

FLEXIBLE POWER GENERATION

CHALLENGES AND OPPORTUNITIES IN
THE FUTURE ENERGY SCENARIO

ETN WEBINAR SERIES

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FEATURED HORIZON 2020 PROJECTS:





The EU energy strategy to meet the 2030 and 2050 climate and energy goals

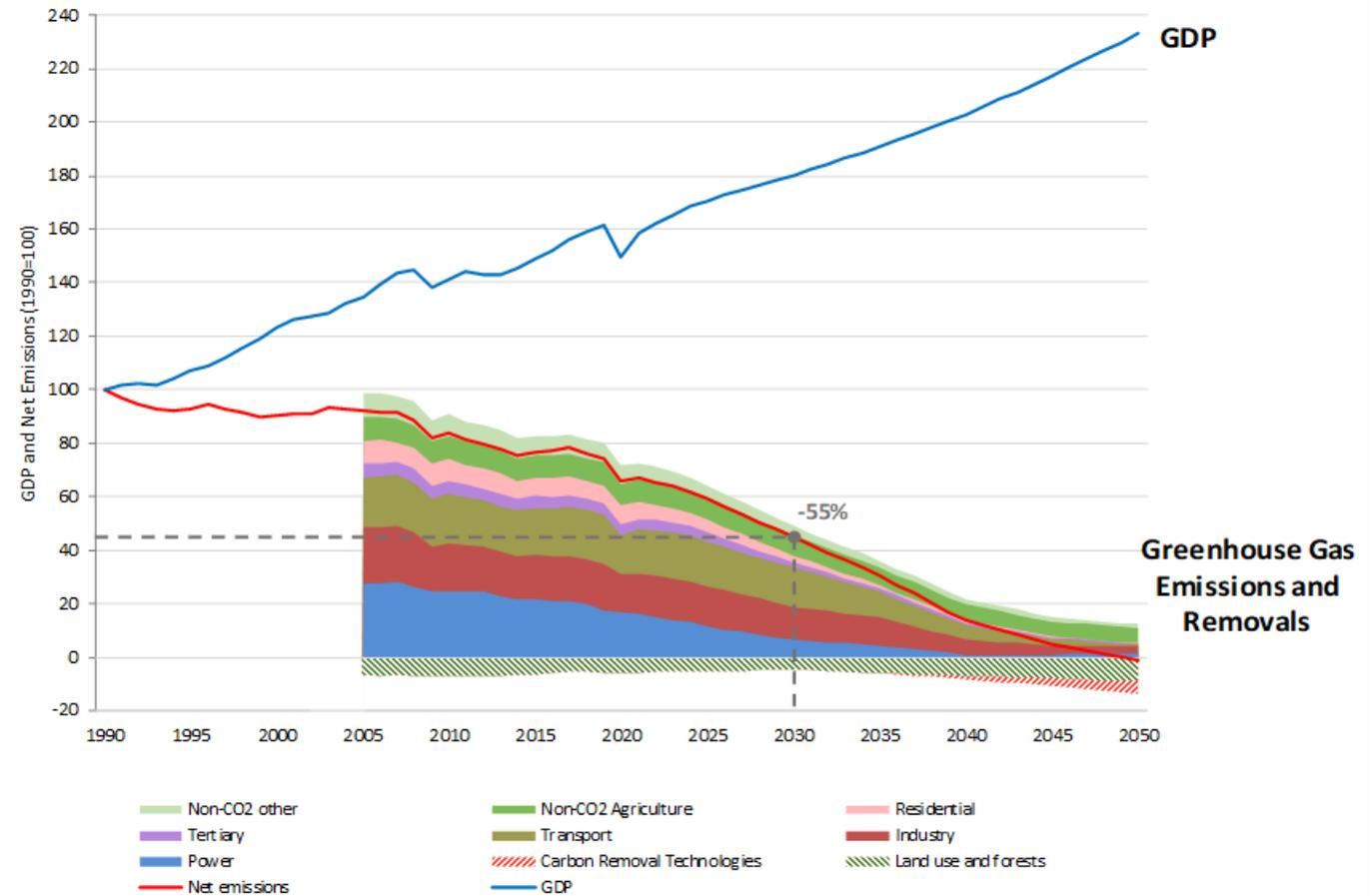
Hans van Steen - Acting Director on Renewables,
Research and Innovation, Energy Efficiency
DG Energy

Flexible Power Generation - Webinar series - 29.09.2020

State of the European Union – 16 Sept 2020

- Increased ambition: 55% GHG reduction by 2030 (vs. 1990)
- Green Deal confirmation: 37% of the EUR 750bn recovery package

Strategy for Energy System Integration

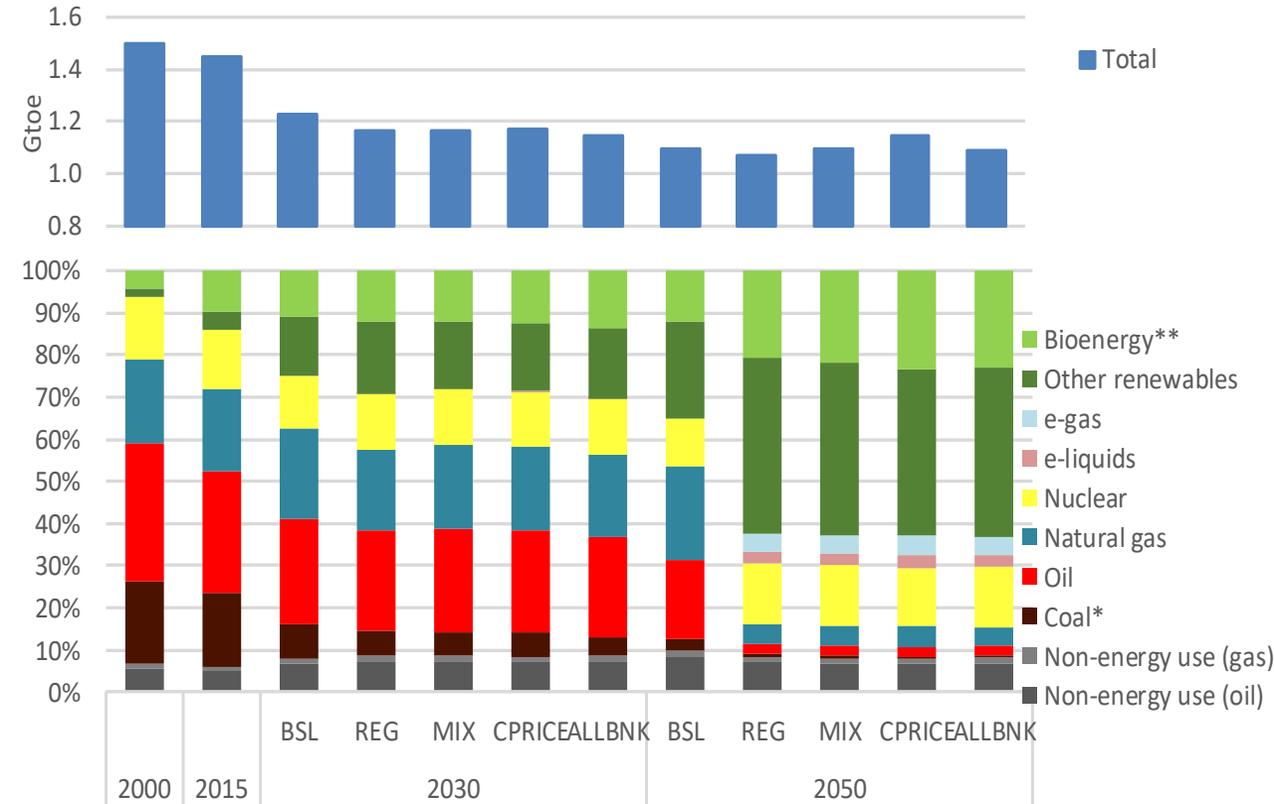


Role of flexible power generation:

- complement to growing variable renewable generation
- quick ramp up and down, run at low capacity factor
- complement to demand response

Role of centralized power generation

- Balance centralised / decentralised



Energy mix scenario in 2030 and 2050 from Impact assessment for 55% GHG reduction

Note :
* includes peat, oil shale,
** includes waste

Source: 2005, 2015: Eurostat, 2030-2050: PRIMES model

Projects funded - Load flexibility :

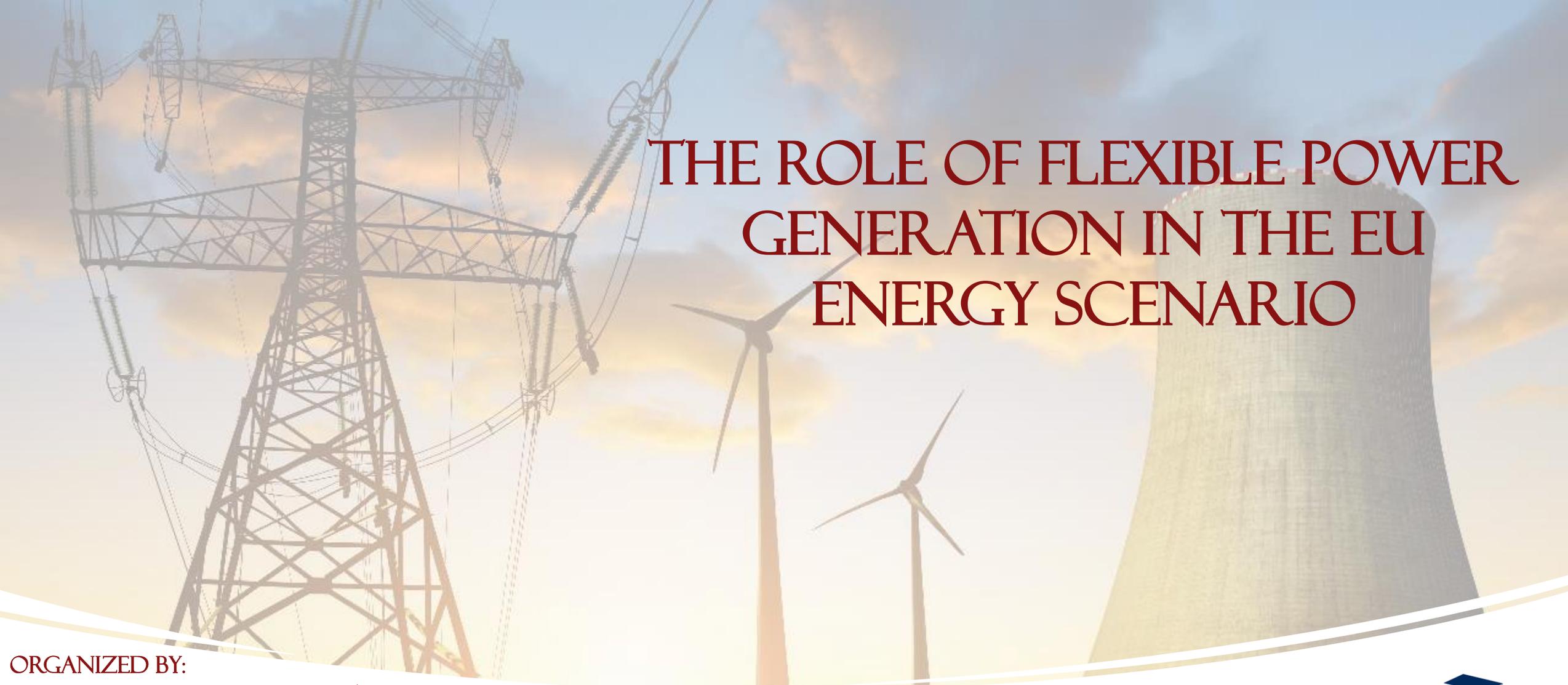
- 2017 - Flexible and efficient fossil fuel power plants:
3 projects - 18.7M€
- 2019 - Integrated solutions for flexible operation of fossil fuel power plants through power-to-X-to-power and/or energy storage: 2 projects, 20.3M€,

Industrial waste heat recovery and conversion to power:

- call closed 01 Sept 2020 - 1 project, max. 14M€



Thank you!



THE ROLE OF FLEXIBLE POWER GENERATION IN THE EU ENERGY SCENARIO

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CHRISTER BJÖRKQVIST
MANAGING DIRECTOR

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Safe, secure and competitive carbon-neutral turbomachinery-based energy solutions by 2030, implemented widely and globally by 2050

Market trends,
policy, legislation



Efficient, low-carbon
optimised operations



Research and
development



Working Groups and Projects

- 
1. The accelerating need for Flexible Power Generation
 2. Flexibility Contributions
 3. The importance of Cooperation

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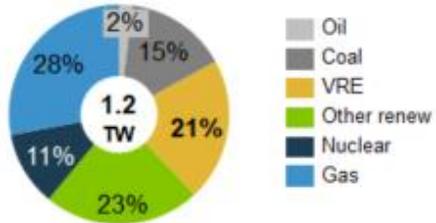
Large expected increase in Variable Renewable Generation (solar & wind)

39-43% installed VRE capacity by 2030

Europe installed capacity

2018

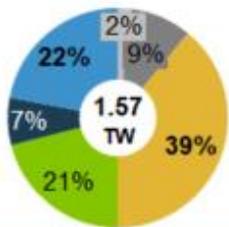
1.2 TW



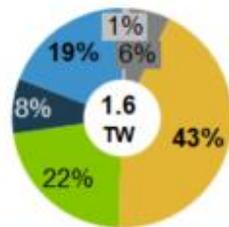
2030

~ 1.6 TW

New policies scenario



Green scenario

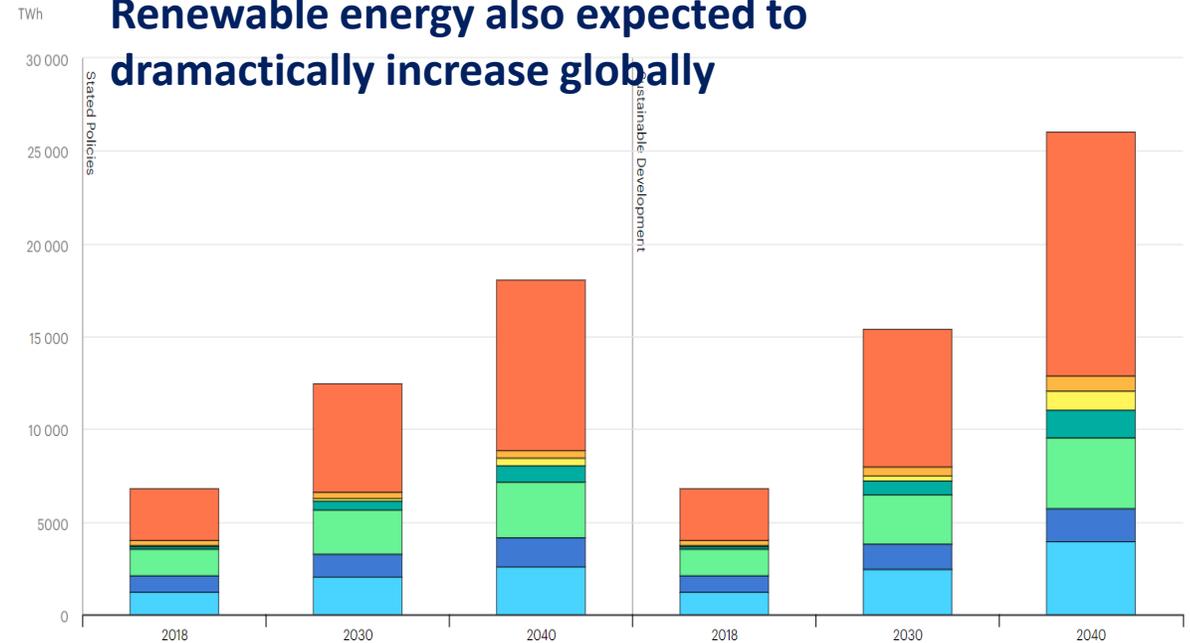


Variable Renewable Energy (wind + solar)



SOURCE: WEO 2018

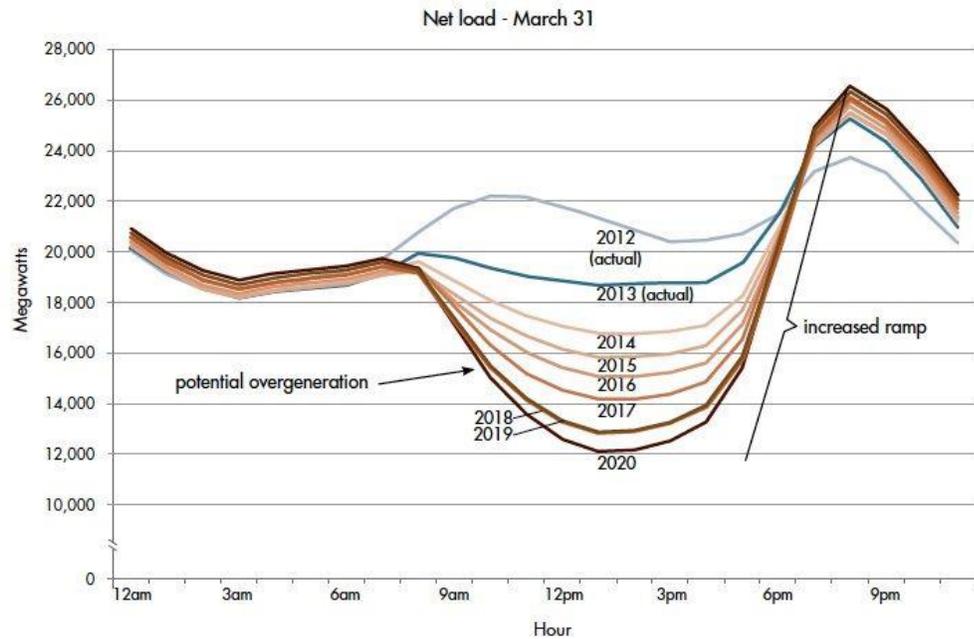
Renewable energy also expected to dramatically increase globally



IEA, Renewable electricity generation by region and scenario, 2018-2040

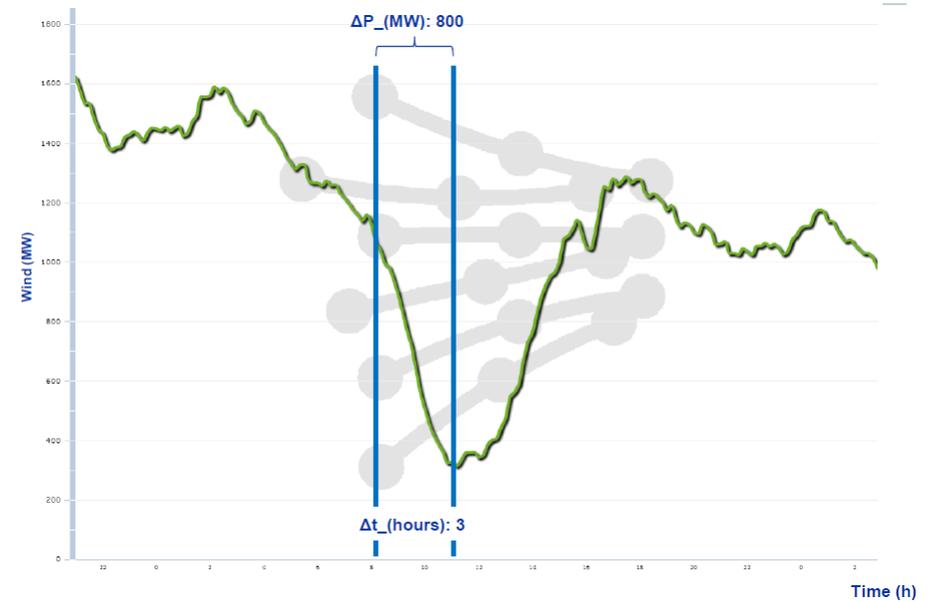
Increasing variable renewable energy provides a growing challenge to balance the grid

California ISO Duck curve –utility power production



California ISO, What the duck curve tells us about managing a green grid

Wind generation in Spain



Intraday wind generation ramping, Endesa



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Flexibility Contributions

Operational flexibility

- Frequent and fast start-up and shut down
- Optimised efficiency at low load
- Fast load ramps & reserve capacity
- Low turn down capacity

Fuel flexibility

Carbon-neutral gases, such as hydrogen, ammonia, biomethane or synthetic methane.

Sector Coupling

- “Absorb” excess electricity supply from renewable sources
- Cross-vector integration between electricity, gas and heat
- Store energy and provide back-up supply in times of high demand and prices

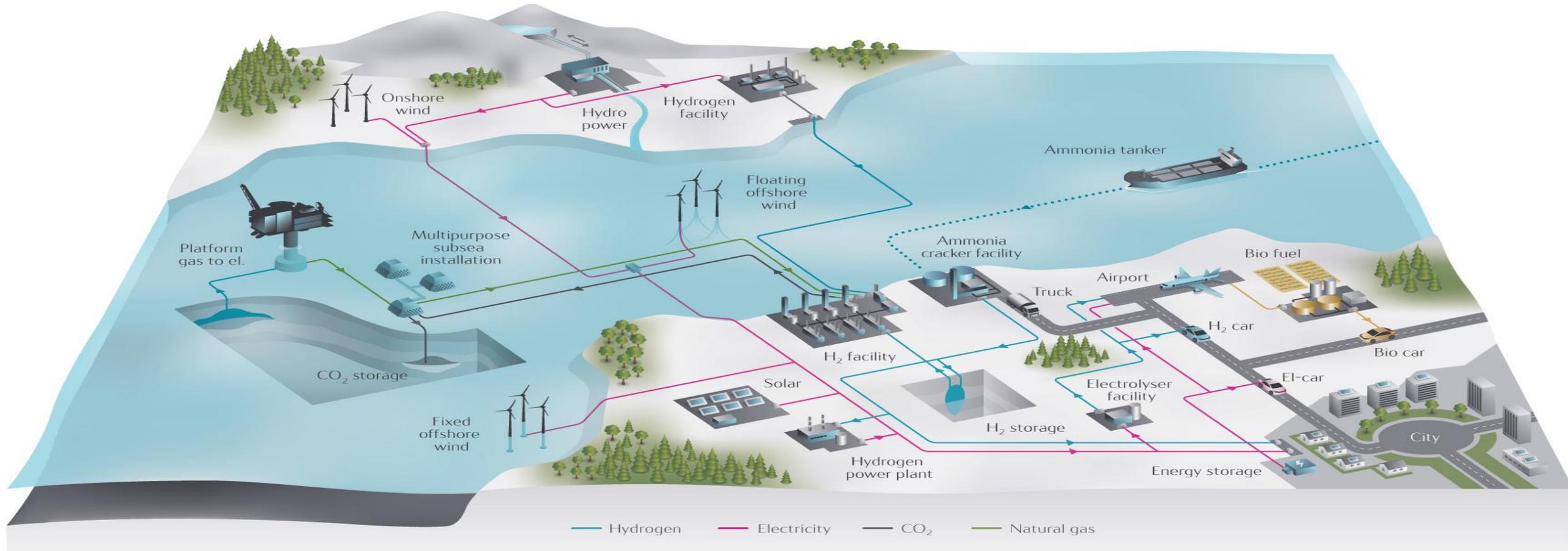
Benefits

- Reactivity-Power on demand
- Operational efficiency
- Grid stability-frequency balancing
- Emission compliance

Carbon & emission reductions

- Energy storage solution
- Power-to-X-Power
(gas, liquid, heat)
- Reduce VRE curtailment

A Flexible hydrogen-society based on sector coupling



Source: Equinor 2019



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ETN Cooperation Opportunities

Focus Areas

Carbon-low/free Gas
Turbine Operation

Operational
& Fuel Flexibility

Additive Manufacturing
& New Materials

Condition Monitoring
& Asset Management

Working Groups

Additive
Manufacturing

Air Filtration

Exhaust
Systems

Hydrogen /
Ammonia

Micro Gas
Turbine

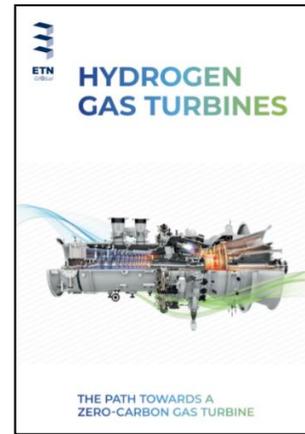
sCO2

Task Forces:

COVID-19 Best Practises

GT Component Life Assessment

Recent Publications



[ISO 21905 – Gas turbine applications – Requirements for exhaust and heat recovery unit](#)



THE DECARBONISATION OF POWER GENERATION: AN END-USER PERSPECTIVE

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SIMON BALMER
OPERATIONS DIRECTOR - GAS TURBINE FLEET

UNIPER



An Introduction to Uniper

Our operations

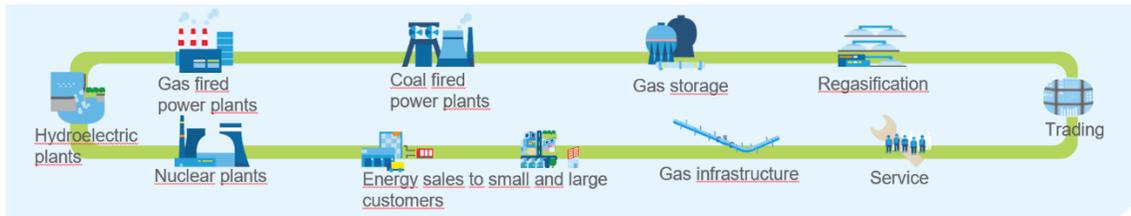
- Power Generation
- Commodity Trading
- Energy Storage
- Energy Sales
- Energy Services



€1.6bn EBITDA¹

~34 GW Generation capacity¹

100 years Experience

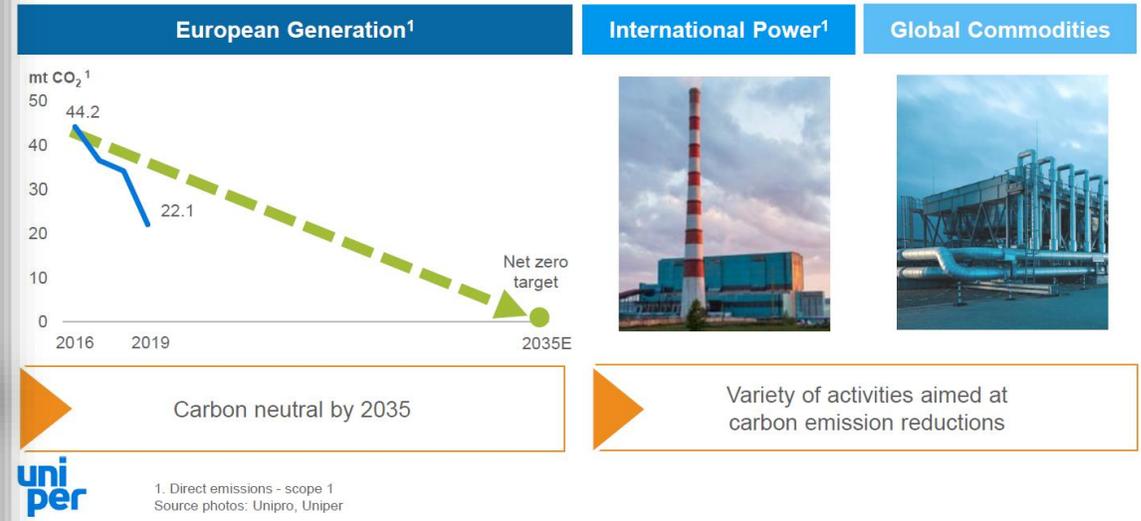


Empower energy evolution – Towards carbon neutrality



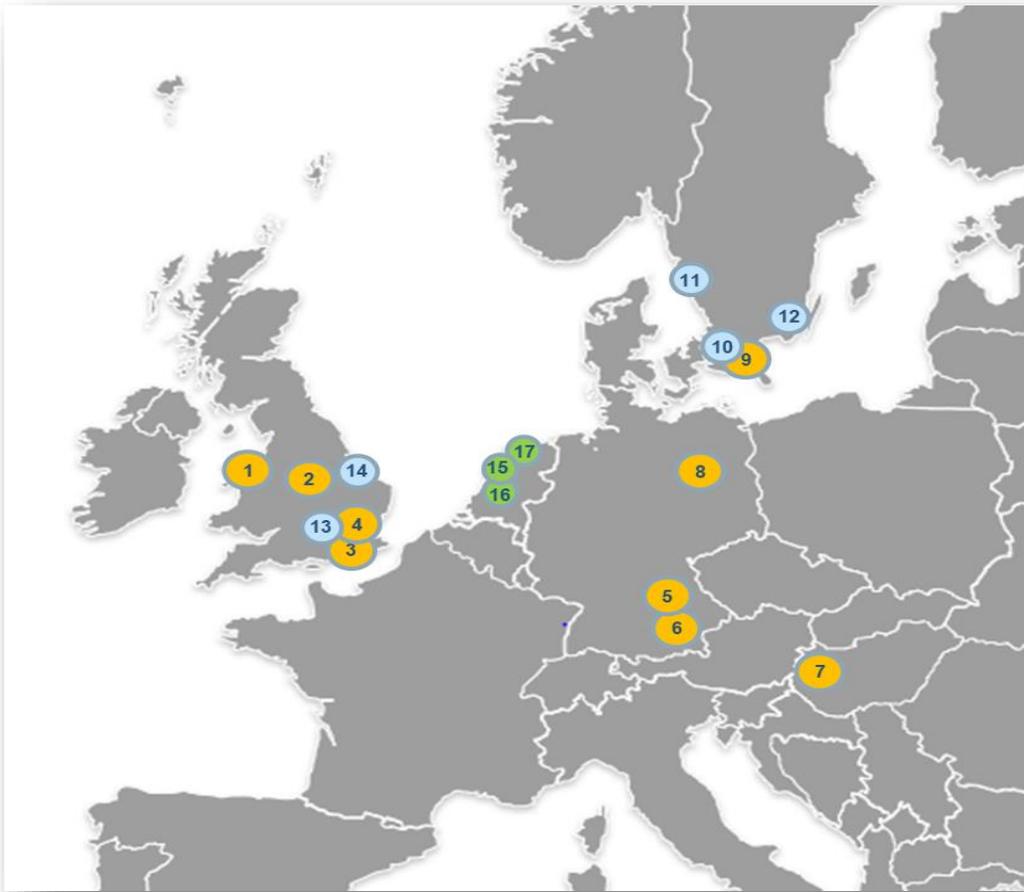
Vision for a clean energy portfolio

Greener Uniper: Ambitious management action to significantly reduce Uniper's environmental impact



The Uniper Gas Turbine Fleet*

*Excluding Russia



Combined Cycle GT Plants		
1	Connahs Quay	GE
2	CDC	SIEMENS
3	Grain	GE
4	Enfield	GE
5	Franken	SIEMENS
6	Irsching	SIEMENS
7	Gönyü	SIEMENS
8	Kirchmöser	SIEMENS
9	Öresundsverket	GE
Open Cycle Plants		
9	Öresundsverket	SIEMENS
10	Barsebäck	P&W
11	Halmstad	SIEMENS
12	Karshamm	RR
13	Taylor's Lane	RR
14	Killingholme	SIEMENS
Heat & Power Plants		
15	The Hague	GE
16	RoCa	GE
17	Leiden	GE

- ~10GW installed capacity.
- Locations in 5 countries.
- Combined and open cycle configurations.
- CHP applications for industry and city heating.
- Delivering a range of products and services into the different markets.



Operating in a Decarbonising World

Current situation:

- High levels of reliability and availability continue to be a high priority to ensure security of supply.
- Increasing use of gas turbine generation as coal contribution reduces.

Preparing for the future:

- Hydrogen is seen as a key pillar of decarbonisation.
- Physical / technological , commercial and regulatory aspects to be understood.
- Collaboration with the OEM's to develop the technical roadmaps.
- Policy and regulatory frameworks are needed to provide investment certainty, foster demand and create a competitive environment.



Siemens and Uniper join forces to decarbonize power generation
08. April 2020, 9:00am

BUSINESS

uni per **SIEMENS**
Cooperation agreement on using "green hydrogen", and promoting sector coupling
Joint projects for the conversion of power plants
Share of "green gas" to be gradually increased

Joint press release, April, 8, 2020

Today, Uniper and Siemens Gas and Power signed a cooperation agreement for the development of projects on the decarbonization of power generation and promoting sector coupling. It extends the long-standing partnership between them because they all can and must contribute to reducing greenhouse gases. One focus of the planned cooperation is the production and use of hydrogen to implement projects in this field together, addressing the entire value chain.

uni per **GE**

Joint Press Release
July 21, 2020

Uniper and General Electric sign a cooperation agreement for climate-friendly natural gas assets

- Objective will be the decarbonization of Uniper's gas-fired power plants and storage facilities with GE technology
- Agreement extends across Uniper's power plants and natural gas storage facilities in Europe
- Focus on Uniper gas power stations in the UK and NL with GE equipment
- GE's first decarbonization agreement with a major power producer

DUSSELDORF, Germany (July 21, 2020) — Uniper (Frankfurt: UN1 DE) and General Electric (NYSE: GE) have signed an agreement aiming at a long-term collaboration on the decarbonization of Uniper's gas-fired power plants and natural gas storage facilities. GE's Gas Power business and Uniper will explore, assess, and develop technology options for decarbonization — GE's first fleet-wide decarbonization program signed with a major power producer.

This agreement — signed in June 2020 — aims at producing a detailed decarbonization roadmap by a joint working group composed of both GE and Uniper representatives by early 2021. This roadmap is to develop an assessment of potential upgrades and R&D programs needed to drive decarbonization, including increasing the use of emissions-friendly hydrogen in GE gas turbines and compressors in Uniper's power plants and gas storage facilities across Europe.



Thank you!



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Flexible Power Generation – Episode 1

SIMON BALMER, UNIPER



CHALLENGES AND OPPORTUNITIES FOR TOMORROW'S TURBOMACHINERY

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PLAN. INNOVATE. ENGAGE.

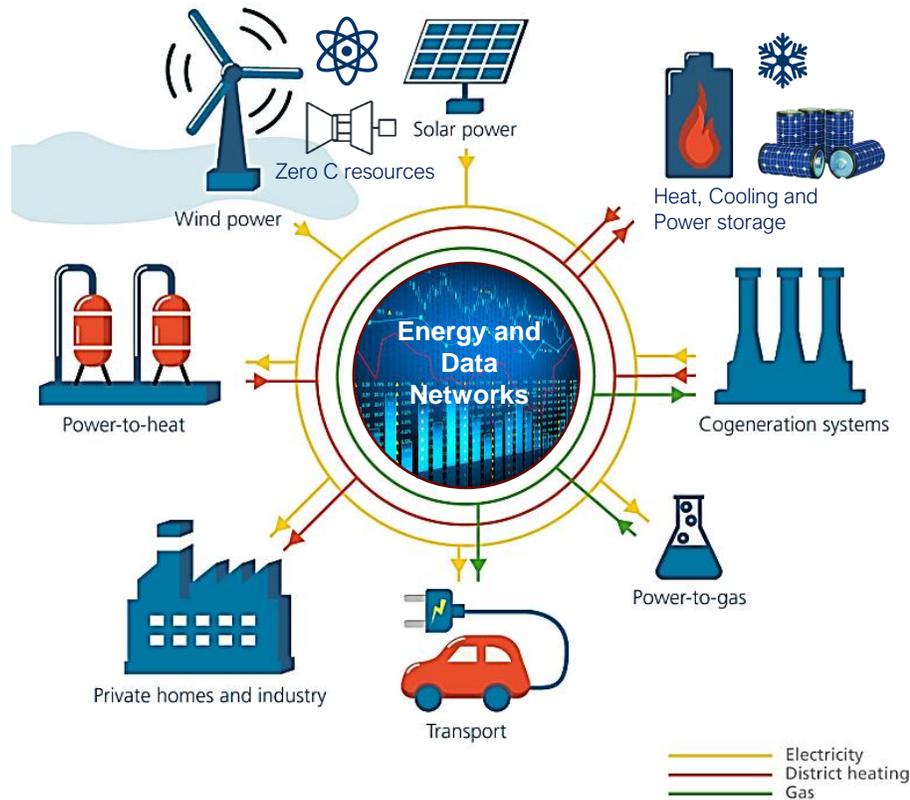
MAURO MORETTO
VP TECHNOLOGY

ANSALDO ENERGIA



Long Term Vision

Going Climate-Neutral



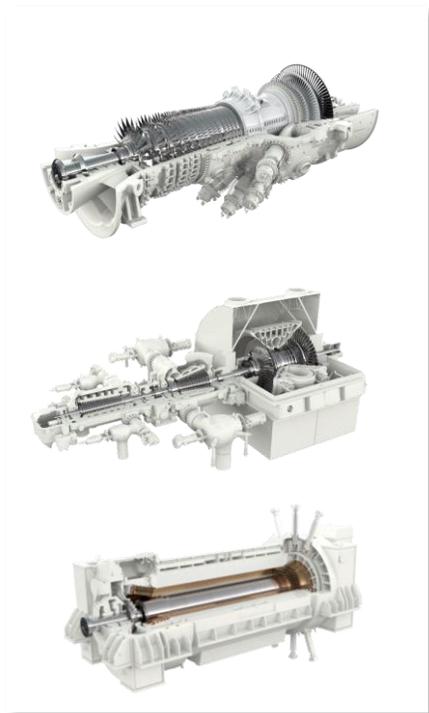
A Vision of Future Energy Systems driven by **Sustainability**

Integrated power, gas, heating, cooling and data networks with storage resources



Turbomachinery

role in the future energy systems



Complement
Renewables
Deployment



Grid stabilization



New Green Cycles



Synchronous Inertia



Hybridization



Turbobatteries



Green fuels



Storage

Fundamental role in repurposing existing assets toward circular economy



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MAURO MORETTO, ANSALDO ENERGIA



Thank you!



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