

# STATKRAFT'S APPROACH TO HYDROPOWER

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**Statkraft**  
PURE ENERGY

No. **1** WITHIN RENEWABLES  
IN EUROPE

**89%** RENEWABLE  
ENERGY

**283** POWER AND DISTRICT  
HEATING PLANTS

**33%** OF NORWAY'S  
POWER  
GENERATION

**3300** EMPLOYEES...  
...IN MORE THAN  
**20** COUNTRIES

PERU



BRAZIL

CHILE



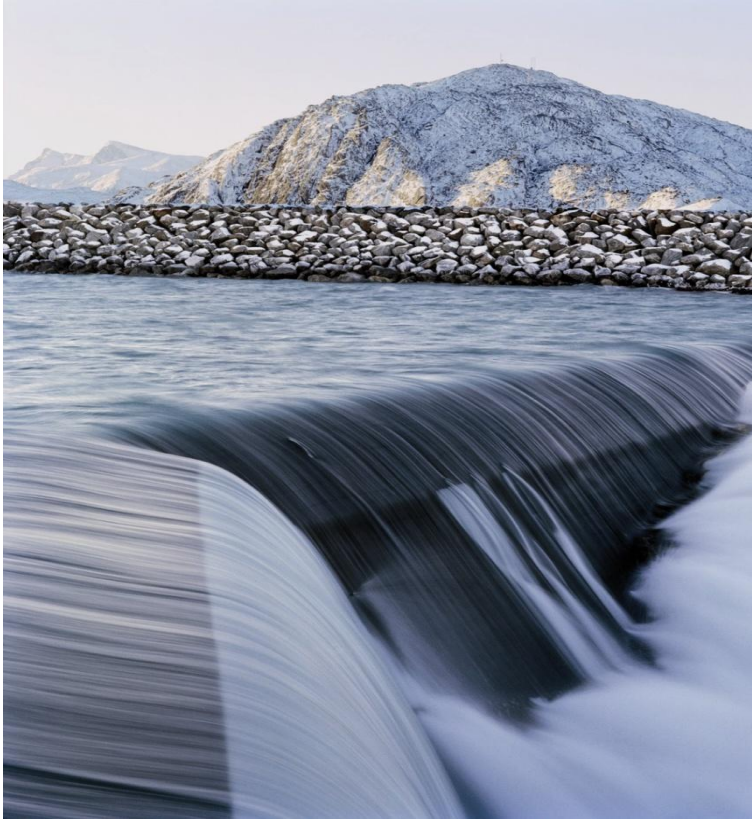
# STATKRAFT IN GERMANY



- > Flexible power plants
- > Statkraft operates in Germany
  - 10 hydropower plants (261 MW),
  - 4 gas-fired power plants (1,938 MW) and
  - has shares in 2 biomass power plants (16 MW).
- > Total installed capacity: 2.215 MW
- > Energy generated is marketed by trading organisation in Düsseldorf.
- > 10-year flexible gas storage contract
- > 100% shares in Baltic Cable (Lübeck-Malmö)



# FLEXIBLE HYDROPOWER



- > Generating capacity:  
More than 12 800 MW
- > 234 hydropower plants  
in Europe, South  
America and Asia.
- > Large reservoir  
capacity and flexible  
generating capacity



**Construction of  
Glomfjord and Nore power plants, around 1920s**



# Svartisen, mid/late 1980s





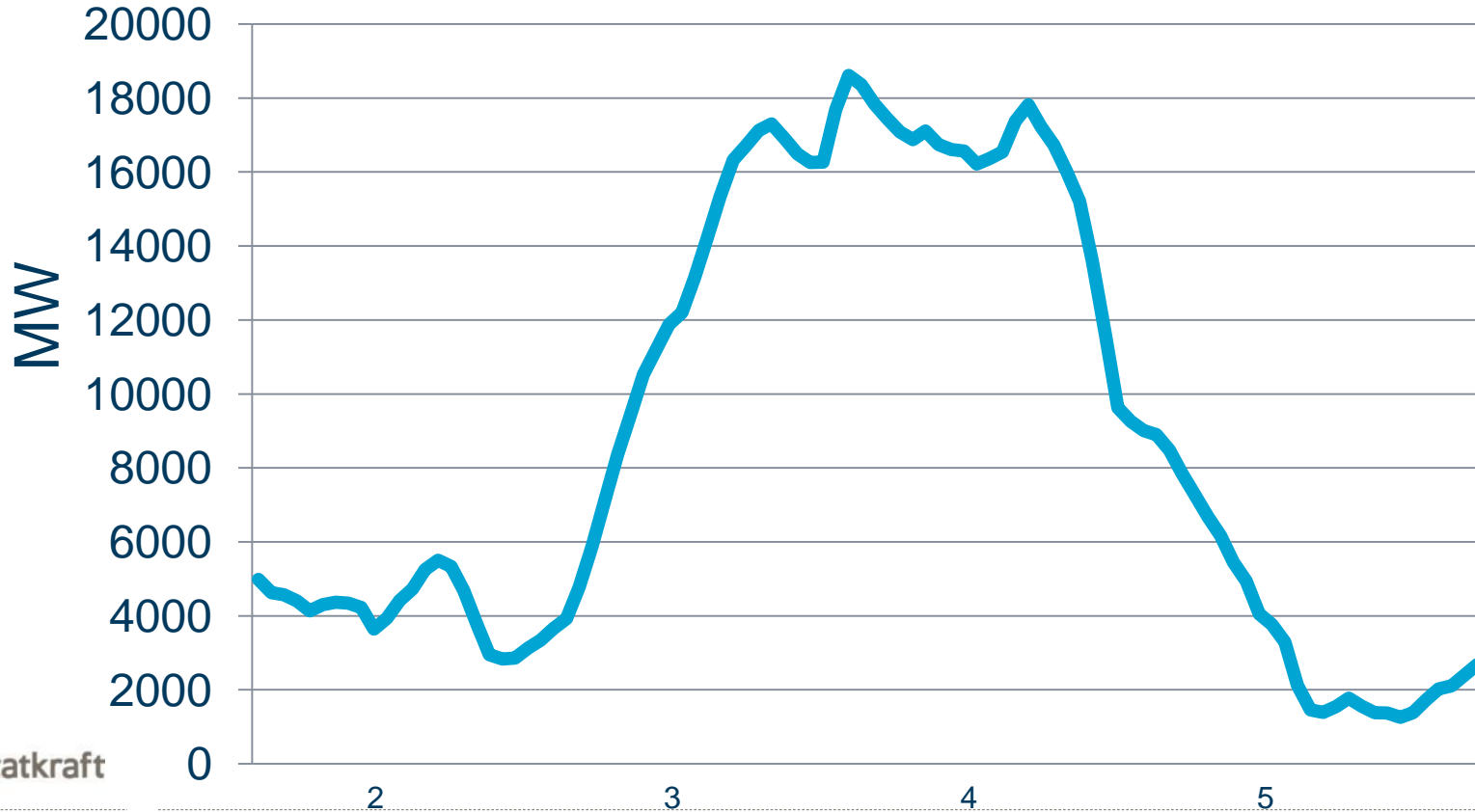


**Cakit, Turkey, 2010**

**Magat, Phillipines, 2010**

# THE INTERMITTENCY CHALLENGE

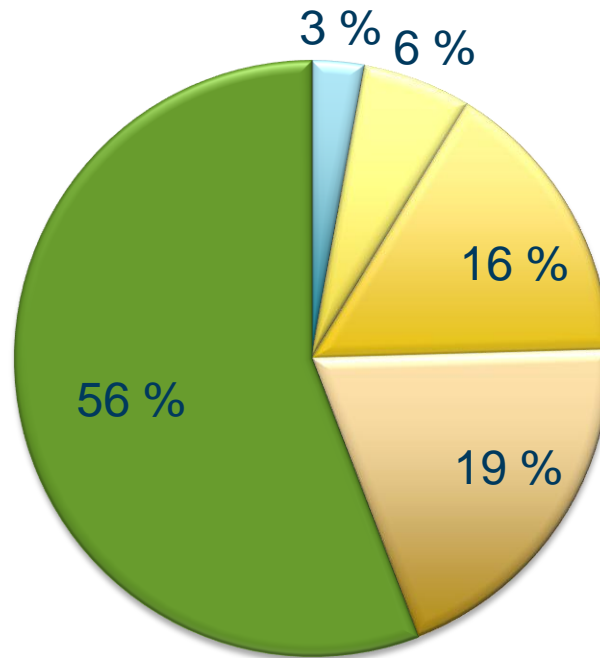
Germany, October 2009





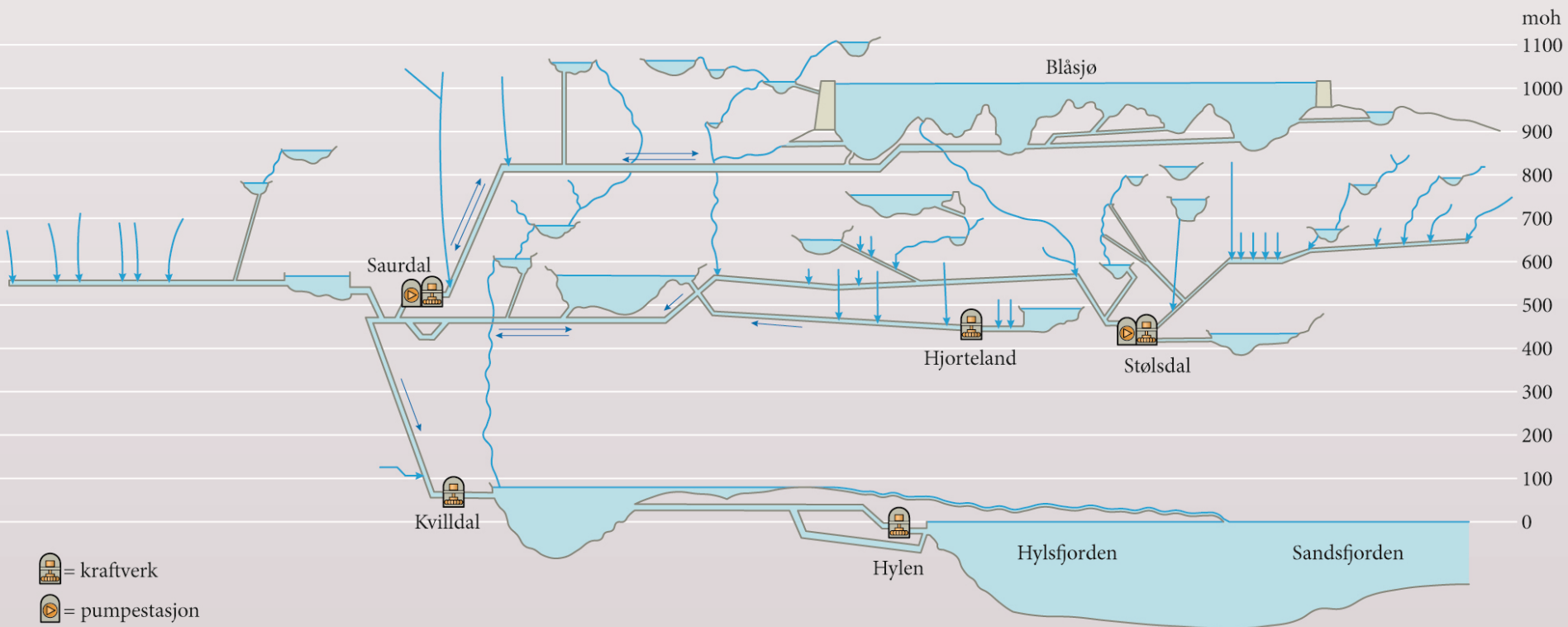
# NORDICS – DOMINATED BY FLEXIBLE HYDRO

Around 90 000 MW - 376 TWh (2010)



- Wind power
- Other renewable
- Fossil fuels
- Nuclear power
- Hydropower

# ULLA-FØRRE POWER PLANT SCHEME



# NORWAY: 50% – 84 TWh

## Options to provide flexibility:

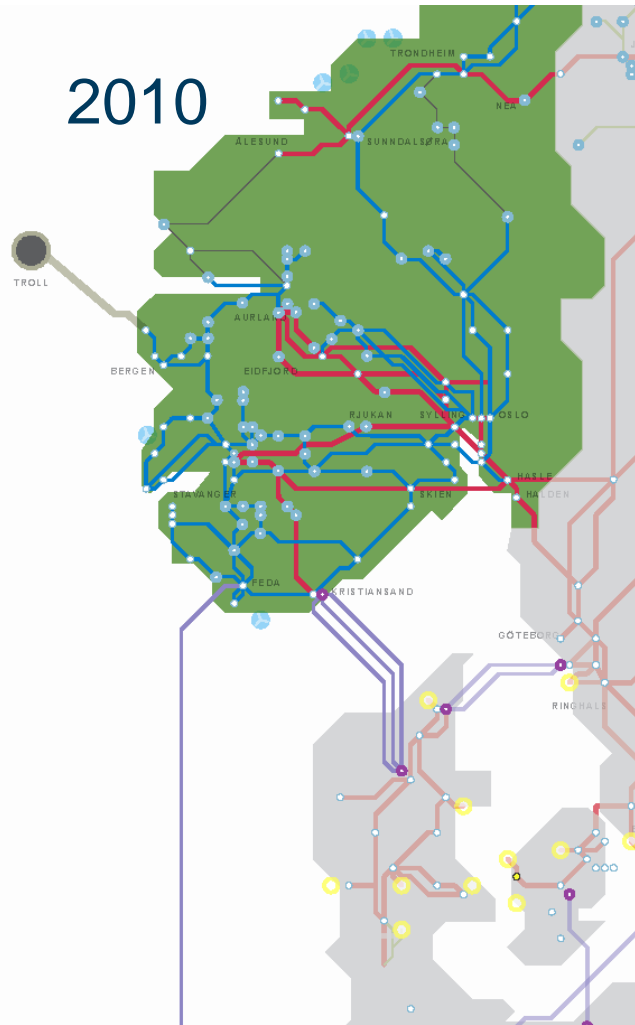
1. Change the operation pattern in existing plants **28 GW**
2. Increase installed capacity **+7-8 GW**
3. Build pumped hydro storage in connection with existing reservoirs + **15-20 GW**



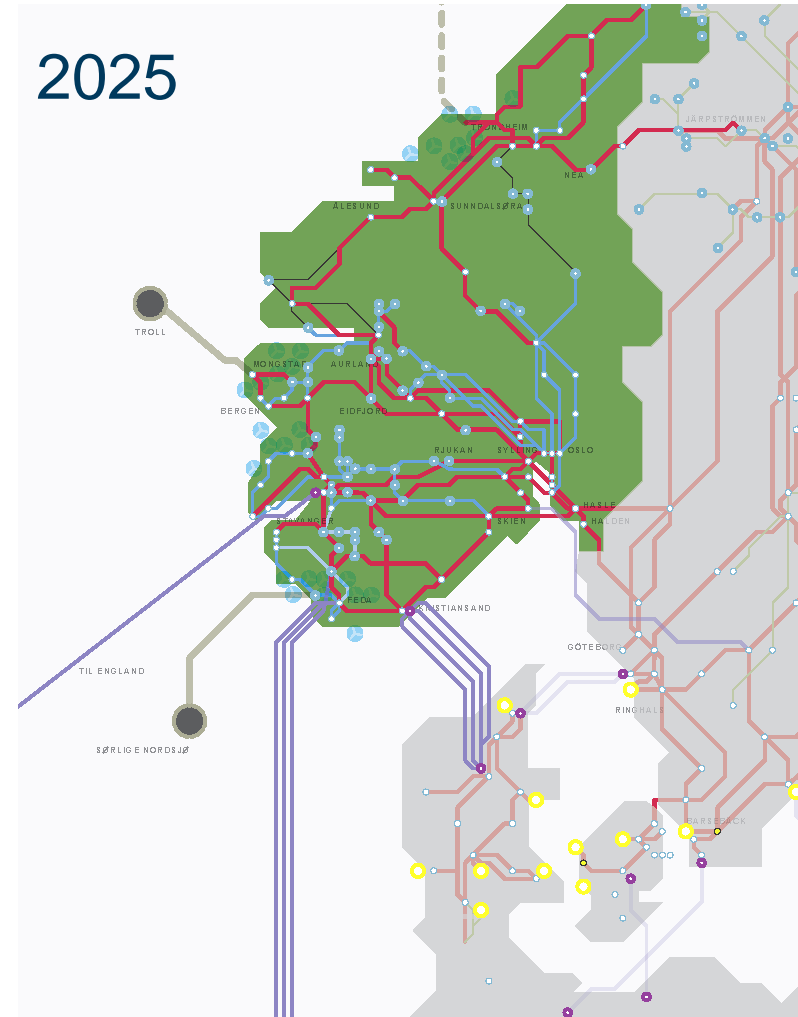


# STATNETT'S PLANS

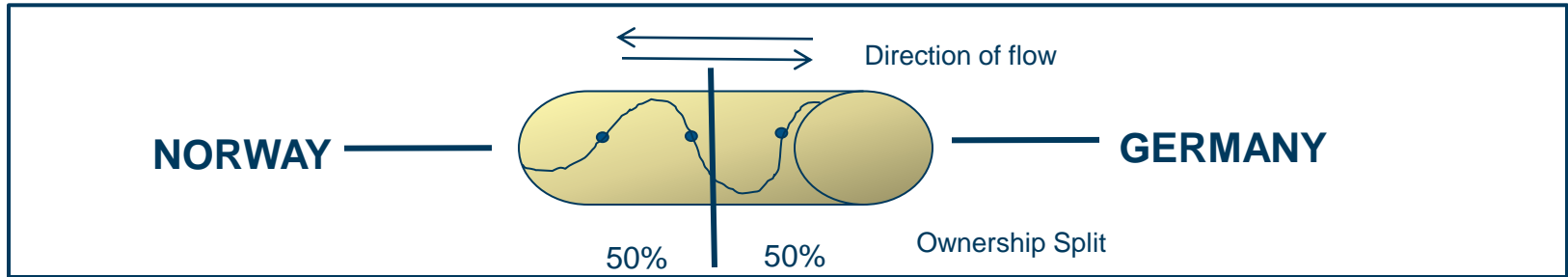
2010



2025



# CABLE BASICS



## --> 1. Cables:

- Exchange the more costly produced electricity with less costly produced electricity

## --> 2. Direction of flow:

- Depends upon the sign of the price difference, DP
- Example: Current will flow from Germany to Norway when price in Norway is higher than price in Germany

## --> 3. Incomes: "Bottleneck-incomes".

- Dependent upon the duration of DP

## --> 4. Distribution of incomes:

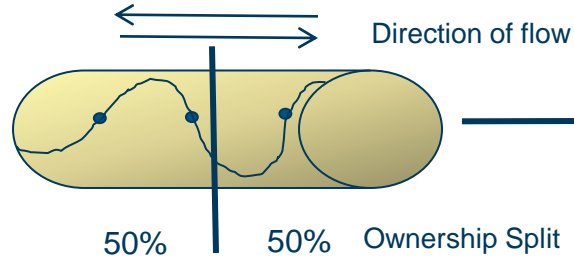
- typically 50% to each owner (depending upon ownership split)
  - TSO-owned Norwegian cables : earnings reduce transmission tariffs in national grids
    - » 1/3 to Producers/ End-Clients / Industry



# COMMERCIAL SPLIT OF CABLES

Alternative A

NORWEGIAN  
GRID

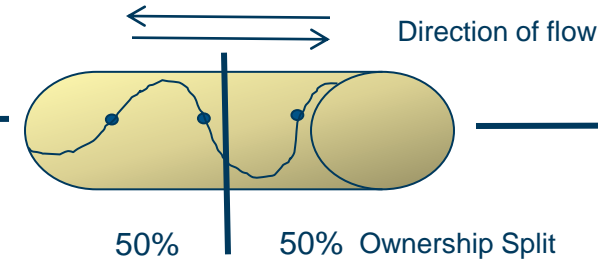


GERMAN GRID

Alternative B

NORWEGIAN  
GRID

**Market Solution**  
Compensate for grid constraints  
by adjustments of production

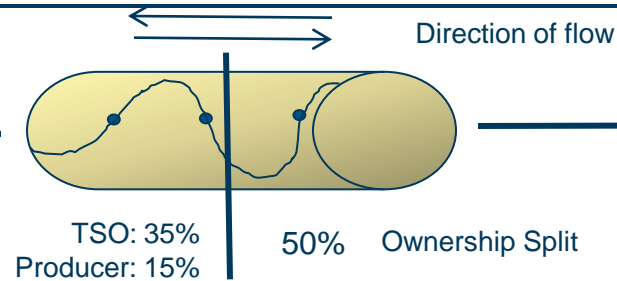


GERMAN GRID

Alternative C

NORWEGIAN  
GRID

**Technical Solution**  
Pumped Storage Plant



GERMAN GRID

# SUMMING UP

- ❑ **Statkraft has more than 100 years of hydropower experience**
- ❑ **Flexible power generation in Nordic area can play important role in providing Germany with flexible power generation**
- ❑ **Sufficient development of interconnections is the key**
- ❑ **Pumped storage hydropower can provide additional generation capacity**
- ❑ **A European approach for efficient solutions to the new challenge is needed**

**PURE**  
ENERGY

