

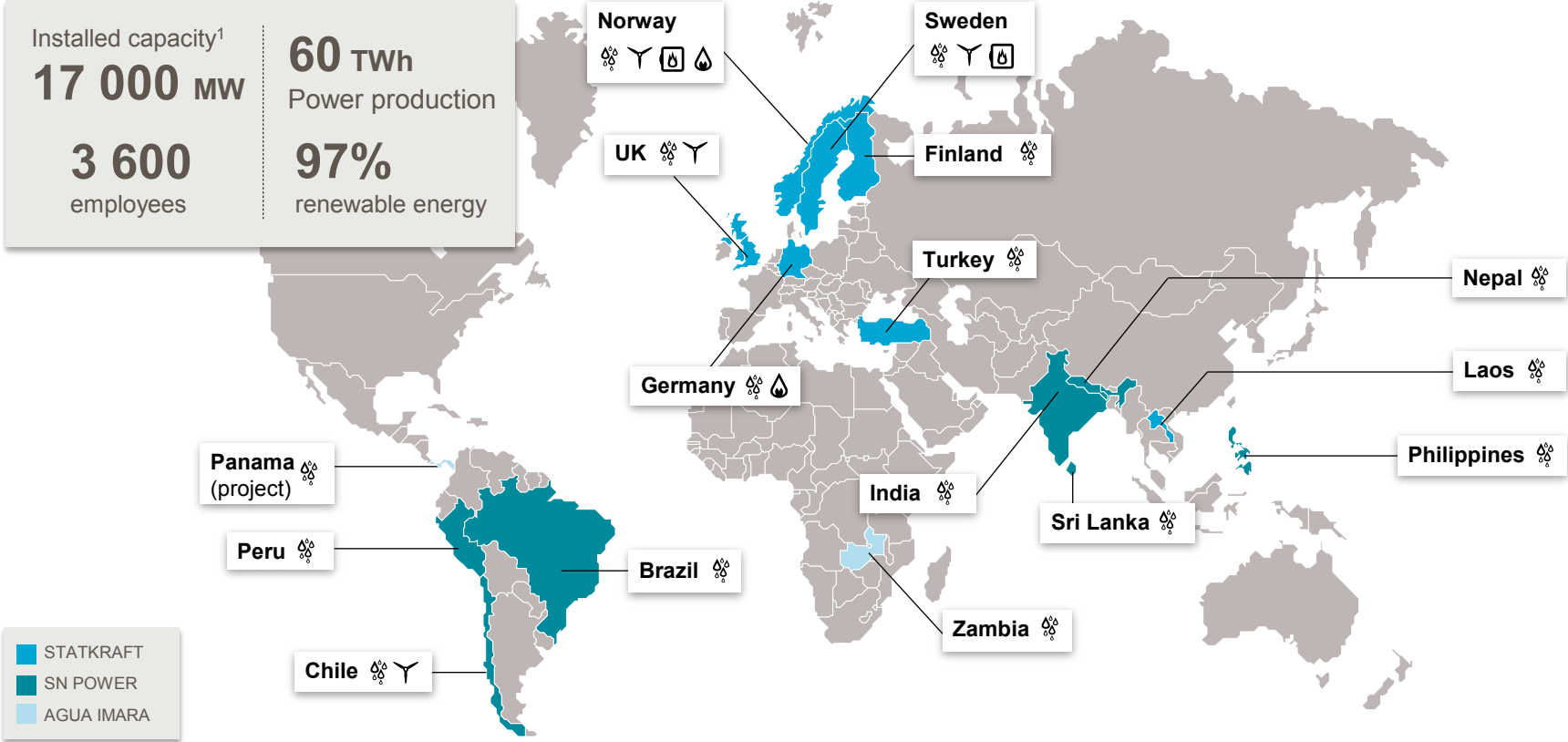
VIEWS AND EXPECTATIONS – KICK-OFF MEETING HYDROBALANCE

Tom Westgård

Statkraft Energi



Statkraft's production 2012



¹Including pro rata ownership in associates outside the Nordics

Why we participate

Vast Norwegian potential in an intermittent European power system

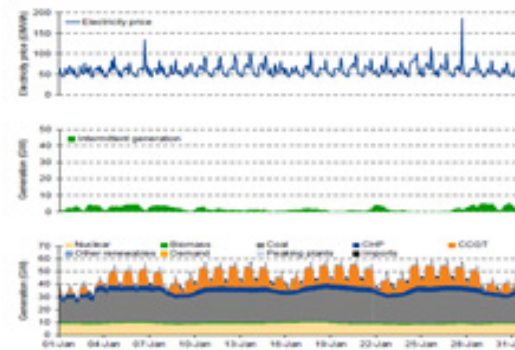
Norway has 50% of the hydro reservoirs in Europe – 84 TWh

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**

EUROPEAN CHALLENGE Dealing with future Intermittency power capacity

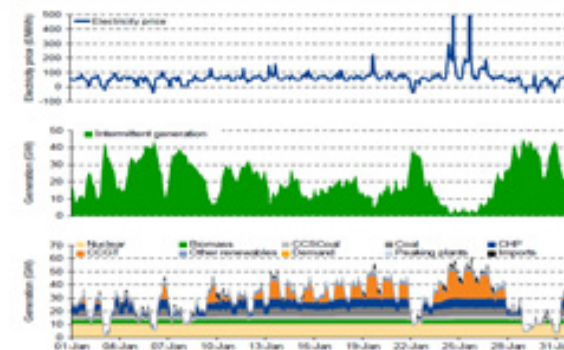
Figure 16 – Typical patterns of prices and plant dispatch in the market today



- Calculations for UK in 2010 and 2030 (Poyry)
- Substantial need for flexibility to compensate for this intermittency

7 Okt 2011

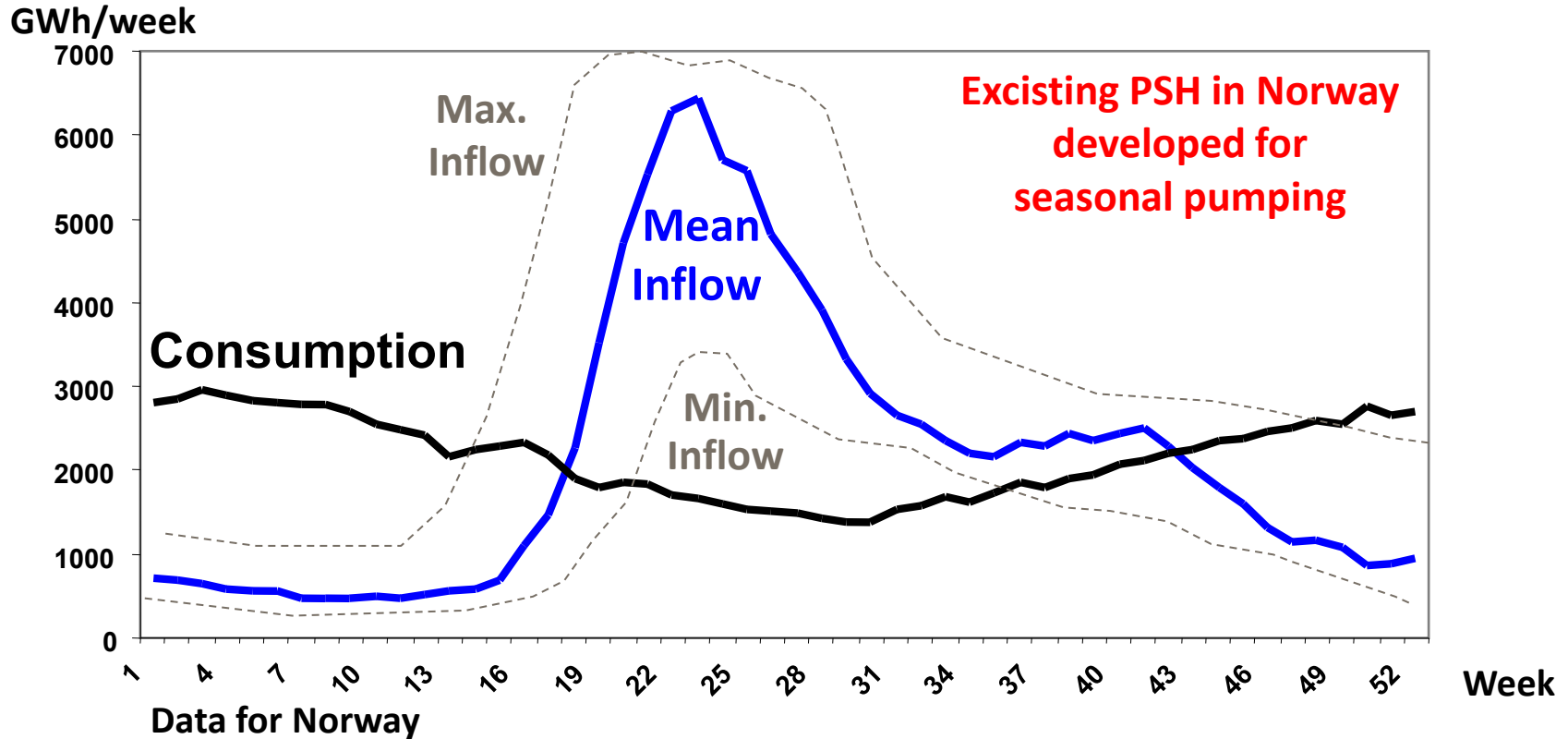
Figure 15 – British market in January 2030 with 2000 weather



- > Nordic Hydro capacity can contribute
- > More HVDC cables is needed

Statkraft

The hydrology vs energy consumption



TECHNICAL POTENTIAL INCREASED CAPACITY SOUTHERN NORWAY

Future PSH possibilities in Norway depends on :

- limitations in the change of water level in upper and lower reservoirs
- and duration for pumping / generation

Change in waterlevel	PSP Capacity (MW) duration pumping mode			Increased capacity exisiting plants (MW)
	24 hours	7 days	60 days	
				7500
0,5 m/hour	85000	30000	N / A	
0,1 m/hour	30000	16000	2600	
0,01 m/hour	3200	3200	1500	

➤ **The technical potential is not the main challenge !**

An aerial photograph of Lake Blåsjø, a large reservoir in Norway. The lake is a deep blue color, surrounded by rugged, rocky terrain with patches of green moss and lichen. A long, curved dam made of grey stone or concrete runs across the middle of the lake. In the background, more mountains and smaller lakes are visible under a cloudy sky.

lake Blåsjø 7.8TWh RESERVOIR

Potential upper reservoir,
several possibilities



Typical lower reservoir

Our main interest in the program

- ▶ European demand for flexibility
- ▶ Competing technologies to Norwegian hydro power
- ▶ Limitations for concept in foreign transmission systems
- ▶ Involvement and focus on European situation
 - A lot of work has already been done regarding different Norwegian issues
 - Norwegian situation will probably not limit the concept in the two first decades
 - Except for interconnector capacities
 - And sustainable business concepts



THANK YOU



Statkraft
PURE ENERGY

www.statkraft.com