

Green Innovation in the Energy Sector

Global Green Growth Institute (GGGI)

*5th Energy and Climate Technical Working Group
8th October 2020*

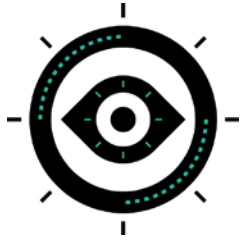
GGGI at a Glance

Headquartered in Seoul, Republic of Korea, GGGI has **38 Members**.



(updated as of Q2, 2020*)

GGGI's Vision, Mission and Position



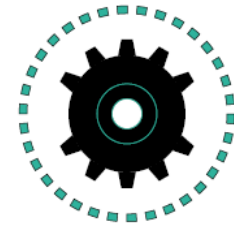
Our Vision

**A LOW-CARBON, RESILIENT
WORLD OF STRONG,
INCLUSIVE, AND
SUSTAINABLE GROWTH**



Our Mission

**GGGI SUPPORTS ITS
MEMBERS IN THE
TRANSFORMATION OF THEIR
ECONOMIES TO A GREEN
GROWTH ECONOMIC MODEL.**



Our Position

**A TRUSTED ADVISOR &
DEVELOPMENT PARTNER
EMBEDDED IN MEMBER &
PARTNER GOVERNMENTS**

Electricity sector challenges in GGGI member and partner countries

Renewable Energy Integration in the Grid (Example)

- As per IEA, Asia's share in global coal power generation has climbed from over 20 % in 1990 to 80 % in 2019.
- Asia is also witnessing very high renewable energy targets
 - ✓ India : 175 GW by 2022
 - ✓ Indonesia: 23 % renewable energy in the energy mix by 2025
 - ✓ South Korea: 35 % renewable energy in the energy mix by 2040
- To meet high share of RE generation and keep supply & demand in balance for system stability would require
 - ✓ Proportionate increase in electricity demand (unlikely compared to targets); and / or
 - ✓ A flexible power generation systems that can react to the demand
- With coal being the pre-dominant source, increasingly expensive and polluting, the onus of providing flexible generation will lie on coal-based power plants.
- The importance of flexibilization of coal-based generation assets is threefold:
 - ✓ Enable higher integration of renewables into the grid
 - ✓ Ensure grid stability
 - ✓ Optimize power purchase cost

Transport Sector Rising Emissions

- Emissions from the transport sector are a major contributor to climate change — about 14% of annual emissions. In terms of transport modes, 72% of global transport emissions come from road vehicles.
- The expansion of vehicle ownership in developing economies (Asia, Africa, & L. America) is leading to rise in congestion, deteriorating air quality and major source of GHG emissions.
- Electrification is an important part of the solution to the challenge of growing transportation sector emissions because it eliminates tailpipe emissions and harnesses the potential to decarbonize the power grid.
- Developing countries and emerging economies need to encourage EVs through incentives and bringing in place adequate charging infrastructure. The real innovation would come from policy-based incentives in the EV space.

**Best Practices
Renewable Energy Integration**

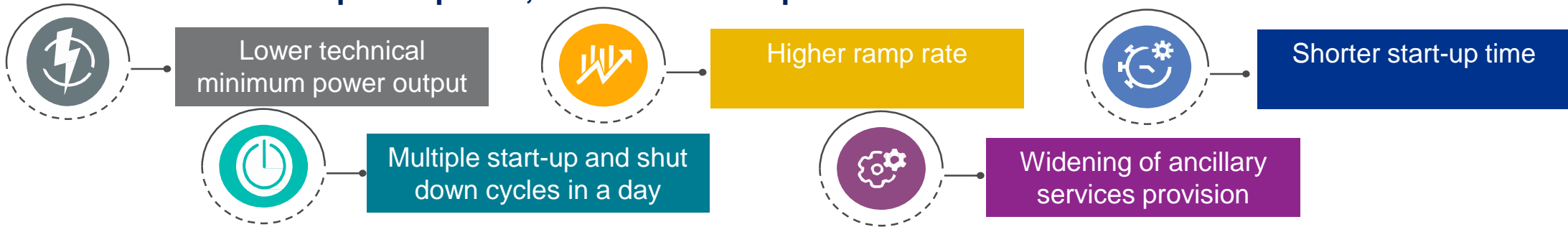
**Flexibilization
Experience in Germany & the UK**

Uniper's Flexibilization Experience



The European power market has gone through many changes and Uniper's coal plants have had to adapt to the increasing flexibility requirements to survive.

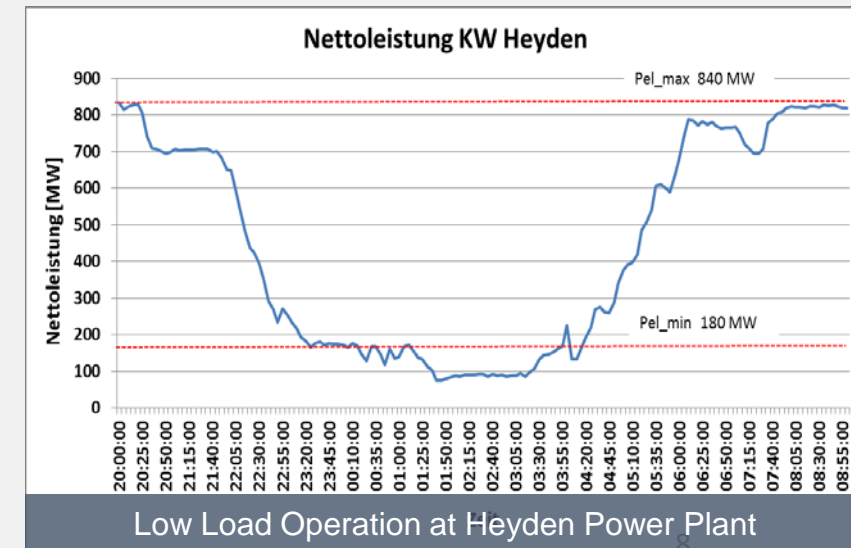
For thermal power plants, flexibilization implies:



Low Minimum Load at Uniper's Heyden Power Station, Germany

- Undertook technical modifications to reduce the minimum stable load from 180 MW down to 90 MW (~11 % of the rated capacity)
- Stable operation was achieved at 10% of the rated power of Heyden Power Plant
- Boiler operation was managed through a single mill operation without oil support

Heyden Plant's Flexibility	Min load	20% / 180MW	Hot start time to grid	1 hour
	Ramp rate	15....20MW/Min	Hot start time to full load	3 hours



The UK Experience: Ratcliffe-on-Soar Plant



With UK witnessing strong influx of RE, Uniper's Ratcliffe-on-Soar power plant has adopted a holistic approach towards flexibility that integrated multiple aspects:



Process changes

- Adjustment of boiler inspection intervals
- Fuel switching with total values of coals
- Switching to lesser no. of mill operation
- Reduction of start oil usage
- Participating in ancillary services market to provide black start, frequency support etc.



Equipment retrofits

- Retrofitting equipment like:
- Boiler
 - Pulverizers
 - Turbines
 - Generator rotors
 - Condenser
 - Thin-walled component



Behavioral changes

- Data driven approach to measure and improve on continuous basis
- Performance monitoring using thermodynamic models
- Onsite, remote and classroom trainings for plant operators

Behavioural and cultural changes, coupled with right education and data driven decision making has played a crucial role in affecting improvements in the plant operations:

50%
reduction
NDZ for
Hot Starts

Faster to grid

25% fuel
cost
reduction
per Hot
Start

Cheaper to start

30%
reduction
in Hot Start
time to full
load

Faster to Load

12%
reduction
in £/MWh

Cheaper to run

50%
reduction
in time to
shut down

Faster off the bars

Best Practices

EVs: Policy and Pilot Interventions in UK and Denmark

Parker Project: Denmark's V2G Pilot



The Parker project is a Danish project aimed at demonstrating potential of EVs to participate in advanced smart grid services:

Grid Applications

- Demonstrated provision of frequency regulation services using EVs and charging infrastructure
- Established a commercial V2G hub that provided frequency services for a 13,000 hours for a single car, with an average annual revenue €1,860/car

Test Protocol

- Developed 'grid keys', i.e. list of technical requirements for controlling the power exchanged between the EV and the grid
- Developed seven different measures of performance to act as benchmark for upcoming car models & standards

Scalability and Replicability

- Analyzed the potential earnings from performing frequency services, which in best case scenario went as high as €2,304/car/year
- Identified barriers for providing frequency services which included few V2G capable EVs, market structures not ready for EV aggregation and market frameworks not developed for the DERs

Policy Initiatives by Danish Government

Denmark has embraced EV revolution with a plan to ban sale of new petrol and diesel cars from 2030. The Danish government has rolled out multiple incentives to accelerate EV adoption:

EV Incentives

- **Registration tax:** Incentives on registration tax for EVs.
- **Parking fees:** Exemption of parking fees up to €670 per year.
- **Public procurement:** Danish Energy Agency has supported municipalities and companies' purchase EVs since 2013

EV Charging Incentives

- **Tax exemption for commercial charging:** The companies that supply EV charging on a commercial basis can receive an electricity tax rebate of around €0.13 per kilowatt-hour.
- **Favorable Tariffs for Buses:** Favorable tariffs for electric bus charging will last until 2024.

UK's Emphasis on Policies and Incentives



The UK is one of the few governments that has a comprehensive strategy for electrification, with both an official **Office for Low Emission Vehicles (OLEV)** and an electrification strategy called the **Road to Zero** strategy:

- **£290 million** budget dedicated to boosting the use of low-emission vehicles to 2050
- **£400 million** Charging Infrastructure Investment Fund

Along with policy interventions, UK is accelerating e-mobility through innovative pilots on new services and technology.

E-Flex V2G Pilot:

Demonstrated the commercial potential of vehicle-to-grid (V2G) in energy markets and establish it as an essential component of the zero-carbon economy. The benefits demonstrated from this pilot included:

54%
Reduced energy costs for the fleet

48%
Reduced energy costs for the business as a whole

43%
Additional revenue generated from sale of unused power

UK EV Incentives

Main EV Incentives in the UK



Plug-in Car Grant

- Save up to 35% (max. £3,500) when buying an electric car
- Save up to 20% (max. £1,500) when buying an electric motorcycle or moped



Tax Benefits & Charge Discounts

- Get an exemption from the Vehicle Excise Duty
- Get an exemption from London's Congestion Charge
- Write down 100% of the purchase price of your EV against corporate tax liability



Local Parking Perks

- Free and discounted parking in many towns and cities



Scottish Benefits

- Benefit from interest-free loans of up to £35,000 when buying an EV in Scotland

Main EV Charger Incentives in the UK



Home Charger Grant (EVHS)

- Save up to 75% (max. £350) on the purchase & installation of an EV charger for your home or workplace



Workplace Charger Grant

- Save up to 75% (max. £350) on the purchase & installation of an EV charger for your workplace (max. 40 sockets)



Scottish EV Charger Grant

- Save up to 75% (max. £500) on the purchase & installation of an EV charger for your home



Tax Benefits

- Businesses can access a 100% first-year allowance for EV charging equipment



GGGI – Regional Activities



Budapest - European Liaison Office

Hungary Long-Term low greenhouse gas emission Strategy (LTS) : set the path toward climate neutrality at national level by 2050. (project ongoing)

- Plan to decarbonize sectors, including electricity
- Inform policy decisions under the European Green Deal
- Support development of Just Transition Plan

Design of financial instrument to support climate action in the Western Balkans (2018-19)



- Project resulted in the establishment of the state-owned Western Balkan Green Center Non-Profit LLC. by a Government decision (1770/2018. [XII. 21.]).

Climate and Resilient Cities in Serbia (pilot project: Sombor)

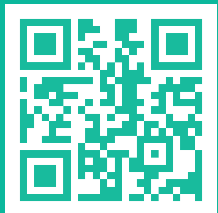


- Assessment of mitigation and adaptation at city level
- City's climate action plan
- Detailed audit and financial assessment for sustainable energy in building

Thank You



www.gggi.org



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