



## Norwegian energy market in relation to EU

19.mai 2020 – Toril Christensen, seksjonssjef Analyse og Forretningsstøtte BKK Produksjon AS



# Agenda

- Some data and numbers from the market
- The transition of the electricity system
- The role of Hydropower now and in the future
- EU and politics

# How will Norwegian power generation develop?

- The graph illustrates how much foreign wind power and solar energy affect Norwegian power generation. Power production in our neighboring countries is fluctuating more and more, and Norway is catching the fluctuations.

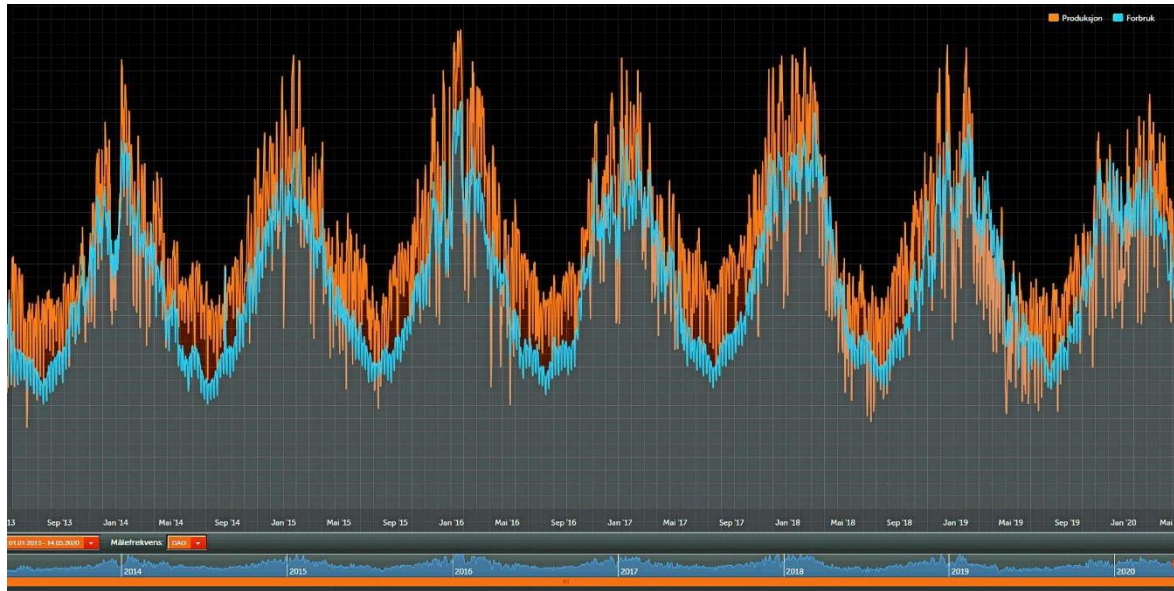


Photo: Statnett

# Renewable power in Europe

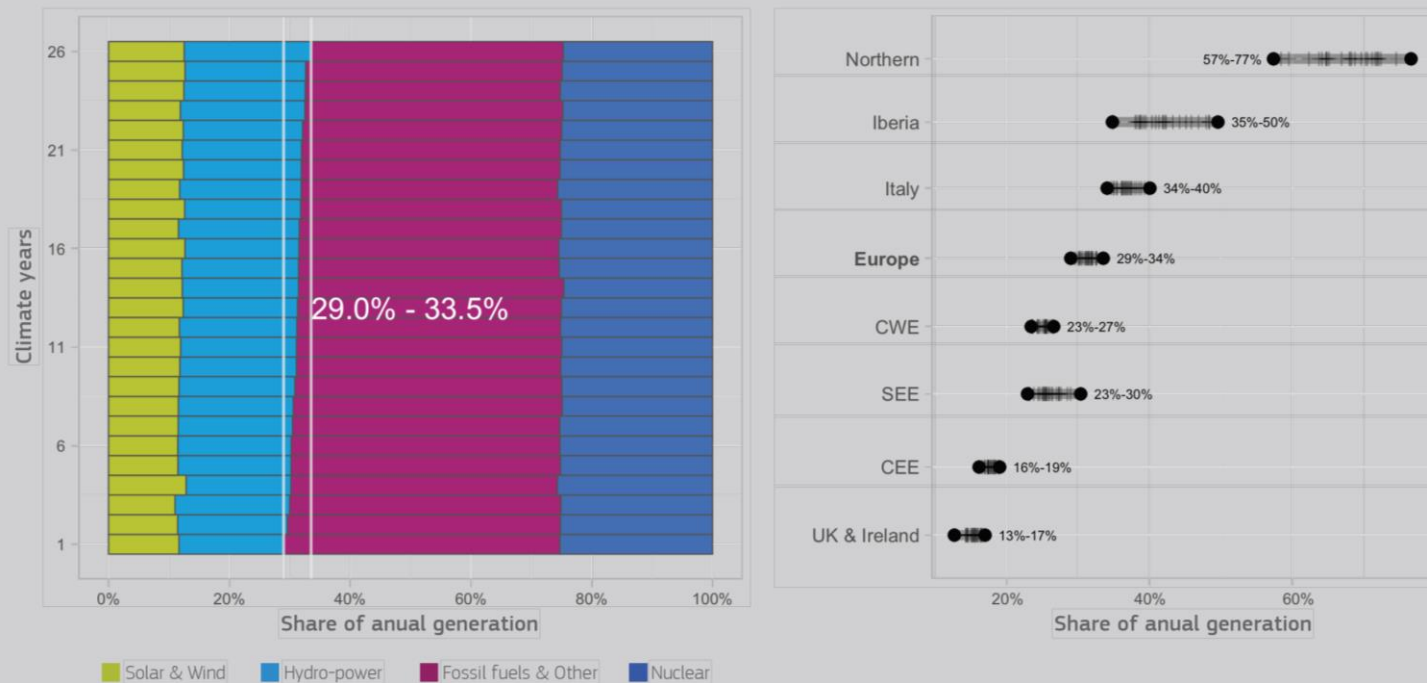
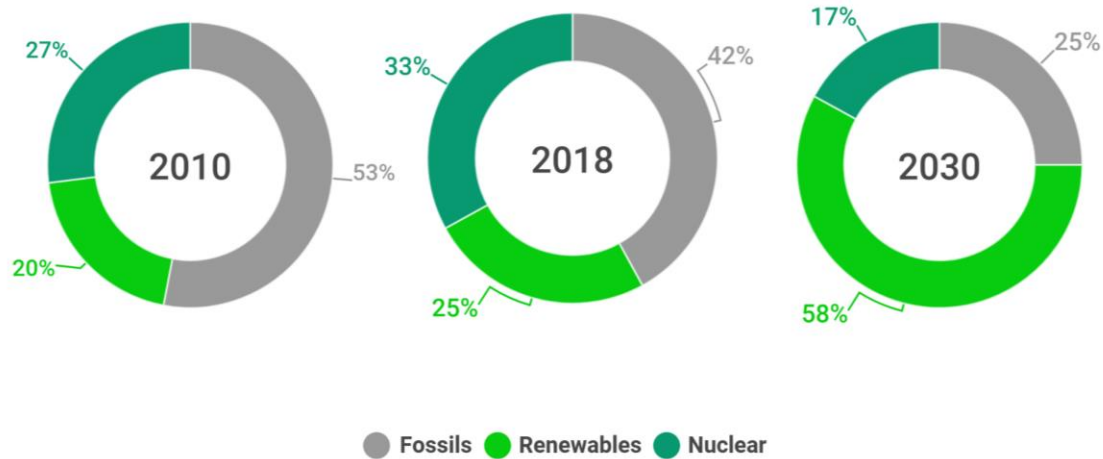


Figure 1: Generation mix and share of renewables for the 26 different climatic conditions (climate years from 1990 to 2015)

# The power sector is marching towards full carbon neutrality



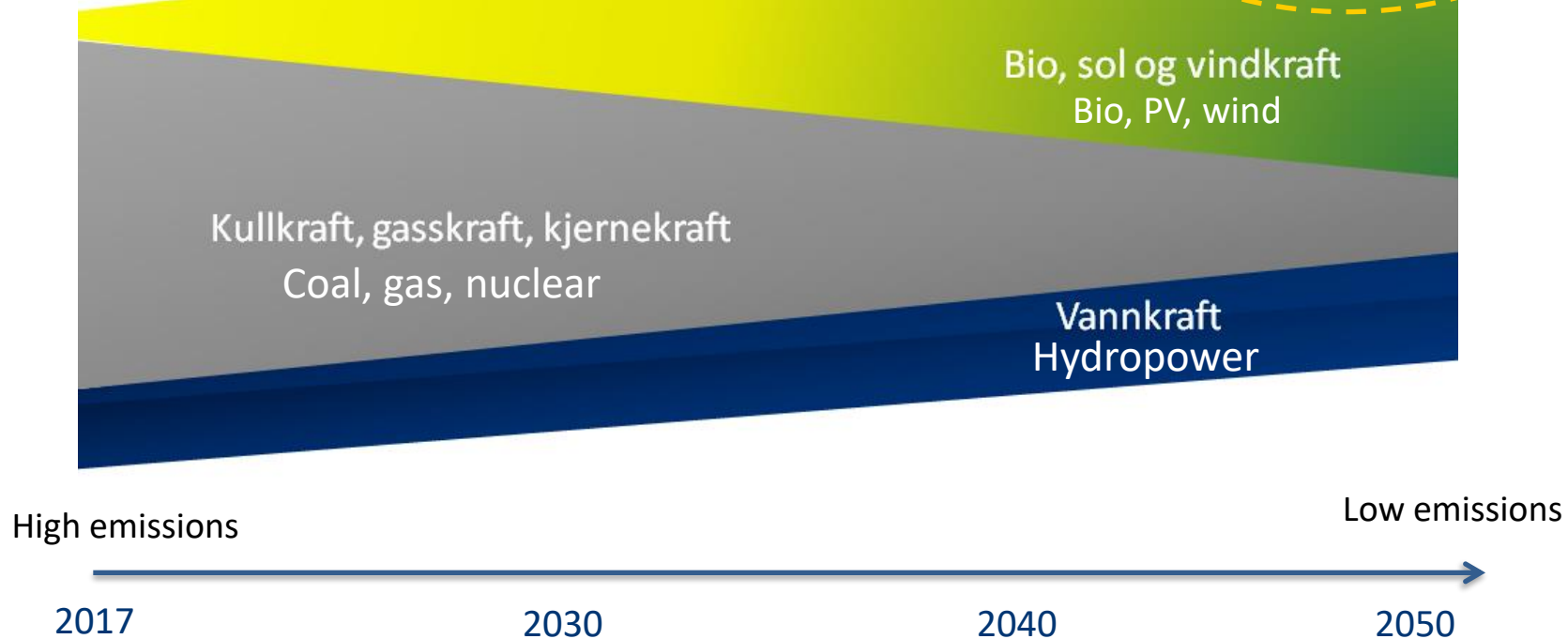
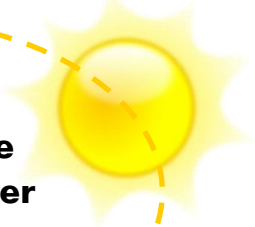
Source: [Eurostat](#) (for 2010), [Sandbag](#) (for 2018), [Eurelectric](#) (for 2030)

# Europe's powersystem in transition towards 2050

Demands a range of solutions

- **Hydropower can play a central role**

**Storage and  
batteries, active  
consumers, power  
exchange and  
hydropower**





# Changing weather conditions affect the operation of the European power systems



## THE IMPACT OF CLIMATE VARIABILITY ON CURRENT EUROPEAN POWER SYSTEMS

- Overall, more than 40% of the electricity generated in Europe is affected by the climate.
- The amount of renewable energy generated in each zone is not independent from other zones, even if they are geographically far away.
- The share of renewable energy generated in the EU varies between 29% and 34% depending on weather conditions, but the range is much wider for some zones, such as Northern Europe (57%-77%) and the Iberian Peninsula (35%-50%).
- Hydropower has the largest year-over-year variability caused by the weather conditions.

Joint Research Centre (JRC), the European Commission's science and knowledge service

[file:///C:/Users/thc7469/Downloads/power\\_system\\_flexibility\\_envarclim.pdf](file:///C:/Users/thc7469/Downloads/power_system_flexibility_envarclim.pdf)

# Power system flexibility in a variable climate

- In some systems the quantity of electricity that can be generated by renewable sources varies considerably due to climatic conditions: by 57-77 % in the Northern countries<sup>1</sup>, or 35-50 % in the Iberian peninsula<sup>2</sup>
- the quantity of water available for hydropower generation in Europe varies annually from -19 % to +25 % with respect to the long-term average
- the season with the biggest capacity factors for wind is the winter; and the highest ones are 39.1 % in UK & Ireland for onshore and 49.6 % in the Northern countries for offshore
- the region with the highest capacity factor for solar PV is Iberia during summer (24 %) followed by Southeast Europe<sup>33</sup> (21 %)
- the three regions with the most variable peak load are UK & Ireland, Iberia and Italy.





- The EU electricity market fit for the challenges of the clean energy transition.
- These changes will adapt current EU market rules by:
  - allowing electricity to move freely
  - enabling more flexibility
  - fostering more market-based investments
  - introducing a new emissions limit for power plants eligible to receive subsidies;
  - improving planning to anticipate and respond to electricity market crisis situations, including through cross-border cooperation.

# Green financing

- Taxonomy – a new system that will revolutionize how to measure emissions and carbon footprints. Investments can be measured as to whether they align with the Paris-agreement.
  - Enabling investments – how is it defined?
  - EEA(EØS)-relevant
  - Interesting to see the role of the EU ETS and the price on carbon
- Green Recovery/New Green Deal

# IEA Hydro



THE INTERNATIONAL ENERGY AGENCY TECHNOLOGY  
COLLABORATION PROGRAMME ON HYDROPOWER

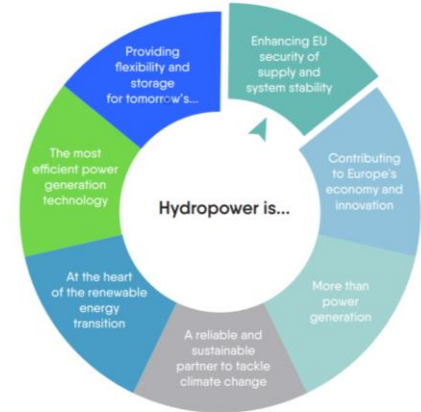
# IEA Hydropower

Flexible hydropower providing value to renewable energy integration

- [https://www.ieahydro.org/media/51145259/IEAHydroTCP\\_AnnexIX\\_White%20Paper\\_Oct2019.pdf](https://www.ieahydro.org/media/51145259/IEAHydroTCP_AnnexIX_White%20Paper_Oct2019.pdf)

# Hydropower fact sheets – Eurelectric/VGB

Hydropower plays a major role in meeting Europe's ambitious energy transition goals. In particular, it complements the increasing share of variable renewables in the European power system. Such a system, with large deployments of wind and solar, requires sufficient flexibility, firm capacity and the ability to balance variable generation. Hydropower has all these capabilities.



- [https://cdn.eurelectric.org/media/3177/hydro-facts\\_sheets-web-28052018-2018-030-0371-01-e-h-8DD82949.pdf](https://cdn.eurelectric.org/media/3177/hydro-facts_sheets-web-28052018-2018-030-0371-01-e-h-8DD82949.pdf)

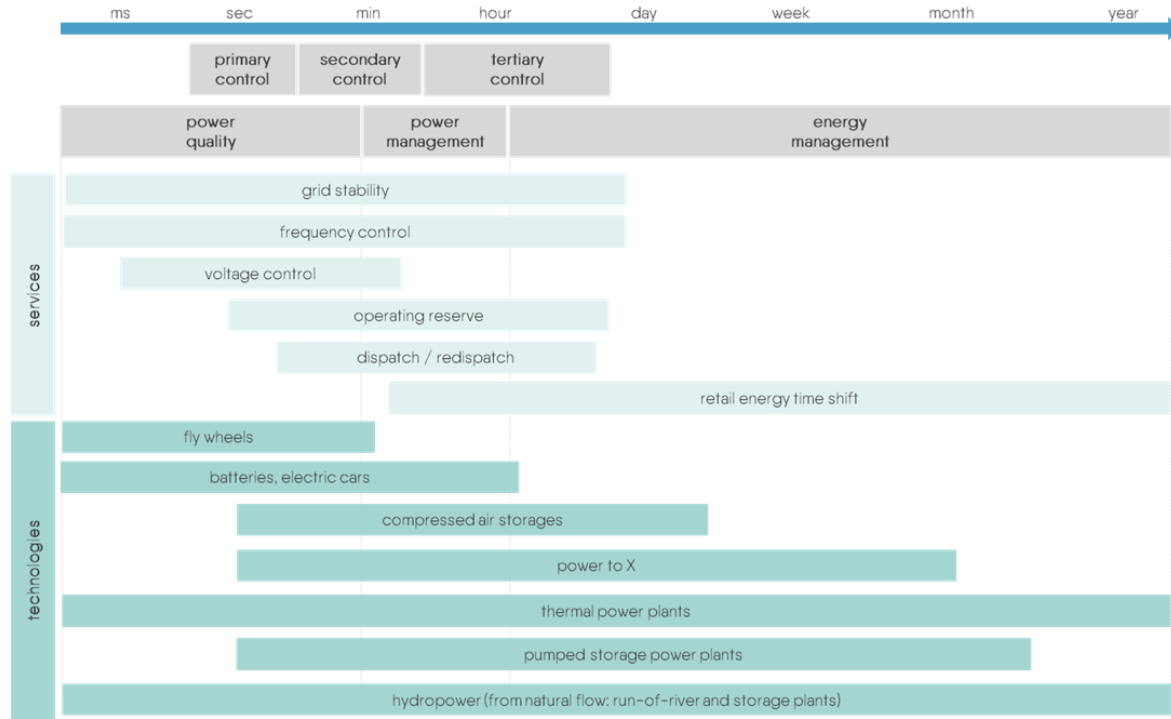
# Hydropower

- more than renewable

- Can be stored for prolonged periods
- Can be produced on demand
- Easy to adjust in line with consumption
- The reservoirs suppress flood peaks



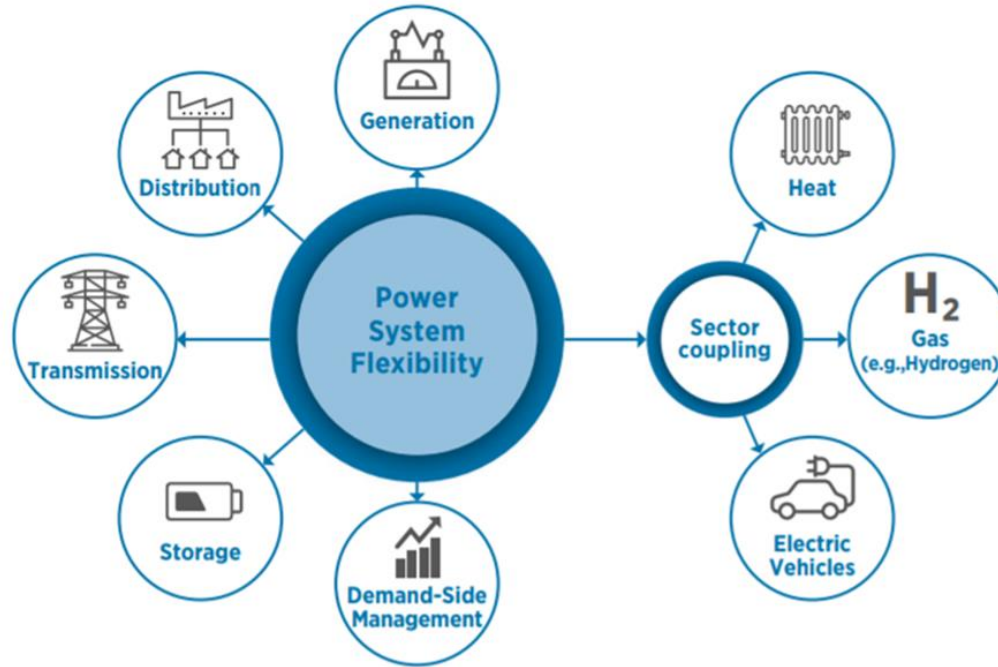
# The need for flexibility in the future



Flexibility services according to technologies and timescale. Source: Eurelectric/VGB, 2018 NB: modify to extend batteries to day



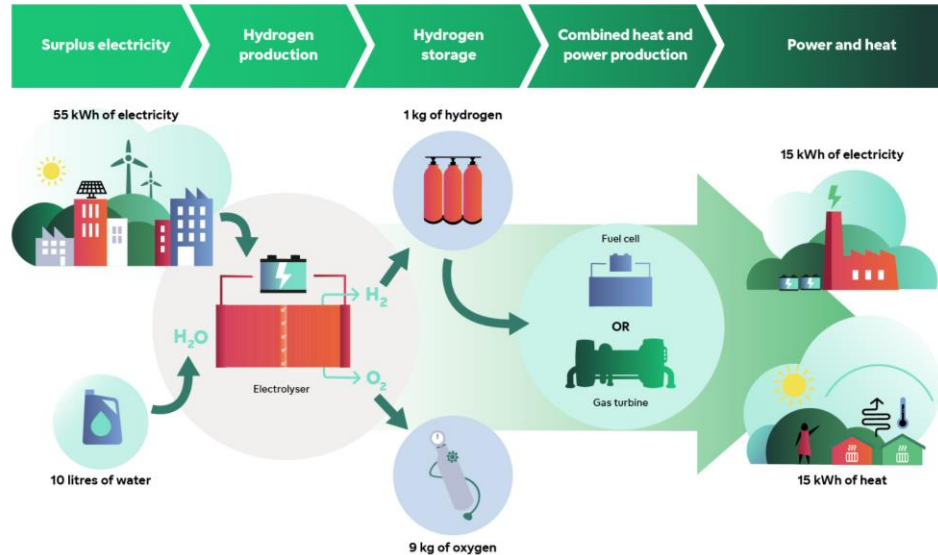
# Storage is one of various flexibility options



# Storage technology in Europe

- Storage will play a very relevant role in any electricity system dominated by variable renewables, delivering firmness, flexibility and minimizing renewables spillage. However, the exact nature of this role is not always well-understood, and storage is sometimes presented as the silver bullet of the decarbonised power system
- However, the EU definition of electricity storage in the Electricity Directive excludes hydropower from reservoirs as storage
- Hydropower storage (with natural inflow and/or pumping) and heat storage (for seasonal storage) are the only proven solutions for seasonal storage
- Reports from The EU Commission, the Parliament, DNV GL, IRENA all handles hydropower differently as storage resource

# Fortum – «The hydrogen economy is coming»



[https://www.fortum.com/about-us/blog-podcast/forthedoers-blog/hydrogen-economy-coming-sooner-or-later?utm\\_source=twitter&utm\\_medium=organic&utm\\_campaign=vetyblogi](https://www.fortum.com/about-us/blog-podcast/forthedoers-blog/hydrogen-economy-coming-sooner-or-later?utm_source=twitter&utm_medium=organic&utm_campaign=vetyblogi)

Hydropower plants

28

Grid customers

221,000

Employees

1,100

incl. apprentices

Telecom

2 300

corporate customers

Customers fast charging

62 000

District heating buildings

979

BKK

- <https://www.stortinget.no/no/Hva-skjer-pa-Stortinget/EU-EOS-informasjon/EU-EOS-nytt/2020/eueos-nytt---16.-april-2020/greenrecovery---pandemien-og-eus-green-deal/>
- <https://www.stortinget.no/no/Hva-skjer-pa-Stortinget/EU-EOS-informasjon/EU-EOS-nytt/2020/eueos-nytt---11.-mai-2020/europakommisjonens-gronne-energiprioriteringer/>



# Hydro power fuelling the economy



**1500**

Hydropower plants, all over the country

Power generation

**96 %**

hydro power

Norwegian power consumption

**25%**

of Germany  
or 4x Denmark



Norwegian reservoirs comprise

**50 %**

of the capacity in Europe



# Hydropower

An aerial photograph of a Norwegian fjord, showing a large dam and hydropower infrastructure. The landscape is rugged and green, with a winding road and a small settlement visible. The water is a deep blue, and the surrounding mountains are covered in lush vegetation. The image is used as a background for a presentation slide about hydropower.

**Highly flexible  
backbone of  
electricity system**

**Mitigation of wetter,  
warmer and wilder  
climate**

**Cost efficient and  
renewable source of  
electricity**

**Provides energy  
storage in high  
volumes**

**Flood prevention  
provides high value to  
society**

**Norwegian hydro  
power as a green  
battery for Europe**



# We work on the solutions of the future. Today.

26.05.2020 | The future is here

