



The Future of Nordic Nuclear Power

Nuclear and Sustainability, Energiforsk Annual Nuclear Conference

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**Join the
change**

fortum

Fortum in brief

Our core

Hydro and nuclear, combined heat and power production, circular economy, energy-related products and expert services

We are the largest electricity retailer in the Nordics and one of the leading heat producers globally. We have **2.5 million** customers.

96% of our electricity production is CO₂ free in Europe, **61%** in all operations

9,000 professionals in the Nordics, the Baltics, Russia, Poland and India

2/3 of our power production is **hydro and nuclear**

Strong Nordic presence

Unit	MW _e (net)	share [%]	share [MWe]
Loviisa-1	507	100	507
Loviisa-2	507	100	507
Olkiluoto-1	890	26.6	236
Olkiluoto-2	890	26.6	237
(Olkiluoto-3)	1,600	25.0	(400)
(Hanhikivi-1)	1,200	6.6	(79)
Oskarshamn-1*	-	43.4	-
Oskarshamn-2*	-	43.4	-
Oskarshamn-3	1,400	43.4	602
Forsmark-1	984	23.4	231
Forsmark-2	1,116	23.4	261
Forsmark-3	1,159	20.1	232

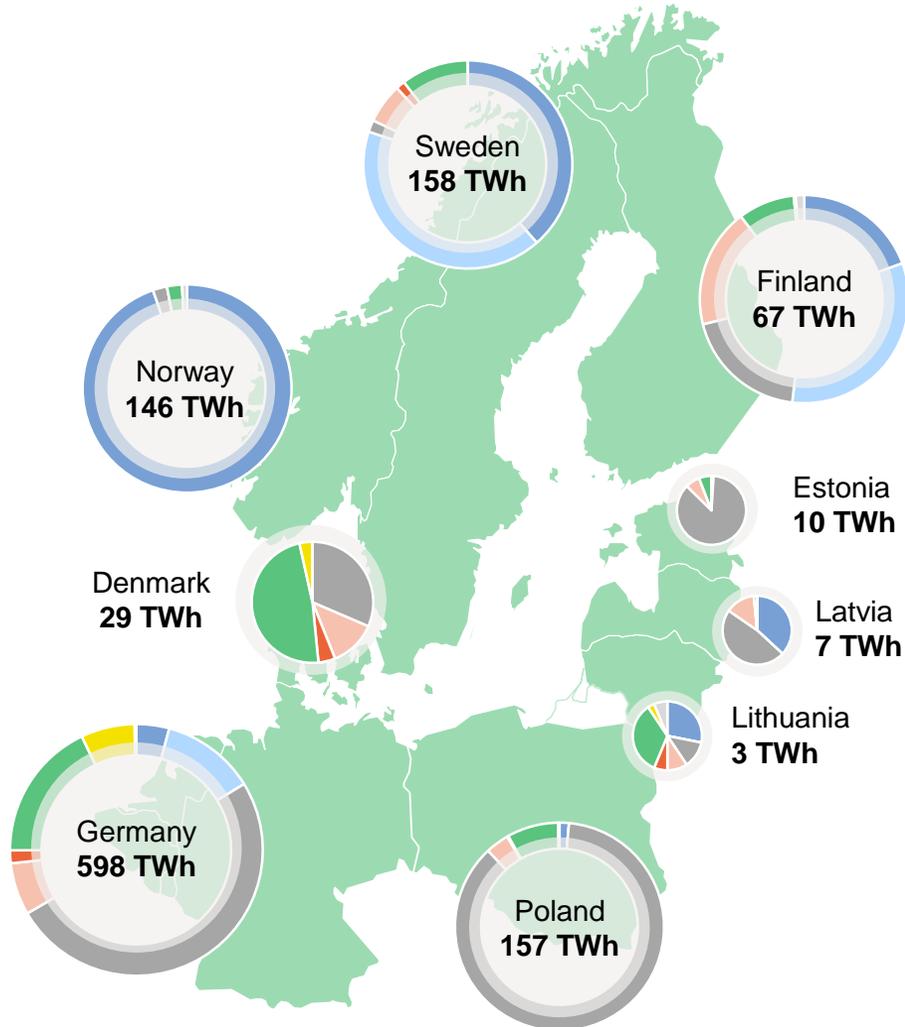
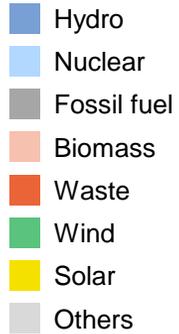
1487 MW_e

1326 MW_e



Figures: 2018

Power Generation in the Baltic Rim in 2018



	NORDICS		BALTICS	
2018	TWh	%	TWh	%
Hydro	*212	53	3	17
Nuclear	88	22	-	-
Fossil fuel	28	7	13	62
Biomass	26	6	2	9
Waste	3	1	0	1
Wind	40	10	2	9
Solar	1	0	0	1
Others	2	1	0	1
Total generation	400	100	20	100
	Net export 2 TWh		Net import 9 TWh	

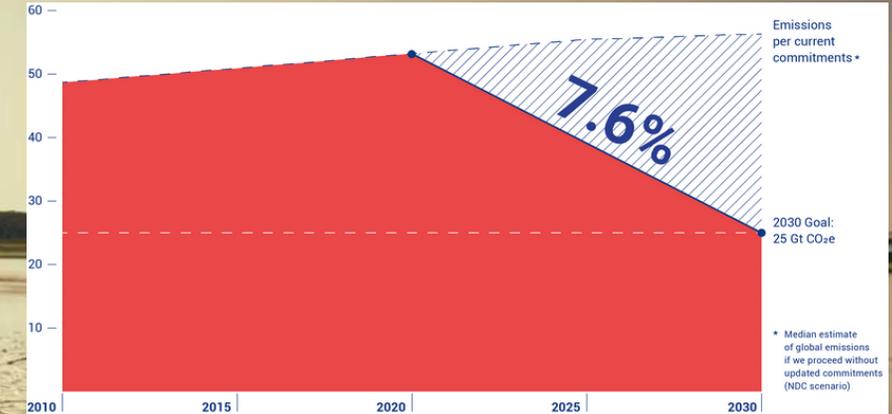
*) Normal annual Nordic hydro generation 200 TWh, variation +/- 40 TWh.

IPCC: Staying below 1.5°C requires “rapid and far-reaching transition” – Fortum calls for an ambitious EU climate strategy

- We need to reach global carbon neutrality by 2050
- The power sector should reduce emissions by 100% well before 2050
- 70-85% of electricity should come from renewables and nuclear will play a bigger role

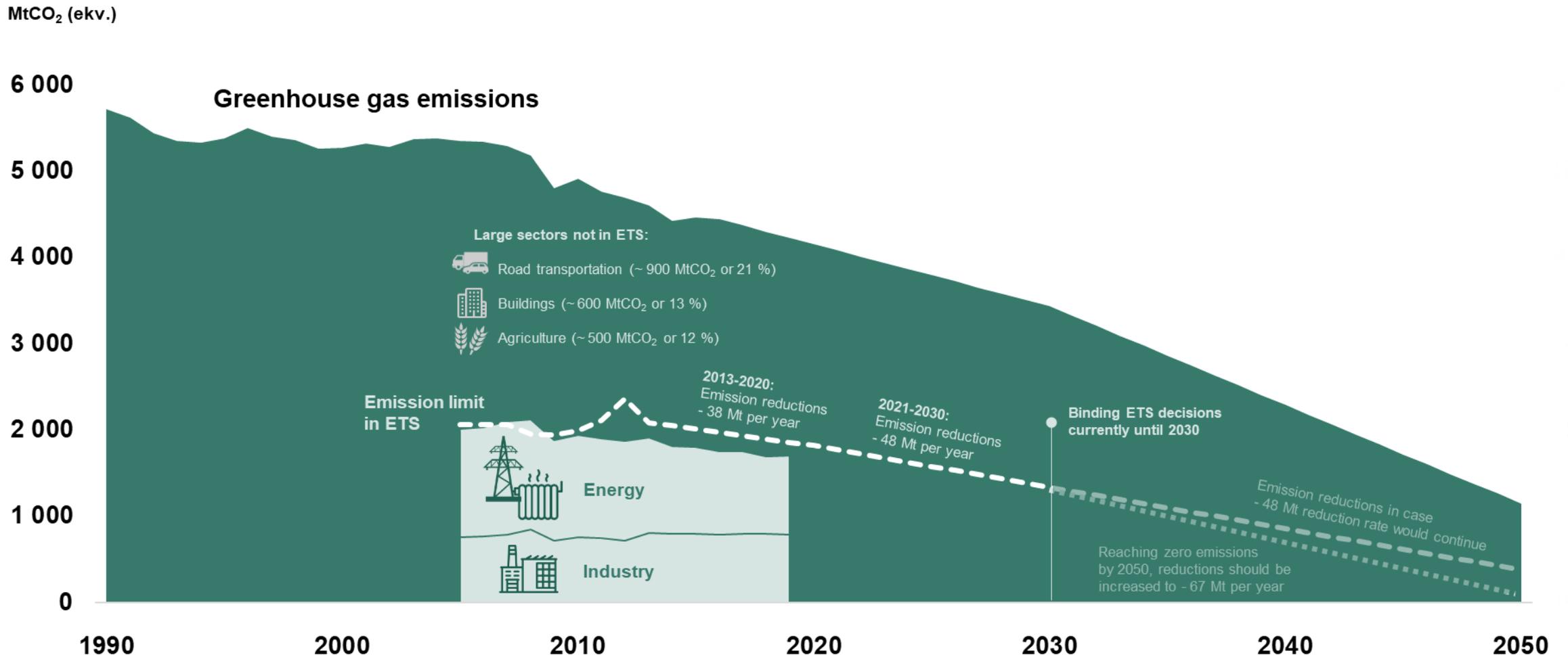
- We believe electrification will be an enabler for decarbonisation
- We ask for a stable, visionary, and long-term political framework
- Carbon pricing should be the key for reaching carbon neutrality and market mechanisms developed to reward CO₂ removal

The gap between the emission reductions needed to reach 1.5°C goal and current commitments



Source: UN Emissions Gap Report, 2019

Emission trading system (ETS) started in 2005 to gradually limit emissions mainly in energy and industry



Source: European Environment Agency (EEA)

- 2013-2020 linear reduction factor (LRF) -1.74 % per year
- 2021-2030 LRF -2.20 % per year
- To reach zero emissions by 2050, LRF assumed 3.05 % from 2030 onwards

Decarbonising all sectors matters

Total CO₂ emissions globally (~ 37 GtCO₂)

CO₂ from global
(~ 7 % of total)

CO₂ from European Union
(~ 9 % of total)

+100%

increase in EU electricity demand by 2050

EURELECTRIC scenario estimate for decarbonized EU

To accommodate a low-carbon system in the future, we must ensure...

COMPETITIVENESS OF NUCLEAR

- Level playing field in the power market, where the ETS should be the main tool to drive decarbonisation;
- Similar treatment in terms of taxation and abolition of nuclear-specific taxes;
- Similar treatment in research, development and innovation policies; and
- Similar access to financing as other low-carbon technologies.

LIFETIME EXTENSIONS OF CURRENT FLEET

- Life-time extensions are the cheapest way to reduce emissions (IEA analysis in US&EU)
- Permissions have no due date and plants can be operated as long as they meet safety regulations.
- We need a prompt decision on the final repository for spent fuel and extension of Clab

NEW TECHNOLOGIES (E.G. SMR'S)

- SMRs: Reducing financial risks, protecting human capital, enhancing safety features
- Need standardisation in design and regulation

Cost-efficiency of nuclear power can be improved



- A car, ca. 30 000 components
- Several electronic systems and mechanical components contributing to safety

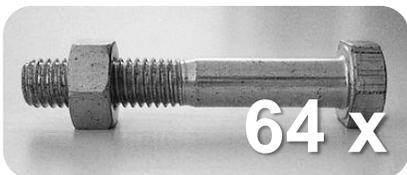
19 000 €
including taxes



- 1 valve plug/stem assembly
- No nuclear safety classification

21 000 €
excluding taxes

Off the shelf without
certificates, ca. 160 €



- Bolts and nuts for flanged connection of pipes
- Safety class 2

20 000 €
excluding taxes

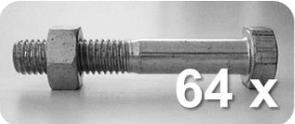
Cost-efficiency of nuclear power can be improved



19 000 €



21 000 €



20 000 €

Qualification of an individual cable fitting

250 000 €

Design basis specification for a simple component

250 000 €

Qualification of software for a protective relay

1000 000 €

The future needs doers - new #nuclearheros

Nordic Nuclear Trainee Programme (NNTP)

a unique opportunity for young talents. The programme will give extensive skills for new nuclear professionals who are in the early stage in their career and offer a unique possibility to network between nuclear professionals in the Nordic countries.

- In 2020, 15 university students or graduated engineers/technicians will have the opportunity to participate in the programme and will gain 15 months of quality mentoring at a nuclear power plant in Sweden and Finland.



Nuclear power has an important role in decarbonized world



Policies and long-term decisions that support companies' ability to promote cleaner energy production on market terms.

Ensure competitiveness with shared best-practises and harmonisation



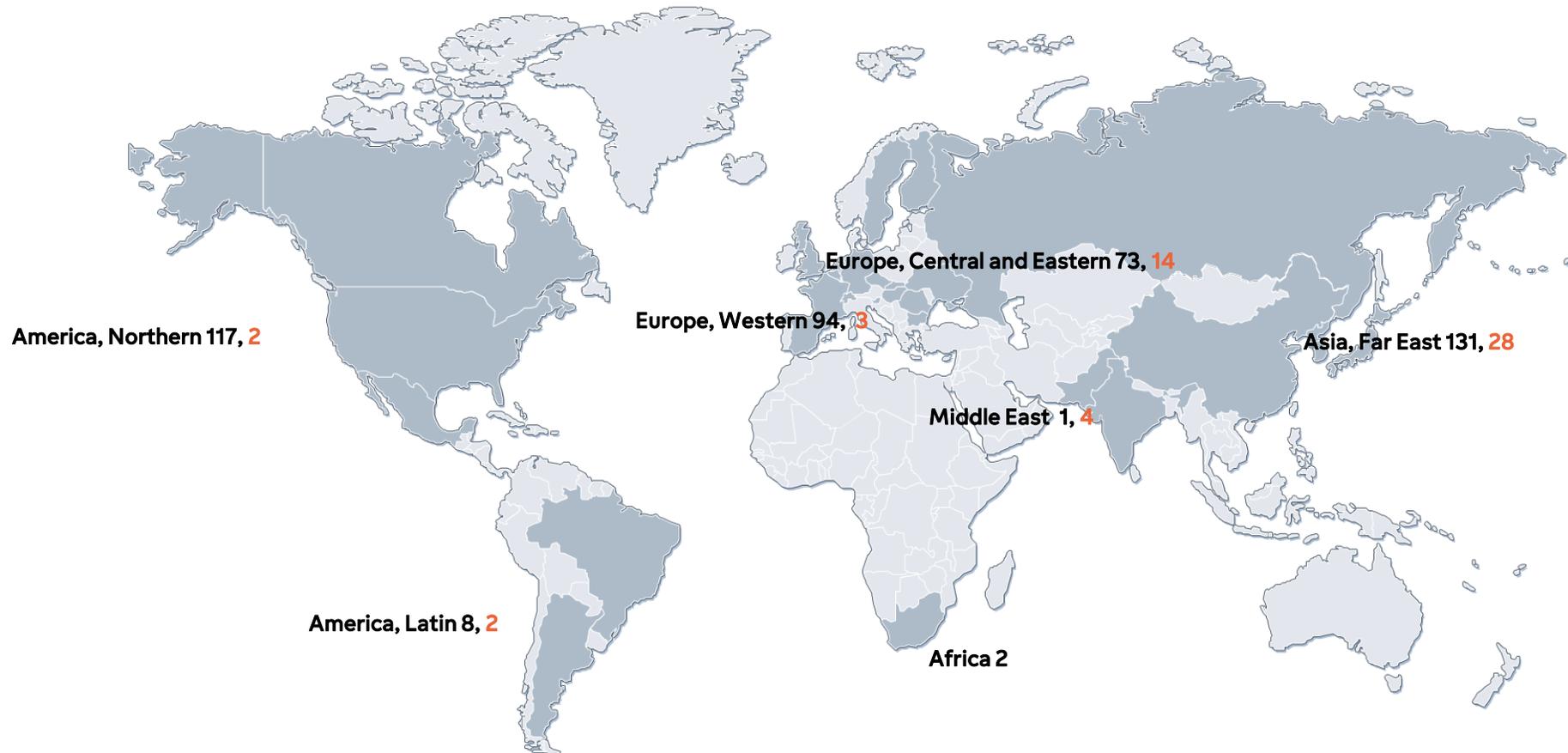


Thank you!



Nuclear power worldwide in 2019

- In production 440 reactors, total 394 836 MW_e net installed capacity (2018: 2563 TWh of electricity)
- Under construction 53 reactors, total 59 627 MW_e



440 reactors in 30 countries provide about 10% of the world's electricity.

Source: iaea.org