

# R&D AND ENVIRONMENTAL MEASURES

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Corporate R&D

Hydropower summit, Feb 6th 2020



# Statkraft – Europe's largest producer of renewable energy

OWN CAPACITY

**19 300 MW**

PRODUCTION

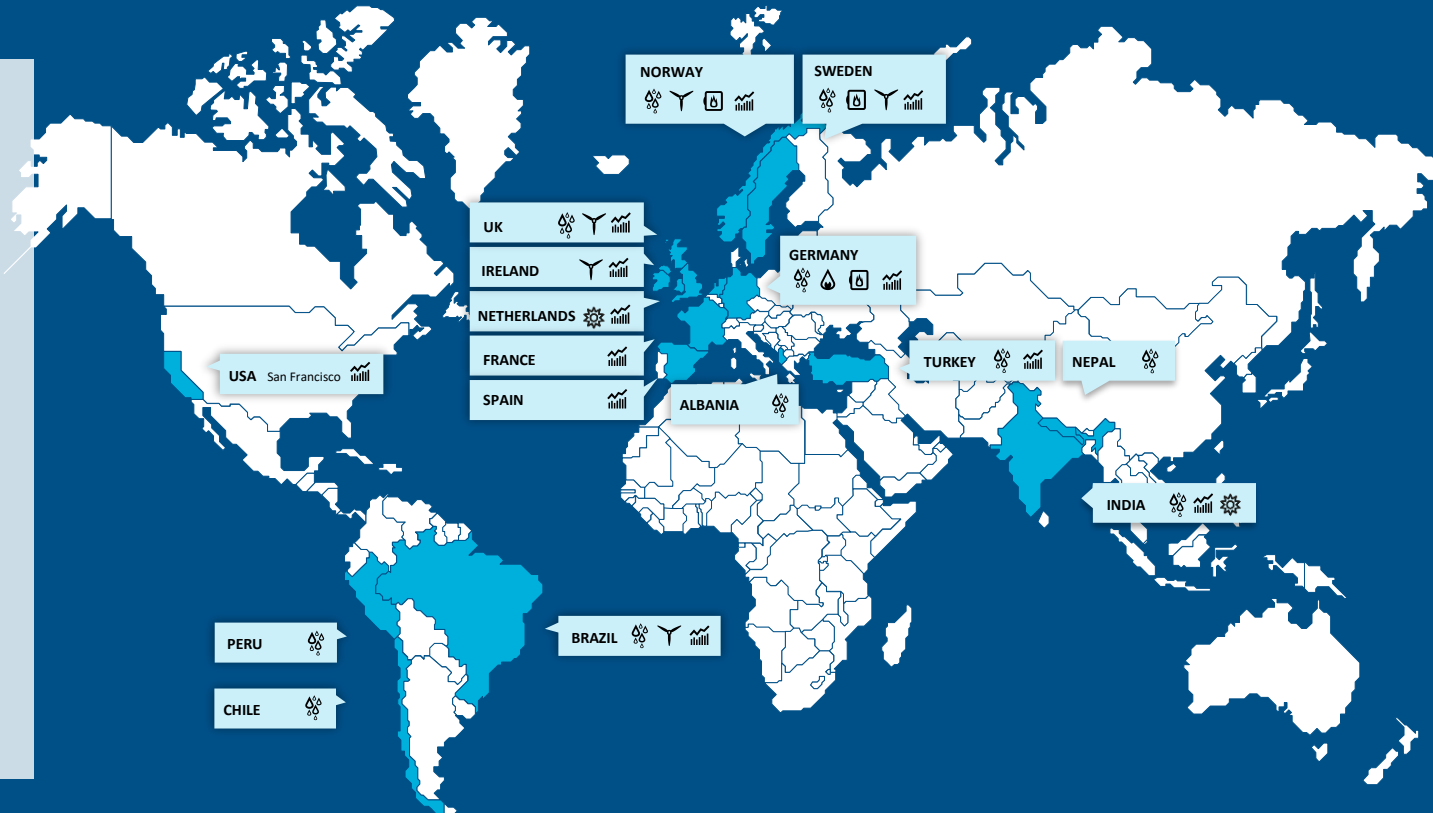
**62 TWh**

EMPLOYEES

**3 600**

NET PROFIT

**13.4 NOK billion**



# Statkraft's growth strategy going forward

## MARKET CENTRIC APPROACH:

Finding the best opportunities in renewable energy within each country, across technologies.

### OPTIMISE HYDRO-POWER PORTFOLIO



### RAMP UP AS WIND AND SOLAR DEVELOPER



### GROW THE CUSTOMER BUSINESS



### DEVELOP NEW BUSINESS INITIATIVES



# Statkraft

## R&D Strategy

2019-2025

Broaden scope  
and  
Extend horizon



  
Enhance  
**COMPETITIVENESS**  
through  
R&D



R&D  
Supporting  
growth

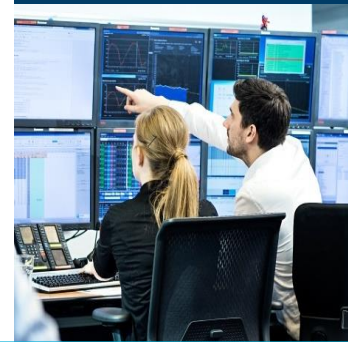
Flexible hydro



Wind and solar



Mrkt/Customer



New Business



Cross sectoral issues

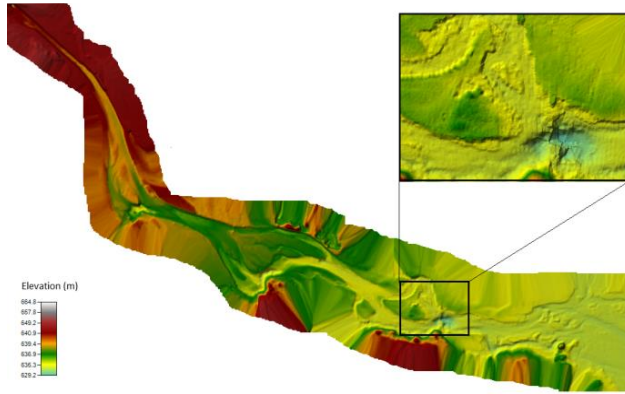


# Hydropower R&D priorities

- ▶ Effective and efficient operations and maintenance
- ▶ Increased flexibility from hydropower
- ▶ Enable good framework conditions

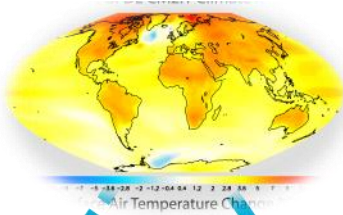


Sediment deposition in Binga reservoir



# Continuously facing dilemmas

## Climate change



## Power system security



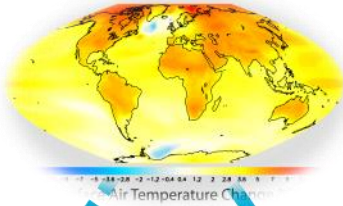
## Local environment

### ▶ Trade offs

- ▶ Renewable hydropower as a climate solution
- ▶ Local environmental measures vs renewable production
- ▶ Nordic power system strongly dependent on flexible hydro

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## Local environment

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# Environmental measures

- ▶ Environmental mapping and investigations
- ▶ Fish cultivation measures
  - Fish release
  - Spawning gravel
  - Thresholds/Weirs
  - Fish ladders
- ▶ Landscape adjustments
- ▶ Erosion measures
- ▶ Arrange for outdoor life
- ▶ Environmental reviews at internal control



- ▶ Role of R&D



## Eidfjord Hydropower System, Western Norway

### Increase of water release to Bjoreio during winter to improve roe survival



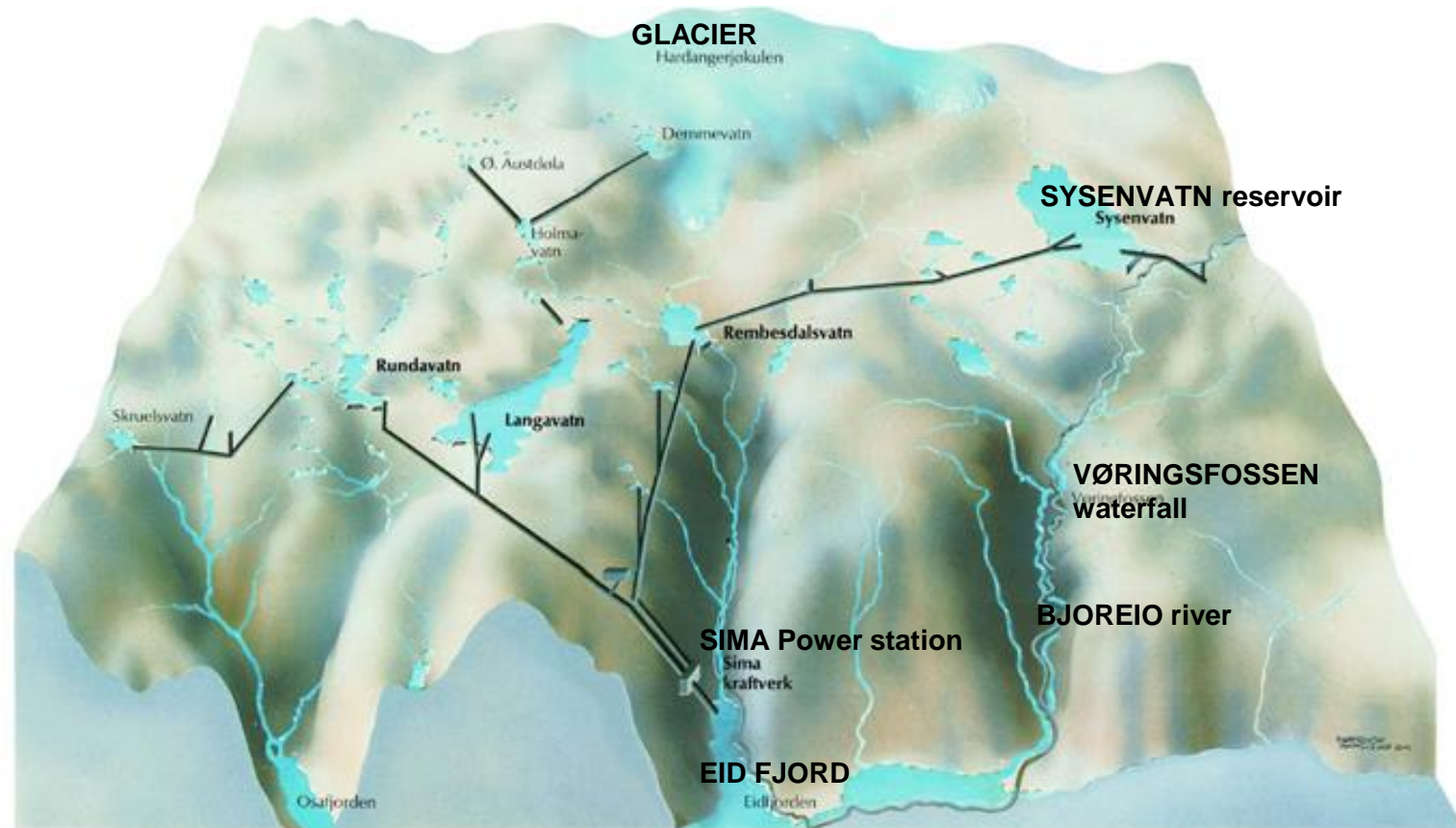
#### Facts – Sima Hydropower System

- ~ 2,7 TWh average annual production
- 1120 MW installed capacity
- power station discharges into a fjord

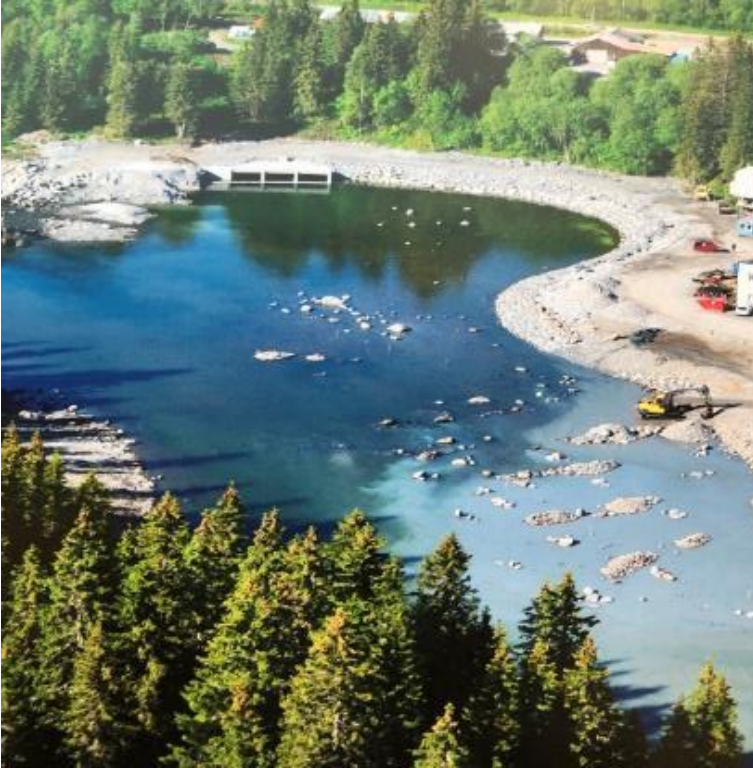
#### Environmental enhancement measures with limited loss of power production

- ▶ Concession describes water release into a waterfall located in the Bjoreio river during summer for tourism.
- ▶ Shifting a part of summer water release to winter allows to improve roe survival.

# Eks utløp til fjord: Sima og Bjoreio



# Moving power station outlet increases salmon habitat area



## Facts - Røssåga Hydropower System

- 3 TWh average annual production
- 535 MW installed capacity
- power station discharges into Røssåga river

## Environmental enhancement measures with no loss of power production

- ▶ A rehabilitation project allowed to move the outlet of the Nedre<sup>1</sup> Røssåga power station 700 m upstream to fully restore the original anadromous stretch of the river
- ▶ Habitat enhancement measures were implemented in the restored stretch such as providing appropriate spawning substrate and shelter places as well as biological monitoring.





## Fish ladders extend habitat area for salmon and sea trout



### Facts – Skjomen Hydropower System

- ~ 1,4 TWh average annual production
- 341 MW installed capacity
- power station discharges into a fjord

### Environmental enhancement measures with no loss of power production

- ▶ The building and monitoring of two fish ladders in the Skjoma river enlarged its anadromous stretch by 30%, which increases the habitat areas for salmon and sea trout.





# THANK YOU

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PURE ENERGY

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# Røssåga Process



- ▶ OU -> rehabilitering
- ▶ Tailor made,
- ▶ Environmental handling – not only biodiversity and fish
  - Visual aspects,
  - other environmental / areas, -> cleaning up laydown-area.
  - Waste handling
  - Optimization of logistics, carefully planning of logistics