include enabling provisions for installing EV charging infrastructure in private and commercial building premises, including across core urban areas.<sup>126</sup> Further, the viability gap funding (VGF) for battery energy storage systems (“**BESS**”) announced in the

<sup>118</sup> For a list of state EV policies, see [here](#).

<sup>119</sup> Available [here](#).

<sup>120</sup> See [here](#).

<sup>121</sup> Available [here](#).

<sup>122</sup> Available [here](#).

<sup>123</sup> The Batteries (Management and Handling) Rules, 2001.

<sup>124</sup> See [here](#).

<sup>125</sup> See [here](#).

<sup>126</sup> See [here](#).



Budget will likely create additional critical infrastructure.

Meanwhile, the draft battery swapping policy, released for comments by NITI Aayog in April 2022,<sup>127</sup> may be finalized soon, according to media reports.<sup>128</sup> This policy may include a voluntary design standardization, pursuant to stakeholder requests made in this regard. Furthermore, in response to incidents of fire in e-two-wheelers,<sup>129</sup> amendments were introduced in respect of EV battery testing standards by the Ministry of Road Transport and Highways late last year.<sup>130</sup> A few months prior, the Bureau of Indian Standards had formulated performance standards for EV batteries.<sup>131</sup>

## PRESENT AND FUTURE INNOVATIONS

The Center for Study of Science, Technology and Policy (“**CSTEP**”) conducted a pilot project in 2021 (the “**CSTEP Study**”)<sup>132</sup> to ascertain whether solar rooftop photovoltaic (“**SRTPV**”) technology can be scaled up in Indian cities. Since India’s power grid is still predominantly coal-based, CSTEP sought to demonstrate the use of solar energy for charging EVs. Among other advantages, the CSTEP Study found that SRTPV systems: (i) represent an economically viable technology for the purpose of sourcing clean energy, (ii) are easily installable on account of their modular design, (iii) provide a cost-

effective alternative and/or supplement to conventional grid-charging, and (iv) may effectively balance the detrimental consequences of demand surges with respect to grid-based EV charging. Accordingly, CSTEP examined the commercial aspects and economic benefits with respect to the use of grid-connected SRTPV both *with* and *without* a BESS<sup>133</sup> to power EVCS.<sup>134</sup> In that regard, the CSTEP Study suggested that the mismatch between the generation and consumption of solar energy could be addressed by deploying net metering at EVCS.<sup>135</sup>

Nevertheless, the simultaneous electrification of road transport and deployment of decentralized renewables such as rooftop solar may make power grid distribution more complex to manage in the long run. Thus, even in a conservative scenario, big cities could face situations of grid congestion. Accordingly, digital grid and ‘smart’ charging technologies<sup>136</sup> may need to be employed. Reports<sup>137</sup> published in cooperation with NITI Aayog (the “**NITI Aayog Reports**”)<sup>138</sup> recognize this contingency.<sup>139</sup> Smart charging with better load management facilities, usage based analytics, and automated payment – coupled with ultra-fast charging technology – enables consumers to usefully exploit battery storage and allows for increased uptakes of renewable energy.<sup>140</sup> In addition, developments in technologies such as portable charging stations and bi-directional charging will create new opportunities

and Development Commission of Delhi (DDC) and WRI India, February 2022, available [here](#).

<sup>136</sup> Smart charging software allows EV owners to plug in during expensive peak hours without the vehicle drawing power until cheaper (off-peak) hours. This eases strain on the electric grid, makes better use of renewable energy and saves money for consumers. In the absence of smart charging, electric grids may get overloaded. See [here](#).

<sup>137</sup> Two reports were prepared by the Indian Institute of Technology, Bombay (IIT Bombay) in collaboration with the Florence School of Regulations Global (FSR Global), as part of the Nationally Determined Contributions - Transport Initiative for Asia (“**NDC-TIA**”) initiative. The NDC-TIA is implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ) and is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety under its International Climate Initiative. The two reports are available [here](#) and [here](#).

<sup>138</sup> The NITI Aayog Reports undertake a global review in respect of integrating EV charging infrastructure with distribution grids, along with an analysis of India’s gaps in this regard, and ultimately suggest potential policy measures towards improvement.

<sup>139</sup> Among other things, the NITI Aayog Reports acknowledge that smart charging represents a key solution in respect of achieving higher EV penetration with minimum grid upgrades, as well as to address issues related to congestion and voltage.

<sup>140</sup> See [here](#).

<sup>127</sup> Available [here](#).

<sup>128</sup> For example, see [here](#).

<sup>129</sup> See [here](#).

<sup>130</sup> See [here](#).

<sup>131</sup> See [here](#).

<sup>132</sup> The report, titled “Solar Energy-Based EV Charging: A Pilot and Techno-Economic Study,” can be found [here](#). See the press release, “Clean Mobility: Study recommends electric vehicle charging stations powered by solar rooftop photovoltaic technology,” CSTEP, Bengaluru, December 22, 2021, available [here](#). Media reports about the CSTEP Study can be found [here](#) and [here](#).

<sup>133</sup> For more on BESS, see [here](#) and [here](#).

<sup>134</sup> This examination was based on a parameter known as the levelized cost of charging (“**LCOC**”). LCOC includes all costs incurred over the lifetime of an asset. LCOC was useful in the CSTEP Study to estimate the economic benefits of using solar energy and BESS for EV charging.

<sup>135</sup> Net metering or net billing enables the deduction of electricity produced on-site using renewable energy from the total electricity consumed in a billing period. This helps lower the consumer’s electricity bill. The consumer would either need to pay for the difference in units or would get paid by an electricity distribution company/public utility for extra units at the end of the billing cycle. See “Residential EV Charging Guidebook,” Report by Dialogue

for the EVCS market. As the NITI Aayog Reports suggest, ‘vehicle-to-grid’ (“V2G”) charging technology<sup>141</sup> enables EVs to store unused power and discharge it to the grid.

## KEY FOCUS AREAS

### Efficient Charging and EV Fleets

In China, more than two out of every five publicly available charging units are fast, signifying a substantially higher proportion compared to other EV markets. Indeed, the deployment of Chinese public charging infrastructure has been rapid, led by government subsidies and proactive developmental initiatives undertaken by public utilities. In turn, regulatory controls on electricity prices, along with a growing demand for public charging (stemming, in turn, from increased urban consumption), have improved the profitability of the EV charging business as a whole – including through a rise in new use patterns such as electric taxis, ride-sharing, and other public/logistical fleets. Further, the speed and scale at which EVSE has been rolled out in China has led to a substantial reduction (almost 70%) in manufacturing costs of the underlying charger modules for fast charging stations.

With rising sophistication and growth in the sector, access to public charging needs to evolve in commensurate fashion. Specifically, in the long run, the EV ecosystem must aspire towards a level of functionality which consumers are familiar with in terms of traditional vehicles. Yet, at present, most EV charging occurs at private hubs only. An appropriate number of chargers per EV will depend on local conditions and requirements, including in respect of real estate availability, median travel distances, population density, and a reliance on ‘private’ charging (at home or at the workplace). While private modes of charging are likely to continue in terms of matching a large part of the aggregate demand, the number of public chargers still needs to expand manifold. Moreover, planning for long journeys requires EV chargers to be both publicly accessible

<sup>141</sup> Comprising a system with bi-directional electrical energy flow between plug-in EVs and the power grid. This, in turn, improves the performance of electrical components and adds value for EV owners.

<sup>142</sup> As the name suggests, ‘range anxiety’ is the fear that an EV will not have enough battery charge to reach its destination, leaving its occupants stranded. This anxiety is particularly prominent when considering long-distance travel along stretches

and fast performing. Unless consumers who lack the means to access private EVCS are appropriately incentivized, range anxieties<sup>142</sup> alone may continue to pose a significant obstacle in widespread EV adoption.

### ZEV Mandates

Given that new registrations of EVs still account for less than a twentieth of annual sales, industry stakeholders have suggested that a regulatory mandate for Zero Emission Vehicles (“ZEV”) may be necessary in India. Such a mandate may establish EV-related percentage targets for annual production/sales, along with a credit trading mechanism to generate additional income streams.<sup>143</sup> For instance, the EU, China, and several states in the US have adopted ZEV mandates with credit/offset-based elements along with financial penalties for non-compliance, leading to a significant growth in EV sales. The state of California, for example, which has more ZEV models than the rest of the US combined, has a percentage credit requirement, where such credits – awarded based on ZEV sales – can be traded.

Indeed, ZEV mandates globally have helped accelerate EV incorporation into mainstream transport, including by diversifying the range of products, providing roadmaps for innovation, pushing down prices, promoting investments in charging infrastructure, and generally building confidence among investors and consumers. Further, like in Europe, in order to increase electrification, India could redesign its extant fuel economy regulations<sup>144</sup> in a manner that champions technological innovation. That way, domestic manufacturers may be incentivized to make more EVs for the purpose of meeting fleet average norms.

### Dependence on Imports for Raw Materials: Lithium

As evident from a 2022 press release issued by the Ministry of Mines,<sup>145</sup> India remains heavily reliant on

of road where EV charging points might be few and far between. See [here](#).

<sup>143</sup> See [here](#).

<sup>144</sup> See the fuel economy norms on the website of the Bureau of Energy Efficiency, Ministry of Power, available [here](#).

<sup>145</sup> See [here](#).

imports from Hong Kong and China to satisfy local demand for lithium and lithium-ion (together, “**li-ion**”) for the purpose of EV battery production. Li-ion accounts for almost 40% of the total cost of an EV. Due to supply chain issues and high import dependence, India’s original equipment manufacturers (“**OEMs**”), and ultimately consumers, remain leashed to higher priced EVs relative to traditional vehicles. This keeps the Indian EV industry susceptible to global supply chain disruptions.<sup>146</sup>

Another major barrier to India’s EV growth is the country’s poor access to key raw materials such as lithium, nickel, cobalt, and manganese, which collectively account for 80% of EV cell costs. India not only has low lithium and cobalt reserves, but it also lacks necessary mineral refining capabilities in this regard.<sup>147</sup>

## CONCLUSION

To address India’s reliance on li-ion imports, local battery manufacturing plants and OEMs could develop their in-house capabilities further, including through foreign partnerships, alliances with global technology players, and joint ventures and acquisitions. Metal and mining companies could also invest towards refining their capabilities and acquiring global resources. Meanwhile, technology-led start-ups in India have already started foraying into cell/battery manufacturing. Ultimately, developing indigenous EV cell technologies at scale and suited to local climatic conditions remains a critical requirement, including for reasons of passenger and vehicular safety. Like China, India needs to continue focusing robustly on R&D and attract more FDI in the sector.

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<sup>146</sup> See [here](#).

<sup>147</sup> See [here](#).

# Renewed Focus: New Norms Directing the Electric Vehicles Sector

FEBRUARY 14, 2023

Over the last few months, various cross-cutting laws and policies related to electric vehicles (“EVs”) have been introduced in India, spanning several discrete pivots and ministries.

For instance, the government has continued with its focus on ramping up local manufacturing, such as through FAME 2 and the Production Linked Incentive (PLI) scheme for EVs and advanced chemistry cells (ACCs), respectively. In the last Budget, the government doubled its financial allocation for FAME 2 and increased customs duties on imports of semi-knocked down and built EV units.

Next, a renewed focus on emissions and waste reduction has been instrumentalized recently through amendments to the Energy Conservation Act, 2001 (“ECA”) and the Battery Waste Management Rules (“BWM Rules”). Through the amended ECA, which now includes vehicular emissions, the central government has been empowered to specify a carbon credit trading scheme. Further, vehicle manufacturers who violate fuel consumption norms will be further penalized.

## MORE PERKS

The Bureau of Energy Efficiency may also specify energy consumption standards for vehicles, along with a carbon credit system for compliance with corresponding regulations. In the future, charging systems could thus earn carbon credits for providing renewable energy to run EVs. Owners of EV charging stations could then generate additional revenue from this parallel income stream.

Further, a regulatory mandate for zero emission vehicles (“ZEV”) may establish percentage targets for annual EV production/sales. The State of California in the US, for example, has a percentage credit requirement for ZEV sales, where such credits can be traded. Like Europe, India could also redesign its fuel economy regulations in a manner

that champions technological innovation. That way, domestic manufacturers may be incentivized to make more EVs for the purpose of meeting fleet average norms.

Meanwhile, under the new BWM Rules (which cover EV batteries), defined producers are required to collect and recycle/refurbish those batteries which they introduce into the market under an ‘extended producer responsibility’ (“EPR”) regime. The rules aim to provide for an exchange of EPR certificates between producers and recyclers to comply with EPR obligations. In general, the new rules intend to encourage new industries and business opportunities along with new technologies and investments in the recycling industry.

## REVISED GUIDELINES

In addition, charging infrastructure and batteries have emerged as a distinct pivot. In this regard, revised guidelines about EV charging infrastructure have been issued by the Ministry of Power. The Ministry of Housing and Urban Affairs have also amended the model building by-laws of 2016 to include provisions for installing EV charging infrastructure in buildings. Further, the viability gap funding for battery energy storage systems announced in the Budget may create additional infrastructure.

Moreover, a draft battery swapping policy, released for comments by NITI Aayog in April 2022, may be finalized soon. On the other hand, in response to incidents of fire in electric two-wheelers, amendments were introduced in EV battery testing standards by the Ministry of Road Transport and Highways late last year. A few months before that, performance standards for EV batteries were formulated by the Bureau of Indian Standards.

With all these developments in regulations, the electric vehicles segment is really getting charged-up.

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Authored by [Deborshi Barat](#) (Counsel), first published by [The Hindu Businessline](#) on February 12, 2023.

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# Being Cool: Investment Opportunities and Policy Imperatives to Combat Global Warming

February 21, 2023

Various studies have found that a steady rise in temperatures across India can significantly compromise biological, social, and labour productivity over the long-term, and perhaps by the end of this decade. Further, such heat-related stress upon both population and economy has increased corresponding cooling demands. In this regard, a recent World Bank report attempts to identify opportunities in certain cooling sectors for private investment, such as in respect of: (i) space cooling in buildings, (ii) cold chain and refrigeration, (iii) passenger transport air-conditioning, and (iv) refrigerants. Nevertheless, such opportunities need to be balanced with the country's international obligations in connection with hydrochlorofluorocarbons (HCFCs) and hydrofluorocarbons (HFCs), respectively, including under the Montreal Protocol.

While HCFCs with ozone depletion potential are poised to be phased out in India by the year 2030, the country recently approved the ratification of the Kigali Amendment pursuant to which the focus will now shift to reducing HFCs.

<sup>148</sup> Press Release dated November 30, 2022, available [here](#) (the "WB Press Release").

<sup>149</sup> See 'Climate Investment Opportunities in India's Cooling Sector,' available [here](#). The study was conducted by the World Bank in partnership with environmental and climate-solution consulting groups, Iora Ecological Solutions, Energe-se, Tessel and Vertiver.

<sup>150</sup> See "Climate risk and response: Physical hazards and socioeconomic impacts – Will India get too hot to work?," Case Study, November 2020, McKinsey Global Institute; available at: <https://www.mckinsey.com/~media/mckinsey/business%20functions/sustainability/our%20insights/will%20india%20get%20too%20hot%20to%20work/will-india-get%20too-hot-to-work-vf.pdf>

<sup>151</sup> See p. 9 of the McKinsey Study:

We find that India could become one of the first places in the world to experience heat waves that cross the survivability limit for a healthy human being sitting in the shade."

Although HFCs do not deplete the ozone layer (like HCFCs do), they are potent greenhouse gases which contribute significantly to global warming and exacerbate climate change. Further, the HFC phase down schedule under the Kigali Amendment is expected to achieve a reduction in carbon dioxide emissions as well with the aim of avoiding a global temperature rise of up to 0.5 degree Celsius by the year 2100.

However, these mitigation strategies remain inadequate for the purpose of reducing global temperatures. Emissions from short-lived climate pollutants (SLCPs) need to be addressed too, and quickly. Innovative investment opportunities, such as through seaweed start-ups that focus on improving bovine feed for the purpose of reducing agricultural methane emissions, could be explored further in the future.

## INTRODUCTION

A recent<sup>148</sup> report on investment opportunities in India's 'cooling sector' by the International Bank for Reconstruction and Development (the "World Bank," and such report, the "World Bank Report")<sup>149</sup> finds India experiencing higher temperatures with every subsequent year. This trend includes the possibility that more than 200 million people across the country will be annually exposed to crippling heat waves by the end of the decade. At this rate, according to a 2020 case study by the McKinsey Global Institute (the "McKinsey Study"),<sup>150</sup> India could soon witness the kind of heat that breaches human survival requirements.<sup>151</sup>

Rising heat can jeopardize economic productivity too, and significantly so – according to the McKinsey

The human body must maintain a relatively stable core temperature of approximately 37 degrees Celsius to function properly. Pushing the core temperature out of equilibrium only a few degrees in either direction results in rapid negative consequences. See Gaither D. Bynum *et al.*, "Induced hyperthermia in sedated humans and the concept of a critical thermal maximum," American Journal of Physiology, November 1978, Volume 235, Number 5.

Also see P. A. Hancock and Ioannis Vasmatzidis, "Human occupational performance limits under stress: The thermal environment as a prototypical example," Ergonomics, 1998, Volume 41, Number 8. Performance under heat stress declines rapidly: the core temperature needs to rise only 0.06 degree to compromise task performance requiring vigilance, 0.2 degree to compromise multitasking ability, 0.9 degree to compromise neuromuscular coordination, 1.3 degrees to affect simple mental performance, 3 degrees to induce dangerous heat stroke, and 5 degrees to cause death.

Study.<sup>152</sup> Three-quarters of India's workforce are engaged in heat-exposed labour, which, in turn, not only contributes to nearly half of the country's GDP but also drives a third of GDP growth. Particularly vulnerable sectors include agriculture and mining, as well as those with poor access to air conditioning ("AC") such as manufacturing and transport. Accordingly, the World Bank Report warns that by 2030, almost 35 million Indians might lose their jobs on account of heat-related stress.<sup>153</sup> More specifically, while the McKinsey Study found that lost labour from rising heat and humidity could risk up to 4.5% of India's GDP by the end of the decade, a *Nature* study<sup>154</sup> from December 2021 found that countries with large populations in South and East Asia witnessed the most number of lost work hours, with India facing the largest impact on heavy labour on account of heat exposure: in excess of 100 billion hours lost per year.

## INVESTING IN INDIA'S COOLING SECTOR

Unsurprisingly, as temperatures rise, so will demands for cooling.<sup>155</sup> India's long-term food and public health security (including in respect of transporting fresh produce and pharmaceutical

products) will depend upon the country's access to a reliable cold chain network. Accordingly, harnessing available programs, such as the "Make in India" or the "Production Linked Incentive" schemes, can help boost investments, promote manufacturing, and create jobs across the cooling value chain. Further, investments in both adaptive technology and infrastructure may reduce the direct consequences of heat.

In 2019, the Indian Government launched the India Cooling Action Plan ("ICAP").<sup>156</sup> However, challenges in its implementation remain.<sup>157</sup> Accordingly, the World Bank Report identifies opportunities for concessional financing<sup>158</sup> and private sector investment in four sectors: (i) space cooling in buildings, (ii) cold chain and refrigeration, (iii) passenger transport air-conditioning, and (iv) refrigerants.<sup>159</sup>

## Space Cooling

With 10 million new homes required to be built every year to keep pace with domestic demand in India, the World Bank Report identifies significant opportunities to introduce natural cooling techniques into climate-responsive construction. Further, the

<sup>152</sup> See p. 10 of the McKinsey Study:

"We further estimate that the effective number of outdoor working hours lost will increase approximately 15 percent by 2030, resulting in approximately 2.5-4.5 percent, or \$150-250 billion, risk to GDP."

<sup>153</sup> Wet-bulb temperature is an indicator that combines air temperature and relative humidity. It provides a more accurate measure of heat stress on the human body than does air temperature alone. Over the past 30 years, maximum wet-bulb temperatures across India have steadily climbed, driven by an increase in humidity. High wetbulb temperatures are more dangerous to human beings than extreme air temperatures. Wet-bulb temperature is technically defined as the minimum temperature to which a parcel of air can be cooled by evaporation at a constant pressure. As wet-bulb temperatures increase, the ability of human beings to exert effort or perform work decreases due to two factors: firstly, the need to take breaks to avoid the physiological consequences of core temperature rise, and secondly, the body "self-limiting" or instinctively fatiguing, to prevent overheating. See TordKjellstrom et al., "Estimating population heat exposure and impacts on working people in conjunction with climate change," *International Journal of Biometeorology*, March 2018, Volume 62, Number 3.

<sup>154</sup> Parsons, L.A., Shindell, D., Tigchelaar, M. et al. Increased labour losses and decreased adaptation potential in a warmer world. *Nat Commun* 12, 7286 (2021).

<sup>155</sup> See p. 36 of the World Bank Report:

"India, with its predominantly tropical climate, is experiencing escalating temperatures along with population growth and rapid urbanization, contributing to a steep increase in cooling demand for which India will require massive cooling infrastructure across sectors."

<sup>156</sup> The Ministry of Environment, Forests, and Climate Change released the India Cooling Action Plan ("ICAP") in March 2019. Built over a 20-year timeline, ICAP is a multi-stakeholder-driven framework that identifies diverse sustainable cooling needs and issues recommendations across key sectors, including space cooling in buildings, agriculture and pharmaceutical cold chains, refrigeration, passenger transportation, and refrigerants transition. It also lists actions across sectors to help reduce India's cooling demand. See Radhika Lalit and Ankit Kalanki, *How India is solving its cooling challenge*, Rocky Mountain Institute, 2019; India Cooling Action Plan, Government of India, Department of Environment, Forests, and Climate Change, 2018.

<sup>157</sup> The World Bank commissioned the World Bank Report to develop an actionable roadmap comprising policy, investment, and knowledge guidelines to help guide the implementation of ICAP.

<sup>158</sup> Concessional finance is below market rate finance provided by major financial institutions, such as development banks and multilateral funds, to developing countries to accelerate development objectives. The term 'concessional finance' does not represent a single mechanism or type of financial support but comprises a range of below market rate products used to accelerate a climate or development objective.

<sup>159</sup> According to ICAP, cooling demand across India is projected to rise at a rate of 15-20% annually, and aggregated cooling demand will grow to around eight times by 2037-38 (compared to a 2017-18 baseline). Space cooling for buildings has the largest current and projected cooling demand, refrigerant demand, energy consumption, and associated GHG emissions as compared to other sectors. Accordingly, the World Bank Report focuses on ICAP's thematic cross-sectoral areas including space cooling in buildings, cold chain and refrigeration, transport airconditioning, and refrigerants.

World Bank Report estimates the market potential in space cooling to reach USD1.5 trillion by the year 2040. Within this market, green buildings<sup>160</sup> themselves have an investment potential of approximately USD1.25 trillion and USD228 billion, for purposes of residential and commercial use, respectively. Effective land use is also crucial. In this regard, urban centres, in particular, may require private sector participation.<sup>161</sup>

### Cold Chain and Refrigeration

The World Bank Report estimates that investment opportunities in India's cold chain and refrigeration sector will be almost USD30 billion by 2038. Other estimates suggest that investments worth about USD12 billion will be required for the purpose of developing physical infrastructure, along with transport-related elements, with regard to the agriculture cold chain alone – the biggest requirement attributable to building modern packhouses (about USD8.5 billion).

### Passenger Transport Air-conditioning

The World Bank Report estimates the market potential and investment opportunity in passenger transport to be USD8 billion. Further, the AC market for Indian passenger cars is predicted to cross USD1 billion by next year. According to ICAP, refrigerant demand for the mobile airconditioning sector (comprising passenger cars, buses, and railways) is expected to quadruple by 2037-38.

<sup>160</sup> Generally speaking, a 'green building' involves the planning, design, construction, and operations of a building with certain key considerations, including those related to energy use, water use, indoor environmental quality, material selection, and the building's effects on the concerned site and surroundings. The Indian Green Building Council (IGBC) offers services in this regard, which include developing new green building rating and training programs along with certification services. Certain government agencies have issued recognitions to IGBC's green rating systems. See <https://igbc.in/igbc/>.

<sup>161</sup> Guidelines for implementation of local and city-wide urban cooling measures, such as cool roofs and nature-based solutions, can support urban planning frameworks while integrating effective responses to heat-related stress.

<sup>162</sup> GWP is defined as the cumulative radiative forcing, both direct and indirect effects, over a specified time horizon resulting from the emission of a unit mass of gas related to some reference gas. GWP has been developed as a metric to compare (relative to another gas) the ability of each GHG to trap heat in the atmosphere. Carbon dioxide was chosen as the reference gas to be consistent with the guidelines of the Intergovernmental Panel on Climate Change ("IPCC").

### Refrigerants

Refrigerant demand is expected to grow more than six times over two decades. In 2015, the AC sector had the largest market share among all such sectors, estimated at more than three-fifths of aggregate refrigerant consumption in India. However, along with market share, the country's commercial refrigeration sector was the highest consumer of hydrochlorofluorocarbons ("HCFCs") as well. HCFCs are chemical compounds commonly used in the foam, refrigeration, and air-conditioning sectors that deplete the ozone layer and contribute to climate change. By global consensus, it is essential to phase out the use of HCFCs across industries. Currently, the most common alternatives to HCFCs are hydrofluorocarbons ("HFCs"), which do not deplete the earth's ozone layer but are nevertheless powerful greenhouse gases ("GHGs") having high 'Global Warming Potential' ("GWP"),<sup>162</sup> and thus contribute significantly to climate change.

### HCFCs AND HFCs

Having implemented the first stage of the phaseout management plan related to HCFCs under the Montreal Protocol on Substances that Deplete the Ozone Layer (the "**Montreal Protocol**"),<sup>163</sup> India is now implementing the second. While HCFCs with ozone depletion potential will be phased out in India by 2030, the country recently approved the ratification of the Kigali Amendment<sup>164</sup> to the Montreal Protocol (such amendment, the "**Kigali Amendment**"),<sup>165</sup> pursuant to which the focus will now shift to phasing down HFCs.<sup>166</sup>

<sup>163</sup> The Montreal Protocol was adopted on September 16, 1987, and entered into force in 1989. It is a multilateral environmental agreement. The phase-out plan under the Montreal Protocol includes both the production and consumption of ozone depleting substances ("ODS").

<sup>164</sup> Recognizing the growth in use of HFCs, especially in the refrigeration and air-conditioning sectors, the parties to the Montreal Protocol agreed, at the 28<sup>th</sup> meeting of the parties held in October 2016 at Kigali, Rwanda, to add HFCs to the list of controlled substances, and further, approved a timeline for the gradual reduction of HFCs by 8085% by the late 2040s.

<sup>165</sup> See "Cabinet approves Ratification of Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer for phase down of Hydrofluorocarbons – National strategy for phase down of Hydrofluorocarbons after required consultation with all the industry stakeholders by 2023," PIB, August 18, 2021 (the "**Kigali Press Release**"); available at: <https://pib.gov.in/PressReleasePage.aspx?PRID=1746946>.

<sup>166</sup> HFCs are factory-made chemicals used primarily in air-conditioning, refrigeration, and insulating foams. HFCs are among the fastest growing GHGs in much of the world, increasing at a rate of 10-15% per year.

While the air-conditioner remains the most effective tool for combating heat, widespread expansion of installed air-conditioning runs the risk of increasing GHG emissions and exacerbating climate change. The World Bank Report predicts a rise in demand for refrigerant based vapor compression technologies to meet cooling requirements of buildings in India. However, the domestic refrigerant sector aims to transition away from HFCs – given India's commitment to the Montreal Protocol.

### The Montreal Protocol

By the mid-1980s, scientific understanding related to atmospheric ozone depletion had crystallized, along with a consensus about adverse consequences on human health and the global environment on account of such depletion.<sup>167</sup> Accordingly, the Vienna Convention for the Protection of the Ozone Layer was negotiated. However, this treaty, in essence, is a framework convention. Thus, despite laying out principles as agreed upon by participants, it does not require countries to take concrete actions with respect to controlling emissions for the purpose of protecting the ozone layer.<sup>168</sup>

On the other hand, the Montreal Protocol regulates the production and consumption of several man-made chemicals that deplete the earth's stratospheric ozone layer when released into the atmosphere. Such chemicals are referred to as ozone depleting substances (“ODS”). The Montreal Protocol contemplates a staggered phasedown of ODS with different timetables for developed and

developing countries, respectively. Although developing and developed countries have equal but differentiated responsibilities, both groups have binding, time-targeted, and measurable commitments.<sup>169</sup>

### The Kigali Amendment

The parties to the Montreal Protocol meet once a year to make decisions aimed towards successful implementation of the protocol, including in respect of adjusting or amending such protocol.<sup>170</sup> In 2016, for instance, the Kigali Amendment called for the phase-down of HFCs.<sup>171</sup>

### INDIA AND THE KIGALI AMENDMENT

The union cabinet press release announcing India's ratification of the Kigali Amendment in 2021 (the “**Kigali Press Release**”)<sup>172</sup> expressed optimism about the scope for domestic manufacturing of equipment, along with alternative non-HFC and low-GWP chemicals for the purpose of enabling a national transition consistent with India's obligations under the Kigali Amendment. In addition, the Kigali Press Release spoke about opportunities to promote domestic innovation in respect of alternative refrigerants and related technologies.<sup>173</sup> In terms of the HFC phasedown schedule under the Kigali Amendment, along with gains in energy efficiency, it is expected to achieve a reduction in carbon dioxide (“CO<sub>2</sub>”) emissions with the aim of avoiding a global temperature rise of up to 0.5 degree Celsius by the turn of the century.

<sup>167</sup> Prior to 1989, most air-conditioning units used a class of coolants called hydrochlorofluorocarbons (“HCFCs”). After it was discovered that HCFCs deplete the ozone layer, global consensus gave rise to the 1987 Montreal Protocol, which required manufacturers to switch to alternative, non-ozone-degenerative coolants. Among the most popular classes of alternative coolants are HFCs. Although they do not deplete the ozone layer, they are extremely powerful GHGs. For example, releasing one tonne of HFC-410a into the atmosphere is the equivalent of releasing 2,088 tonnes of carbon dioxide. See Mohit Sharma, Vaibhav Chaturvedi, and Pallav Purohit, “Long-term carbon dioxide and hydrofluorocarbon emissions from commercial space cooling and refrigeration in India: A detailed analysis within an integrated assessment modelling framework,” *Climatic Change*, August 2017, Volume 143, Number 3–4.

<sup>168</sup> It is an instrument for harmonizing policies and strategies on research. See “Decision VC I/3: Relationship between the Vienna Convention and the Montreal Protocol,” available at: <https://ozone.unep.org/treaties/viennaconvention/meetings/first-conference-parties/decisions/decision-vc-i3-relationship-between-vienna-conventionand-montreal-protocol>

<sup>169</sup> The Montreal Protocol includes provisions related to Control Measures (Article 2), Calculation of control levels (Article 3),

Control of trade with non-Parties (Article 4), Special situation of developing countries (Article 5), Reporting of data (Article 7), Non-compliance (Article 8), Technical assistance (Article 10), along with provisions related to other topics. The substances controlled by the Montreal Protocol are listed in its Annex A (CFCs, halons), Annex B (other fully halogenated CFCs, carbon tetrachloride, methyl chloroform), Annex C (HCFCs), Annex E (methyl bromide), and Annex F (HFCs).

<sup>170</sup> Such separate adjustments and amendments to the Montreal Protocol were adopted by the meetings of the parties in 1990 (London), 1992 (Copenhagen), 1995 (Vienna), 1997 (Montreal), 1999 (Beijing), 2007 (Montreal), 2016 (Kigali), and 2018 (Quito).

<sup>171</sup> At the 28th meeting of the parties to the Montreal Protocol held in Kigali between October 10 and 15, 2016, such parties adopted a further amendment to the Montreal Protocol in accordance with the procedure laid down in paragraph 4 of article 9 of the 1985 Vienna Convention for the Protection of the Ozone Layer.

<sup>172</sup> The Kigali Amendment entered into force on January 1, 2019, subject to certain exceptions and qualifications. 146 countries are parties to such amendment as of date.

<sup>173</sup> See the Kigali Press Release.



## SLCPS

Unfortunately, India's aggressive CO<sub>2</sub> mitigation initiatives and allied pivot towards renewable energy, although essential, are not enough.<sup>174</sup> Fast reductions of short-lived climate pollutants ("SLCPS")<sup>175</sup> are equally crucial, especially over the short-term.<sup>176</sup> Reducing SLCPS can (i) avoid four times more warming by the year 2050, and slow down warming one to two decades earlier (relative to what cutting down on CO<sub>2</sub> emissions alone can achieve); (ii) decrease the current rate of global warming by half; and (iii) provide global benefits for climate, crops, and health which is valued at almost USD6 trillion annually, starting from the year 2030. Apart from HFCs, such SLCPS include, among other things, methane.<sup>177</sup>

## METHANE

India did not sign the Global Methane Pledge<sup>178</sup> at the 26th United Nations Climate Change Conference (COP26)<sup>179</sup> despite being one of the largest

methane emitters in the world.<sup>180</sup> Methane has more than 80 times the warming power of CO<sub>2</sub> over the first 20 years after it reaches the atmosphere. Even though CO<sub>2</sub> has a longer-lasting effect, methane sets the pace for warming in the near term. At least a fourth of today's global warming is driven by anthropogenic methane emissions (*i.e.*, those stemming from human actions).<sup>181</sup>

Most Indian methane emissions can be traced back to agriculture (about 75%).<sup>182</sup> In turn, the largest source of agricultural methane is enteric fermentation, generated in the digestive tracts of ruminant livestock. The fact that India has the largest cattle population in the world further complicates the issue.<sup>183</sup>

## SEAWEED START-UPS

However, a key method for reducing agricultural methane emissions is by manipulating microbial processes in bovine feed and gut through the introduction of seaweed-extract additives.<sup>184</sup>

<sup>174</sup> Achieving 'net-zero' CO<sub>2</sub> emissions is essential towards global decarbonization goals. However, decarbonization alone, and on its own, will *not* keep the planet from exceeding the 1.5 °C limit, and thereby facing a climate catastrophe. Even the most aggressive decarbonization efforts will not have a discernible cooling effect until midcentury, when it can avoid 0.1°C. Recent science and mitigation reports prepared by the IPCC, such as the Sixth Assessment Report of the IPCC (AR6), confirm the need for a dual strategy to slow down both near-term and longterm warming.

<sup>175</sup> Since SLCPS have atmospheric lifetimes ranging from only a few days to a decade and a half (compared to CO<sub>2</sub> which can persist in the atmosphere for millennia), these super pollutants are considered 'short-lived'.

<sup>176</sup> Reducing SLCPS is the best, and likely the only, strategy that will avoid near-term warming fast enough to prevent the world economy from losing control of the climate system. See Dreyfus G. B., Xu Y., Shindell D. T., Zaelke D., & Ramanathan V. (2022) Mitigation climate disruption in time: A self-consistent approach for avoiding both nearterm and long-term global warming, PROC. NAT'L. ACAD. SCI. 119(22).

<sup>177</sup> SLCPS include methane, tropospheric ozone, black carbon, and HFCs. Methane is a powerful GHG with a 100year GWP – *i.e.*, 21 times that of CO<sub>2</sub>. Approximately 60% of methane is emitted to the atmosphere through human activities (anthropogenic emissions) such as oil and gas systems, agriculture, landfills, wastewater treatment, and emissions from coal mines. Methane has contributed to about one-third of current anthropogenic GHG-driven warming. See *Methane matters*. Nat. Geosci. 14, 875 (2021), available at: <https://www.nature.com/articles/s41561-021-00875-1#citeas>

<sup>178</sup> The Global Methane Pledge, launched in 2021, aims to keep alive the 1.5 degrees Celsius goal. Over 100 countries have committed to reducing global methane emissions by at least 30% by 2030 from 2020 levels. This reduction could eliminate over 0.2°C warming by 2050.

<sup>179</sup> Held at Glasgow in 2021.

<sup>180</sup> See <https://www.iea.org/reports/global-methane-tracker-2022/the-global-methane-pledge>

<sup>181</sup> See "Methane: A crucial opportunity in the climate fight," Environmental Defense Fund (EDF), available [here](https://www.edf.org/press-releases/methane-a-crucial-opportunity-in-the-climate-fight).

<sup>182</sup> The two predominant sources of methane emissions in India are enteric fermentation and paddy cultivation. These emissions result from the agricultural activities of small, marginal, and medium farmers across India. India's methane emissions in 2016 (excluding land use, land-use change and forestry (LULUCF) activities) were 409 million tonnes of CO<sub>2</sub> equivalent, of which 73.96% was from the agriculture sector, 14.46% from the waste sector, 10.62% from the energy sector, and 0.96% from industrial processes and the product use sector.

<sup>183</sup> See LOK SABHA UNSTARRED QUESTION NO. 2478, "Emission on Methane," asked by Smt. MANEKA SANJAY GANDHI, answered on December 13, 2021 by the MINISTER OF STATE IN THE MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE, SHRI ASHWINI KUMAR CHOUBEY; available at: <https://164.100.24.220/loksabhaquestions/annex/177/AU2478.pdf>

<sup>184</sup> See Lauren Kramer, "Aquaculture pioneer Josh Goldman's Asparagopsis venture aims to reduce methane emissions in terrestrial farming," Global Seafood Alliance, October 14, 2019, available at: <https://www.globalseafood.org/advocate/beefing-up-seaweed-production-to-green-up-beef/>; Kinley, Robert D., de Nys, Rocky, Vucko, Matthew J., Machado, Lorenna, and Tomkins, Nigel W. (2016) *The red macroalgae Asparagopsis taxiformis is a potent natural antimethanogenic that reduces methane production during in vitro fermentation with rumen fluid*. Animal Production Science, 56 (3). pp. 282-289, available at: <https://researchonline.jcu.edu.au/43225/>; Judith Lewis Mernit, "How Eating Seaweed Can Help Cows to Belch Less Methane," Yale School of the Environment, July 2, 2018, available at: <https://e360.yale.edu/features/how-eating-seaweed-can-help-cows-to-belch-less-methane>; James Temple, "Seaweed could make cows burp less methane and cut their carbon hoofprint," MIT Technology Review, November 23, 2018 ("A diet supplemented with red algae could lessen the huge amounts of greenhouse gases emitted by cows and sheep, if we can just

Accordingly, seaweed start-ups across the world<sup>185</sup> are now raising capital to expand operations.<sup>186</sup> According to global estimates, the commercial seaweed market was valued at over USD40 billion in 2020.<sup>187</sup> Participants in this market remain involved in a number of strategic initiatives, including with respect to mergers and acquisitions, geographical expansion, scaling up production capacity, and partnerships.<sup>188</sup> Most money raised so far has been in pre-seed and seed rounds. Although corporate and venture capital (“VC”) investments dominate this space, traditional VCs are yet to meaningfully discover the seaweed industry relative to other options and sectors in the market. While Europe leads in terms of having the largest number of seaweed start-ups, both in terms of the number of deals and the amount of money invested, North American start-ups are able to attract capital more easily, consistent with trends across industry. Nevertheless, a majority of companies that raise funds are vertically integrated to some extent: thus, most seaweed producers also process their own ‘crops’ into finished products.

figure out how to grow enough”), available at: <https://www.technologyreview.com/2018/11/23/1826/how-seaweed-could-shrink-livestocks-global-carbon-hoofprint/>.

<sup>185</sup> See “Seaweed startups in 2021: an ecosystem emerges,” Phyconomy, available at: <https://phyconomy.net/articles/state-of-the-seaweed-industry-2022/>. Phyconomy is a new project to track the emerging economy of seaweed.

<sup>186</sup> Last year, Symbrosia Inc., a US-based Hawaiian seaweed start-up that developed ‘SeaGraze’ – a seaweed additive made with the tropical seaweed *Asparagopsistaxiformis* – to reduce methane emissions in cattle belches, raised a further USD 7 million in new funding. In 2017, seaweed first made headlines when research showed that adding *Asparagopsistaxiformis* to cattle-feed helped reduce methane emissions in cow burps up to 50%. Several companies started developing sea plants in the hopes of reducing the climate impacts of cattle production. See State of the Seaweed Industry 2022, Phyconomy, available at: <https://phyconomy.net/state-of-the-industry-2022/>.

<sup>187</sup> <sup>41</sup> See “Commercial Seaweed Market,” Global Market Insights, Report ID: GMI1658, July 2021, available at: <https://www.gminsights.com/industry-analysis/commercial-seaweed-market>. However, according to a different report, the global commercial seaweed market was valued at about USD 14 billion in 2020. See “Commercial Seaweed Market,” Fortune Business Insights, Report ID FBI100077, July 2021, available at: <https://www.fortunebusinessinsights.com/industry-reports/commercial-seaweed-market-100077>.

<sup>188</sup> See “In 2021, seaweed investment deals doubled,” Phyconomy, available at: <https://phyconomy.net/articles/state-of-the-seaweed-industry-2022/>.

<sup>189</sup> See Nimesh Khakhariya, “Seaweed feed to reduce methane emission in bovine,” November 20, 2020, Times of India, available at: <https://timesofindia.indiatimes.com/city/rajkot/seaweed-feed-to-reduce-methane-emission-in-bovine/articleshow/79309067.cms>; also see “Seaweed Based

## India and Seaweed

In India too, a seaweed-based additive substance with regard to cattle-feed was developed around two years ago, and its commercial production subsequently approved.<sup>189</sup> Moreover, as part of its ‘Blue Revolution’,<sup>190</sup> India aspires to expand seaweed production to at least 1 million tons a year by 2025.<sup>191</sup> The country’s extensive coastline (almost 8,000 km), open waterways (14,500 km), and diverse ecosystems sustain thousands of seaweed species, each with substantial commercial value. In addition, collected seaweed can be used to create biofuels, the use of which is now being actively promoted in India.

Foreign entities have already invested in early-mover Indian companies engaged in the local seaweed industry.<sup>192</sup> Further, by sanctioning 100% FDI through the automatic route in both pisciculture and aquaculture, the Indian government is aiming to attract more foreign investors, even as domestic seaweed farming and aquapark investments continue to grow, especially in states such as Tamil Nadu and Gujarat.

New Animal Feed Additive Formulations for Improving Productivity and Health,” Central Salt & Marine Chemicals Research Institute, Council of Scientific & Industrial Research, updated on May 27, 2021, available at: <https://www.csmcri.res.in/node/8131>. Around the same time, FutureFeed, an Australian company, secured new funding from five separate investors using the same seaweed-based technology. See <https://www.future-feed.com/>; Jack Ellis, “CSIRO, Woolworths unveil FutureFeed, a seaweed supplement that cuts cow methane by 80%,” AgFunder News, August 20, 2020, available at: <https://agfundernews.com/futurefeed-gets-9-3m-from-csiro-woolworths-others-for-seaweed-supplement-that-cuts-cow-methane-by-80>.

<sup>190</sup> See ‘Blue Revolution’, Department of Fisheries, at: <https://dof.gov.in/blue-revolution>.

<sup>191</sup> See <https://www.investindia.gov.in/team-india-blogs/seaweed-india>.

<sup>192</sup> For instance, see Nell Lewis, “An Indian startup could revolutionize ocean farming with its ‘sea combine harvester,’” CNN Business, October 6, 2022, available at: <https://edition.cnn.com/2022/01/05/business/india-sea6-energy-seaweed-harvester-spc-intl/index.html>. Pursuant to a joint news release dated August 17, 2022, it was announced that (i) BASF Venture Capital GmbH, the corporate venture company of BASF SE, Germany, and (ii) Aqua-Spark, a Dutch investment fund focusing on the global aquaculture industry, were investing in Sea6 Energy Pvt. Ltd. (“Sea6 Energy,” an Indian seaweed company founded in 2020 and located in Bangalore) as part of a Series B round. Other existing investors in Sea6 Energy included Tata Capital Innovations Fund. With such investment, Sea6 Energy completed its Series B transaction of INR 1402 million (about USD 18.5 million) in total. See “BASF Venture Capital and Aqua-Spark invest in Sea6 Energy,” Joint News Release, August 17, 2022, available at: <https://www.basf.com/global/en/media/news-releases/2022/08/p-22-312.html>.

## SUGGESTIONS AND CONCLUSION

The World Bank Report suggests that with a steady rise in temperatures across India on account of climate change and a corresponding demand for cooling, the use of alternative, innovative, and energy-efficient technologies can produce investment opportunities aggregating USD1.6 trillion by the year 2040.<sup>193</sup> A supportive policy environment can boost further investment in India's cooling sector, including via insights from the World Bank Report that might be used to improve upon ICAP – including in terms of its implementation. While India's HFC/HCFC phaseout plans and corresponding obligations under the Montreal Protocol (along with the Kigali Amendment) may continue in tandem, the country's present initiatives towards decarbonization and renewable energy can be considerably strengthened through informed policy decisions with respect to reducing SLCPs as well (e.g., methane).

Given India's ambitious plans related to climate and promoting the ease of doing business, respectively, both domestic and foreign entities could explore relatively *avant-garde* options with respect to global warming including through investing in methane capture/reduction technologies. While certain causes of warming are universal, the source, nature, and extent of emissions, along with allied investment strategies differ from region to region (and/or across cultures and countries). Accordingly, seaweed start-ups that aim to scale up production with the goal of mitigating agricultural methane emissions are an illustration of a localized solution which could be replicated elsewhere and/or in other contexts.

For instance, given that the waste sector constitutes the second largest source of methane emissions in

India (about 15%), municipal authorities, private landfill owners, and project developers could finance landfill gas (“LFG”)<sup>194</sup> management systems.<sup>195</sup> Developing LFGs to energy<sup>196</sup> requires financial investments that are often beyond the reach of local governments or landfill owners alone. Obtaining financing typically requires a range of public and private actors to agree on how to incentivize development, equitably assign risk, divide potential project revenue, and support ongoing operations. Further, the profitability of LFG systems is subject to market volatility in natural gas, electricity, and carbon, as well as other factors such as regional variation in the cost of maintenance, availability of skilled labour, and ability to obtain spare parts. Consequently, LFG is a largely untapped municipal asset.

Nevertheless, a mixture of both innovative and traditional infrastructure-finance methods including through municipal infrastructure bonds, public-private partnerships, and leveraged government incentives can be, and have been, used to build effective LFG management systems around the world. In India too, the Ministry of New and Renewable Energy has launched a program to support the setting up of ‘waste to energy’ projects for generation of biogas from urban, industrial, and agricultural residue. This program provides central financial assistance to developers of such projects.<sup>197</sup> Large municipal waste dumpsites in India have, in fact, been turned into significant sources of green automotive fuel, converting LFG into compressed biogas.<sup>198</sup>

Paddy is another sector that could be tapped into. Along with bovine enteric fermentation, paddy cultivation is a major source of agricultural methane emissions in India. Accordingly, large investments

released into the atmosphere. Flaring (burning) or converting methane gas into an alternative energy source both reduce harmful emissions and have the potential to generate revenue for local governments or other landfill owners. Though there are many technologies available for LFG collection and combustion, the challenges involved in financing these systems continues to present a major obstacle to mitigating emissions from waste.

<sup>197</sup> See ‘Waste to Energy (WTE) Schemes,’ MNRE, available at: <https://mnre.gov.in/waste-to-energy/schemes>.

<sup>198</sup> See, e.g., “Telangana: India's Largest Landfill Based Biogas Plant Inaugurated In Hyderabad,” India Infra Hub, October 29, 2021, available at: <https://indiainfrahub.com/2021/waste-management/telangana-indias-largest-landfill-based-biogas-plant-inaugurated-in-hyderabad/>.

<sup>193</sup> See the WB Press Release

<sup>194</sup> Landfills and dumpsites contain a significant amount of biodegradable waste, including food scraps and agricultural refuse. When these organic materials break down in municipal landfills, various gases known collectively as landfill gas (LFG) are produced and either build up within such landfills or get discharge into the atmosphere. Managing LFGs is a growing challenge around the world. LFG is a by-product of decomposing waste and a significant source of methane.

<sup>195</sup> See Markgraf, Claire and Kaza, Silpa. 2016. Financing Landfill Gas Projects in Developing Countries. Urban Development Series Knowledge Papers, no. 23; World Bank, Washington, DC.

<sup>196</sup> While diverting organic waste entirely from landfills would obviate the need to manage corresponding emissions, a second-best solution is the capture and combustion of LFG before it is

are needed across rice value chains to transform the sector. To achieve this goal, governments can leverage public finance to attract private investment, over and above existing initiatives such as the Gobardhan Scheme,<sup>199</sup> direct seeded rice,<sup>200</sup> crop diversification program,<sup>201</sup> and system for rice intensification<sup>202</sup> (in India). For example, the Thai Rice Nationally Appropriate Mitigation Action (NAMA)<sup>203</sup> project<sup>204</sup> uses overseas development assistance to finance a revolving fund for integrating locally adapted best management practices in combination with laser land levelling<sup>205</sup> to facilitate private sector involvement. In fact, one of the key factors driving the growth of the global laser land leveller industry is the rising demand for water-saving technologies in agriculture owing to climate change.<sup>206</sup> Further, impact investors could include rice in their portfolios and investment strategies.

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<sup>199</sup> The Indian Government is taking a number of initiatives to reduce methane emissions. Through initiatives like 'The Gobar (Galvanizing Organic Bio-Agro Resources) – Dhan' scheme (the "Gobardhan Scheme") and the New National Biogas and Organic Manure Programme, cattle waste utilization is being incentivized, in addition to the promotion of clean energy in villages. Among other things, the Gobardhan Scheme supports biodegradable waste recovery, conversion of waste into resources, and reduction of GHG emissions.

<sup>200</sup> This system reduces methane emissions because it does not involve raising nurseries, puddling, and transplanting. Unlike transplanted paddy cultivation, standing water is not maintained in this system.

<sup>201</sup> Methane emissions are avoided due to diversion of paddy to alternative crops like pulses, oilseeds, maize, cotton and agroforestry.

<sup>202</sup> The technique has the potential to enhance rice yield from 36-49% with about 22-35% less water than conventional transplanted rice.

<sup>203</sup> The decision-making body of the NAMA Facility is the NAMA Facility Board, currently comprising representatives of donors

including: the Germany Federal Ministry for Economic Affairs and Climate Action; UK's Department for Business, Energy and Industrial Strategy; the Danish Ministry of Climate, Energy and Utilities; the Danish Ministry of Foreign Affairs; the European Union; and the Children's Investment Fund Foundation.

<sup>204</sup> Thai Rice NAMA is a joint project funded by NAMA Facility with the Thai government. Thai rice is significant because it is cultivated on almost half of all agricultural land in Thailand, accounting for nearly 55% of Thai emissions from agriculture. Thailand is the world's fourth-largest emitter of rice-related GHG. In irrigated rice production, flooding of paddy fields leads to significant emissions of methane.

<sup>205</sup> Laser levelling is the process of smoothing the land surface  $\pm 2$  cm from its average elevation by using laser equipped drag buckets to achieve precision in land level.

<sup>206</sup> See "Laser Land Levelers Market by Type, End-user, and Geography - Forecast and Analysis 2022-2026," Technavio, Report, April 2022; available at: <https://www.technavio.com/request-report?path=laser-land-levelers-marketindustry-size-analysis>.



# Green Buildings and Energy Efficiency: The India Story

MARCH 22, 2023

## INTRODUCTION

With 10 million new homes required to be built every year to keep pace with Indian housing demand, significant opportunities exist with regard to establishing new techniques in climate-responsive construction. Within this market, green buildings<sup>207</sup> have immense investment potential for both residential and commercial use.

Most markets around the world, including emerging ones, remain deeply engaged in the process of articulating, and eventually pursuing, sustainability and/or other allied goals, such as those stemming from climate change, global warming, as well as environmental, social, and governance-related (“**ESG**”) priorities. As part of their short-term goals on ESG, listed developers may want to substantially increase their green portfolio by the end of the decade, along with ramping up deployment of renewable energy. Further, an increasing number of real estate investment trusts (“**REITs**”) are participating in global ESG benchmarks for commercial real estate.

Accordingly, it is useful to examine the actual cost of pursuing such goals. This pursuit includes making informed estimates about the availability of resources and funding with respect to goal-realization, especially given extant housing demand

<sup>207</sup> Generally speaking, a ‘green building’ involves the planning, design, construction, and operations of a building with certain key considerations, including those related to energy use, water use, indoor environmental quality, material selection, and the building’s effects on the concerned site and surrounds. The Indian Green Building Council (“**IGBC**”), for instance, offers services, which include developing new green building rating and training programs along with certification services. Certain government agencies have issued recognitions to IGBC’s green rating systems. See <https://igbc.in/igbc/>.

<sup>208</sup> For instance, see [here](#).

<sup>209</sup> JLL is the brand name, and a registered trademark, of Jones Lang LaSalle Incorporated.

<sup>210</sup> According to the JLL study, 321 million sq. ft. of Grade A office stock was green certified. This represented almost 44% of the

total stock, aggregating 732 million sq. ft. spread across India’s top seven cities.

## PRESENT FORECASTS

The global pivot on sustainable development has revitalized preferences among both occupiers and developers for green certified commercial buildings.<sup>208</sup> According to a JLL<sup>209</sup> study conducted last year across major Indian cities, well above two-fifths of all commercial Grade A office stock had a green certification.<sup>210</sup> Further, this penetration rate was poised to cross 50% over the next decade.<sup>211</sup> Moreover, almost three quarters of new supply is likely to be rated green, while older projects may undergo upgrades for the purpose of reducing their carbon footprint.

In this regard, according to a more recent real estate outlook (the “**Colliers Report**”) released by Colliers International Property Consultants, Inc. earlier this month (March 2023),<sup>212</sup> a burgeoning ESG focus has created significant opportunities for landlords and developers to upgrade outdated office assets.<sup>213</sup> Further, this year promises to witness greater activity from developers towards improving both efficiency and sustainability in their buildings.<sup>214</sup> Among other considerations, such upgrades are expected to provide long-term benefits and enable the underlying assets to remain competitive. In addition, 2023 is predicted to evidence increased green financing, as domestic and offshore investors seek good quality Grade A projects that are sustainable and ESG compliant.

total stock, aggregating 732 million sq. ft. spread across India’s top seven cities.

<sup>211</sup> According to the Colliers Report (Real Estate Outlook, March 2023), the stock of green certified buildings in major Indian cities has witnessed a five-fold increase in 2022 compared to 2010 levels.

<sup>212</sup> See [here](#).

<sup>213</sup> According to the Colliers Report, the top six cities in India (Delhi NCR, Mumbai, Bengaluru, Chennai, Hyderabad, and Pune) have Grade A office buildings of about 120 million sq. ft. that can be refurbished.

<sup>214</sup> About 58 million sq. ft. of additional green grade A stock has either received pre-certifications or is under discussion for green certification, likely to come in the office markets of Hyderabad, Pune, and Delhi NCR. See [here](#).

## BRSR

Further, according to a recent consultation paper,<sup>215</sup> the Securities and Exchange Board of India (“SEBI”) soon plans to introduce an assurance-driven reporting regime (“BRSR Core”) as a subset of the wider Business Responsibility and Sustainability Reporting (“BRSR”) framework – which, in turn, SEBI had introduced in May 2021<sup>216</sup> to ensure standardized disclosures on ESG-linked parameters. While the top 1,000 listed companies in India (by market capitalization) could make these ESG-based disclosures on a voluntary basis until now, from FY 2022-23 onwards, such disclosures are mandatory. In addition, the list of mandated reporting entities may be expanded upon later.

While BRSR Core, by design, has been formulated on the basis of ‘reasonable assurance’ (similar to an audit verification), the general BRSR framework also requires quantitative data with respect to ESG across key performance indicators (“KPIs”), such as the quantum of investment made towards reducing a company’s environmental footprint.<sup>217</sup> The environmental footprint of a building, for instance, can be measured in several ways – ranging from the amount of carbon used in construction, as well as to maintain a building through its lifecycle; to the everyday consumption of resources such as water and energy; to the amount of waste produced. Thus, based on the KPIs under the wider BRSR regime, reporting about both investments made and capital expenditure incurred in respect of green and/or energy-efficient buildings (e.g., through the use of environment-friendly and sustainable building materials, or providing for ‘smart technological’ heating or ventilation) may significantly improve ESG ratings, and thereby reduce the cost of future capital.

<sup>215</sup> On February 20, 2023, SEBI released a consultation paper on disclosures, ratings, and investing related to ESG parameters to seek public comments.

<sup>216</sup> See [here](#).

<sup>217</sup> See Attribute no. 3 on page 18 in Annexure I of the Consultation Paper.

<sup>218</sup> BEE’s standards and labeling (S&L) program provides energy ratings (ranging between 1 to 5 stars, where one star represents the minimum efficiency level) for a number of cooling

## THE REGULATORY ENVIRONMENT

The Energy Conservation Act, 2001 (the “EC Act”) specifies norms and standards for appliances and equipment, as well as in respect of building construction. Established by the EC Act, the Bureau of Energy Efficiency (“BEE”), a body functioning under the Ministry of Power, administers such standards through interventions such as: (1) a ‘star labeling’ system for ACs,<sup>218</sup> (2) a voluntary rating program for commercial buildings, and (3) the ‘Perform, Achieve, Trade’ (“PAT”) scheme.<sup>219</sup> Formulating building codes with regard to energy conservation also falls within the EC Act’s ambit. Accordingly, the BEE has pursued initiatives such as the Energy Conservation Building Code (“ECBC”).<sup>220</sup>

Recently, the Energy Conservation (Amendment) Act, 2022 (the “EC Amendment”) came into force. Among other important changes, the EC Amendment has now included large residential buildings under the EC Act’s regulatory regime, along with enhancing the scope of ECBC.

## GREEN BUILDINGS: OPPORTUNITIES AND CHALLENGES

Emerging evidence suggests that green buildings are a higher-value, lower-risk asset than standard structures. Further, new constructions offer a significant opportunity to integrate energy efficiency into building design from the outset, avoiding the bother of expensive retrofits later.

However, there are a number of constraints in this regard, which include the perception of high construction costs, a lack of alignment between incentives and benefits, as well as a mismatch between (1) short hold periods with respect to real estate assets in portfolios, on the one hand; and (2) long building lifespans on the other – especially when coupled with the possibility of stricter future regulation. Nevertheless, there does exist strong

technologies. This includes mandatory standards for room ACs (RACs) and voluntary ones for chillers and fans.

<sup>219</sup> PAT is a regulatory instrument to reduce energy consumption in energy intensive industries, with an associated market-based mechanism involving tradable certifications related to excess energy savings (*i.e.*, energy savings certificates, or ESCerts).

<sup>220</sup> The ECBC was released in 2007 and revised in 2017. The ECBC includes guidance on building envelope, heating, ventilation and AC, as well as in respect of renewable energy integration in commercial buildings.

market sentiment along with corresponding demand for energy efficient buildings in India. Local developers are increasingly realizing that the additional capital expenditure (“**capex**”) incurred upfront is likely to be offset by the significant savings made on operational costs (“**opex**”) over the longer term.

## INVESTORS AND FINANCERS

Real estate financiers and investors may influence the market for green buildings in meaningful ways. In terms of commercial bank lending – construction finance, mortgages, home improvement loans, and green financial products for resource-efficient buildings can significantly accelerate the uptake of green buildings, along with lower interest rates and longer tenors. As a result, such banks can diversify their client base and product offerings, build higher-value and lower-risk portfolios, and access new sources of finance through green bonds, green securitizations, and green credit facilities. On the other hand, institutional investors that participate in green real estate can help inject liquidity in such markets and enable primary lenders to free up capital to develop new green lending products.

In addition, multinational development finance institutions (“**DFIs**”) such as the International Finance Corporation (“**IFC**”), can catalyze nascent markets and facilitate the entry of private investors, including foreign ones. DFIs provide a range of financial products not readily available in most markets, often in combination with technical support and capacity-building programs. These institutions can also build the government’s capacity to develop enabling environments. Indeed, DFIs such as IFC have actively invested in affordable housing in India. DFIs also have specific ESG and other sustainability standards/policies that are required to be monitored and complied with, which would include investments in green and resource-efficient buildings.

## THE GOVERNMENT

The government can create a pipeline of green building assets and incentivize financiers to route their capital to this sector. Specifically, it can

enhance investor appetite by requiring public buildings to be green. In turn, this can build technical capacity and skills among designers, engineers, and workers, who might then become better equipped to construct privately financed green buildings.

Fiscal incentives like tax breaks, grants, subsidies, loans, and rebates, complemented by non-fiscal incentives such as preferential or expedited permits, can also be put into play. Further, mandatory building codes may ensure that green measures are incorporated from the outset.

## BUILDING CODES

While the ECBC represents a key regulatory policy with regard to space cooling in new commercial buildings (such as offices, malls, hotels, hospitals, airports, educational institutions, etc.), the results of implementation have been relatively modest, including on account of the absence of a strong enforcement regime. A recent report<sup>221</sup> by the Ministry of Environment, Forest and Climate Change (“**MoEFCC**”) has suggested concrete steps for public departments to: (1) integrate ECBC across government-led construction, and (2) operationalize recommendations for space cooling as issued by the India Cooling Action Plan (“**ICAP**”).

Nevertheless, the EC Amendment has now introduced the idea of sustainability, where a new building code related to energy conservation will provide norms for: the use of renewable sources, as well as for green buildings. Further, while the ECBC applies to a specified category of commercial buildings only, the new code will apply to office and residential buildings as well, subject to certain specifications.<sup>222</sup>

Given emerging ESG trends and ESG-related organizational policies around the world, most multinational companies (“**MNCs**”) looking to lease or set up offices in India are keen to occupy premises with green energy/sustainability ratings, thereby incentivizing Indian developers to incur additional capex to procure such ratings. In turn, such developers can effectively monetize Grade A

it serves as a model code for both public and private construction, along with offering certain sustainability approaches in addition, those need to be made more robust in the future.

<sup>221</sup> Available [here](#).

<sup>222</sup> In addition, the National Building Code of India 2016 (“**NBC**”), prepared by the Bureau of Indian Standards (“**BIS**”), provides guidelines for regulating building construction in general. Although

commercial and industrial assets since the target end-users and lessees are often large-scale MNCs.

## VOLUNTARY COMMITMENTS

A surge in the voluntary adoption of green construction practices by private real estate developers and owners can create much-needed momentum. Current commitments range from greening individual buildings and portfolios to joining ambitious pledges through international platforms and initiatives. Such commitments have been primarily linked to, and delivered through, green building certification programs.

## RATING SYSTEMS

Voluntary green building ratings systems – such as the Indian edition of the Leadership in Energy and Environmental Design (“**LEED**”), Green Rating for Integrated Habitat Assessment (“**GRIHA**”), Indian Green Building Council (“**IGBC**”), etc. – have proved somewhat successful in the commercial building segment, driven by green policies among larger companies. However, India does not yet have a *mandatory* green construction code or a set of *mandatory* green building standards like in the US – where the International Green Construction Code (“**IgCC**”) <sup>223</sup> and ASHRAE 189.1, <sup>224</sup> respectively, apply in specific cases.

Nevertheless, the LEED benchmark has been recognized by most developers and builders in India. Further, GRIHA was adopted as the national rating system for green buildings in India by the Ministry of New and Renewable Energy (“**MNRE**”) in 2007.<sup>225</sup> GRIHA evaluates the environmental performance of a building based on quantitative and qualitative criteria, providing a definitive standard for green buildings.

<sup>223</sup> The IgCC is a model code that contains minimum requirements for increasing the environmental and health performance of buildings, sites and structures. See [here](#).

<sup>224</sup> The ANSI/ASHRAE/USGBC/IES Standard 189.1-2011: Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings (“**ASHRAE 189.1**”) is a model code that contains minimum requirements for increasing the environmental and health performance of buildings, sites and structures. ASHRAE 189.1 is an alternative compliance path for the IgCC – i.e., in jurisdictions that adopt the IgCC, a builder has

## ENFORCEMENT

Strictly enforced labeling and energy performance certifications for buildings and appliances by the BEE can ensure better compliance with green standards, catalyze the market for energy-efficient technologies, and generate market data to help financial intermediaries select efficient buildings to invest in.

Further, various policy options can be adjusted to suit local legal frameworks as well as unique socioeconomic contexts. Training construction industry professionals and officials can make enforcement easier. Stakeholder engagement that incorporates the interests and expertise of the public and private sectors, respectively, can help remove some barriers to compliance. Mandating third-party certification can address ‘greenwashing’ concerns and ensure that only legitimate recipients receive incentives without overextending public sector overheads.

## AT THE STATE LEVEL

The National Building Code of India, 2016 (“**NBC**”) <sup>226</sup> has been revisited in certain Indian states to serve the latter’s particular sustainability goals. In Haryana, for instance, the government has incentivized GRIHA/IGBC/LEED-rated projects by awarding additional floor area ratio (“**FAR**”) in respect of all building use (except plotted residential), and especially for the purpose of achieving such ratings pursuant to an amendment in the Haryana Building Code, 2017. The Pune Metropolitan Region Development Authority also offers additional FAR to developers with gold/platinum IGBC ratings.

## THE WAY FORWARD

Future digitalization may further expand opportunities for space cooling across buildings. The diffusion of internet-connected devices in the

the option to design and construct a building in accordance with the provisions of ASHRAE 189.1 rather than those of IgCC. See [here](#).

<sup>225</sup> GRIHA was initially developed by The Energy and Resources Institute (TERI).

<sup>226</sup> The NBC, prepared by BIS, provides guidelines for regulating building construction in general. It serves as a model code for both public and private construction, along with offering certain sustainability approaches in addition.



residential and commercial sectors may allow added integration across demand and supply. From the government's perspective, policies need to take into consideration the opportunities that arise from the emergence of digital technologies – which, in turn, can make cooling and other buildings-related energy services more sustainable. For instance, the roll-out of smart thermostats can reduce energy consumption in response to real-time price signals.

However, there are concerns with widespread digitalization as well, including in respect of data security and privacy, along with technical and economic considerations. Given the fragmented nature of local laws on construction, sustainability goals vis-à-vis buildings are often compromised in terms of implementation. With the rise in demand for Grade A assets with appropriate green energy ratings for commercial and industrial leasing, there is much to be done in terms of addressing additional capex requirements.

## DISTRICT COOLING AND TRIGENERATION

India's large-scale space cooling requirements can be met through new technologies, including through the use of delivery/distribution models involving 'cooling as a service' ("CaaS"). However, viable implementation models will be necessary to support such business and operations, such as those of district cooling systems ("DCS"). A DCS produces chilled water in a central plant and delivers it to buildings through an insulated distribution network and via energy transfer stations. The idea of a 'merchant' DCS in India is relatively new: it involves the aggregation of different demand groups such as special economic zones ("SEZs") and large commercial business districts in a CaaS model –. Nevertheless, emerging examples include the GIFT City in Gujarat and Amaravati in Andhra Pradesh. In the latter case, a foreign cooling service provider entered into a long-term concession agreement with the state government.

Globally, DCS projects have been developed under various business paradigms. A variety of stakeholders such as municipal corporations, state governments, building developers, international finance providers, special purpose vehicles ("SPVs"), etc., can invest in such projects. For example, in Dubai, building developers double up as

utility operators to provide services such as water, waste, power, and cooling in integrated townships. Other business models (e.g., in London, Paris) are based on public utilities investing directly in such integrated projects, with their investment linked to the underlying incentives related to land, access to energy sources and wastewater connections, as well as to revenue streams. Accordingly, an Indian implementation agency could coordinate among various stakeholders and manage the different processes involved, such as those of tendering, financing, and setting up a district cooling network, including under the aegis of a public-private partnership ("PPP") model.

For instance, a couple of years ago, Energy Efficiency Services Limited ("EESL"), a state-owned Indian company, entered into a memorandum of understanding ("MoU") with GAIL (India) Limited to develop trigeneration projects. Tri-generation is a process that provides combined cooling, heating, and power from a single generator, producing electricity and utilizing the residual heat to generate chilled water for air-conditioning or refrigeration using a chiller. Pursuant to this MoU, EESL will be responsible for the upfront capital costs and risks, as well as provide tri-generation to customers through an offtake based on a long-term power purchase agreement ("PPA"). This model may serve as a template to create a viable ecosystem for tri-generation projects in the future, along with standard contractual and operating processes to develop a CaaS model.

Finally, scaling up new cooling technologies and business models will require cities to become 'smart' and have longer horizons for meeting space cooling demand in a sustainable manner. Concomitantly, cities need robust incentive structures to become active stakeholders in respect of DCS adoptions. Infrastructure development programs such as the Smart Cities Mission can be utilized accordingly.

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