

A wide-angle photograph of a solar farm at sunset. The rows of solar panels stretch into the distance, reflecting the golden light of the setting sun. The sky is a mix of blue and orange, and the sun is visible on the horizon to the right.

Fortum's new strategy and development

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24 May 2016

This is Fortum



Fortum worldwide

Nordic countries

- Power generation capacity 8,484 MW (+ Fortum Värme* 639 MW)
- Heat production capacity 1,974 MW (+ Fortum Värme* 3,891 MW)
- Electricity sales customers 1.3 million

Baltic countries

- Power generation capacity 93 MW
- Heat production capacity 812 MW

Poland

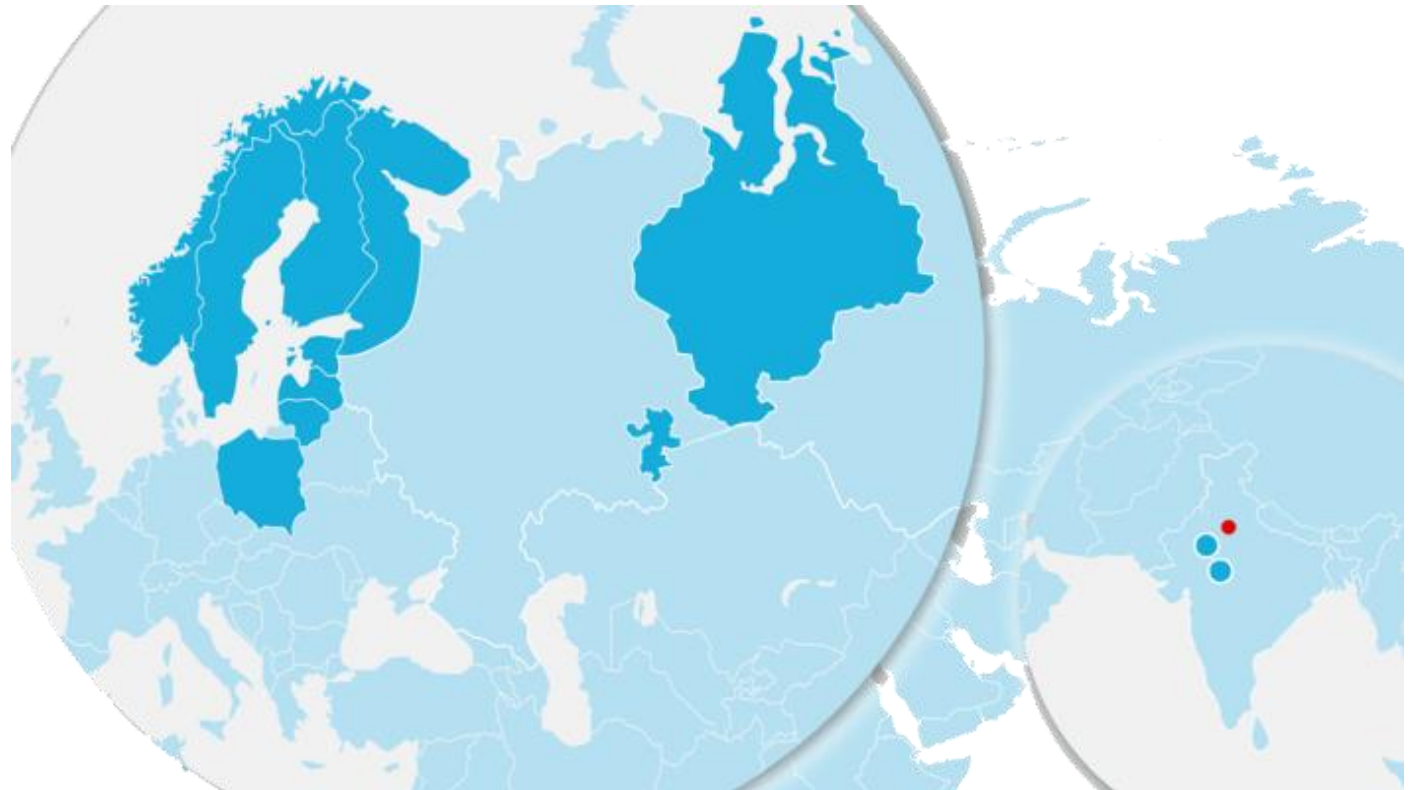
- Power generation capacity 197 MW
- Heat production capacity 1,129 MW

Russia

- Power generation capacity 4,903 MW
- Heat production capacity 12,696 MW

India

Power generation capacity
15 MW



Expert services
globally

Figures: 2015

*Joint venture AB Fortum Värme owned together with Stockholms Stad

Fortum – Forerunner in clean energy

MEGATRENDS

Climate change
Urbanisation
Active customers
Digitalisation, new technologies



VISION
Forerunner in
clean energy

MISSION

We provide customers with energy solutions that improve present and future life, and we deliver excellent shareholder value.

STRATEGY



Drive
productivity
and industry
transformation



Create
solutions
for sustainable
cities



Grow in
solar and
wind



Build new
energy
ventures

MUST-WIN-BATTLES

Put the customer
in the centre

Establish a culture
of speed and agility

Digitalise our business
for maximum scalability

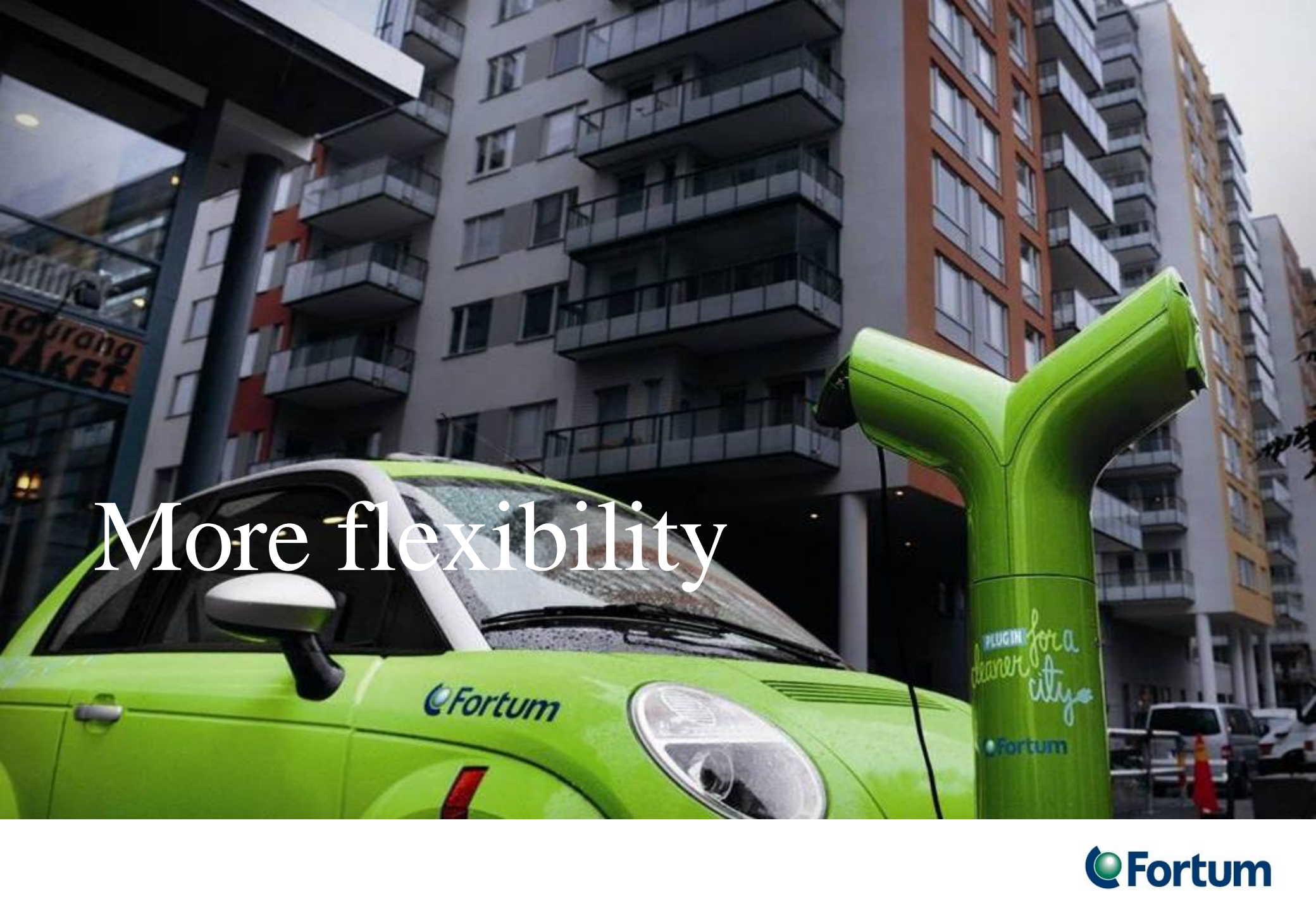
Create value from
market volatility

Drive competitive markets
and fair regulation

Successful implementation of the strategy: Fortum in the 2020s

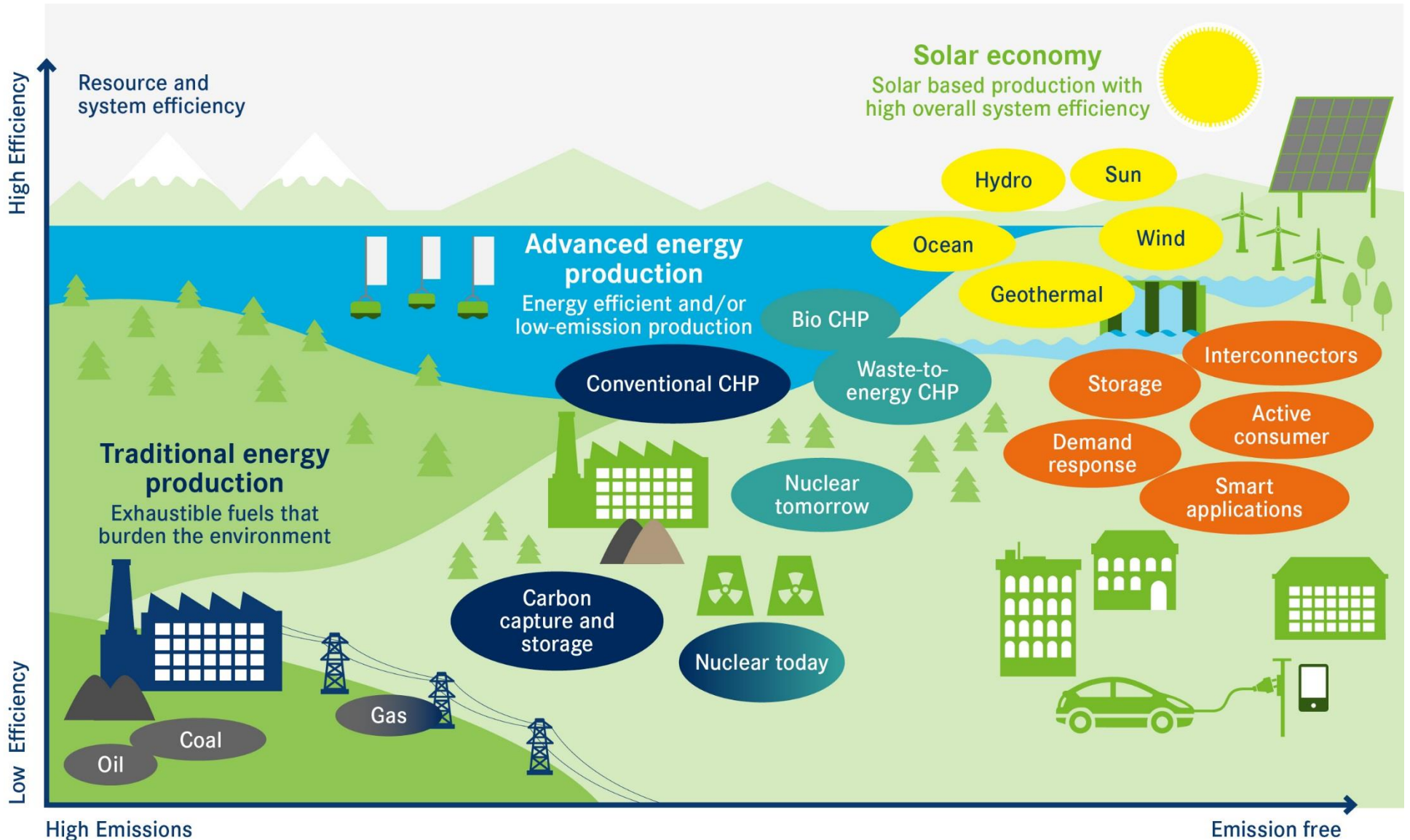


- **Benchmark in productivity**, internationally recognised and valued know-how
- **Significant fleet of sustainable and efficient hydropower** enabling a decarbonised energy system
- **Strong position in providing modern energy and waste solutions** to a number of cities and urban areas
- **Sizeable and growing solar and wind portfolio** in favourable locations
- **Recognised forerunner in providing modern, innovative energy solutions** to customers
- **Driver in energy start-up** eco-system
- **Excellent shareholder value**

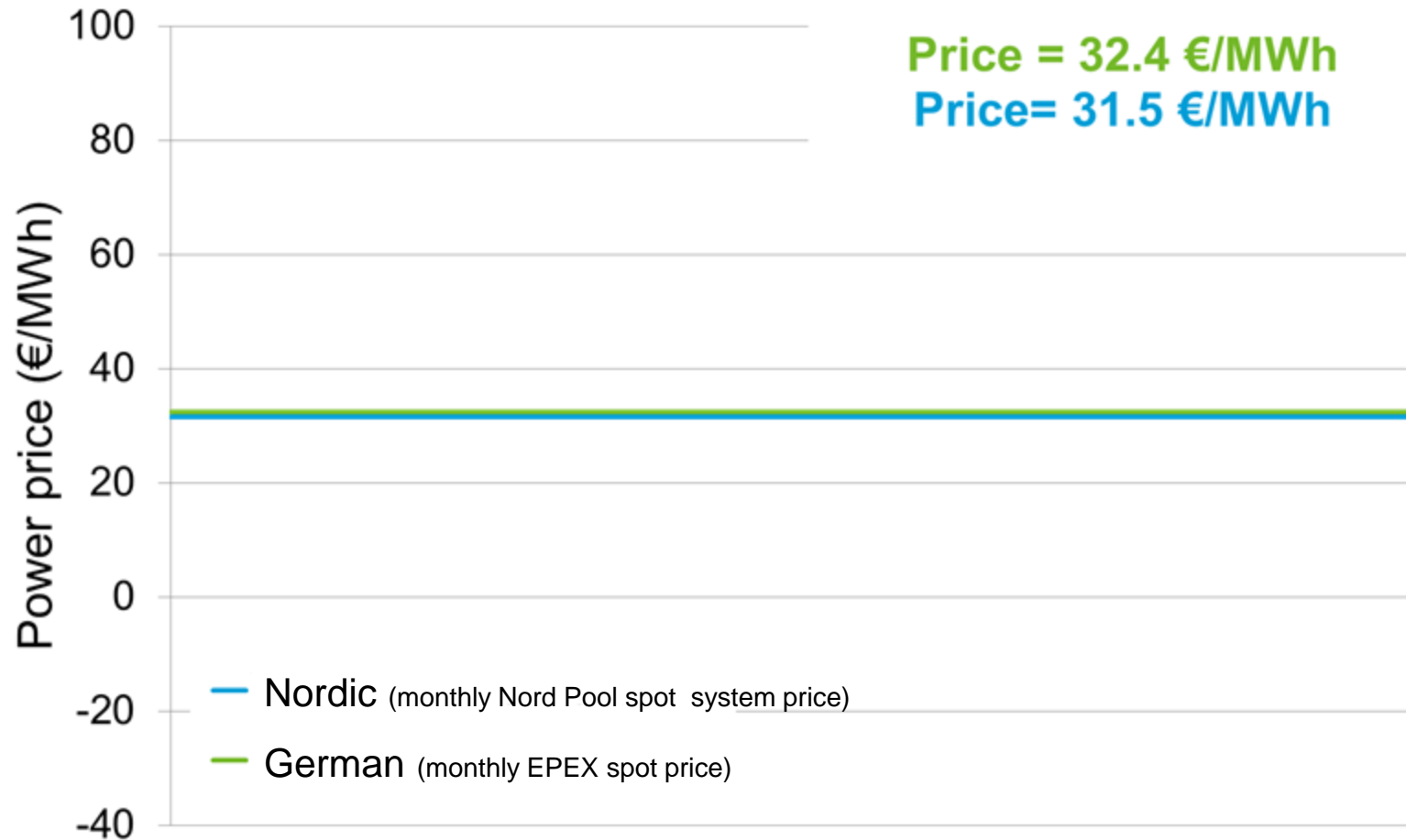


More flexibility

Transition towards Solar Economy is ongoing



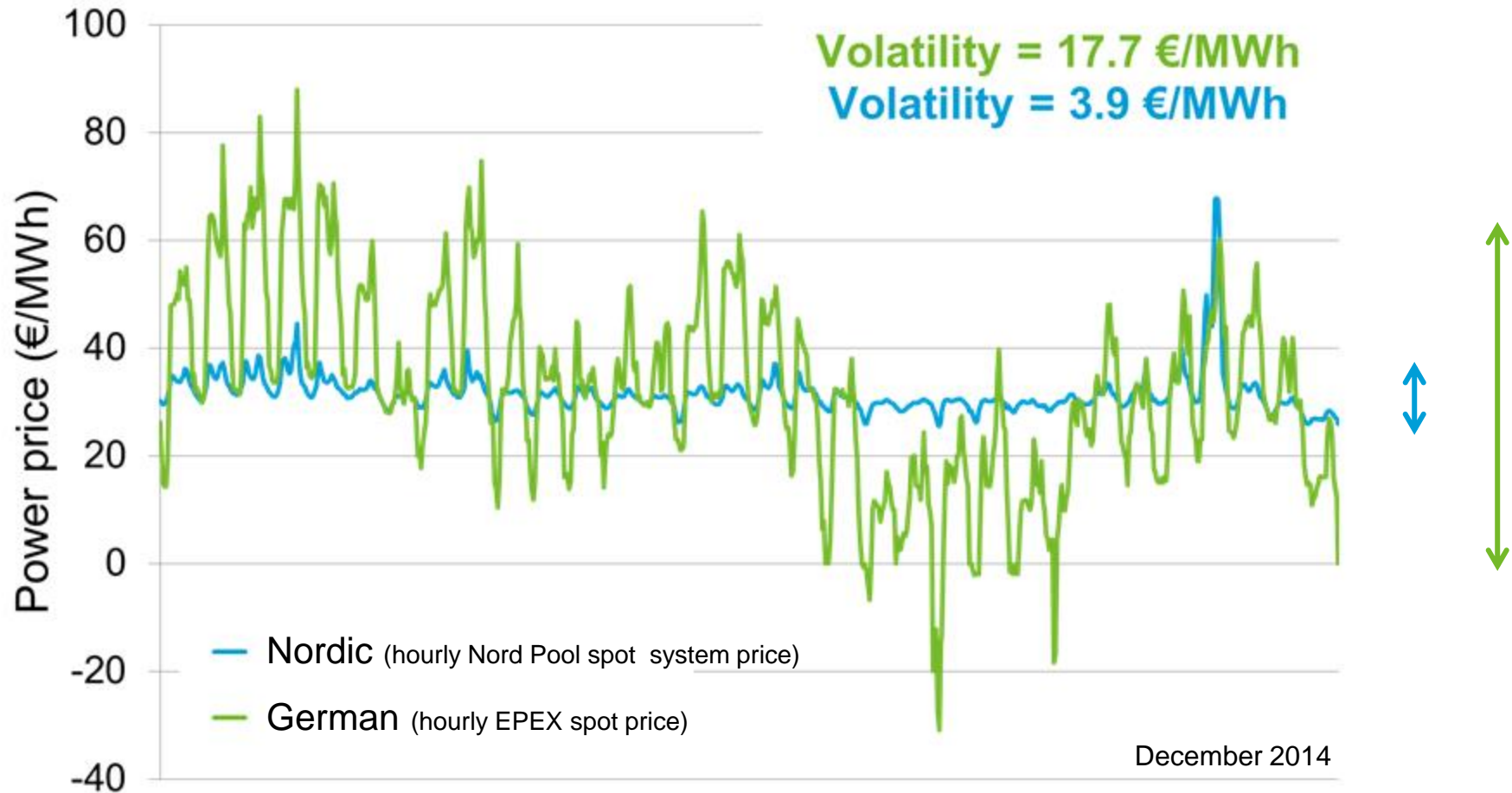
Average power prices in Nordics and Germany were very close in December 2014 ...



Source: Nord Pool Spot, Bloomberg Finance LP

... but hourly prices were very different !

Price pattern is getting more important than average price



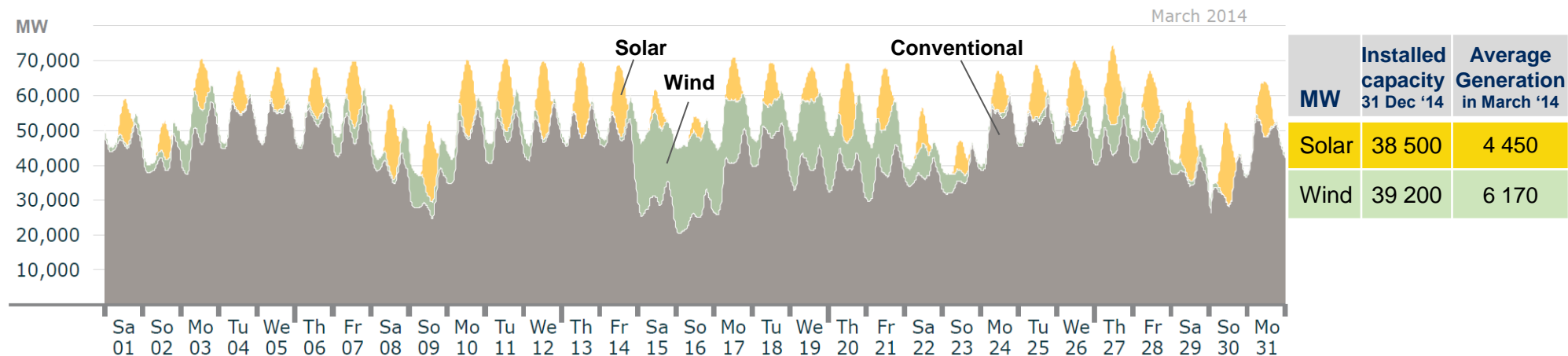
Source: Nord Pool Spot, Bloomberg Finance LP

Reality in Germany – and it is not getting easier

March 2014

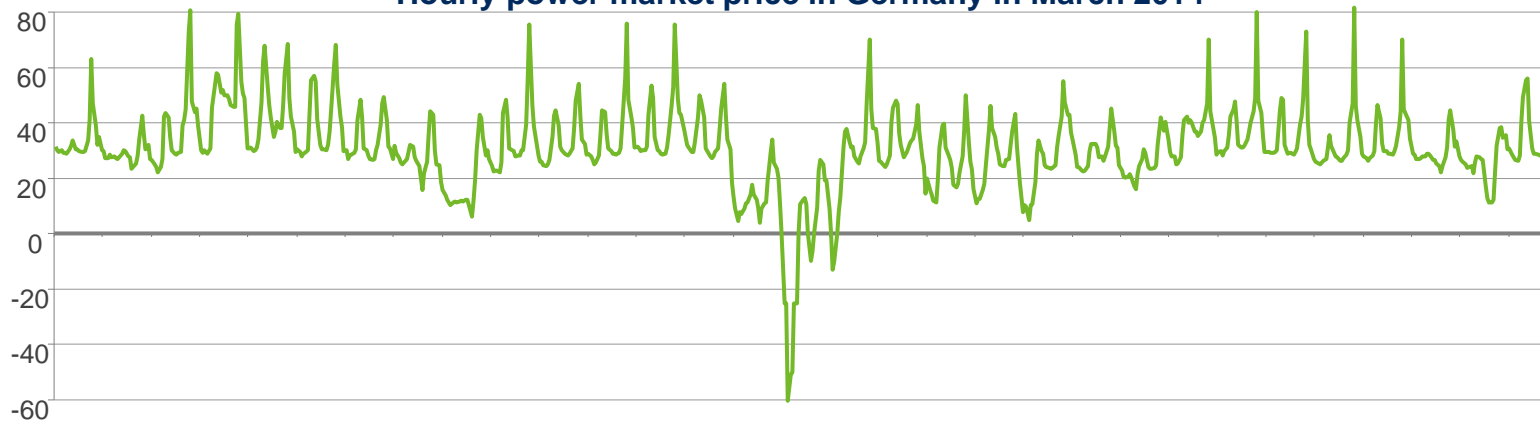
Actual production

Electricity generation in Germany in March 2014



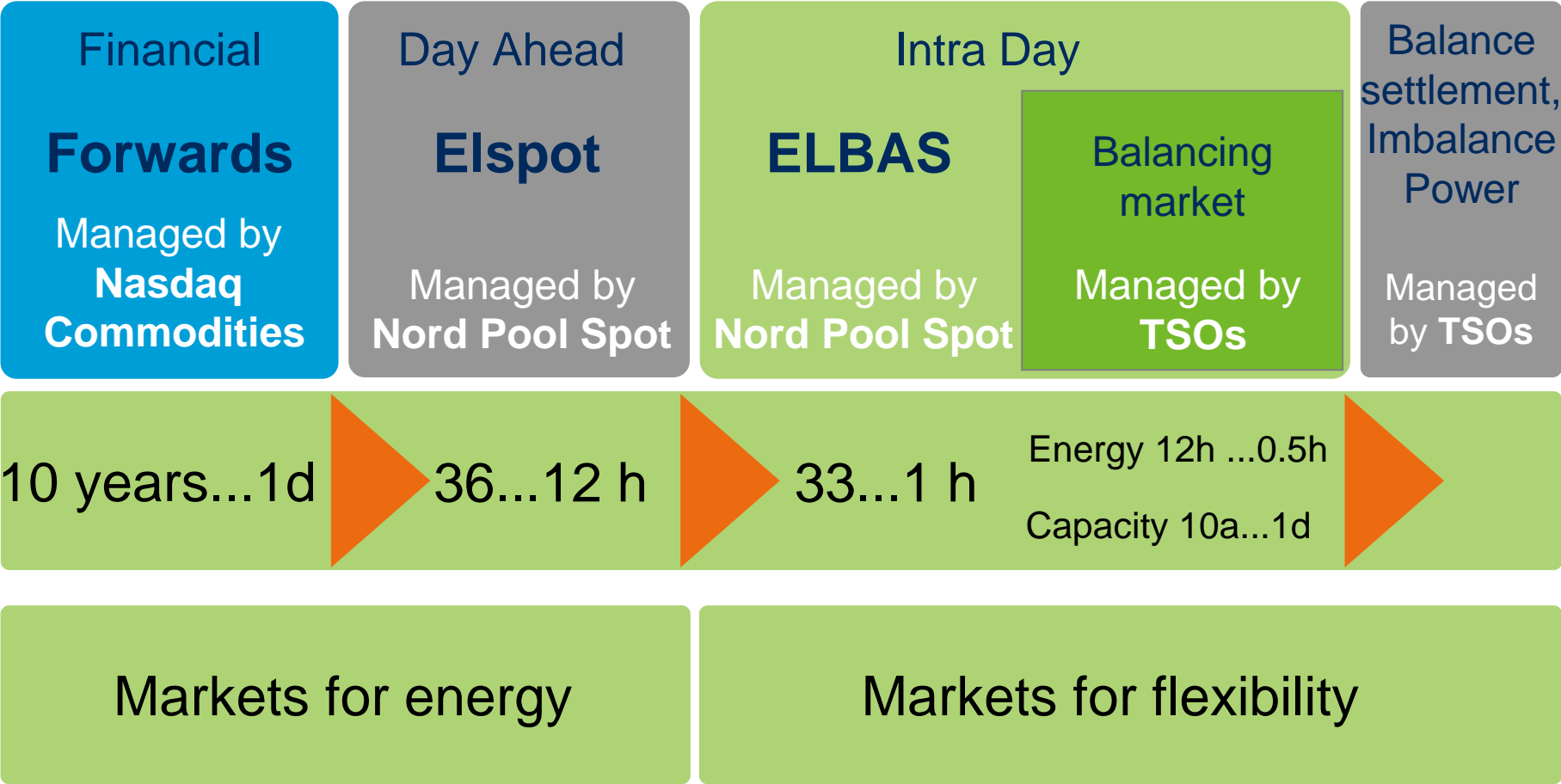
€/MWh

Hourly power market price in Germany in March 2014



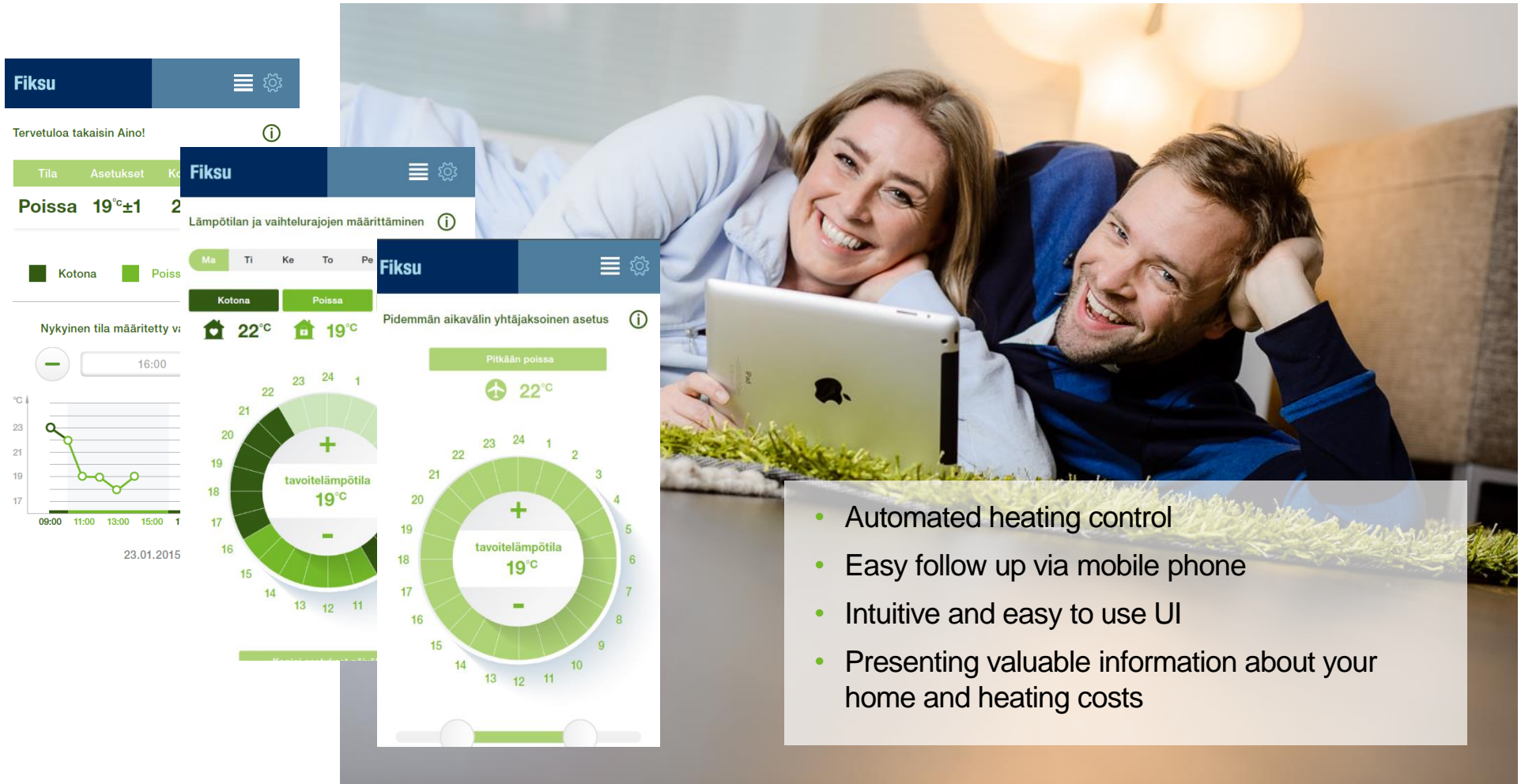
Source: Electricity generation graph: Bruno Burger, Fraunhofer ISE, price curve: Bloomberg Finance LP, Wind capacity: EWEA

To keep the power system supply-demand balance every moment, several markets are needed



New Fortum Fiksu

Excellent user experience



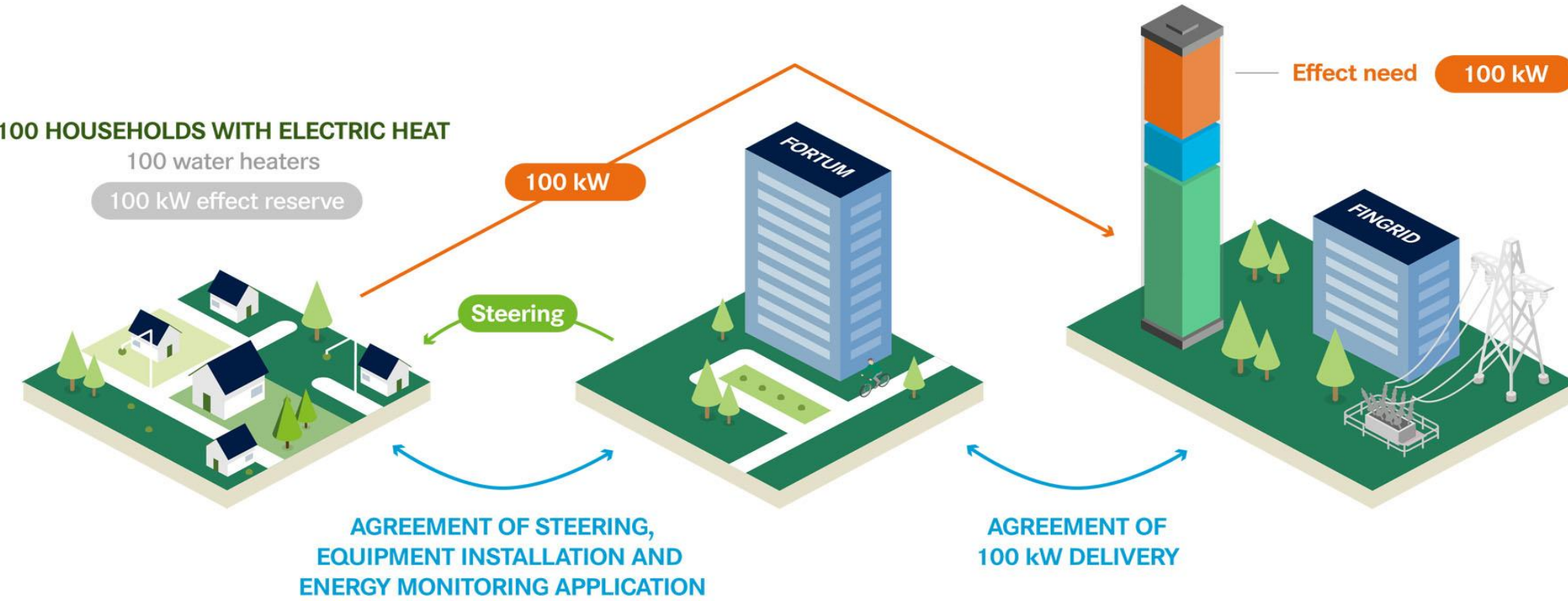
The image displays the Fortum Fiksu app interface overlaid on a photograph of a smiling couple using a tablet. The app interface includes:

- A top navigation bar with the 'Fiksu' logo and a settings icon.
- A greeting: 'Tervetuloa takaisin Aino!'.
- A status bar showing 'Tila Asetukset Ke' and 'Fiksu'.
- A main status indicator: 'Poissa 19°C±1 2'.
- A section for 'Lämpötilan ja vaihtelurajojen määrittäminen' (Setting temperature and fluctuation limits).
- A section for 'Nykyinen tila määritetty v:' (Current status set for) with 'Kotona' (Home) at 22°C and 'Poissa' (Away) at 19°C.
- A temperature graph showing a line graph for the date 23.01.2015, with a time range from 09:00 to 15:00.
- Two circular temperature control dials. The left dial is set to 'tavoitelämpötila 19°C' and the right dial is set to 'tavoitelämpötila 22°C'.
- A section for 'Pidemmän aikavälin yhtäjaksoinen asetus' (Long-term uniform setting) with a 'Pitkään poissa' (Away for long) mode set to 22°C.

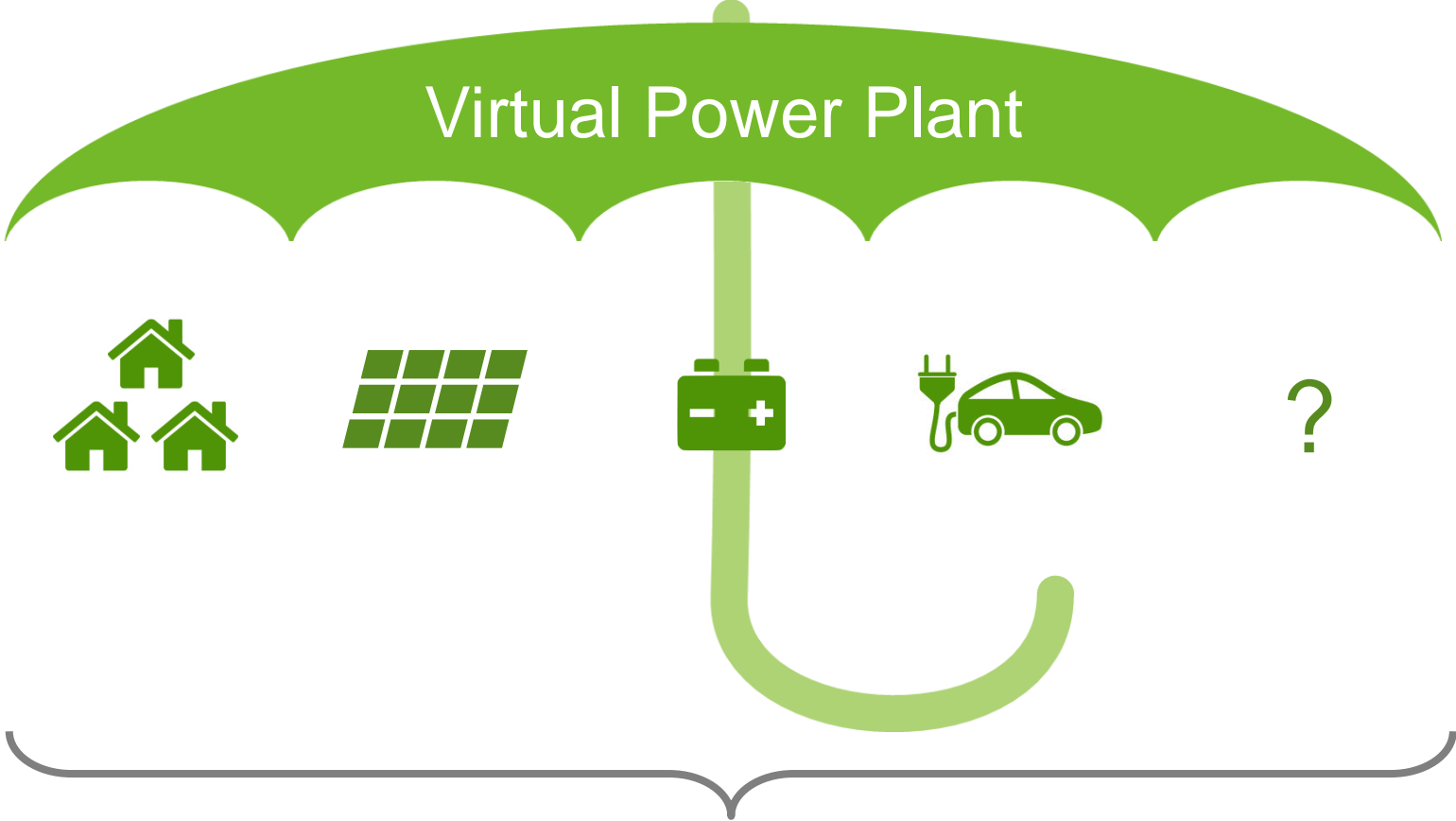
The couple in the background is smiling and looking at the tablet together, illustrating the app's user experience.

- Automated heating control
- Easy follow up via mobile phone
- Intuitive and easy to use UI
- Presenting valuable information about your home and heating costs

In Fortum's commercial VPP-pilot customer loads are sold to the TSO Fingrid to be used in the Frequency Containment Reserve (N)



We are building a significant VPP, which will also enable new service offerings for our customers



New service offerings to customers

District heating demand response

- Heat consumption can be controlled based on hourly heat price signal
- Buildings act as heat storages without variation in inside temperatures
- Pilots have been carried out during two heating seasons

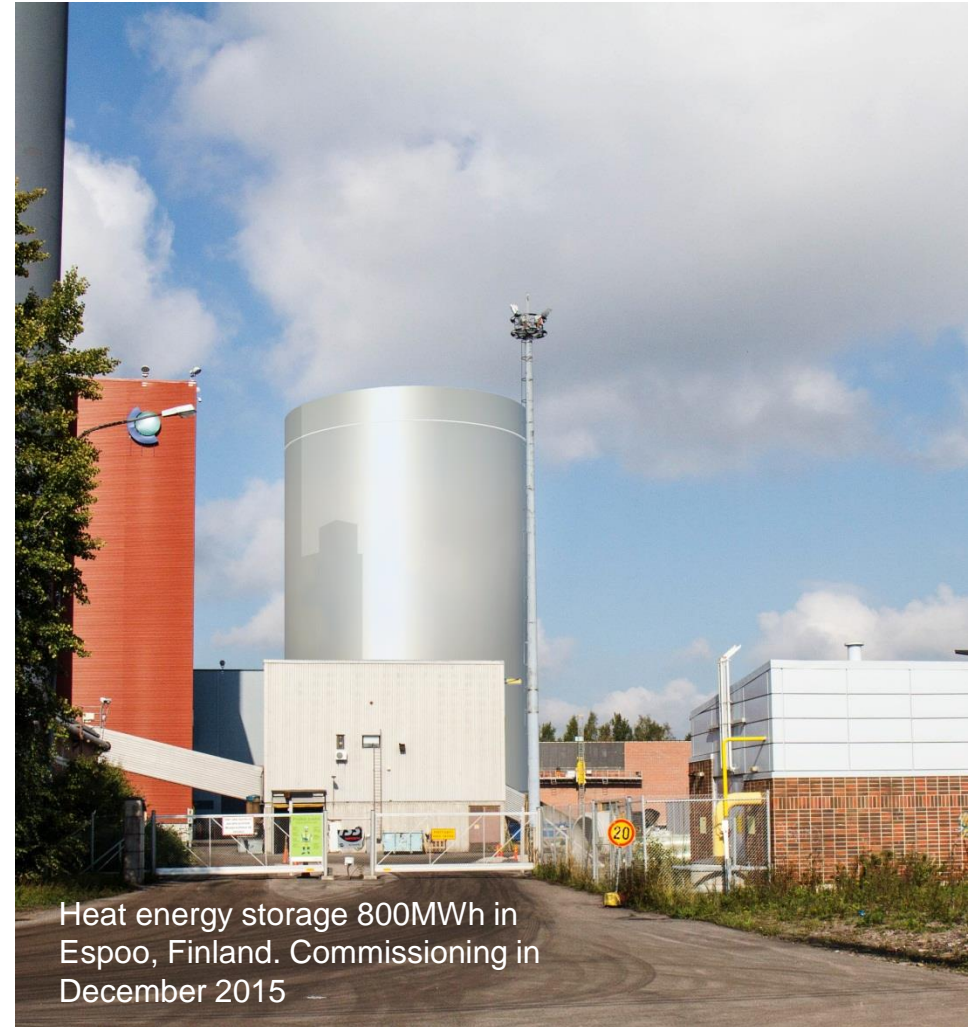


Press release: Fortum ja Leanheat kehittävät kerrostaloille big dataa ja keinoälyä hyödyntävää lämmitysratkaisua

In addition to hydro and demand response, also district heating systems can be an efficient source of power system flexibility

Optimal use of the district heating system provides flexibility to the electric power system

- CHP generation flexibility (incl. extraction condensing and by-pass turbines)
- Electric boilers
 - E.g. used with very low electricity prices
- Industrial size heat pumps
 - E.g. used predominately with lower electricity prices
- Heat accumulators
 - Allow flexible electricity production from CHPs with back-pressure turbines
 - Increase peak load condensing generation for CHPs with extraction turbines
- District heating customer demand management
 - Even apartment buildings can have several hours capacity to store heat without any impact on apartment temperature



An aerial photograph showing three yellow wave energy converters (WECs) in a turbulent, blue sea. The WECs are cylindrical with a central vertical shaft. The sea is characterized by large, white-capped waves. The sky is a pale, overcast blue. The text "More renewables" is overlaid in white serif font across the middle of the image.

More renewables

Future energy system features



2030 Solar Power is Competitive even with 10 % Interest Rate

- Solar power LCOE based on EU PV Technology Platform report and EU PVSEC 2015



2030 assumptions
Stockholm
Toulouse
Malaga
India
Australia
Texas
South Africa
Chile

Utilisation (h)
1070
1380
1840
1860
2100
2150
2200
2500

Applied to all locations:	
CAPEX	470 €/kW _p (base case 50 MW _p)
OPEX	10.5 €/kW _p /a (base case 50 MW _p)
Discount factor	10%
Inflation	2.0%
Lifetime	30 years
Initial degradation	1.0%
Continued degradation	0.5%/a

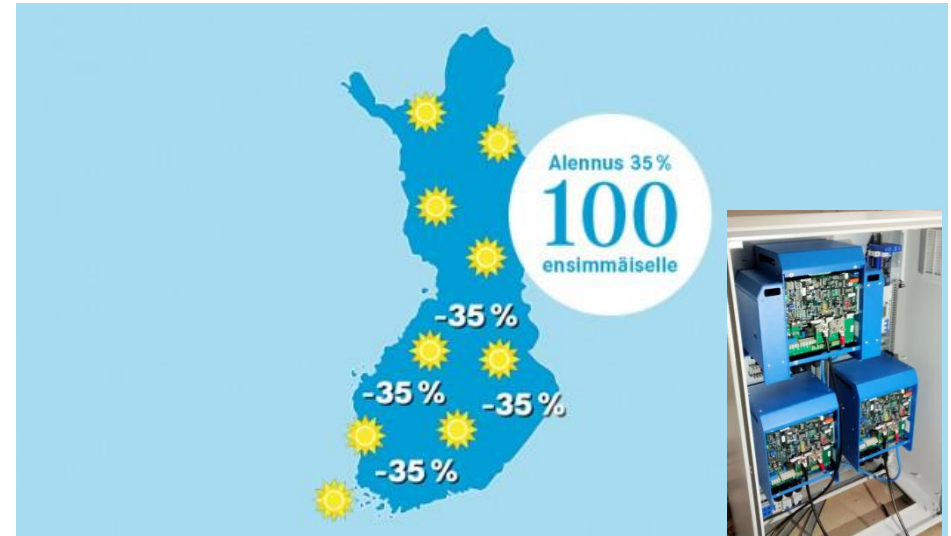
Note that performance ratios and hence utilisation hours are expected to increase by 7.5% points from 2015 to 2030

Large scale solar and wind power – Fortum pipeline

- June 2013, Fortum acquired a 5 MW solar power plant in the state of Rajasthan in north-western India.
- December 2014: Fortum Finnsurya Energy Pvt Ltd, a subsidiary of a Finland-based utility, connected 10 MW solar PV plant in Madhya Pradesh to the grid.
- January 2016: Fortum wins a reverse auction for the 70 MW project with a fixed tariff for 25 years in Rajasthan, India.
- April, 2016: Fortum seeks to allocate of its planned growth capital in the range of EUR 200–400 million in solar projects in India.
- April, 2016: Fortum wins bid for 100 MW solar power park in a reverse auction in Karnataka, India, with a fixed tariff for 25 years.
- Fortum is shareholder in Blaiken wind power farm in Sweden
- 35 MW wind farm project ongoing in Russia Ulyanovsk, which is located 680 km south-east of Moscow and has 620,000 residents.
- In February, 2016 Fortum acquired a 75-megawatt (MW) windfarm project. The Solberg site is fully-permitted and construction-ready. It is located in Västernorrland County in northern Sweden.

Other Fortum solar power initiatives

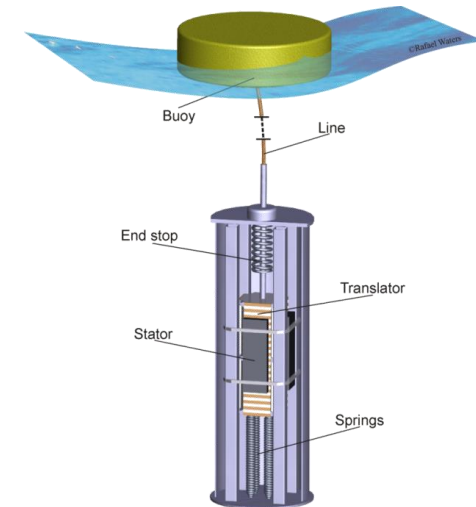
- Solar power to homes in Sweden and Finland since 2012
 - Fortum also buys excess electricity from customers
- Solar power systems to business
- Fortum participated in November, 2015 in solar power crowdsourcing organised by TRINE in Sweden to deliver off-grid solar power system to Kenya
- Piloting ongoing of solar+battery storage systems in households



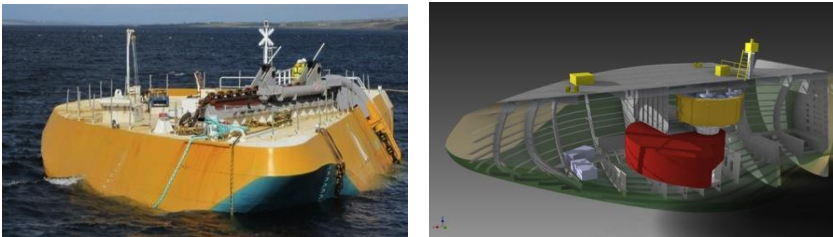
Wave power – three different technologies

- Wave power has potential to cover 10 % of global power consumption
- Wave power is now in demonstration phase
 - Full-scale demonstration project in Sweden in co-operation and using technology by Seabased , power generation to grid begun in January 2016
 - 5 year EU Horizon 2020 project with Wello Penguin technology in Great Britain
 - AW-Energy has been operating its pilot wave energy power plant in Portugal since 2012 and plans to deploy a full scale commercial power unit utilizing WaveRoller® near shore technology during 2016

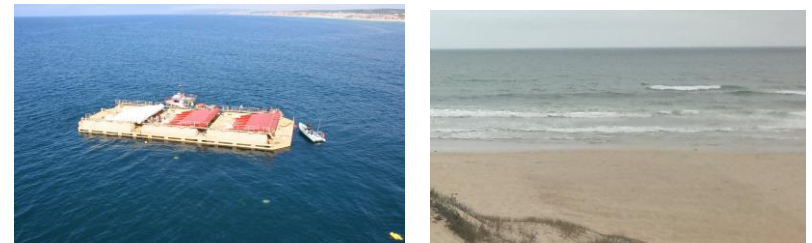
Seabased



Wello* Penguin



AW Energy* Waveroller®



*Fortum is shareholder in the company

Example of Fortum internal venturing: HorsePower circular economy concept



- Easy solution to stables for their bedding and manure management
- Environmentally friendly and economically competitive
- Based on domestic, renewable bedding material
- A regional solution: both bedding and manure transport distances are minimized

- In Finland there are 77 000 horses, in Sweden 360,000, in Poland 300,000 and in UK and in France even 1,000,000
- In Finland the energy content of used bedding material is about 500 GWh; this is more than the annual fuel use of Järvenpää combined heat and power plant
- The energy content of the used bedding material of three horses corresponds to the heating energy of one house
- Used bedding material can be used in many ways, although new restrictions will be enforced in 2016
- Using it as a fuel for a big CHP plant with over 90% efficiency is the environmentally, commercially and technically best way



Thank you