



# Nuclear Power in the Future Energy Market

Nuclear Science and Technology Symposium 2019 (SYP2019)

Tiina Tuomela, Executive VP, Generation

30 October, 2019

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 CO<sub>2</sub> 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 <sub>e</sub> (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         |

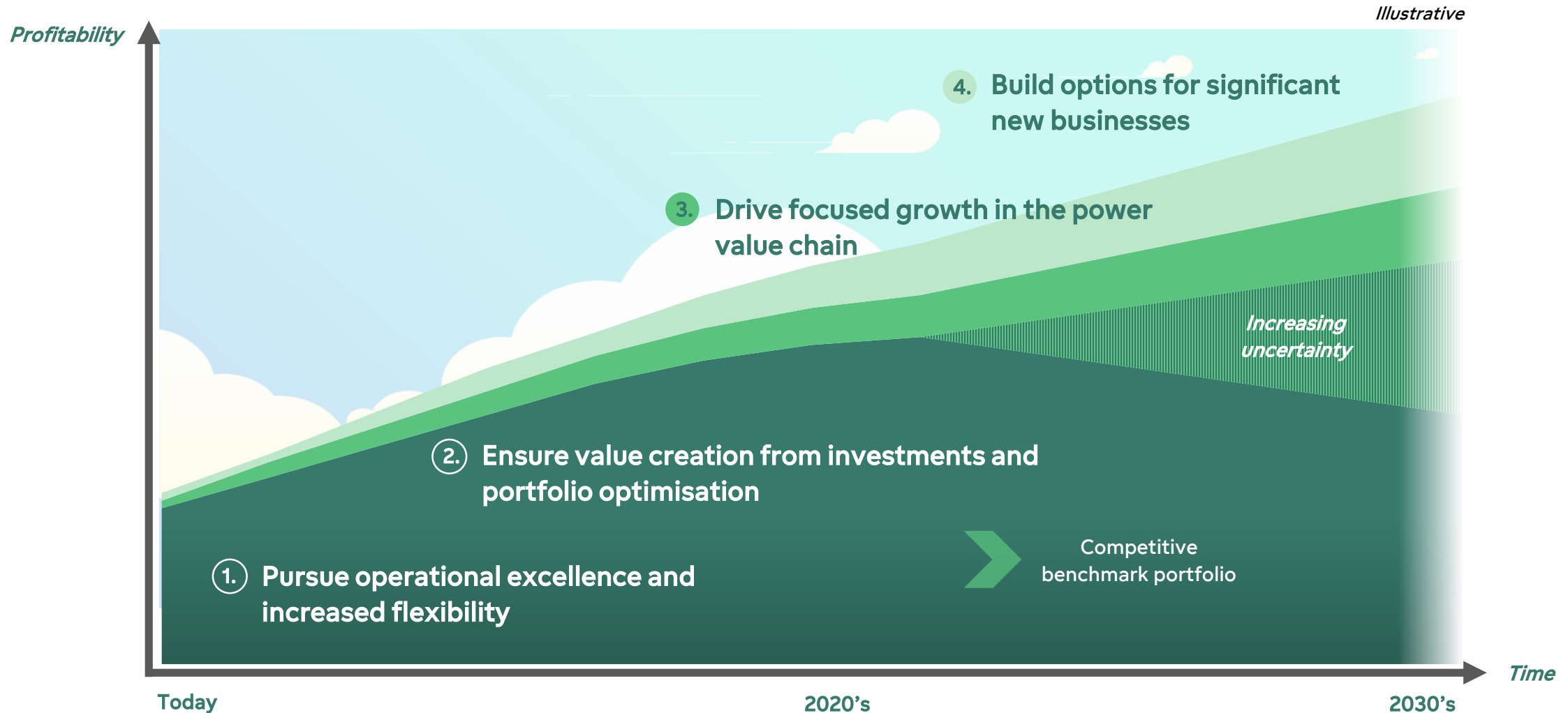
1487 MW<sub>e</sub>

1326 MW<sub>e</sub>

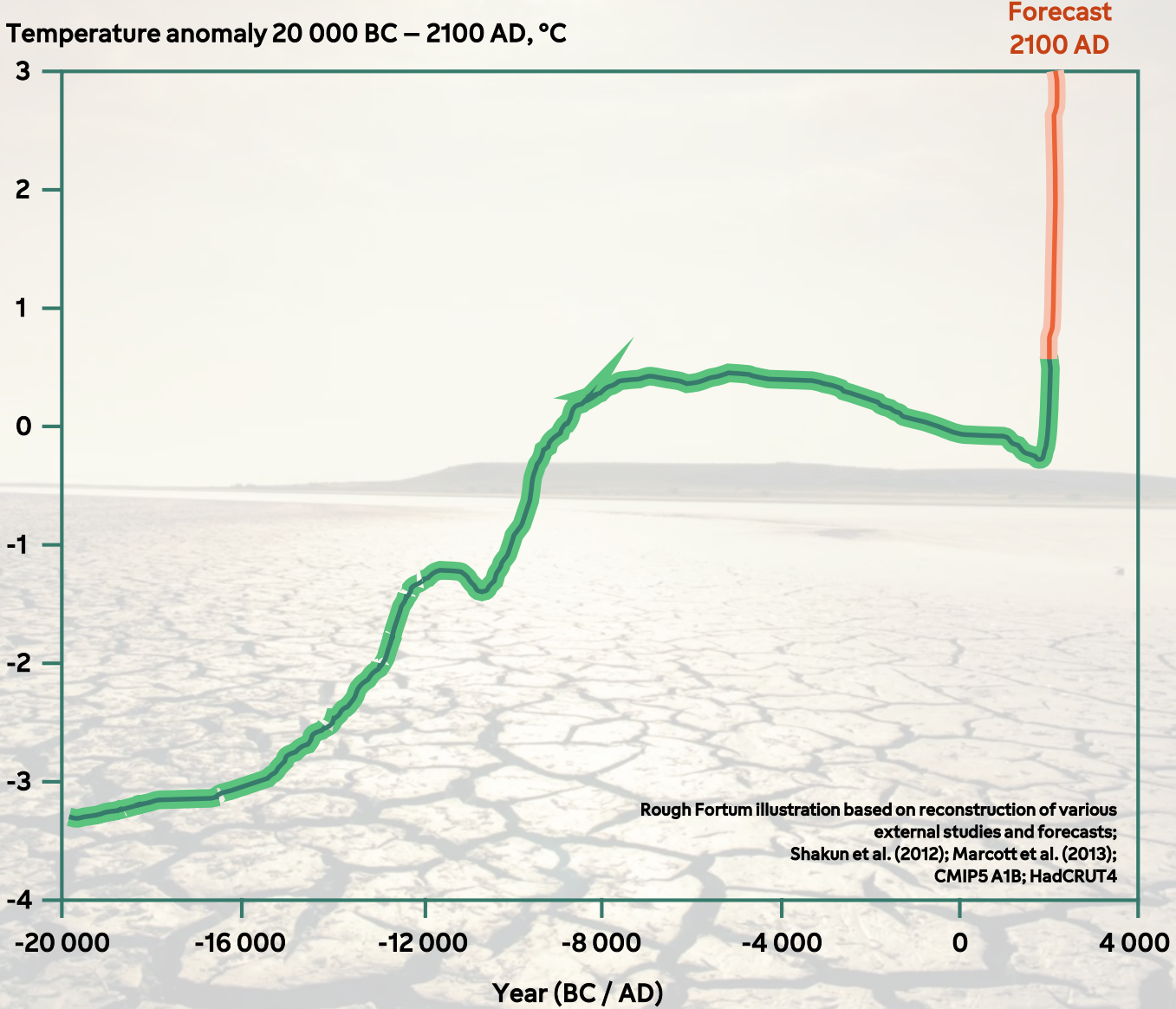


Figures: 2018

# We are now positioning Fortum for the decade of electricity – *For a cleaner world*



# Fast actions are required to mitigate climate change





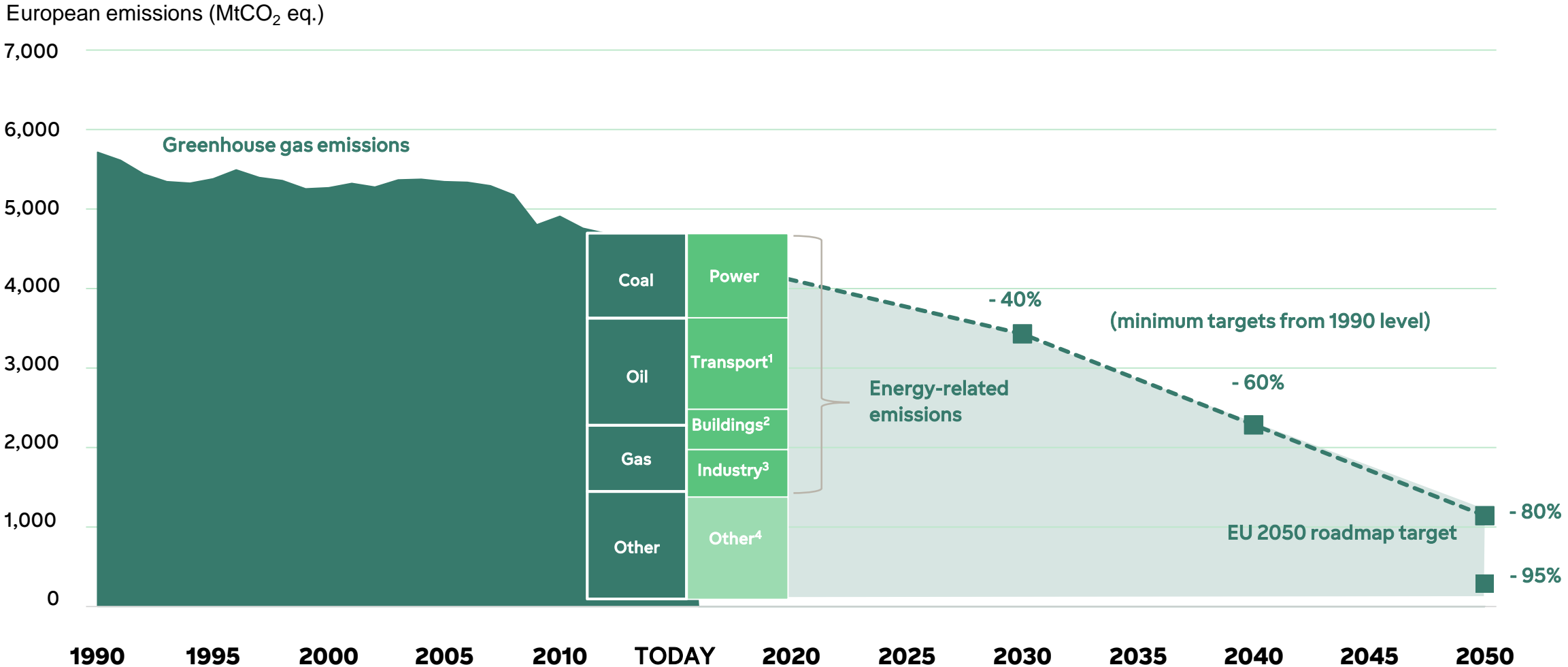
# IPCC: Staying below 1.5°C requires “rapid and far-reaching transition”

– 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 CO<sub>2</sub> removal

# Europe needs to eliminate CO<sub>2</sub> emissions to reach climate goals



<sup>1</sup> including international aviation and marine

<sup>2</sup> residential and commercial heating & cooling

<sup>3</sup> iron & steel and chemicals are among the biggest contributors

<sup>4</sup> non-energy related emissions: industrial processes and product use, waste management, agriculture, fugitive emissions

Source: IEA World Energy Outlook 2017, Eurostat, Eurelectric, Fortum Industrial Intelligence

# Decarbonising all sectors matters

Total CO<sub>2</sub> emissions globally (~ 37 GtCO<sub>2</sub>)

CO<sub>2</sub> from global  
(~ 7 % of total)

CO<sub>2</sub> from European Union  
(~ 9 % of total)

# +100%

## increase in EU electricity demand by 2050

EURELECTRIC scenario estimate for decarbonized EU



# Cost-efficiency of nuclear power can be improved



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

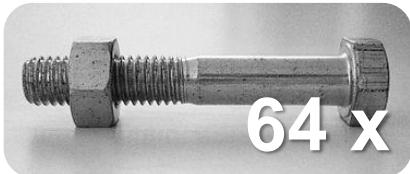
**19 000 €**  
including taxes



- 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

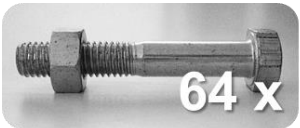
# Cost-efficiency of nuclear power can be improved



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 €



## **KELPO project:**

# **Developing the licensing and qualification processes for the systems and equipment of nuclear facilities in Finland**

- The heavy licensing process in nuclear is challenging in modernization of ageing components and systems
- KELPO project aims to
  - ensure equipment suppliers and manufacturers interest in future nuclear projects,
  - ensure and develop nuclear safety
  - assess possibilities to utilize standard equipment and parts, and
  - secure the operating conditions of the nuclear industry in a changing business environment.
- Joint project of the Finnish license holders/licensees Fortum and TVO, to which also the Finnish nuclear authority STUK participated.

**“Safety is not achieved through inspections but is a result of responsible operators safety solutions and human efforts”**

Stated in the new strategy of the Radiation and Nuclear Safety Authority in Finland (STUK)

# 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** to develop new nuclear concepts to meet the demands of the future; and
- and 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)
- If policies do not change, nuclear power will decline in the EU from 26% to 12-15% by 2050

## New technologies (e.g. SMR's)

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





# Future #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



Strong co-operation within the industry

Ensure competitiveness with shared best-practises and harmonisation







**Thank you**



# Nuclear power worldwide in 2018

- In production 451 reactors, total 394 836 MW<sub>e</sub> net installed capacity
- Under construction 58 reactors, total 59 627 MW<sub>e</sub>



451 reactors in 30 countries provide about 11% of the world's electricity.

Source: iaea.org