# Aluminium – energy in solid state

Investor Relations Webinar

Arvid Moss, EVP Energy

June 9, 2015

# Hydro aspiration translated into action in Energy

## Better

- Realize full potential of strong asset base and competencies
- Further improve operational and commercial performance
- Provide competitive global energy sourcing and competence

## Bigger

- Mature captive growth opportunities
- Raise income potential from market operations and commercial optimization
- Leverage value from Nordic power surplus

## Greener

- Capitalize on strong climate position over time
- Capture value of the green certificate scheme in new growth projects
- Promote responsible energy policy in the regions where Hydro operates



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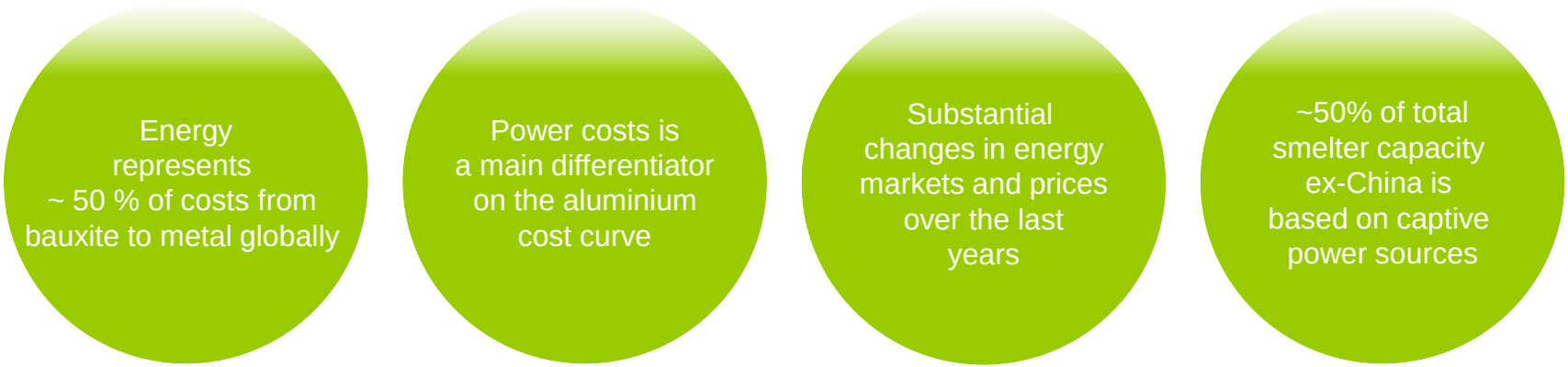
# Energy plays a key role in aluminium




**High volatility in energy and power prices**, combined with political risk for add-on costs makes commercial competence and stakeholder management critical

**Forward trends**

- High price volatility
- High uncertainty for future power price level
- Increasing captive share

**Hydro Energy**

- Strong captive foundation in Norway
- Adding value to business globally through market, policy and commercial competence



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# 01

# Industry perspective



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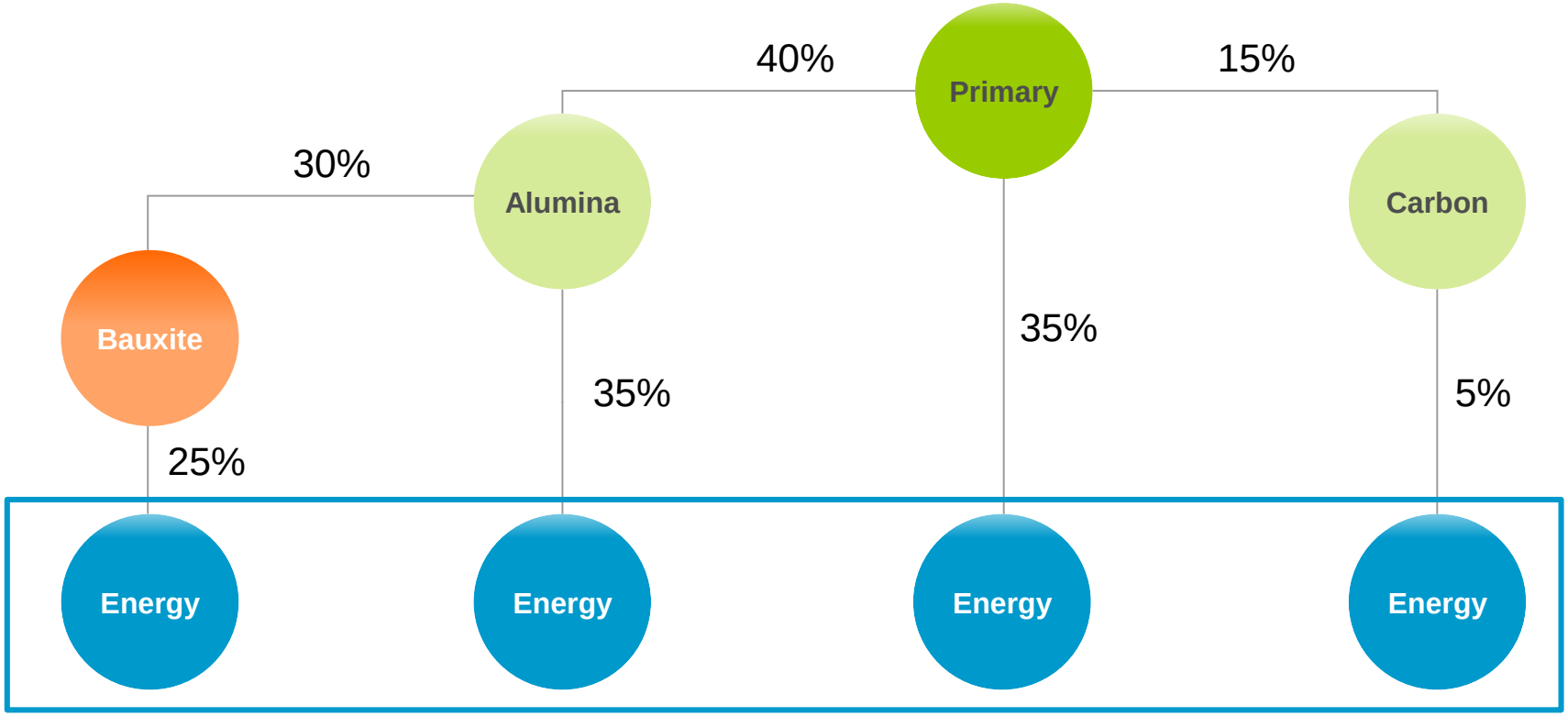
# Energy represents ~ 1/3 of smelter cost and ~ 50% of the total value chain cash cost




**Total energy cost: ~50%**

**Percentages indicate share of respective input costs globally**

Illustrative figures
*Source: CRU*



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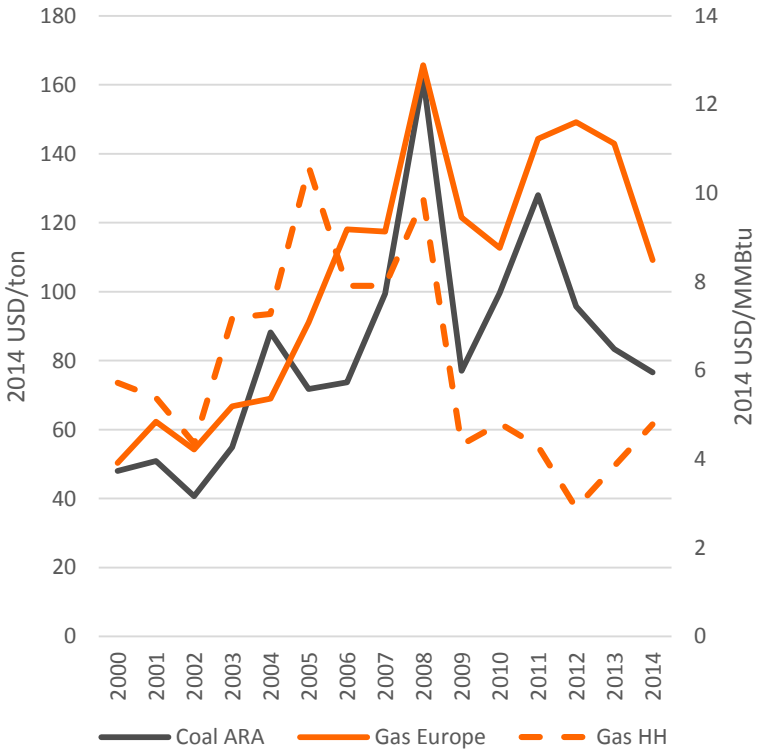
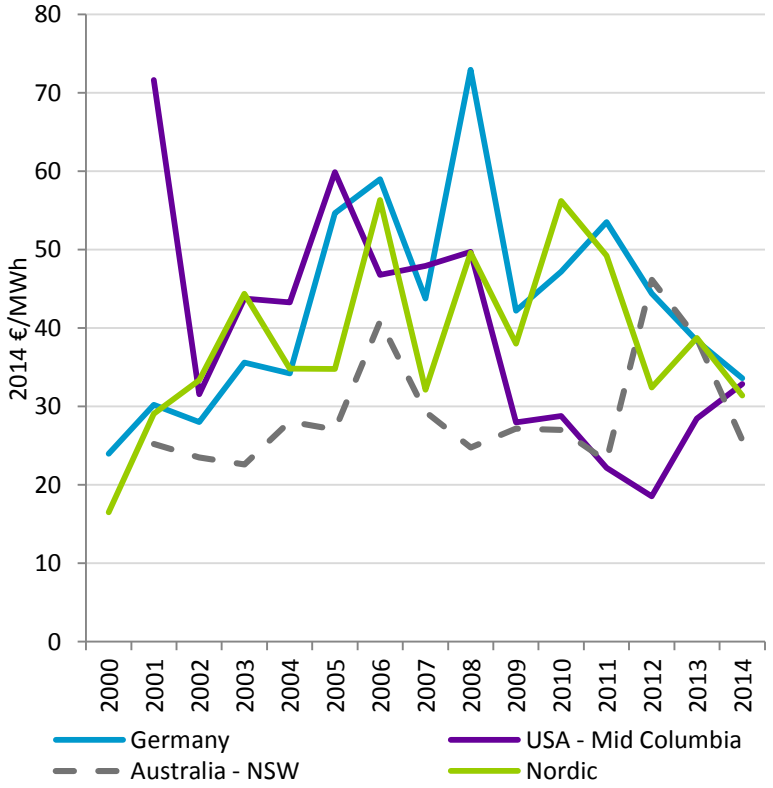
# Volatile energy prices around the globe last 15 years

## Coal and gas prices




(6)

## System Power prices




Sources: NordPool, EEX, EIA

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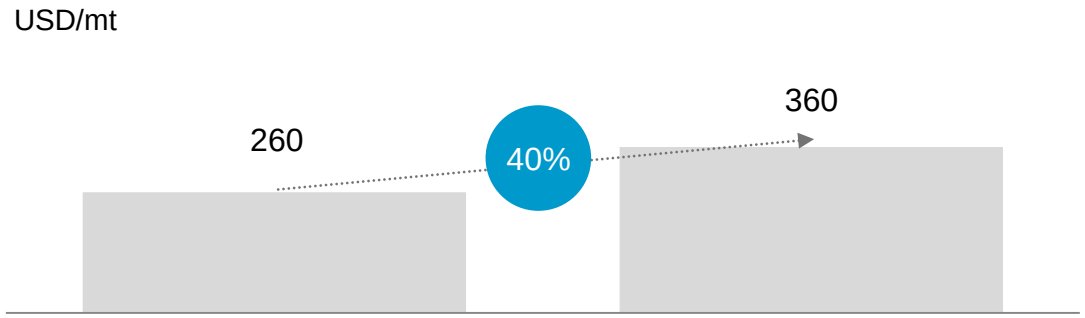
# Stronger increase in contract prices than captive cost

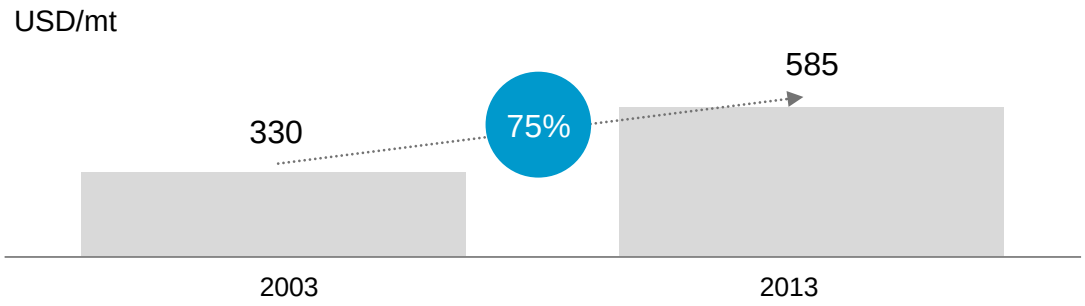
Smelters, world ex-China

**100% captive**




Despite power cost increases also for captive, such plants have seen power costs **decline** as share of total cost

**Non-captive**




Non-captive have seen a very **rapid power cost increase** and costs as **share of total costs increasing** from an already high level

Source: McKinsey Team analysis/Woodmac, rounded figures



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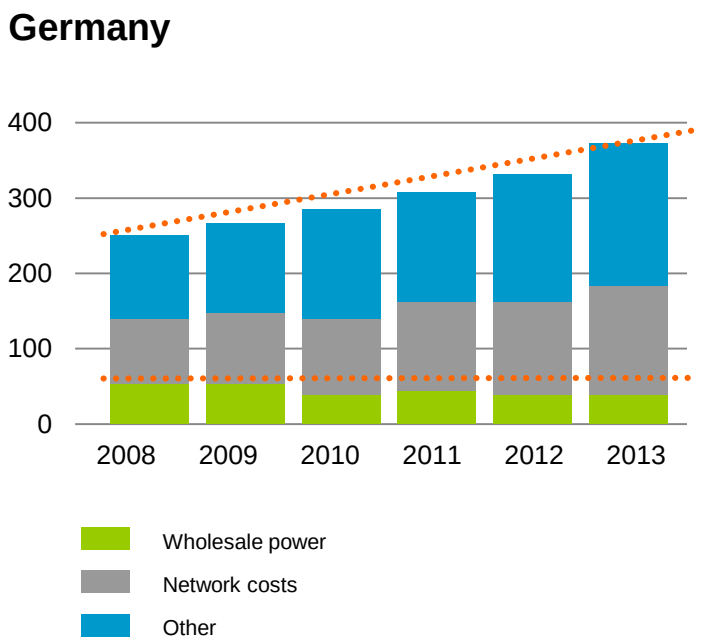
# Grid tariffs and “green costs” affect prices for consumers

Composition of residential electricity tariffs, 2008-2014 (EUR/MWh)




## Changing European power markets

- Rising share of non-regulated power requires higher investments in stable and reliable grid
- European power market coupling and harmonizing efforts to reduce bottlenecks require grid developments
- Political targets for more renewable power and reduced CO2 emissions add cost pressure

*Source: Eurostat Bloomberg New Energy Finance*



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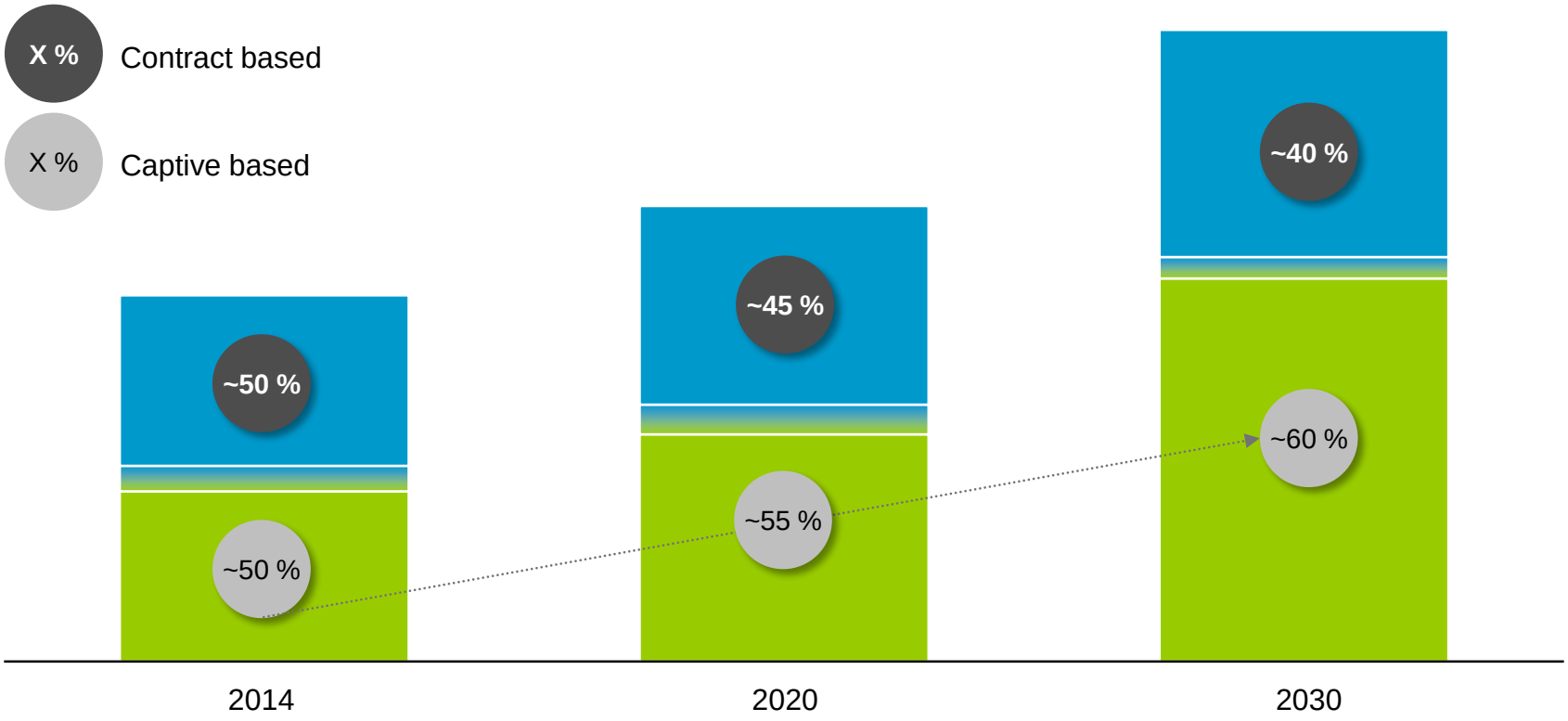
# Captive gaining share in primary metal production

Could increase to around 60 % towards 2030

**Primary production estimates, World ex. China (mtpy)**




Source: Hydro Analysis
* Average semi-captive smelter has captive share of ~60 % (2014)



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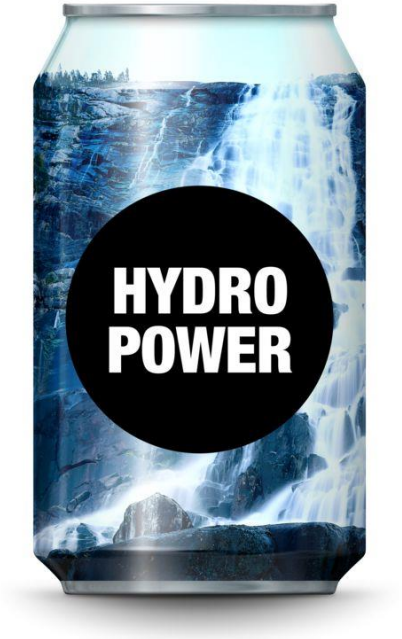
# 02

# Dual mission

# Energy has a dual mission in Hydro

Strong, sustainable value creator *and* energy provider throughout the value chain




To own, operate and maximize value of Hydro's energy assets


To provide competitive power sourcing and global energy competence



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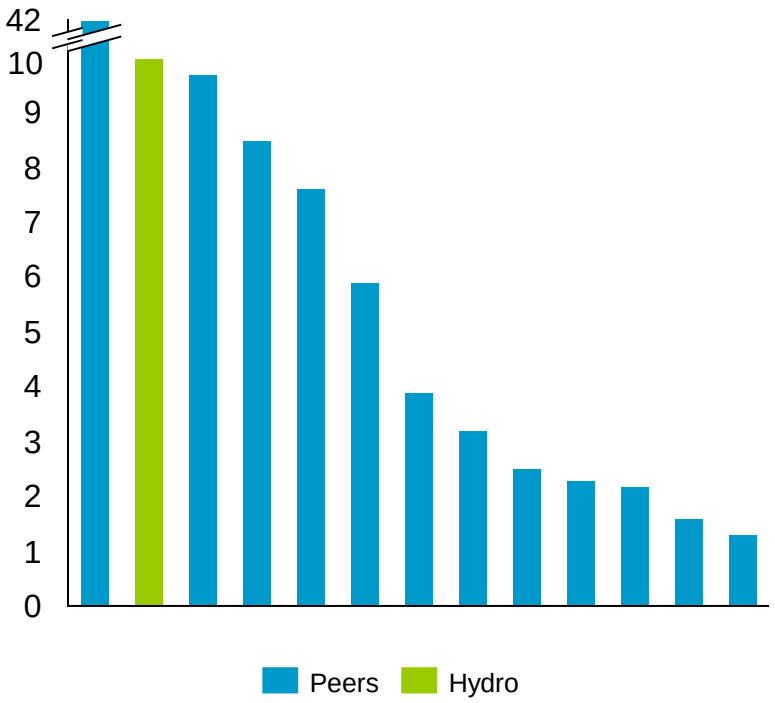
# Hydro is second largest hydropower producer in Norway

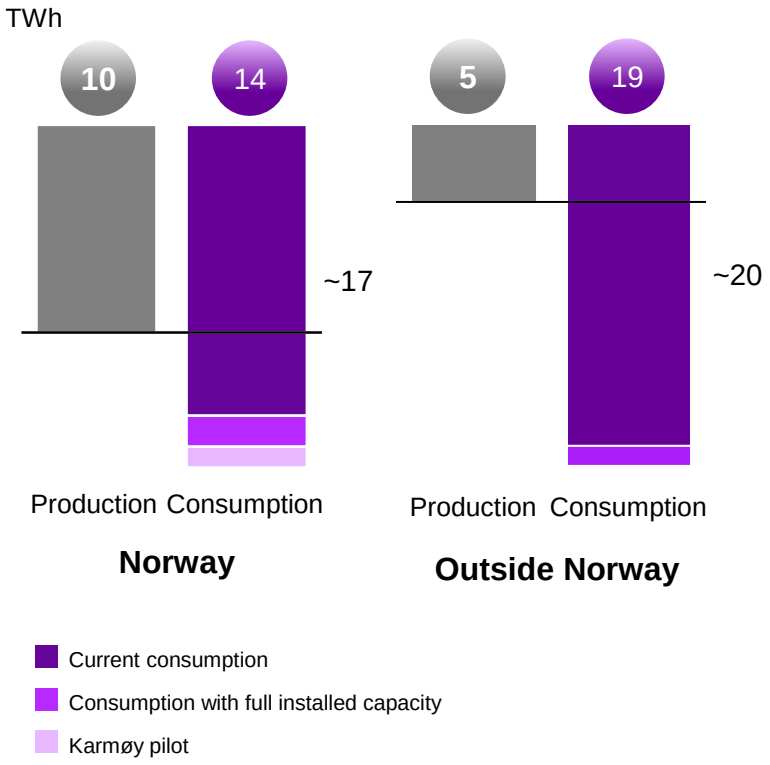
But a net buyer of power globally

## Norwegian power producers*

TWh normal production




## Power production and consumption in Hydro smelters**




* Equity normal production

** Based on consolidated production in Hydro smelters, mid-2015



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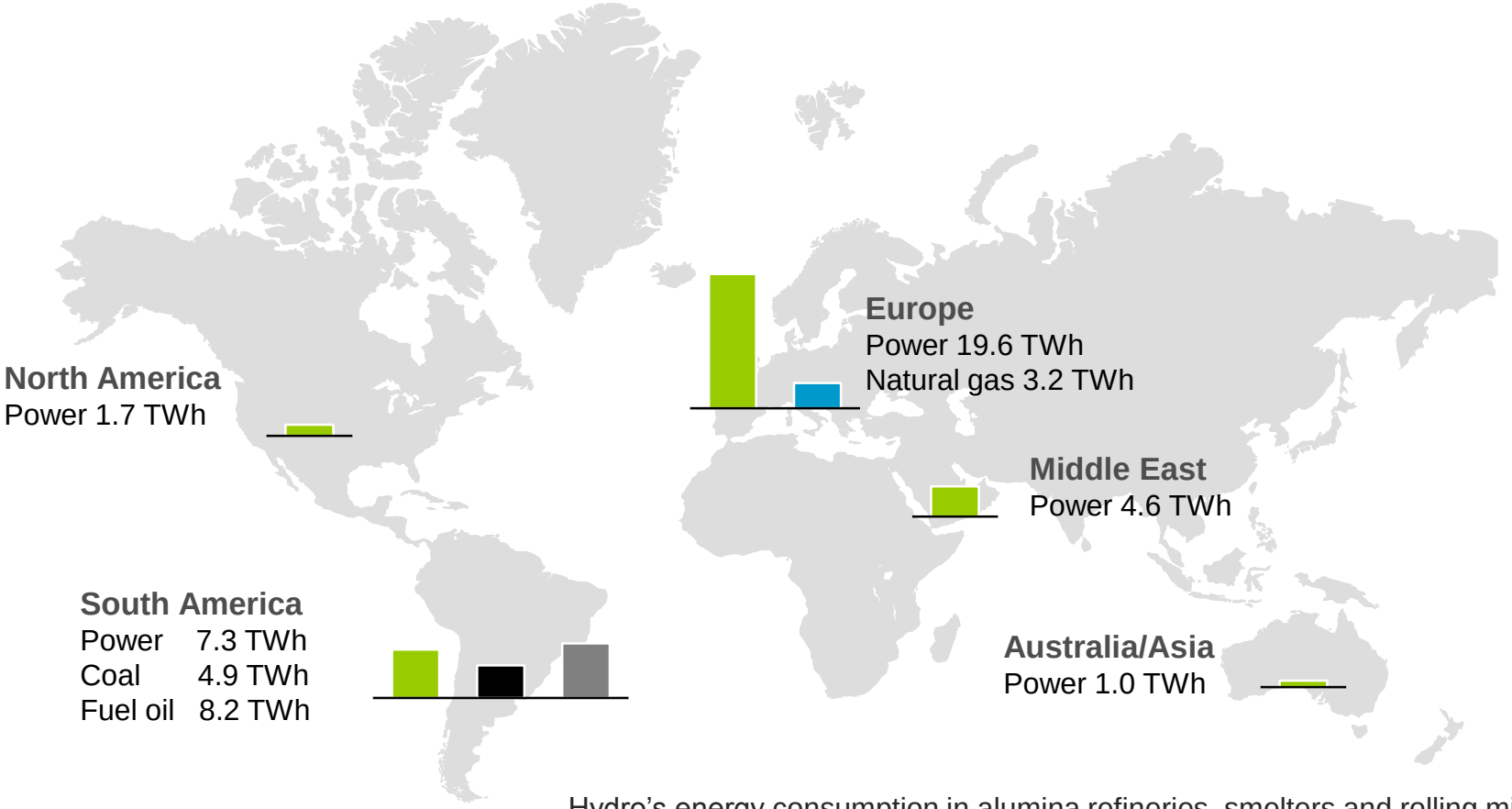
# Hydro energy needs are spread across the value chain, global regions and energy carriers




Hydro's energy consumption in alumina refineries, smelters and rolling mills

Based on consolidated figures mid-2015



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# 03

# Power producer



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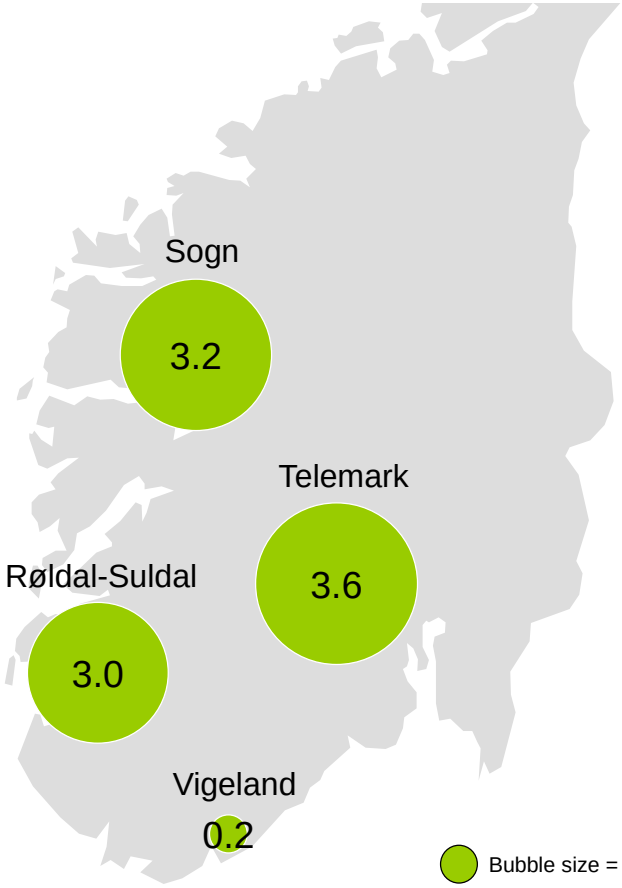
# Hydro’s 110-year history started with energy

Mission: to create a more viable society by developing natural resources and products in innovative and efficient ways




**10 TWh production in a normal year of precipitation**

- 20 operated hydropower stations
- 35 turbines and pumps
- 2 000 MW in installed capacity



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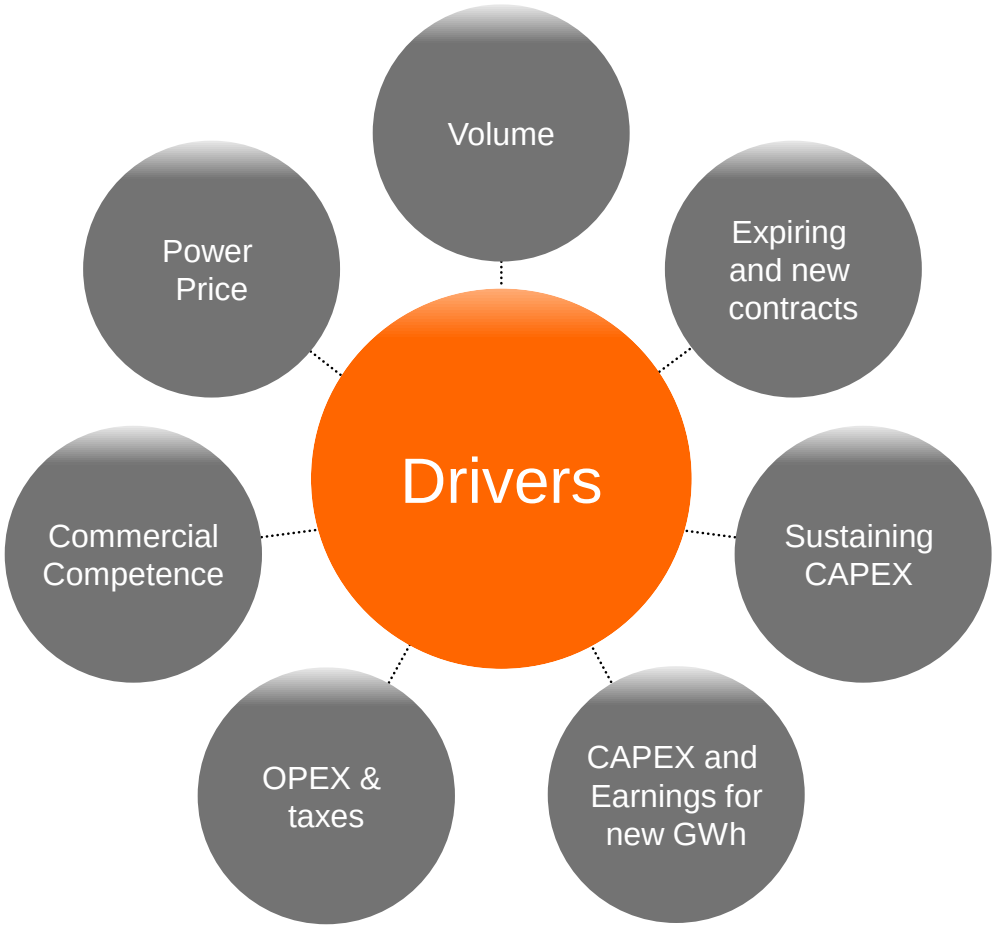
# Value-creation in Energy

Key factors



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# Hydropower – flexible, competitive, renewable

## Economies of scale and operational excellence

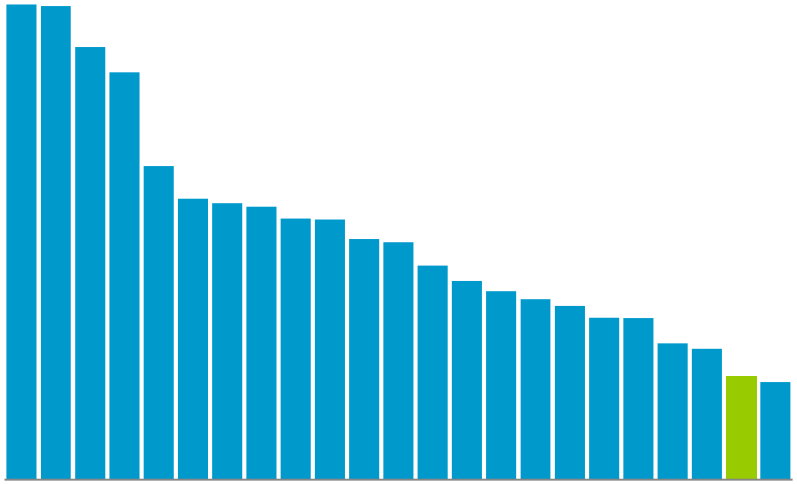
OPEX & taxes


Reservoirs and dams

Tunnels and power stations

**Total operating costs for Norwegian power producers**

NOK/GWh




*TRI rate (own employees) – cases per 1 million hours worked; 2014
**Source: EnergiNorge, H2 statistics for 2014



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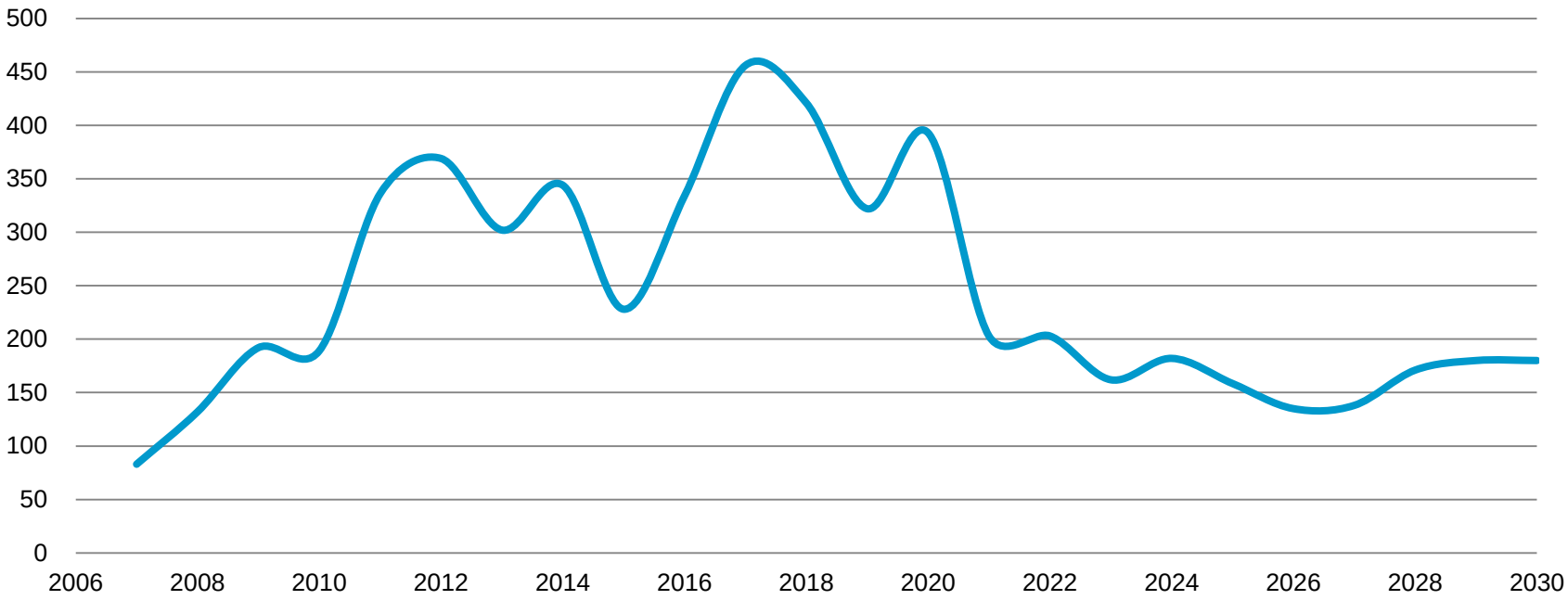
# Sustaining capex above historical average

Sustaining CAPEX

Peak in the rehabilitation cycle for an average plant every 40-60 years

**Hydro Energy sustaining capex, MNOK**



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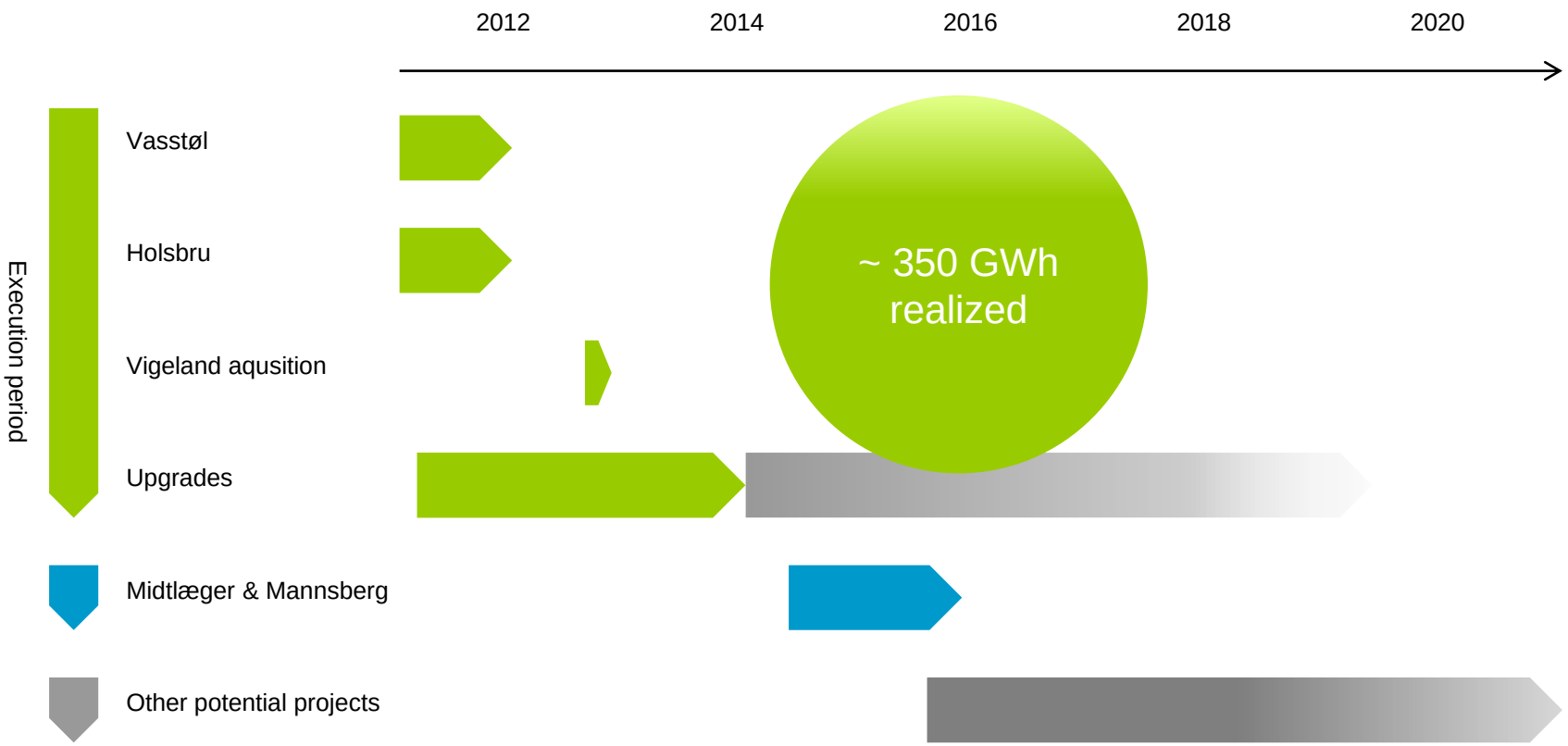
# Delivering value from growth

CAPEX and Earnings for new GWh

## Green certificates for 15 years if production starts ahead of 2020



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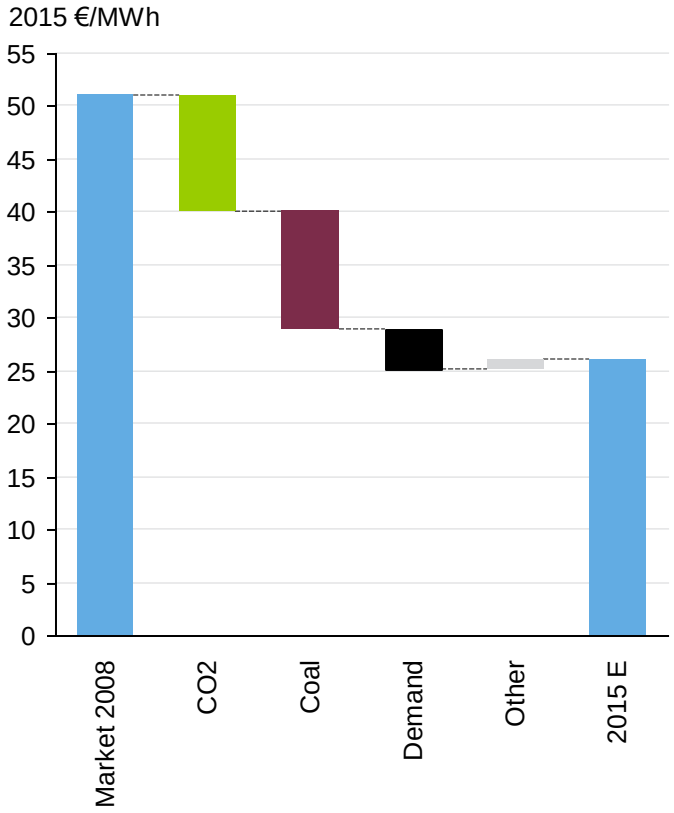
# Moderate Nordic power price level

Power Price

## Main price drivers from 2008 to 2015

**Nordic system price and most important price drivers**




- Hydrology is close to neutral in both 2008 and 2015
- Total Nordic nuclear is relatively similar in both years
- There are other drivers not included here, e.g. changes in renewable and thermal generation

| | 2008 | 2015 |
|---|---|---|
| CO2 (2015 €/tonne) | 24.3 | 6.9 |
| Coal (2015 USD/tonne) | 164 | 58 |
| Demand (TWh) | 403 | 390 |



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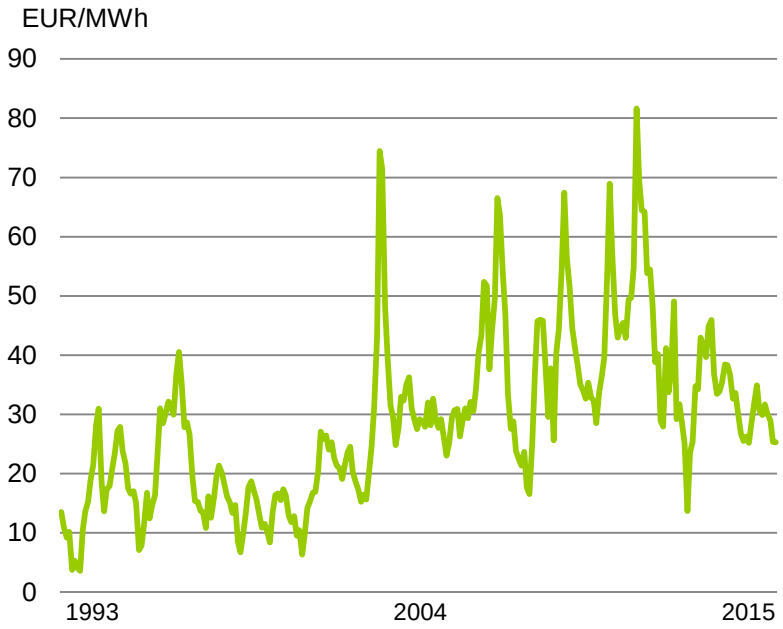
# Nordic spot prices are highly volatile

Inter- and intra-year fluctuations and area price differences

Power Price

**Monthly Nordic system price, 1993-2015**




Sources: Nordpool



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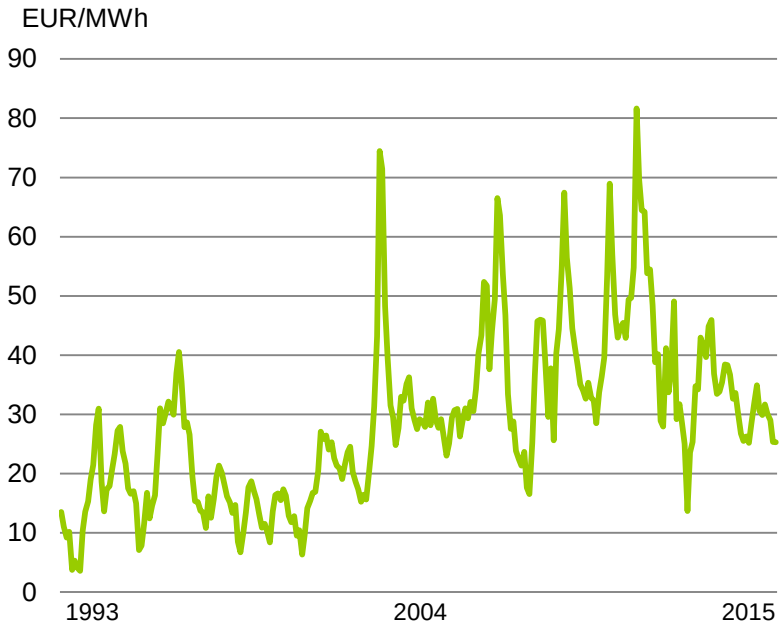
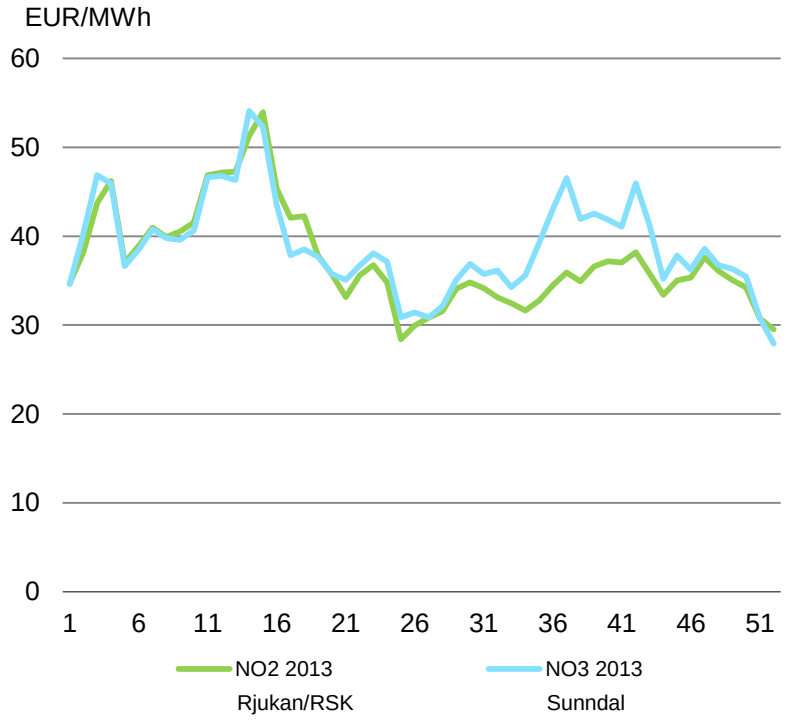



**Weekly spot prices year 2013 and 2014 in key elspot areas for Hydro**




Sources: Nordpool



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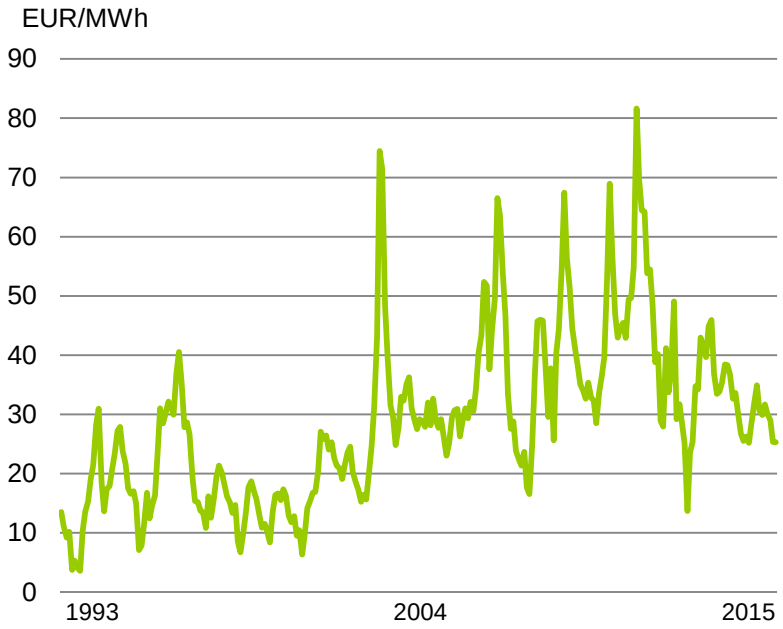


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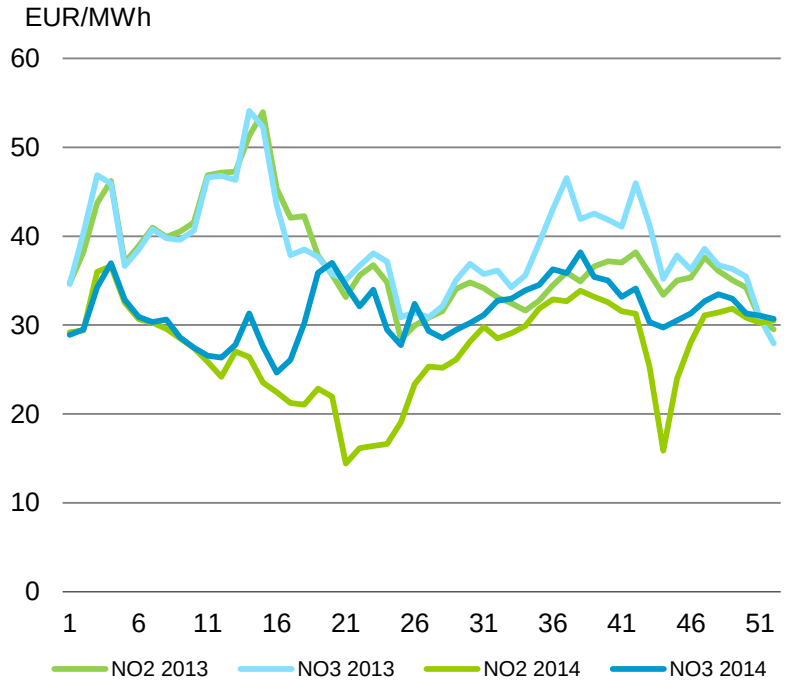


Sources: Nordpool



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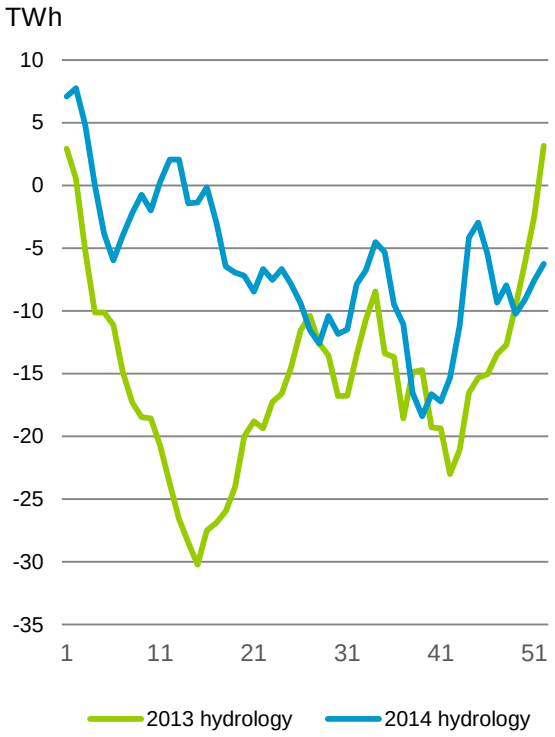
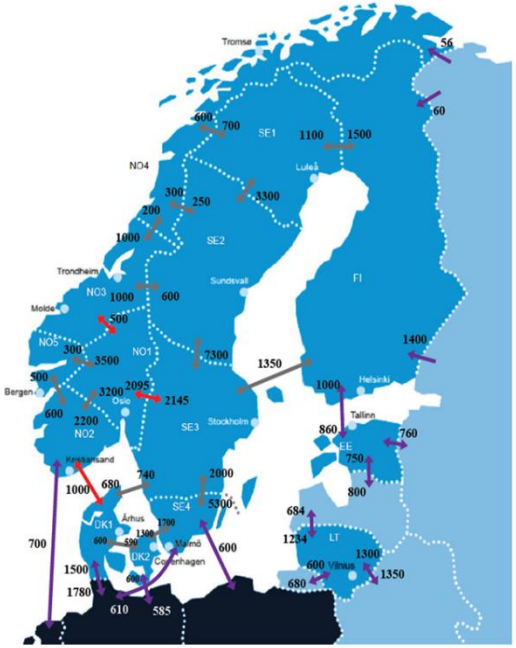
# Main drivers for short term volatility and regional price differences

Power Price

## Nordic hydrological balance*




## Nordic power system map




- Hydrological balance in Nordic region (water and snow reservoirs)
- Nuclear power plant availability
- Transmission capacity in/out of Nordic region and between areas
- Growing amount of renewables (wind and solar)
- Temperature

Source: Thomson Reuters (Point Carbon)
* Hydrological balance – balance of water and snowmelt inflow to, outflow from, and storage in, a hydrologic unit, such as reservoir.



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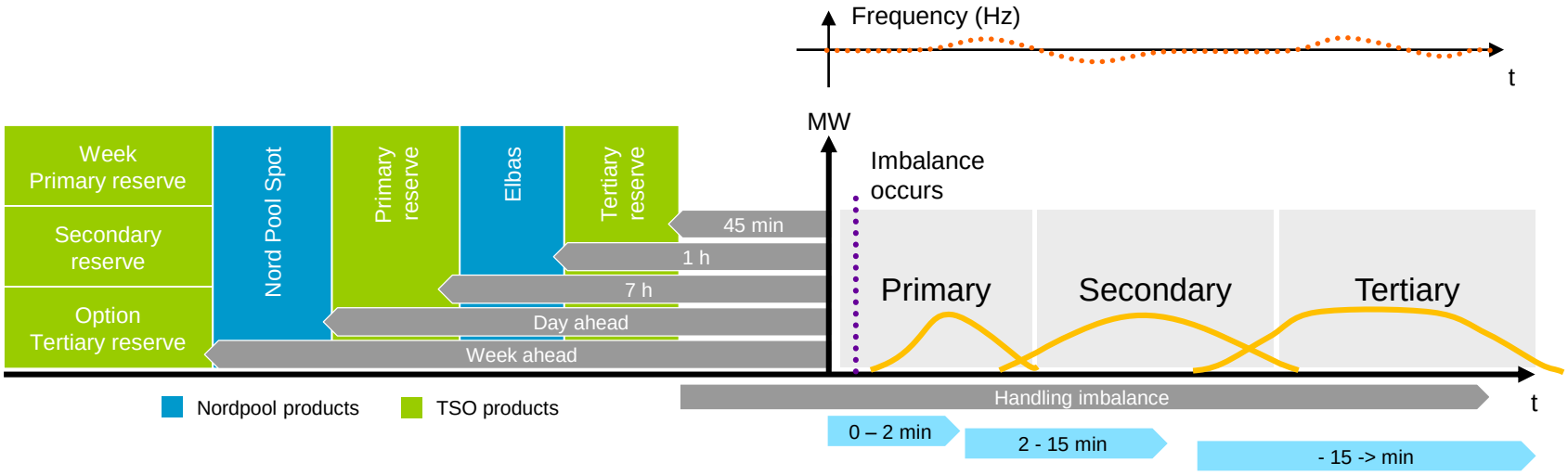
# Maximizing value from commercial operations

## In the deregulated Nordic power market

Commercial Competence

- Hydro has one of the strongest commercial competence centers in the Nordic power market
- Commercial insight and risk competence from day-to-day asset optimization and trading
  - Key to understand market development and long-term sourcing
- Physical assets optimized in spot markets and balancing markets
  - Increasing balancing needs with renewables
  - Smelter consumption flexibility key to future power system operation
- Limited financial hedging and trading to reduce risk and to profit from market competence



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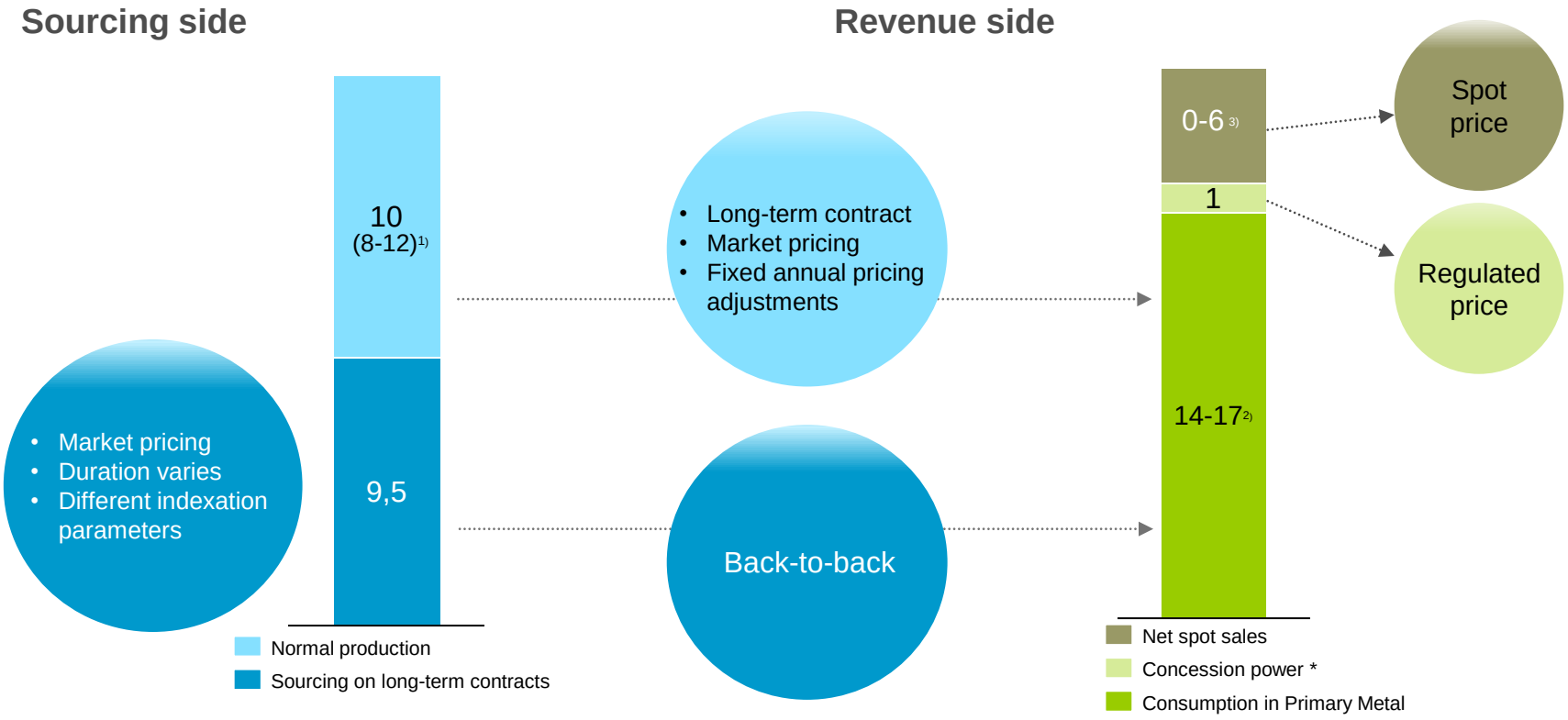
# Market pricing principle applied to internal contracts

Expiring and new contracts

Based on external price references




## Norway up to 2020

1) Depending on the precipitation level, hydropower production may vary from 8 TWh in a dry year to 12 TWh in a wet year
2) Consumption in PM at current production levels and at full installed capacity (incl. Karmøy pilot plant)
3) Net spot sales vary depending on the power production level and internal consumption in PM
* Includes legacy external contracts

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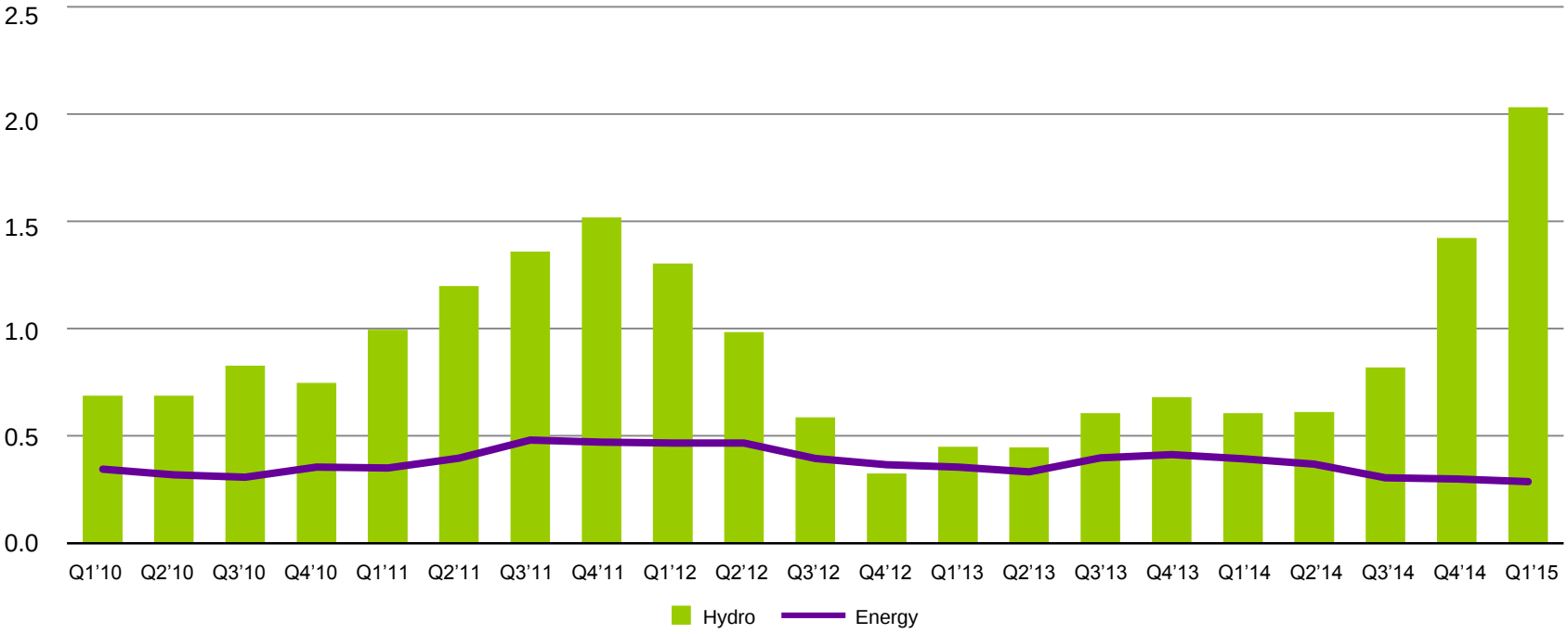
# Energy delivers stable earnings and cash flow

Lower risk profile compared to Hydro as a whole


## Underlying EBIT Energy and Hydro Group

Quarterly average, 4 quarters rolling, NOK billion



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# 04

# Energy provider



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# Energy is adding value across the value chain

Commercial competence, analytical capability and market understanding

## Global energy perspective

Special focus on markets and energy carriers in Nordics, Europe, Brazil

## Operational and analytical expertize

Best-practice operations and global energy competence, insight and understanding

## Commercial agility and experience

Maximizing value of equity power operations and sourcing at competitive terms



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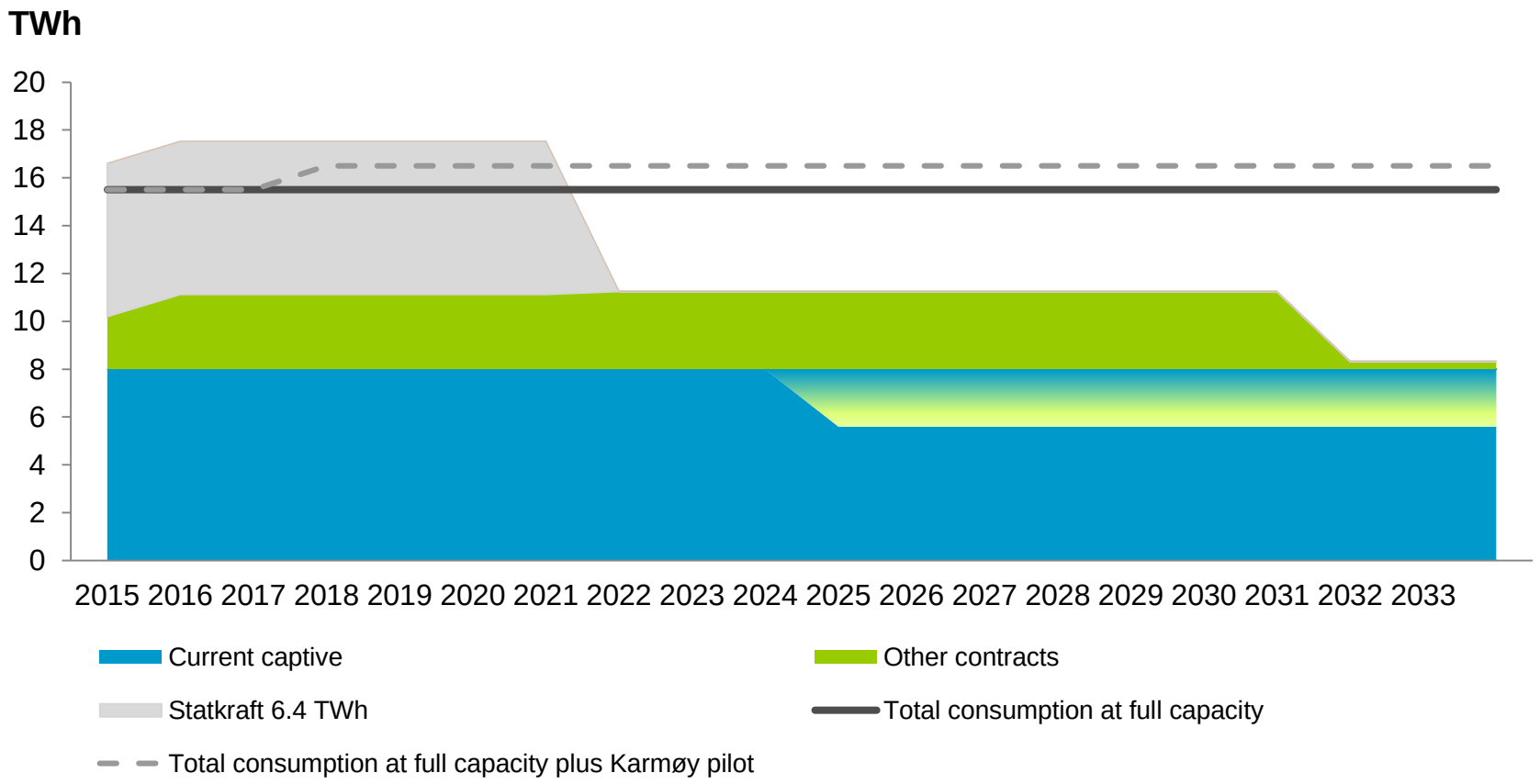
# Hydro’s sourcing platform in Norway




* Net 8 TWh captive assumed available for smelters



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# Utilizing historically low pricing environment

Recent long-term sourcing contracts in Norway

| New sourcing contracts in 2014 | | |
|---|---|---|
| Agder Energi | 1,0 TWh/yr | 2021-2030 |
| Lyse | 0,7 TWh/yr | 2021-2030 |
| Axpo | 0,5 TWh/yr | 2021-2030 |
| Agder Energi | 0,5 TWh/yr | 2021-2030 |

| New sourcing contracts in 2015 | | |
|---|---|---|
| Lyse | 0,33 TWh/yr | 2031-2040 |
| Axpo | 0,25 TWh/yr | 2021-2030 |
| Eidsiva | 0,30 TWh/yr | 2021-2030 |



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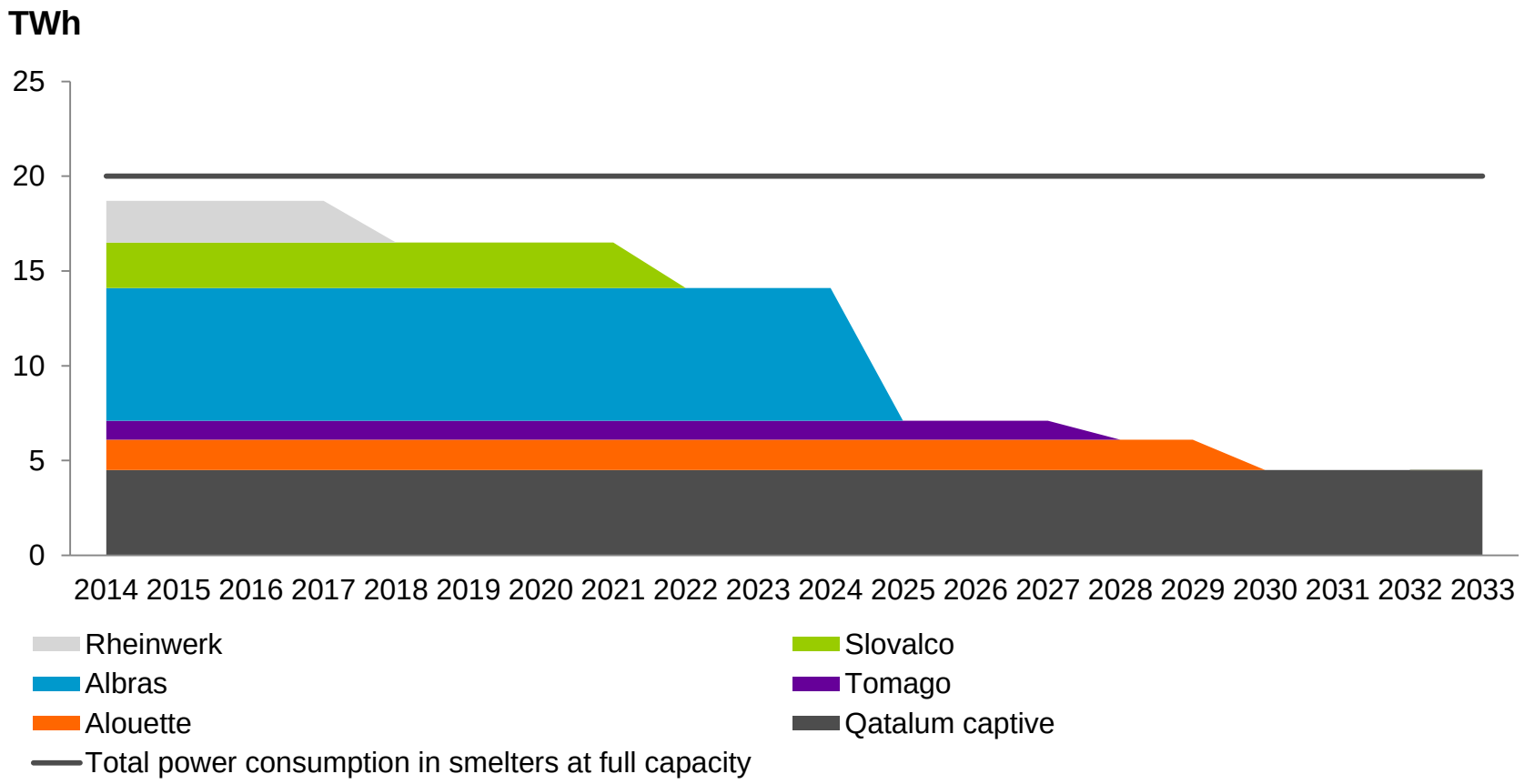
# Hydro’s sourcing platform outside Norway




* Albras and Slovalco on 100% basis



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# 05

# Power market outlook



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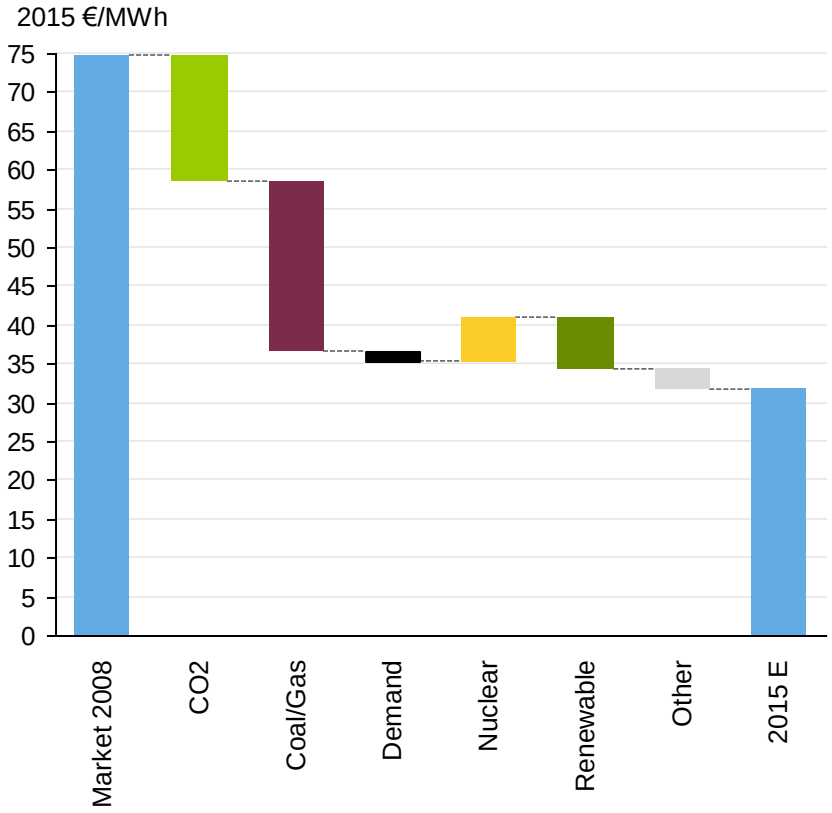
# Main drivers for German power price level development

From 2008 to 2015

**German price and most important price drivers**




- Coal and $CO_2$ - the main price drivers
- Growth in renewable power offsets reduction in nuclear capacity
- Changes in thermal generation fleet and transmission capacity not included in the illustration

| | 2008 | 2015 |
|---|---|---|
| CO2 (2015 €/tonne) | 24.3 | 6.9 |
| Coal (2015 USD/tonne) | 164 | 58 |
| Demand (TWh) | 528 | 515 |
| Nuclear (TWh) | 141 | 80 |
| Renewable (TWh) | 95 | 166 |



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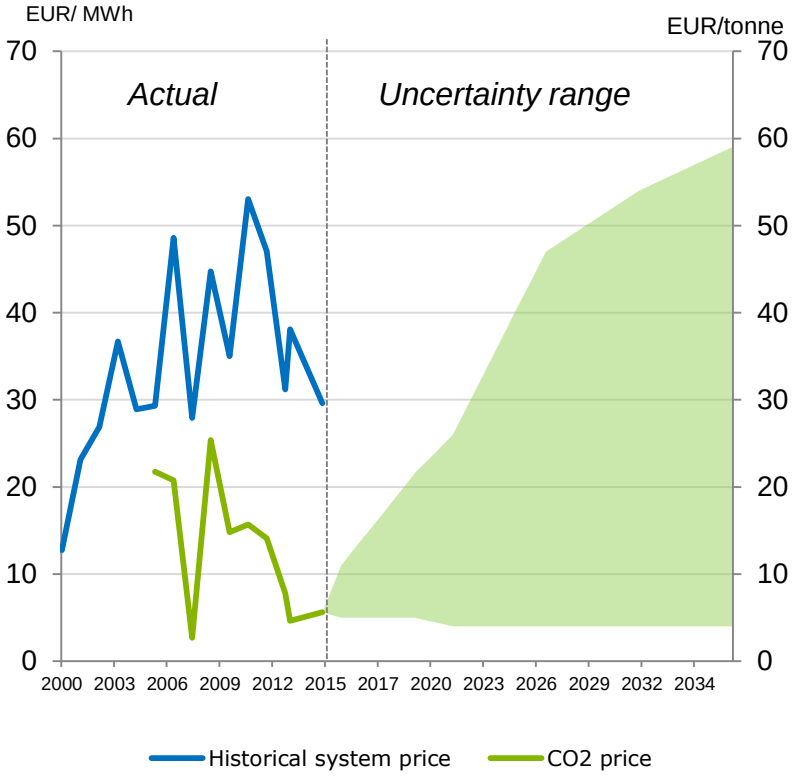
# Carbon policy and effect on CO2-prices creates large uncertainty for the future market power price

**Nordic power price and CO2 cost**




**Impact on market power price**

- Strong market impact of CO2 price
  - 1 €/tonne increase in CO2 price results in ~ 0.7 €/MWh increase in market power price
- Low CO2 price – asymmetric risk

**Impact on smelters**

- In Europe indirect emission costs for smelters are 6-7 times higher that direct emission costs
- CO2 compensation scheme in EU/ Norway until 2020, expected to be prolonged until 2030
  - Compensation aimed at creating competitive playing field for a globally priced product

Source: Nord Pool Spot and EEX

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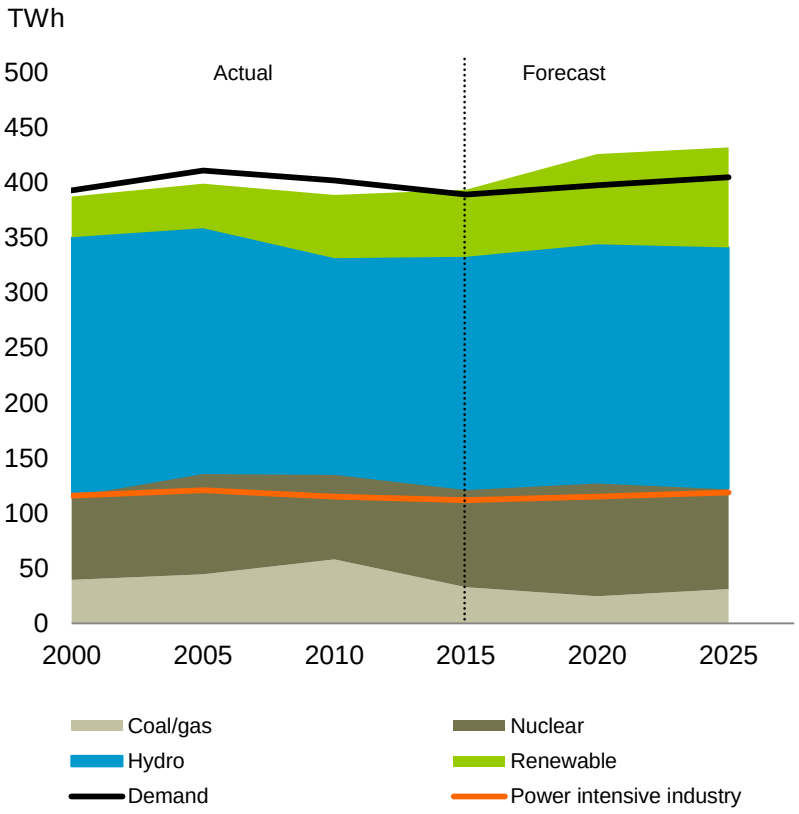
# Nordic power generation expected to increase more than demand

## Nordic power demand and consumption




## Global trends drive production and reduce energy needs

Source: Hydro Analysis



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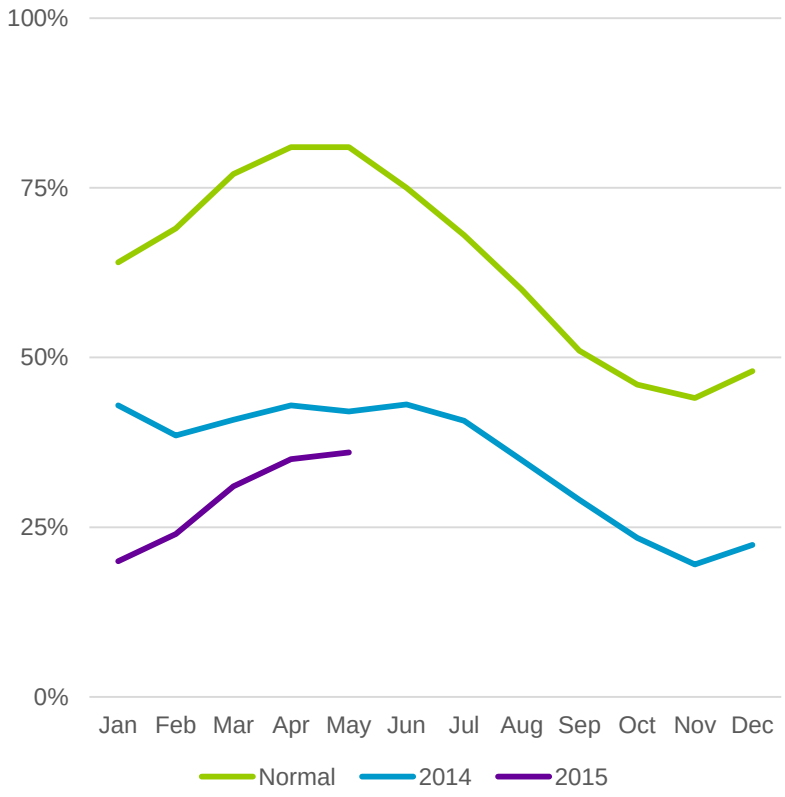
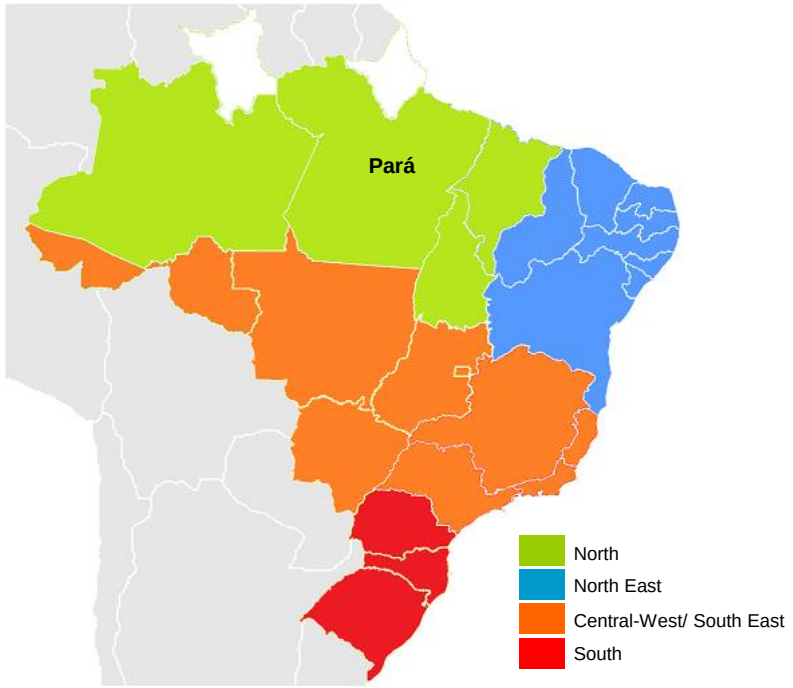
# Brazilian power system

Hydropower based and interconnected transmission system

## Reservoir filling Brazil total




## Interconnected price areas, Brazil




Source: www.ons.org.br



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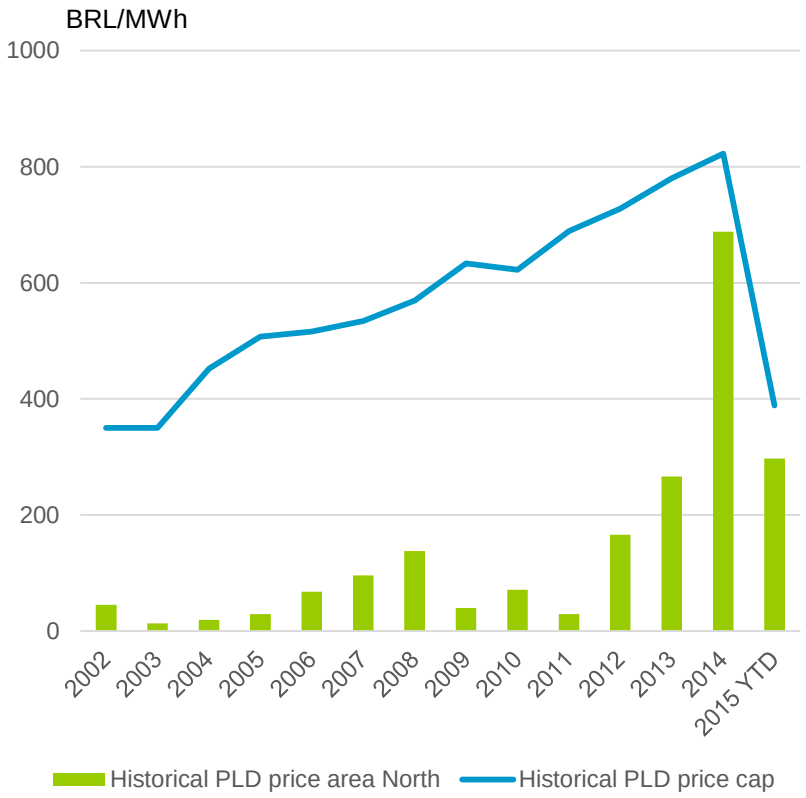
# Closely following short and long-term developments in the Brazilian power market

**Historical PLD balancing prices, area North**




- Low inflow to Brazilian hydropower plants for prolonged period
  - Strained supply situation, high balancing prices
- Recent improvements in the short term supply situation
  - Weak electricity demand due to high power prices and reduced GDP growth
  - Measures from authorities to secure supply
- Hydro optimizing total energy portfolio
  - Power supply
    - Albras – long term contract until 2024
    - Paragominas/Alunorte – short and mid term
  - Overall energy matrix optimization

Source: *CCEE, yearly average price area North



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# 06

# Norwegian reversal regime



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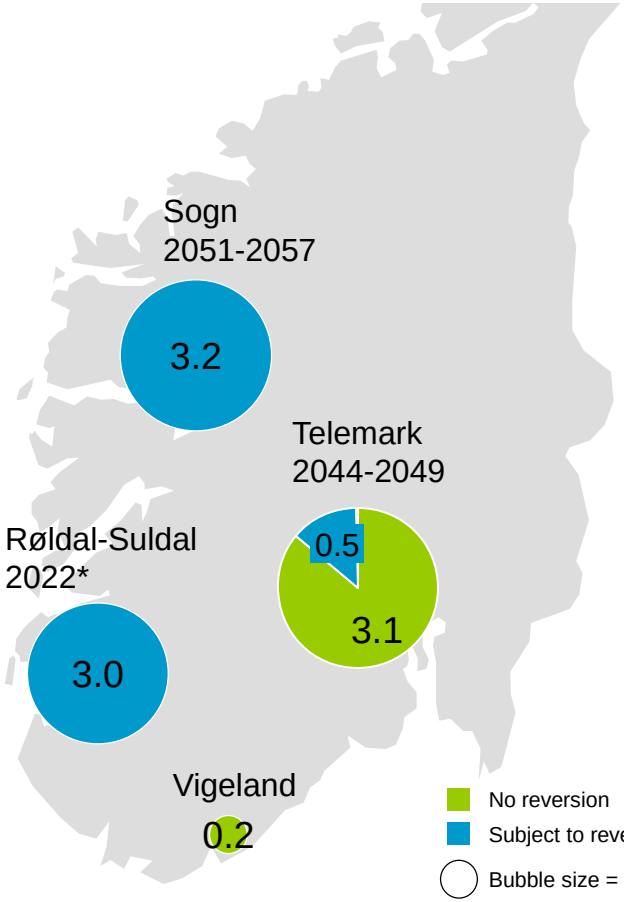
# Norwegian reversal regime

Private ownership not to exceed 1/3 in Norwegian waterfalls




- Secures majority public ownership of Norwegian hydropower resources (on a state, regional or local level)
- 1906 – waterfalls and related assets “revert back” to the state without compensation at license expiry
- 2008 – adjustment preventing further licensing to non-public entities, but allowing for everlasting minority private ownership of up to 1/3

* Reversion year



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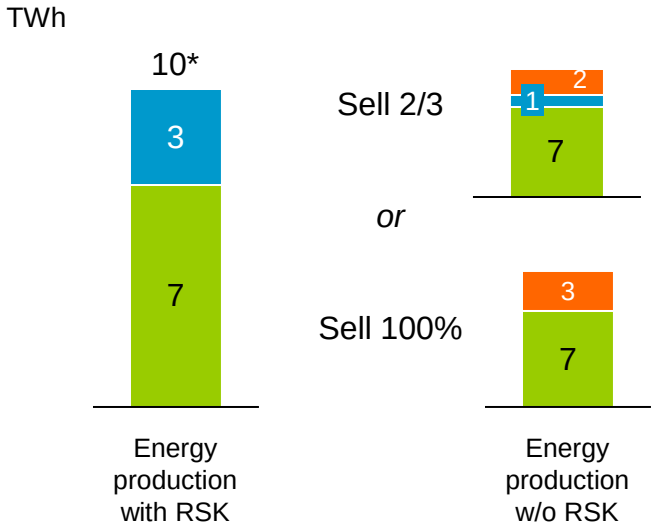
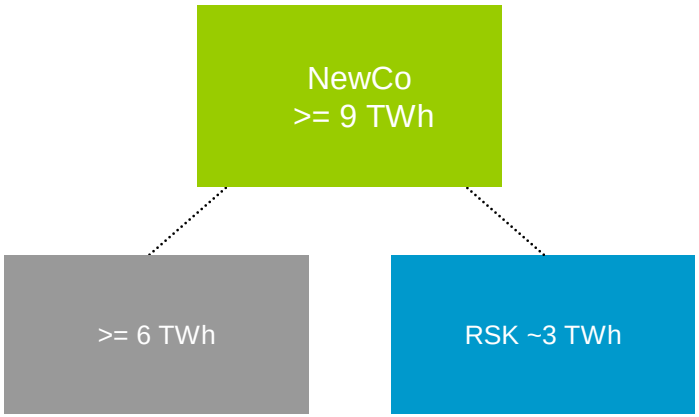
# Broad optionality allows to maintain value of our assets within the reversal regime

## Sell to a publicly owned entity




## Merge into a larger publicly owned asset with one or several owners




- Retain full production as part of a larger asset
- Max 1/3 Hydro (private) ownership
- No reversion after such a transaction
- Need partner(s) with min 6 TWh to maintain equity volume

The diagrams on this slide are simplified for illustration purposes
* Normal production



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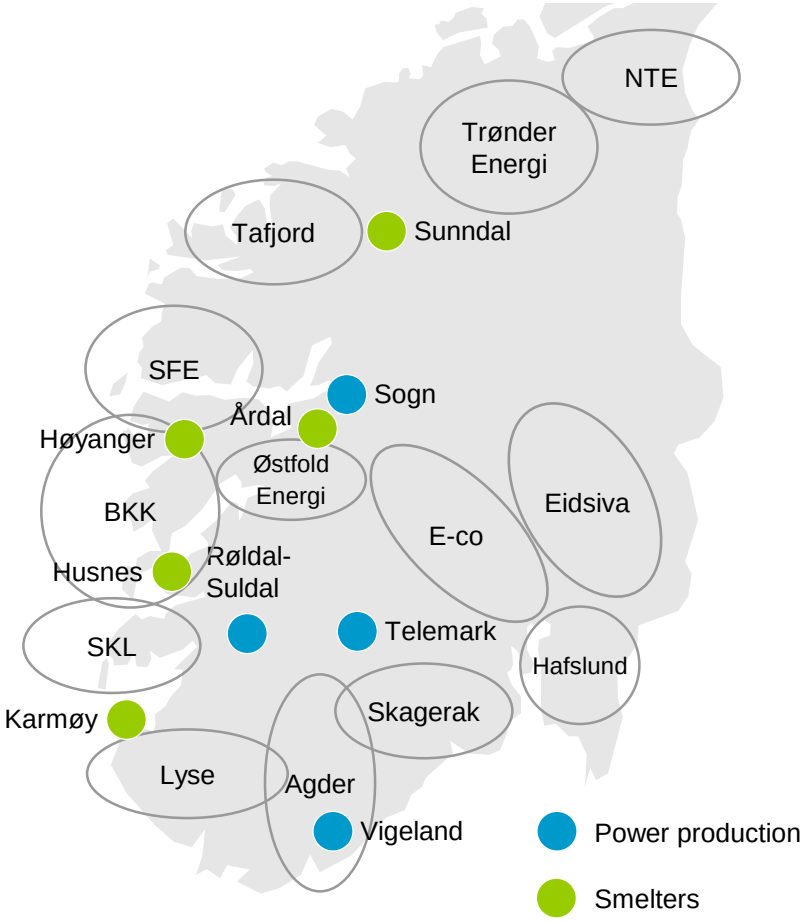
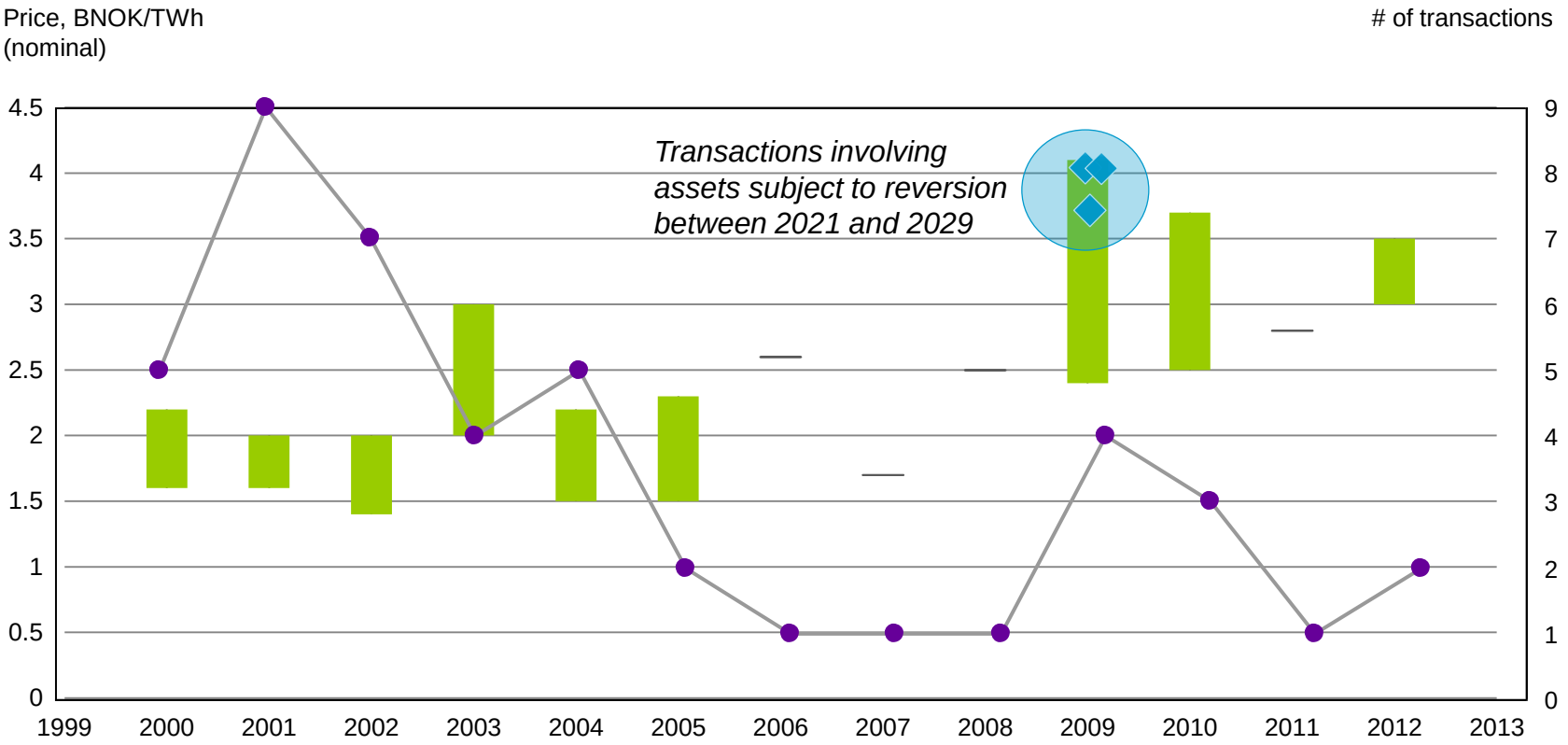
# Several midsized, professional regional players

In addition, Statkraft has assets and ownership in several companies



# Historical hydropower transactions in Norway

Price levels also reflect asset quality, reservoir capacity, concessions




Source: Pareto Securities



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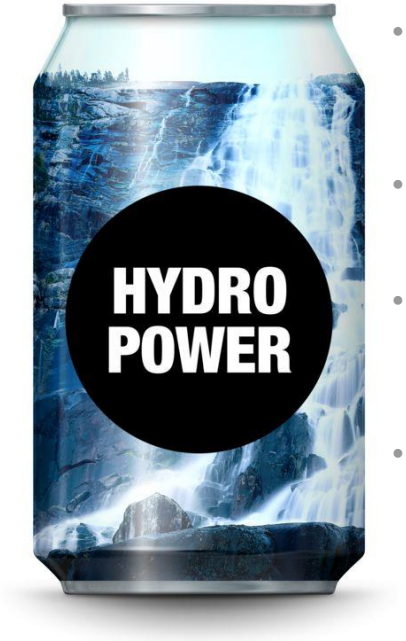
# Energy in Hydro

Unique industry combination of operational and commercial competence




- Stable earnings and cash flows contribute to a low risk profile
- Active value creation and commercial optimization
- Internal power sales based on external price references
- Broad solution optionality for the RSK reversal regime

To own, operate and maximize value of Hydro's energy assets


- Support energy agendas of global operations across the value chain and energy carriers
- Secure competitive terms in increasingly volatile and uncertain power price environment
- Promote responsible energy policy in the EU and towards relevant national authorities

To provide competitive power sourcing and global energy competence



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