



# WT#1 for usage and exposure of renewable energy and carbon emission information

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# Goal of this discussion paper

## As described in Scope of Rel-19:

- WT #1. Study potential framework for network energy consumption exposure. This will include whether and what information is exposed, how it is exposed (e.g., charging) and at what granularity, e.g., at RAN level, Core Network level, network slice level, UE level, PDU session level, and/or QoS flow level. Additionally, whether and how renewable energy or carbon emission information for such granularities can be exposed by an MNO will be studied.

This discussion paper is going to address the concern on whether renewable energy and carbon for MNO can be exposed for WT#1.

# Carbon Emissions Definition

## Definition of Carbon Emissions Scope [1]:

- Scope 1: **Direct** emissions from the sources owned or controlled by company.
  - E.g., emissions from company-owned vehicles, etc.
- Scope 2: **Indirect** emissions from the generation of purchased energy by company.
  - E.g., purchased electricity from power grid, etc.
- Scope 3: **All other** indirect emissions (i.e., during the series of consecutive steps for creation, delivery and use of the company's products and services).
  - E.g., customers may request service provider (e.g., MNOs) to provide the information of carbon emissions for providing services (e.g., data transmission).
  - Note: Your Scope 3 emissions come from Scope 1 and Scope 2 emissions in your value chain.
    - 15 categories associated with upstream and downstream stakeholders are not under the company's operational control, e.g., emissions from the suppliers and the customers.

[1] GHG Protocol: <https://ghgprotocol.org/guidance-0>



# Government Regulations on Sustainability Reporting

- 🌿 **California (see [2,3]):** The California Legislature passed two far-reaching climate disclosure bills – SB 253, the Climate Corporate Data Accountability Act (CCDAA), and SB 261, the Climate-Related Financial Risk Act (CRFRA) – together, the California Climate Accountability Package.
- SB 253 requires disclosure of and independent third-party assurance on all global greenhouse gas (GHG) emissions – Scopes 1, 2 and 3 – for any entity “doing business in California” with global annual revenues exceeding \$1 billion.  
→ **SB 253 requires that all covered companies report their Scope 3, or full value chain, emissions**
  - SB 261 requires disclosure of climate-related financial risks, in accordance with recommendations from the Task Force on Climate-Related Financial Disclosures (TCFD), for entities doing business in California with global annual revenues exceeding \$500 million.

[2] CALIFORNIA LEGISLATURE: [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=202320240SB253](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB253)

[3] CALIFORNIA LEGISLATURE: [https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill\\_id=202320240SB261](https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202320240SB261)

# Challenge: Highly Variable Nature of Renewable Energy

🌿 Different renewable energy sources have different characteristics in terms of time, location, etc.



**Hydroelectric power** depends on precipitation.



**Solar power** cannot provide electricity in all 24 hours.



**Wind power** is located on land or offshore.

🌿 **Carbon Intensity:** average carbon emissions per unit of energy consumption (e.g., tCO<sub>2</sub> per kW·h).

- To capture that different energy sources have different levels of carbon emissions.

🌿 The availability of renewable energy is highly variable in **time** and **location**.



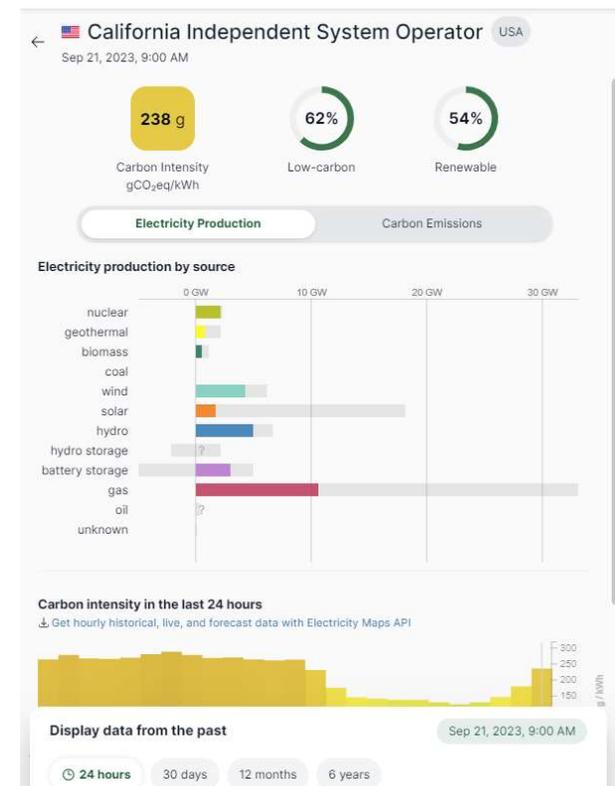
# Calculation of Carbon emissions

- Given carbon intensity information (or renewable energy information) which is the function of time  $t$  and location  $s$ , the carbon emissions  $C$  of an MNO can be given by
  - $C = \sum_{t,s} (\text{energy consumption at } t \text{ at } s) * (\text{carbon intensity at } t \text{ and at } s)$
- The **time** and **space** dimensions of information matter for MNOs to correctly calculate their **carbon emissions**.



# Electricity Maps: Third-party API for Carbon Intensity

- **Electricity Maps (see [4]):** the resource for 24/7 electricity CO2 data
  - Provide data quantifying how carbon intensive electricity (i.e., carbon intensity of grid) is on an hourly basis across 50+ countries.
  - Electricity Maps API can be easily integrated with products and services: Retrieve all relevant electricity data from targeted regions including real-time, historical, forecasts as well as marginal **renewable energy and carbon intensity data** through API.



[4] Electricity Maps: <https://app.electricitymaps.com/map>



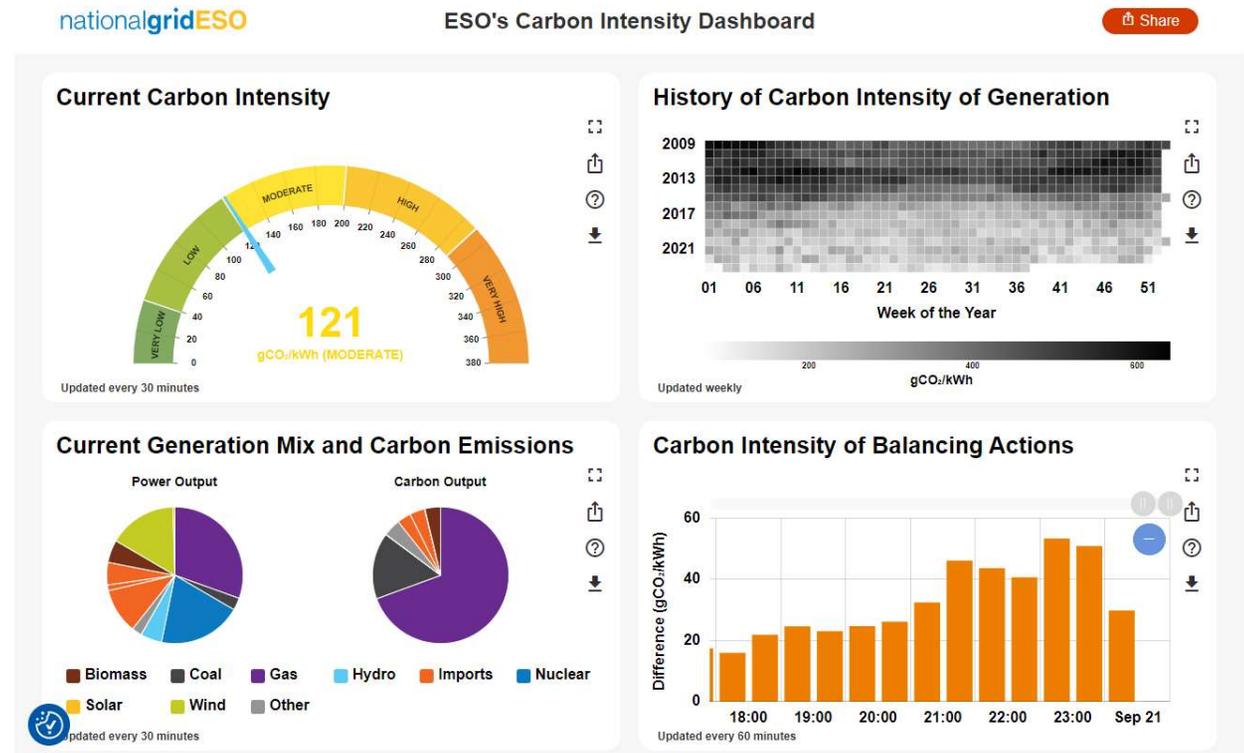
# Real-time electricity data sources

There are many sources for providing real-time electricity data in different regions or countries.

- For example [5], UK's National Grid ESO provides, in real time, the carbon intensity of the system and the current generation mix.
- For example [6], The California ISO is committed to supporting important energy and environmental policies while maintaining reliability through a resilient power grid system.

[5] Carbon intensity dashboard,  
<https://www.nationalgrideso.com/future-energy/our-progress-towards-net-zero/carbon-intensity-dashboard>

[6] California ISO,  
<http://www.caiso.com/TodaysOutlook/Pages/supply.aspx>





# Summary

- 📶 Reporting and reducing carbon emissions is going to be **required by legislation** for MNOs, either by an MNO itself, the customers of the MNO, or both.
- 📶 Carbon emissions reduction is **an urgent issue** for ICT sector.
- 📶 **Renewable energy is a key approach** for reduction on Carbon emission
- 📶 Based on the previous slides, the information of renewable energy and carbon emissions used by MNOs can be obtained using state of art energy management mechanisms
- 📶 However, the **Gap** will be
  - what renewable energy information are collected and what is the appropriate spatial (e.g., per country , per state, per city, per facility, per RAN site, per data center) and temporal (e.g., per hour, per day, per week, per month or per year) granularity of renewable energy information to be collected.
  - after collecting by MNOs, how to utilize the information in the MNO's 5GS network deployment



# Proposal Key Issue

- Proposal on Key Issue X: Whether and how renewable energy and carbon emission information can be exposed by an MNO
  - If is required to be exposed by MNO, where to obtain and how to calculate and at what granularity to be exposed