



Indian Railways: On track to Net Zero
SDG7 Energy Compact of Ministry of Railways, Government of India

A next Decade Action Agenda to advance SDG7 on sustainable energy for all, in line with the goals of the Paris Agreement on Climate Change

SECTION 1: AMBITION

1.1. Ambitions to achieve SDG7 by 2030. [Please select all that apply, and make sure to state the baseline of each target]

(Member States targets could be based on their NDCs, energy policies, national five-year plans etc. targets for companies/organizations could be based on their corporate strategy)

<input type="checkbox"/> 7.1. By 2030, ensure universal access to affordable, reliable and modern energy services.	Target(s): Time frame: Context for the ambition(s):
<input type="checkbox"/> 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix.	Target(s) : <i>Increasing the share of renewable energy by proliferation of renewable energy in various forms.</i> Time frame: <i>By the year 2030.</i> Context for the ambition(s): <i>Indian Railways is the 4th largest Rail network in the world. Indian Railways plays a key role as a contributor to India's energy ambitions. Hence, in line with the nation's target of achieving 450 GW of renewable energy by 2030, Indian Railways is dedicated to increase the share of renewable energy in its portfolio over the next decade.</i>
<input type="checkbox"/> 7.3. By 2030, double the global rate of improvement in energy efficiency.	Target(s) : i) <i>Energy reduction targets in Electric Traction-1.90% in passenger and 5.37% in goods.</i> ii) <i>Energy reduction targets in Diesel Traction- 3.38% in passenger and 1.36% in goods.</i> iii) <i>Energy reduction targets for manufacturing units- 7.88% for Railway loco manufacturers, 7.47% for coach manufacturers and 7.10% for Railway wheel manufacturers.</i> Time frame: <i>By the year 2024.</i> Context for the ambition(s): <i>In line with the Government's National Mission for Enhanced Energy Efficiency, Indian Railways aims to reduce specific energy consumption through initiatives to improve its energy efficiency, thereby optimising its energy demand.</i>
<input type="checkbox"/> 7.a. By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	Target(s): <i>Partnering with 2 international organisations/alliances for promotion of investment, technology and knowledge transfer.</i> Time frame: <i>By the year 2030.</i> Context for the ambition(s): <i>To achieve the target of net zero carbon emission by 2030, Indian Railways is adopting new and enabling technologies to transition its energy infrastructure. An effort for up-gradation of technology will help accelerate this journey for Indian Railways and other stakeholders internationally. Partnership with international organizations will help Indian Railways to upgrade its technology.</i>
<input type="checkbox"/> 7.b. By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programs of support.	Target(s): Time frame: Context for the ambition(s):

1.2. Other ambitions in support of SDG7 by 2030 and net-zero emissions by 2050. [Please describe below e.g., coal phase out or reforming fossil fuel subsidies etc.]

Target(s): Achieve net zero carbon emission

Time frame: By the year 2030.

Context for the ambition(s): In order to contribute towards India's Renewable Energy (RE) and Intended Nationally determined Contributions (INDC) commitments, Indian Railways targets to become a net-zero carbon emitter by 2030, taking India a step closer to decarbonisation. A combination of increased deployment of renewable energy to green its supply and energy efficiency initiatives to optimise its energy demand will help Indian Railways achieve this goal.

SECTION 2: ACTIONSTO ACHIEVE THE AMBITION

2.1. Please add at least one key action for each of the elaborated ambition(s) from section 1. [Please add rows as needed].

<p>Description of action (1.1: 7.2: Renewable energy capacity in energy mix)</p> <ul style="list-style-type: none"> • Utilise Railways' vacant land parcels to set up ground-mounted solar plants or procure RE through Open access for meeting traction power requirement. • Install solar panels on rooftops of various Railway stations and service buildings for meeting non-traction power requirements • Deploy storage technologies to fully integrate RE into Railways' energy mix by managing its intermittency •Undertake RE proliferation across states in the country to meet the renewable purchase obligation (RPO). 	<p>Start date 2021 and end date 2030.</p>
<p>Description of action (1.1: 7.3: Energy efficiency)</p> <p>Indian Railways has undertaken several initiatives in the area of energy efficiency for optimising the energy demand:</p> <ul style="list-style-type: none"> • Traction network, <ul style="list-style-type: none"> i) Indian Railways will adopt energy efficient rakes. ii) Provision of Capacitor banks. iii) Creation of smart rail energy grids. iv) Replacement of short duration train with EMU/MEMU/ DEMU. v) Track electrification. vi) End-on-Generation to Head-on-Generation. vii) Replacement of Diesel locomotives with 3-phase locomotives having regenerative braking features. • Non-traction network <ul style="list-style-type: none"> i) Indian Railways has already replaced all lights with LED lights. ii) Use of all higher star rated appliances. iii) Deployment of occupancy sensors iv) Adoption of Green Building Design & Green Railway Stations Rating system v) Use of variable-voltage/ variable-frequency for Lifts/Elevators. 	<p>Start date 2021 and end date 2024</p>
<p>Description of action (1.1: 7.a: International cooperation)</p> <ul style="list-style-type: none"> • Partnering with international organizations for technology and knowledge transfer-Technical Assistance would be sought. 	<p>Start date 2021 and end date 2030.</p>

<p>Description of action (1.2: Achieve net zero carbon emissions)</p> <ul style="list-style-type: none"> • Procure diverse RE mix for its traction and non-traction network • Undertake initiatives in the area of energy efficiency for optimising energy demand. • 100 % Railway electrification by replacing diesel with electricity. • Use of 5% blending of bio-fuels in traction diesel fuel to reduce emissions due to diesel. • Higher tree plantation to increase carbon sink. 	<p>Start date 2021 and end date 2030</p>
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<p>SECTION 3: OUTCOMES</p>	
<p>3.1. Please add at least one measurable and time-based outcome for each of the actions from section 2. <i>[Please add rows as needed].</i></p>	
<p>1.1: 7.2: Renewable in energy mix:</p> <ul style="list-style-type: none"> – Adoption of new technology such as battery storage. – Pilot Project on Solar based Battery storage systems has been Initiated. Likely to be completed by 2023-24 – Open access for electricity procurement in remaining States.- 	
<p>1.1: 7.3: Energy efficiency:</p> <ul style="list-style-type: none"> – Increase energy productivity – Reduce carbon emissions – Achieve energy savings as a result of optimized consumption- Targets already mentioned in Section-2, Subsection-1.1,7.3. 	
<p>1.1: 7.a: International cooperation:</p> <ul style="list-style-type: none"> – Partnership/alliances with 2 international organisations –Technical assistance would be sought. 	
<p>1.2: Carbon emissions</p> <ul style="list-style-type: none"> – 100% electrification of traction network- Target of Completion for 100 % Electrification work is Decmber’2023. – Reduction in pollution due to Railway operations- IR plans to be Net Zero carbon emitter by 2030. 	

<p>SECTION 4: REQUIRED RESOURCES AND SUPPORT</p>	
<p>4.1. Please specify required finance and investments for each of the actions in section 2.</p>	
<p>1.1: 7.2: Renewable in energy mix:</p> <ul style="list-style-type: none"> – Green financing options to lower the cost of financing for RE technologies like solar and wind – Subsidies to accelerate adoption of new technologies such as battery storage. 	
<p>1.1: 7.3: Energy efficiency:</p> <ul style="list-style-type: none"> – Investment support for replacement and up-gradation of existing traction and non-traction technology applications 	
<p>1.1: 7.a: International cooperation:</p> <ul style="list-style-type: none"> – Support in identification and collaboration with technology providers. 	
<p>1.2: Carbon emissions:</p> <ul style="list-style-type: none"> – Carbon credit and offset measures to incentivise efforts in area of carbon emission reduction 	

4.2. [For countries only] In case support is required for the actions in section 2, please select from below and describe the required support and specify for which action-

[Examples of support for Member States could include: Access to low-cost affordable debt through strategic de-risking instruments, capacity building in data collection; development of integrated energy plans and energy transition pathways; technical assistance, etc.] - Not applicable for Indian Railways

<input type="checkbox"/> Financing	Description
<input type="checkbox"/> In-Kind contribution	Description
<input type="checkbox"/> Technical Support	Description
<input type="checkbox"/> Other/Please specify	Description

SECTION 5: IMPACT

5.1. Countries planned for implementation including number of people potentially impacted.

Implementation of the efforts will be across India and will directly and indirectly impact the entire population of India i.e. ~1.4 billion. Direct impact will be on all the users utilizing the services of Indian Railways, primarily the train travelers, and also the employees and staff working across Railway stations, building and establishments. Indirect impact will be on potentially the entire country population, as reduction in carbon emissions by one of the largest electricity consumers of the country, will significantly improve the air quality and the environmental impact across the nation.

5.2. Alignment with the 2030 Agenda for Sustainable Development – Please describe how **each** of the actions from section 2 impact advancing the SDGs by 2030.
[up to 500 words, please upload supporting strategy documents as needed]

The actions taken by the Indian Railways will impact the following SDGs:

— **SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all:**

Indian Railways is taking multiple initiatives to deploy clean energy power plants, thereby increasing the share of renewable energy in the overall energy mix. Indian Railways has set a target of achieving net zero carbon emission by 2030 by proliferation of renewable energy in various forms, and to achieve this, Indian Railways has already set up ~124.23 MW solar PV plants (including solar PV rooftop) and 103 MW of wind plants. Additionally, ~2 GW of solar PV plants are under implementation. To diversify its energy portfolio, Railways is also planning to set up its first solar PV power plant coupled with battery energy storage systems (BESS) on vacant Railway land and is also planning to procure power in RTC mode to ensure 24x7 access to power supply.

— **SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all** Through adoption of new technology and up-gradation of existing technology, Indian Railways will achieve higher levels of economic productivity. Increase in renewable energy deployment will also act as a driver for job creation. Indian Railways is also contributing to the Prime Minister’s vision of ‘Make in India’ by manufacturing 800 electric locomotives, in a joint venture with Alstom. Adoption of new technology such as Head-on-generation (HOG) which allows electrical power for catering hotel load of train to be met directly from locomotive power, has led to projected savings of more than INR 3425.1 Crores per year.

— **SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation** Indian Railways plans to electrify railway tracks, develop dedicated freight corridors, and modernize its infrastructure, including stations and lines, which will increase power demand and enable higher resource efficiency. To ensure optimization of land and infrastructure, Indian Railways is taking steps to utilize vacant railway land, and land along the railway track, to install solar panels for generating power, thereby fostering innovation.

— **SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable**

Indian Railways will ensure access to sustainable transport by using efficient train infrastructure, creation of dedicated freight corridors, and modernization of its railway stations and lines.

— **SDG 12: Ensure sustainable consumption and production patterns**

With procurement of solar, wind, etc. Indian Railways manage sustainable and efficient use of natural resources to replace conventional sources of power.

— **SDG 13: Take urgent action to combat climate change and its impacts**

With energy efficiency initiatives across its traction and non-traction network, deployment of 20 GW of renewable energy, 100% electrification of traction network, adoption of new energy technologies such as battery storage, Indian Railways will significantly reduce its carbon emissions over the years, thereby achieving its target of Net Zero carbon emissions by 2030.

5.3. Alignment with Paris Agreement and net-zero by 2050 - Please describe how **each** of the actions from section 2 align with the Paris Agreement and national NDCs (if applicable) and support the net-zero emissions by 2050. [up to 500 words, please upload supporting strategy documents as needed]

India has a population of over 1.3 billion people spread over a vast geography. The transport sector is and will continue to remain a critical enabler of development and would also have to grow in a sustained manner for the country to meet its developmental objectives. Indian Railways plays a key role in the economic and social development of the country by providing safe, financially viable and environmentally sustainable mode of transport for freight as well as passengers. Indian Railways' initiatives are aligned with both:

1. Paris Agreement: Limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels 2. India's NDCs:

- Achieve 33-35% reduction in emissions intensity of its GDP from 2005 level*
- Achieve 40% cumulative installed capacity from non-fossil fuel-based energy resources*

In order to contribute towards India's RE and INDC commitments, Indian Railways, the fourth largest railways in the world by network and one of the largest electricity consumers in the country, has decided to achieve Net Zero carbon emissions by 2030 through continuous efforts. This objective will be fulfilled by focusing on energy security, enabling consumption efficiency and ensuring greening of supply. The organisation plans to electrify railway tracks, develop dedicated freight corridors, and modernise its stations which will increase power demand and necessitate the need for additional supply from green energy sources such as solar and wind-based power plants.

Indian Railways (IR) has about 51,000 hectares of vacant land with the potential of setting up ~20 GW of renewable energy. Indian Railways has installed 103.4 MW wind-based power plants and 6.7 MW of ground-mounted solar PV plants. To utilise the available rooftop space on different stations and service buildings, IR has installed 117.53 MW solar capacity till July 2021. Indian Railways is also planning to deploy new technologies like battery storage to diversify its energy portfolio. Additionally, IR will procure Renewable energy through open access where installation of RE plants is challenging.

In line with the nation's vision of reducing carbon emission intensity by 33-35% by 2030, Indian Railways has decided to target 100% electrification of broad-gauge railway network by FY24. The speed of electrification has vastly been scaled up over the last 5 years to achieve this target.

To optimise its energy demand, Indian Railways is taking multiple energy efficiency initiatives across its traction and non-traction network. Along traction network, Indian Railways will adopt energy efficient rakes, capacitor banks, creation of smart rail energy grids, replacement of short duration train with EMU/MEMU/ DEMU, track electrification, End-on-Generation to Head-on-Generation. Head-on-generation (HOG) allows electrical power for catering hotel load of train to be met directly from locomotive power, and has already led to projected savings of more than INR 3425.1 crores per year. In the non-traction network, Indian Railways will replace all lights with LED lights and higher star rated appliances, deploy occupancy sensors, building management systems, adopt Green Building Design & Green Railway Stations Rating system, and use variable-voltage/ variable-frequency for Lifts/Elevators.

Other initiatives that strengthen IR's role in helping India achieve its NDCs are:

- Enhance the share of the Railways in the overall land-based freight transport from the present 36% to 45% by the year 2030 • Use of 5% blending of bio-fuels in traction diesel fuel.*
- Improve water use efficiency by 20% up to 2030*
- Tree Plantation to increase Carbon Sink.*

SECTION 6: MONITORING AND REPORTING

6.1. Please describe how you intend to track the progress of the proposed outcomes in section 3. Please also describe if you intend to use other existing reporting frameworks to track progress on the proposed outcomes.

Indian Railways publishes the following reports with energy efficiency initiatives taken every year.

- Energy conservation: A way of life*
- Environment Sustainability Annual Report*

SECTION 7: GUIDING PRINCIPLES CHECKLIST

Please use the checklist below to validate that the proposed Energy Compact is aligned with the guiding principles.

I. Stepping up ambition and accelerating action - Increase contribution of and accelerate the implementation of the SDG7 targets in support of the 2030 Agenda for Sustainable Development for Paris Agreement

I.1. Does the Energy Compact strengthen and/or add a target, commitment, policy, action related to SDG7 and its linkages to the other SDGs that results in a higher cumulative impact compared to existing frameworks?

Yes No

I.2. Does the Energy Compact increase the geographical and/or sectoral coverage of SDG7 related efforts? Yes No

I.3. Does the Energy Compact consider inclusion of key priority issues towards achieving SDG7 by 2030 and the net-zero emission goal of the Paris Agreement by 2050 - as defied by latest global analysis and data including the outcome of the Technical Working Groups? Yes No

II. Alignment with the 2030 agenda on Sustainable Development Goals – Ensure coherence and alignment with SDG implementation plans and strategies by 2030 as well as national development plans and priorities.

II.1. Has the Energy Compact considered enabling actions of SDG7 to reach the other sustainable development goals by 2030? Yes No

II.2. Does the Energy Compact align with national, sectoral, and/or sub-national sustainable development strategies/plans, including SDG implementation plans/roadmaps? Yes No

II.3. Has the Energy Compact considered a timeframe in line with the Decade of Action? Yes No

III. Alignment with Paris Agreement and net-zero by 2050 - Ensure coherence and alignment with the Nationally Determined Contributions, long term net zero emission strategies.

III.1. Has the Energy Compact considered a timeframe in line with the net-zero goal of the Paris Agreement by 2050? Yes No

III.2. Has the Energy Compact considered energy-related targets and information in the updated/enhanced NDCs? Yes No

III.3. Has the Energy Compact considered alignment with reaching the net-zero emissions goal set by many countries by 2050? Yes No

IV. Leaving no one behind, strengthening inclusion, interlinkages, and synergies - Enabling the achievement of SDGs and just transition by reflecting interlinkages with other SDGs.

IV.1. Does the Energy Compact include socio-economic impacts of measures being considered? Yes No

IV.2. Does the Energy Compact identify steps towards an inclusive, just energy transition? Yes No

IV.3. Does the Energy Compact consider measures that address the needs of the most vulnerable groups (e.g. those impacted the most by energy transitions, lack of energy access)? Yes No

V. Feasibility and Robustness - Commitments and measures are technically sound, feasible, and verifiable based a set of objectives with specific performance indicators, baselines, targets and data sources as needed.

V.1. Is the information included in the Energy Compact based on updated quality data and sectoral assessments, with clear and transparent methodologies related to the proposed measures? Yes No

V.2. Has the Energy Compact considered inclusion of a set of SMART (specific, measurable, achievable, resource-based and time based) objectives? Yes No

V.3. Has the Energy Compact considered issues related to means of implementation to ensure feasibility of measures proposed (e.g. cost and financing strategy, technical assistant needs and partnerships, policy and regulatory gaps, data and technology)? Yes No

SECTION 8: ENERGY COMPACT GENERAL INFORMATION

8.1. Title/name of the Energy Compact

Indian Railways: On track to Net Zero

8.2. Lead entity name (for joint Energy Compacts please list all parties and include, in parenthesis, its entity type, using entity type from below)

Indian Railways

8.3. Lead entity type

Government

Local/Regional Government

Multilateral body /Intergovernmental Organization

Non-Governmental Organization (NGO)

Civil Society organization/Youth

Academic Institution /Scientific Community

Private Sector

Philanthropic Organization

Other relevant actor

8.4. Contact Information

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Sh. Sumit Garg, Director, Ministry of Railways, [Email-deeps@rb.railnet.gov.in](mailto:deeps@rb.railnet.gov.in).

Sh. Shray Saxena, SSE/Electrical, Ministry of Railways, [Email-shray.5757@gov.in](mailto:shray.5757@gov.in)

8.5. Please select the geographical coverage of the Energy Compact

Africa Asia and Pacific Europe Latin America and Caribbean North America West Asia Global

8.6. Please select the Energy Compact thematic focus area(s)

Energy Access Energy Transition Enabling SDGs through inclusive just Energy Transitions Innovation, Technology and Data Finance and Investment.

SECTION 9: ADDITIONAL INFORMATION (IF REQUIRED)

Please provide additional website link(s) on your Energy Compact, which may contain relevant key documents, photos, short video clips etc.