Status of SF_6 in developing countries

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UN environment programme

CTCN UN Climate Technology Centre & Network

UN Climate Technology Centre and Network

An integral mechanism of the UNFCCC convention

Mandated to support the development, transfer, deployment and dissemination of climate technologies

United Nations Framework Convention on Climate Change

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164 country focal points (NDEs)

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World Bank, MDBs, etc.

Our Strategic Plan for 2023-2027

INTRODUCING THE 2023–2027

Programme of Work

This programme aims to enhance transformational impact and scale across its core service areas through two proven technology enablers and five system transformations.

Water-Energy-Food Nexus

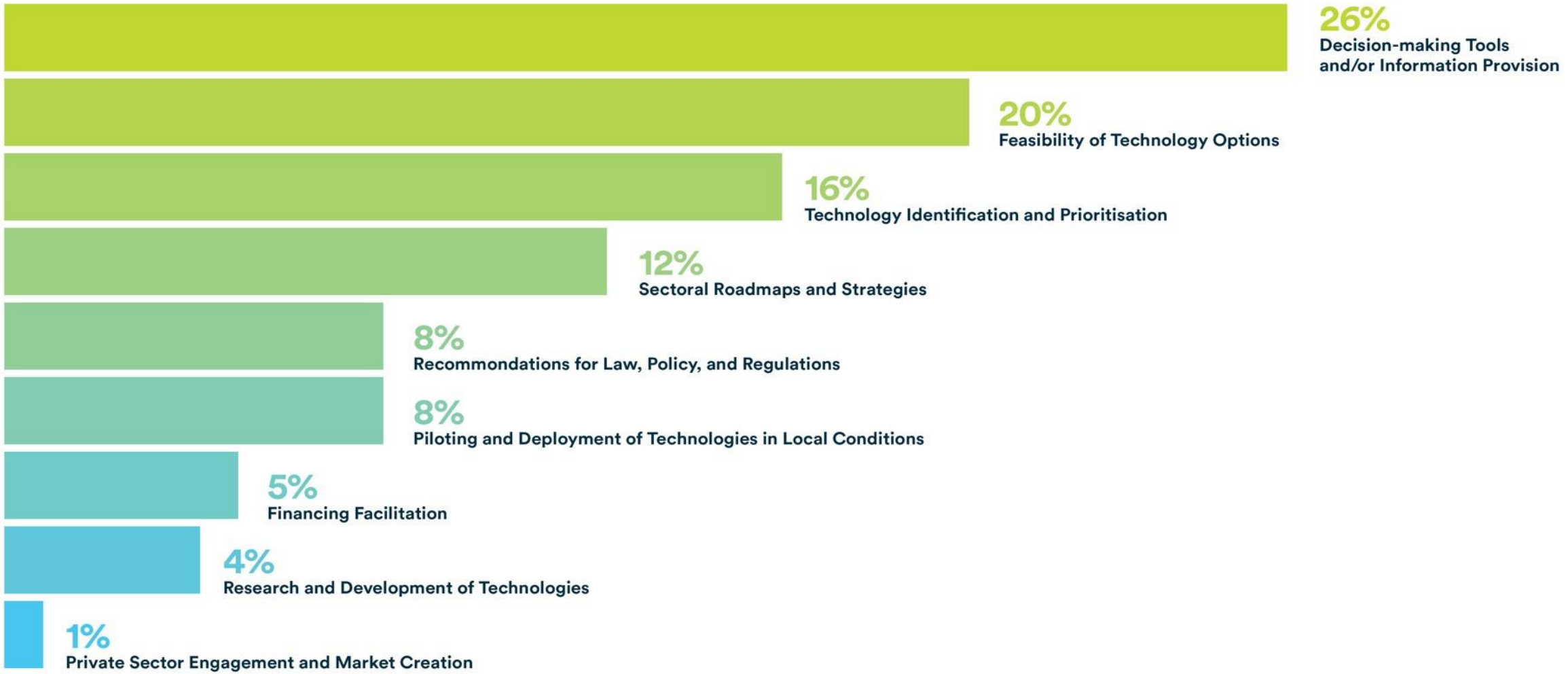
Sustainable Mobility

Energy Systems

Buildings and resilient infrastructure

Business and Industry

Distribution of Technical Assistance Requests by Type of Assistance



Outline

- Survey results and research on the topic:
  - Awareness
  - Infrastructure
  - F-gas in NDCs
  - SF_6 gas emission in GHG reporting
  - Regulations
  - Policies
  - Summary
  - Gaps and Needs

Section 1 of 4

SF6 Programme and Learning Event

CTCN with the National Designated Entity (NDE) of Germany organizes a **3-day programme and learning event on the topic of F-gas regulations and SF6-free technologies** for decarbonization pathways in energy systems.

This **questionnaire** aims to gather information about the regulatory, infrastructure, and financial environment related to F-gases, and SF6 in particular, in the developing countries that are attending the event. The insights gathered will provide a foundational understanding of the challenges and opportunities faced at a national level, enabling active participation from attendees and providing organizers and technology providers with essential context.

Your participation in this questionnaire is crucial in fostering fruitful discussions during the event. We kindly request your honest and thoughtful responses to the following questions to ensure that the event's agenda aligns with the needs and aspirations of developing countries. To complete the questionnaire, you may need to consult with relevant stakeholders in the national energy sector.

Please provide your answers by 30 June 2023.

Awareness

- In the survey, we asked if stakeholders dealing with switchgears in their countries aware of the environmental impact related to SF_6-gas, opportunities for SF_6-free technologies and EU F-gas regulations.

- Viet Nam and Thailand replied with Yes, but other countries said No;
  - Lack of knowledge in climate impact (Timor Leste)
  - Little dissemination of equipment and technologies using SF_6 (Mexico)
  - Small contribution to the inventory (Chile)

- We also asked about their infrastructure, regulations, and financing.

Infrastructure

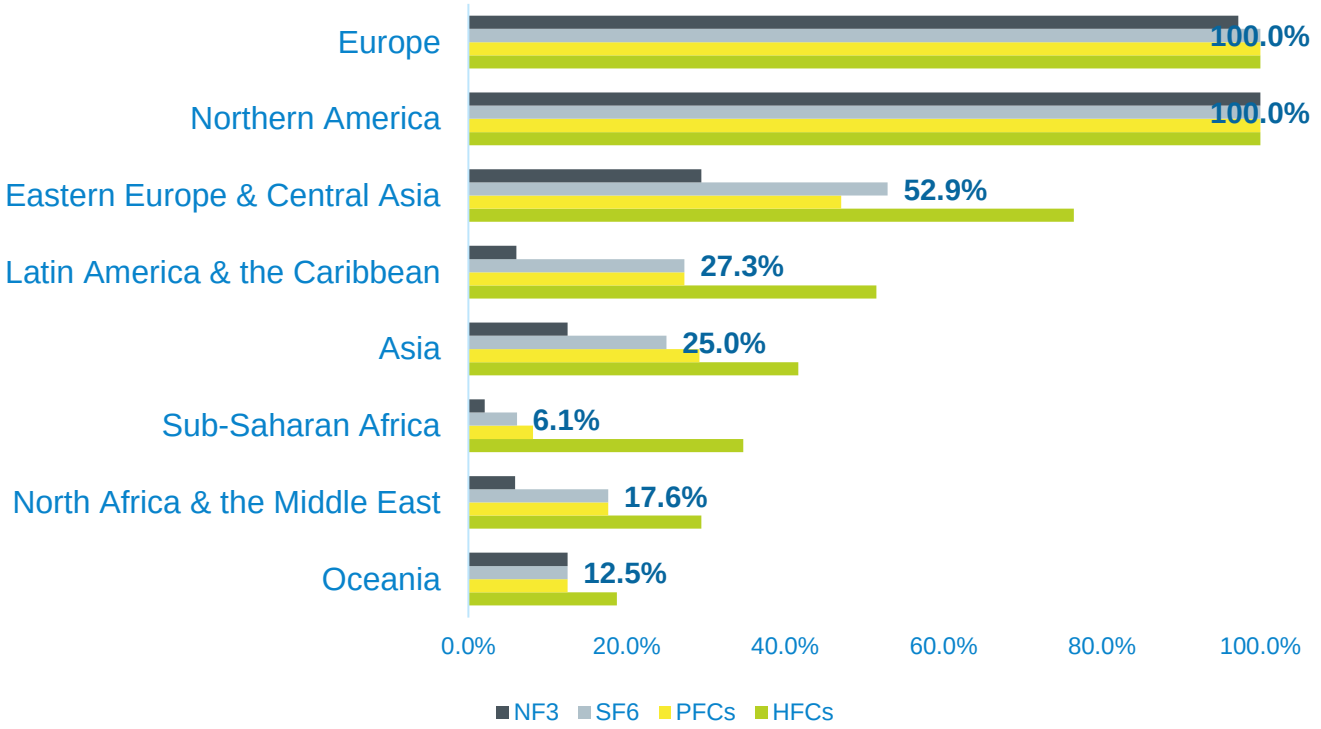
- Air-insulated switchgear (AIS) are predominant in the medium and high voltage grid.
- The equipment used in new facilities is GIS (SF_6), replacing the use of Metal-Clad (AIS) type metal boards (Mexico).
- Some countries rely on imports of GIS technologies (Timor Leste, Thailand).
- Procurement processes of equipment vary depending on the degrees of privatization in the electricity sector. (Complexity and speed)
    - Privately owned and operated by foreign and local companies. CEN(Comisión Nacional de Energía) acts as a coordinator between multiple service providers for generation, and T&D (Chile)
    - Electricity generation is contributed by the state by 54%, and the national electricity system is controlled and operated by the state (Mexico)

Infrastructure

- Not much information is available on the amount of installed SF_6 gas and the annual imports reported in the country.
  - The Federal Electricity Commission (CFE) is a government company. All your purchases of equipment and materials are published through its website(Mexico).
  - No track record on the amount of switchgear usage, SF_6 gas installed in production, emission from leakage and the disposal after its operation. (Timor Leste, Chile, Vietnam)

F-gas in NDCs – Global look

- According to the 2006 IPCC Guidelines, F-gases are included in the mitigation target, NDCs) as well as in national GHG inventories.

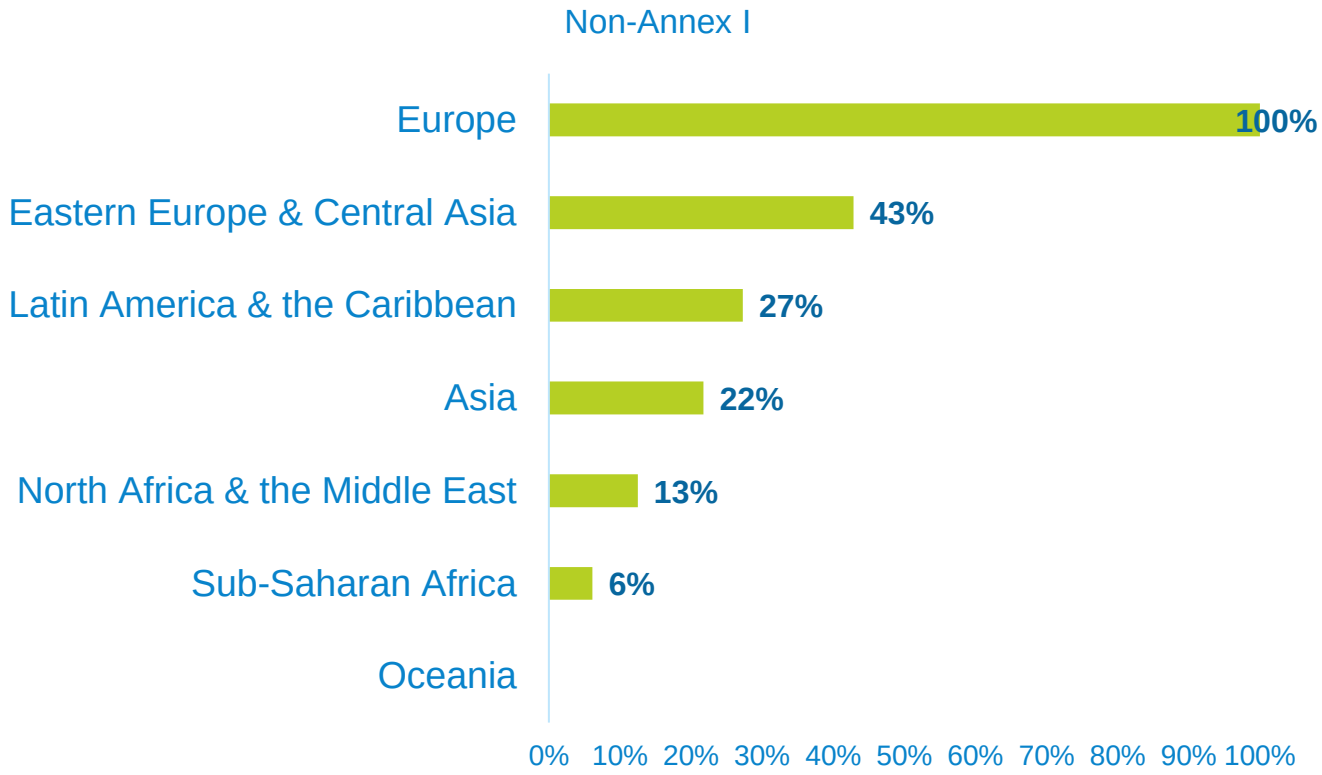


Number of countries covered F-gases in their NDCs, by region (%)

- All countries in Europe and Northern America covered all major F-gases (HFCs, PFCs, SF6, and NF3), but countries in other regions are not sufficiently covered.

SF6 in NDCs

- In particular, among **Non-Annex I countries**, Sub-Saharan Africa (6%), the Middle East, and Northern Africa(13%) are relatively low in covering SF_6 in their mitigation target(NDCs).



12 Countries in Reporting

Party	HFCs	PFCs	SF6	NF3
Mexico				
Chile				
Kenya				
Thailand				
South Africa				
Ghana				
Viet Nam				
Egypt				
Lebanon				
Senegal				
Timor-Leste (East Timor)				
Uganda				

- Countries included F-gases in their updated **NDCs**.
  - Covered **all** F-gases: Mexico, Chile, Kenya
  - Covered **at least one** of them: Thailand, South Africa, Ghana, Vietnam
  - **Not** covered: Egypt, Lebanon, Senegal, Timor-Leste, Uganda
- Only two countries included the SF_6 emissions in their latest National GHG reporting in Biennial Update Reports(**BURs**) or National Inventory Reports(**NIRs**).
  - Chile reported **191** Gg CO_2 eq. as their total SF_6 emissions – not by sources though. (2020)
  - Mexico reported the total amount of SF_6 as **400** Gg CO_2 eq., **0.07%** of total GHG emitted by sources of which 99% came from electric equipment. (2019)

12 Countries in Reporting

- The rest did not report SF_6 due to lack of data
  - Working with Eskom on the process to collect, report and regulate the SF_6 emissions.(South Africa)

The emissions for the reporting period are presented as trends by gas and sector covering carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs). Sulfur hexafluoride (SF_6) emissions are not reported due to a lack of data. The Department of Forestry, Fisheries and the Environment (DFFE) are in discussions with South Africa's main electricity producer (Eskom) to obtain historical SF_6 data so that it can be included in the next inventory. Furthermore, a threshold has been set for SF_6 in the new GHG Reporting Regulations so that companies will start reporting SF_6 data. The trends per sector are also presented, highlighting the methods, data and quality control (QC) measures that have been implemented.

Regulations

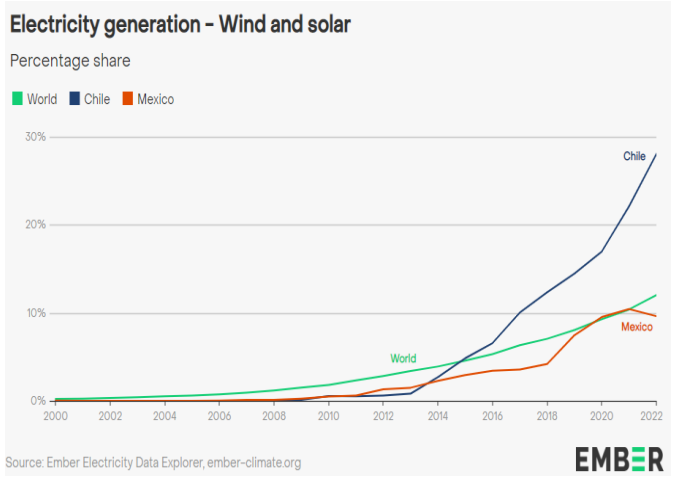
- F-gas regulations exist mostly for HFCs, but no restrictions for SF_6.
    - No educated policy on reducing harmful emissions from the use of SF_6 (Mexico)
    - There are import/export control regulations for HFCs. (Chile)
    - Such national policies already exist in our country aiming to reduce emissions of F-gases, as well as ODS but no regulations for the use of SF_6-based switchgear specifically. (Timor Leste)
    - A draft circular on GHG MRV and inventory is under development (Vietnam)
    - Egyptian national **regulations on F-gases currently exist, leaving room for improvement to develop the reduction of leakage, recovery of F-gases**, and appropriate treatment of used refrigerants, the transition to **F-gas alternatives**, technician training, etc. **National legislation on F-gases will be drafted** in coordination with relevant ministries and based on experience from the EU and other countries (Cool up, 2022) (Egypt)

Policies

- Countries have plans to refurbish, modernize and expand transmission and distribution networks.
  - improve and upgrade/the transmission and distribution networks including extra high-voltage substations, control centers, and smart grids (Egypt)
  - has an expansion plan for national & zonal transmission system containing a total of 48 expansion works, whose investment amounts to a total of approximately USD 1,485 million (Chile)

Policies

- Most countries have strong potential for renewables and plan for grid integration
  - Deploy and scale up solar and wind energy, to decarbonize the power sector and install additional RE capacities to reach an electric power contribution target of 42% by 2035 as per Egypt's Integrated Sustainable Energy Strategy 2035 on Plans (Egypt)
  - Set a target for 70 percent of the country's energy consumption to come from renewable power sources by 2030, national electro-mobility strategy (Chile)
  - recently adopted Power Development Plan 8 (PDP8), which regulates the development of renewable energy production(Vietnam)
  - Integration of large/small decentralized RE systems (Egypt, Lebanon)



Summary

- Developing countries are not well aware of the harmful effects of SF_6 gas
  - Low emissions
  - Lack of regulations and reporting
  - Lack of knowledge and technologies on SF_6-free alternatives

- However, countries are expected to see a rapid increase in **installations of new switchgear** due to policy drivers like,
  - Grid refurbishment and T&D expansion
  - Renewable grid integration
  - Electric mobility strategy

Summary

- Countries are in a time of installing or refurbishing grids,
  - continue installing SF_6 based GIS
  - adopt the best available technology in the market, and share the responsibility to reduce global SF_6 emissions

- What could be **the incentives** for technology leapfrogging, **to switch** to the best available technology, SF_6-free GIS?

Gaps and Needs Identified

- Financial support
  - Generate economic resources to finance a technological replacement by generating relevant financing opportunities and sharing cost burden (Chile)
- Technical support
  - Comparative analysis among alternatives (AIS, SF_6 GIS, SF_6-free alternatives) like Life Cycle Assessment or Cost-Benefit Analysis (Mexico, Chile, Lebanon)
  - Knowledge and experience sharing among grid operators and manufacturers for the production and operation of SF_6-free GIS (Vietnam, Timor Leste)
  - Training on regulations, and standards (Timor Leste)
  - Field test to determine specifications – land size, temperature, gas type (Mexico)

Gaps and Needs Identified

- Ways to reuse/recycle the use of F-gases/SF_6 for circularity (Chile)
- Collection of SF_6 consumption and creation of a national inventory (South Africa) from sources, and reporting & supervision of the use of F-gases in the electricity sector (Timor Leste)

Activity	Objective	Amount Needed ($)	Implementing Entity	Identified by	Priority
Collection of AD on the consumption of F-gases, particularly SF6.	Collect relevant industry and ODS activity data through a national survey	130,000	EPA, Ministry of Trade, Ghana Custom Services	Technical Team of Expert and Ghana	High
Aggregating the project-level results of mitigation actions to sectoral and	Improve the methodology for computing the	30,000	EPA	Technical Team of Expert and	High

7.2.2 Information on capacity needs and support received

During the report consideration stage of the BUR2 under the International Consultation and Analysis (ICA) process, Ghana, together with the Technical Team of Expert (TTE), identified the following capacity building needs that could facilitate the preparation of subsequent BURs and participation in ICA:

- Collection of AD on the consumption of F-gases, particularly SF6.
- Collection of AD and EFs to support the development of a tier 2 method for road transport.
- Support in expanding the current facility-level carbon accounting programme, considering lessons from the public electricity utility's current voluntary carbon accounting programme.

Roundtable Discussion

UN environment programme

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Thank you for listening.

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