

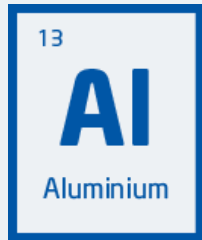
Corporate Sourcing of Renewable Energy

Cillian O'Donoghue, Climate & Energy Manager,
Eurometaux - European Non-Ferrous Metals Association

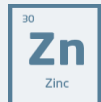
29th January 2019



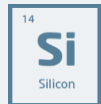
Why we care: Non-Ferrous metals production is unavoidably electro-intensive



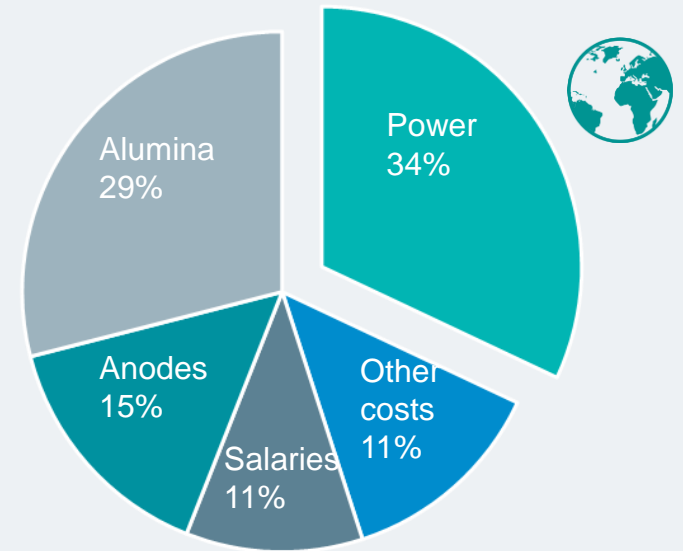
Electricity costs
= **38%**
of costs for primary production



Electricity = **40%** of production costs



Electricity = **35-40%** of production costs



Electricity costs the key **localization** factor for our industry

One of Europe's most **electro-intensive** industries

With further electrification of industry, aligned with EU's 2050 vision, other industries will likely soon face the same challenges



Three topics for Today

1

Non-ferrous metals are the frontrunner in signing long term PPAs with intermittent RES in the Nordic Market

Why and how we are signing these deals in the Nordics

2

Why not elsewhere?

Conditions needed to unlock RES PPAs beyond the Nordics

3

Recommendations

Practical actions to encourage more RES PPAs



1. RES PPAs in the Nordic Market

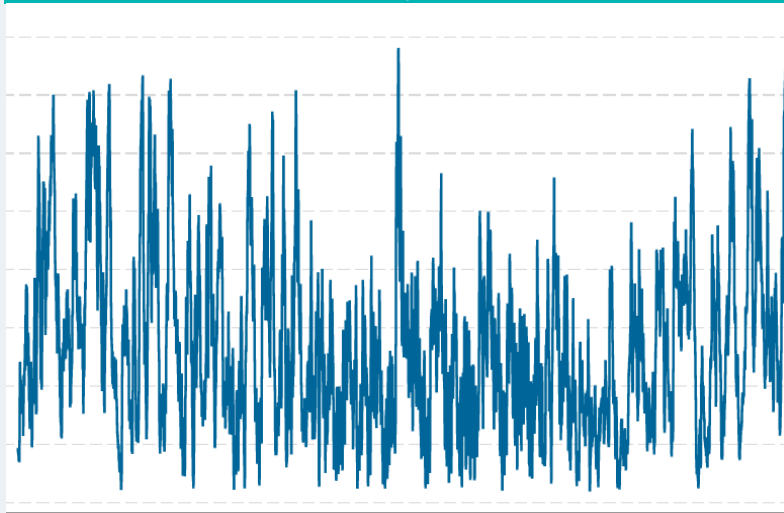


Non-Ferrous Metals Production - Baseload Consumers

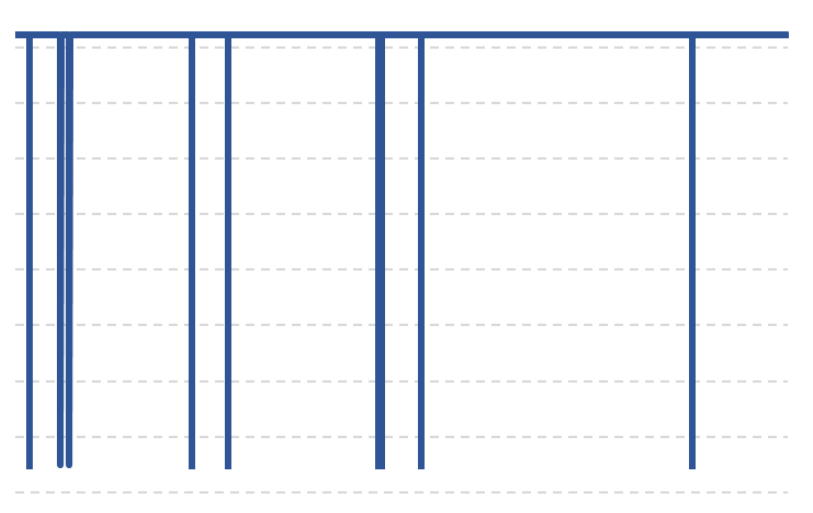
Renewable variable generation and aluminum production may not be seen as natural allies at first sight...

Vs.

Wind hourly production profile
in a year



Al Smelter hourly consumption
profile in a year



However, these obstacles can be overcome

Renewable Energy & Long term PPAs - Non-ferrous metals leadership




Renewable Energy

+ Add to myFT

Norsk Hydro in 'biggest' deal to secure wind farm energy


FINANCIAL
TIMES

New renewables PPAs in our industry:



~ 9 TWh/year
Hydro and Wind Power contracts in Norway beyond 2021

HYDRO **~4.5 TWh/year**
Wind Power contracts



Alcoa

~ 2.6 TWh/yr
3 Wind PPAs for 15 yrs



Elkem

~ 1.8 TWh/yr

Long term renewable PPAs – a ‘win-win’ for both parties

- **For developers:** Enabling new large scale wind farms through a stable revenue stream
- **For Industry:** Long term horizon for investment– wants to reduce risk of volatility by achieving predictable power costs

The Prerequisites: The Commercial and Regulatory Framework

The commercial framework

1. Need to be costs competitive

Not just the energy component but all components (Regulatory components, etc)

2. Access to electricity competence for balancing

In the companies or the electricity market.
It varies between regions

3. Access to financing/ guarantees:

Often the credit support provided by investment grade entities for the entire contract. **This can be a showstopper**

The regulatory framework

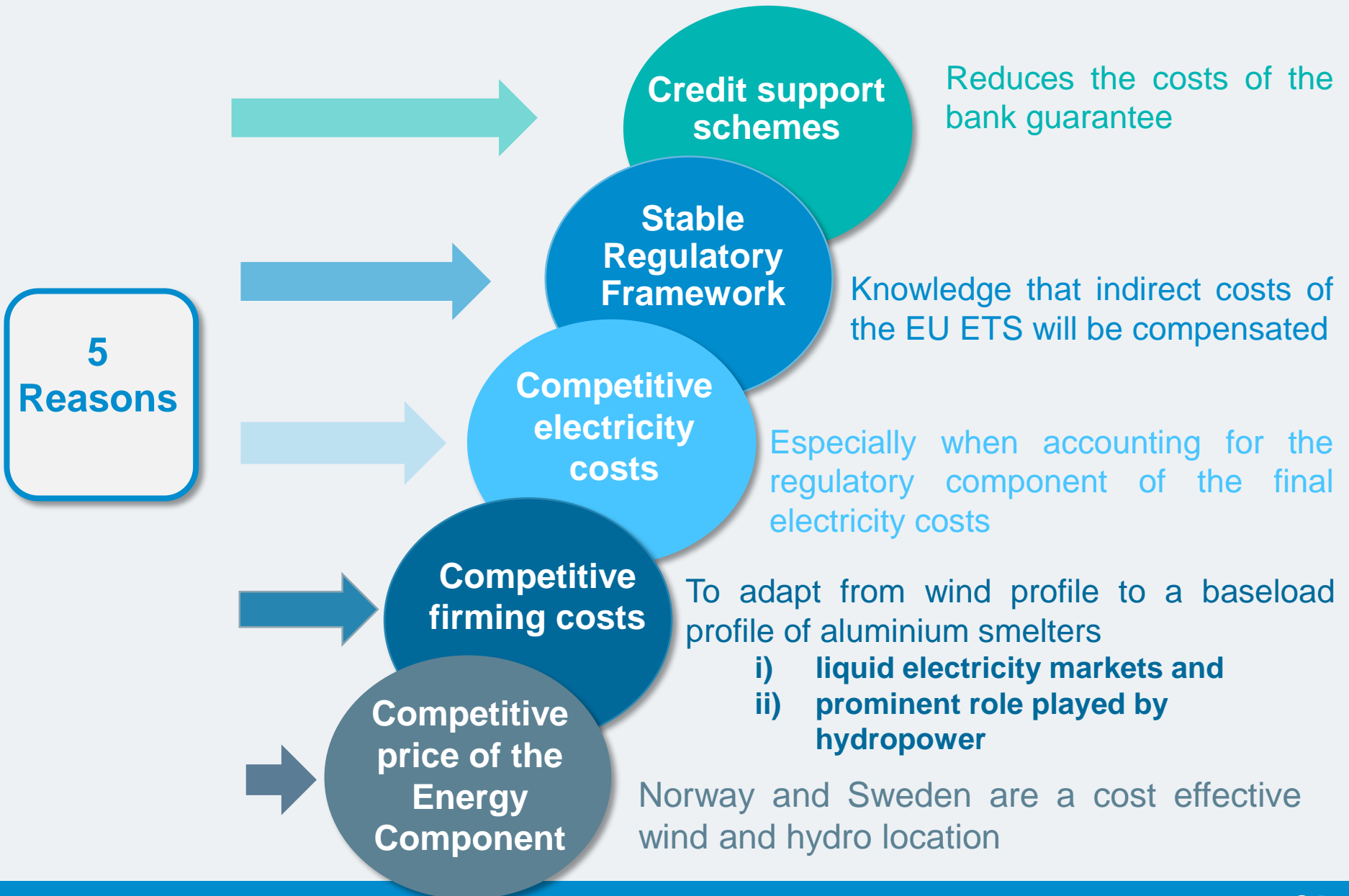
1. Indirect costs compensation

Adequate compensation for the indirect costs of the EU ETS

2. EEAG 2014-2020

Understand if the exemption to the RES surcharges will continue post 2022 and to what extent

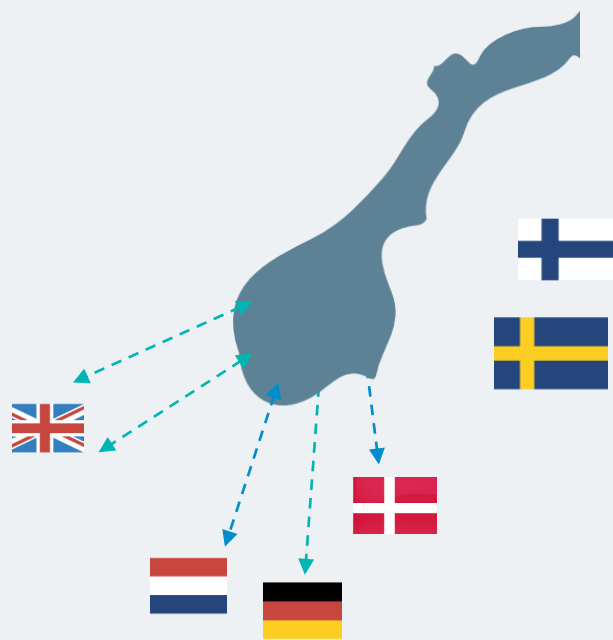
Why are RES PPAs happening in the Nordics?



Indirect Carbon Costs with renewable PPAs??

Yes. Even with renewable PPAs, companies still face full indirect carbon costs

Example – Green Aluminium Production in Norway



←---→ Existing interconnector

←---→ Interconnector under construction

Norwegian NFM production is carbon free currently based on hydropower... and in the future wind as well

BUT

Fossil fuel production in Nordics and interconnectors set **the marginal cost** for Nordic electricity generation

The industry reality is that **100% of electricity costs** are impacted by indirect CO2 costs

Recent long term PPAs **do not reduce indirect carbon cost exposure**

2. Why not other Regions?

13 Al Aluminium	29 Cu Copper	28 Ni Nickel	82 Pb Lead	30 Zn Zinc	79 Au Gold	47 Ag Silver	78 Pt Platinum	51 Sb Antimony	4 Be Beryllium	14 Si Silicon	27 Co Cobalt	42 Mo Molybdenum	23 V Vanadium	50 Sn Tin	46 Pd Palladium	44 Ru Ruthenium	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	74 W Tungsten	73 Ta Tantalum	32 Ge Germanium	34 Se Selenium	31 Ga Gallium	24 Cr Chromium	12 Mg Magnesium
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Why are renewable PPAs not happening in Other Regions?



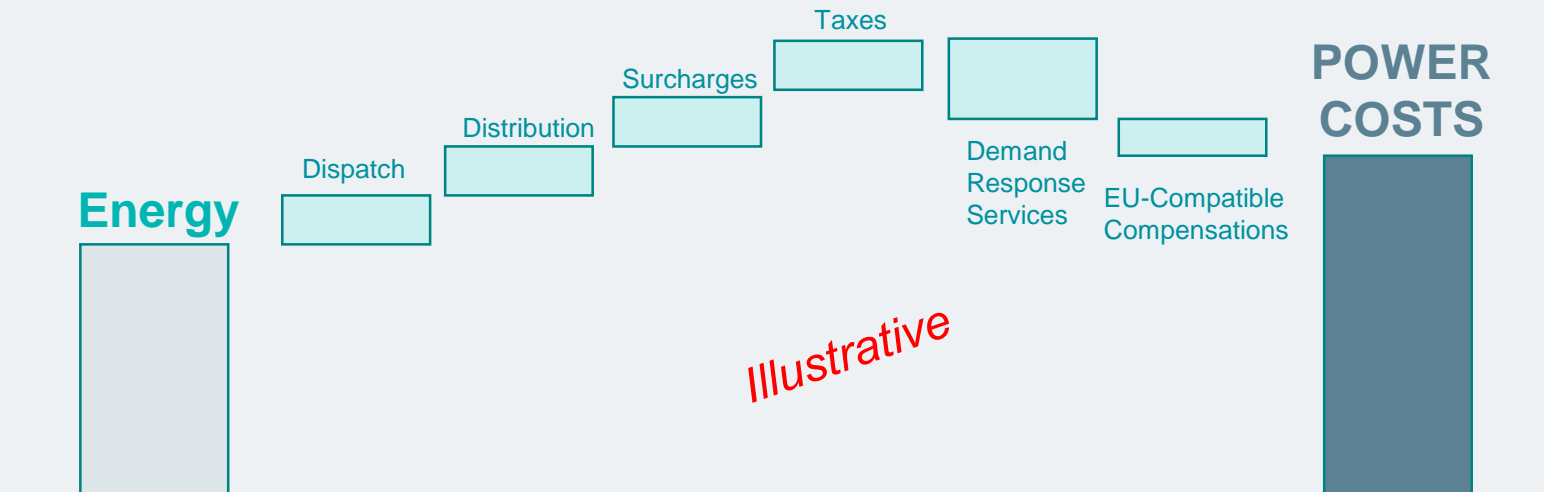
Power costs are not only energy

Lack of competitive and minimally predictable framework for the rest of cost components that define the net power price for energy-intensive industries

Non exempted renewable support or carbon surcharge schemes

Costly transmission/distribution tariffs

Non compensated ETS indirect costs



Uncertain regulatory framework can erode already limited capability to enter into a long term Power Purchase Agreement

3. Conclusion

How can we unlock more RES PPAs



Encouraging more RES PPAs

Three things are needed:

A predictable and sustainable

long term climate &

energy policy – new

governance plans

should access

industry's

competitiveness

Ensure **market based costs efficient**

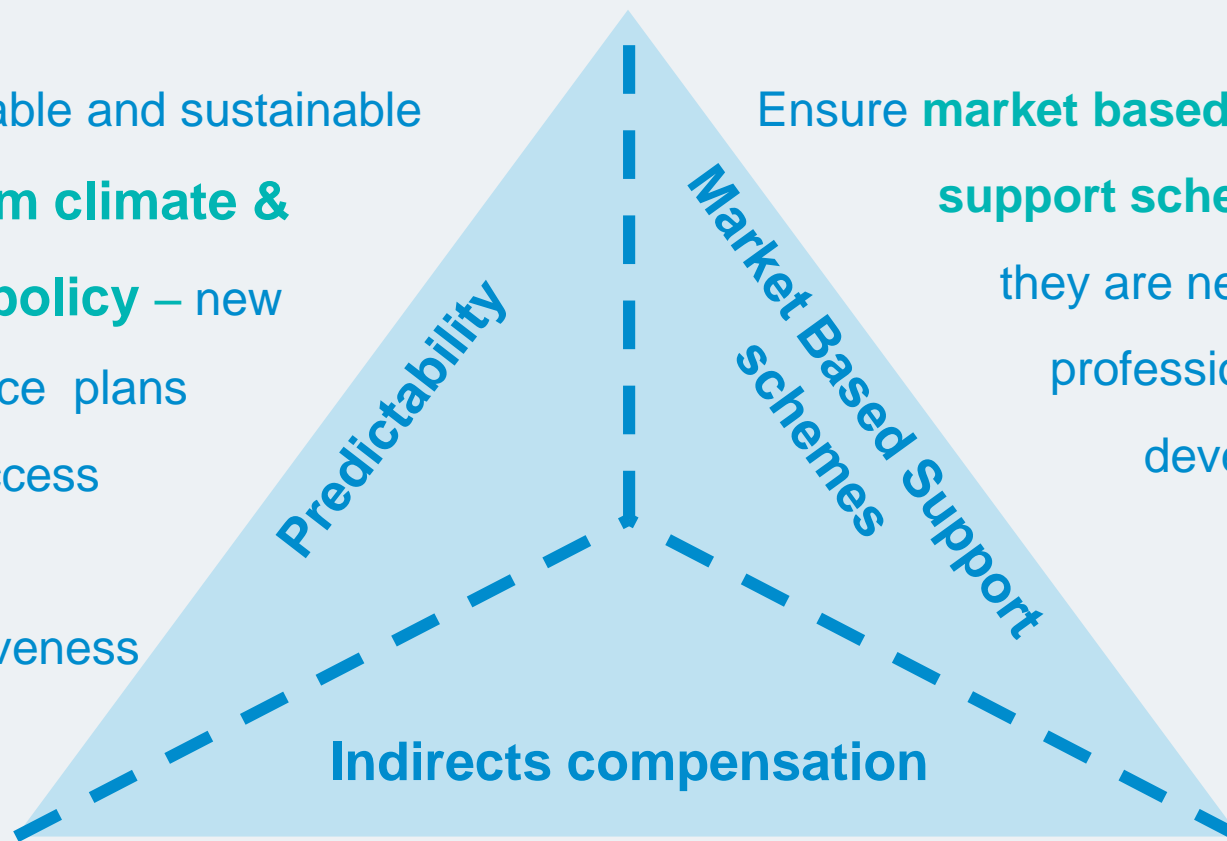
support schemes as long as

they are needed – enables

professional investors to

develop sustainable

projects

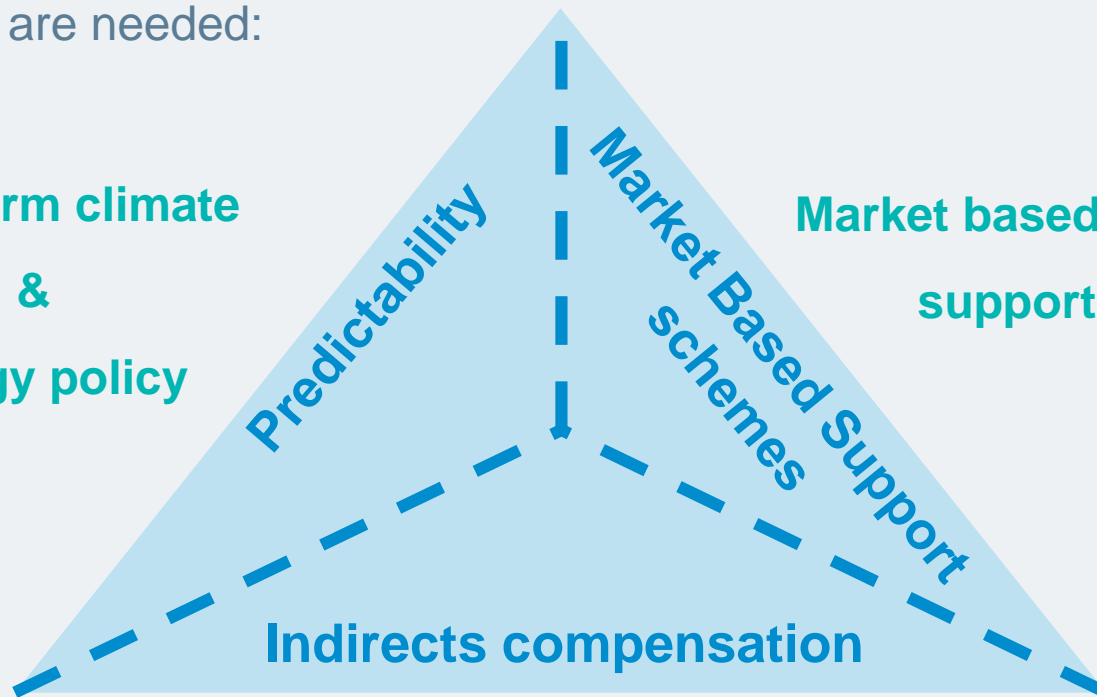


Improved compensation for the **indirect costs of the EU ETS** – with a rising ETS price, a partial and voluntary scheme won't be sufficient to stop carbon leakage

Encouraging more RES PPAs

Three things are needed:

Long term climate
&
energy policy



Market based costs efficient
support schemes

Indirects costs of the EU ETS embedded in PPAs

Many things already work well...

The financial markets in Europe and the electricity market (in the Nordics) function well. With market based cost efficient support schemes, RES technology will continue to be more effective and thus, less important to setup new structures

Thank you!

Any questions?

Annex

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Pricing of electricity & RES PPAs



Electricity Procurement Methods

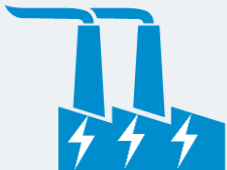
Consumer's purchase prices are always market based

Companies' purchasing strategies

Spot purchase on the exchange
(daily prices)

Forward prices on the exchanges
(acceptable liquidity up to 5 years)

Long term PPA prices
(up to 30 years)



The electro-intensive industries use all options

Pricing of electricity in European spot and forward markets

Electricity price is based on marginal producer not average energy mix

Different energy sources are ranked by operating cost in a “merit order curve”¹⁾



Spot prices notified on exchanges every hour

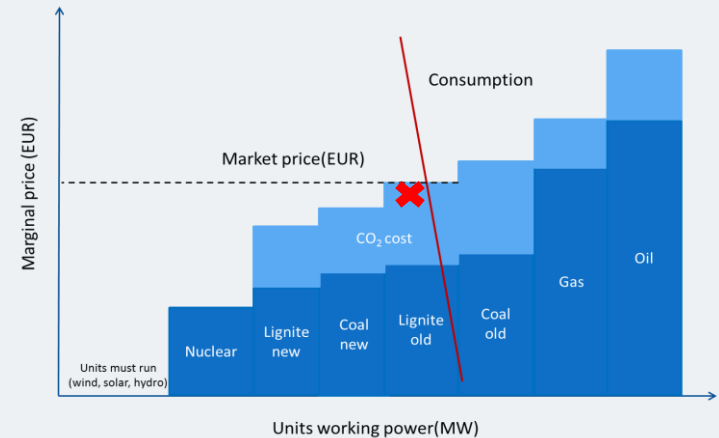
- Buyers and sellers send bids to the exchange every hour for the next day. Prices are set where supply meets demand (merit order)
- The producers bid in their marginal cost/alternative value of producing electricity
- The market price is impacted by the CO₂ costs to the marginal producer in the merit order
 - The average of all hours through the year is the markets’ emission pass-through factor
 - Even with increasing share of wind and solar, the marginal producer will mostly become fossil production in the next decade
 - A slight decrease of the emission pass-through factor is expected



Forward prices on the exchanges

- Linked to the spot prices, liquidity up to 3 years
- Similar principles for CO₂ cost impact

Merit Order Curve – Example



In most EU countries, fossil fuels are the marginal producer and set the electricity price.

CO₂ costs are embedded



Same principles for the expected long term market prices

Long term market prices affected by the price drivers

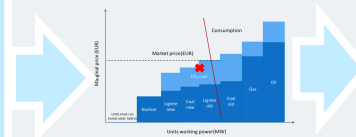
Long term market price forecasts (up to 30 years)

- Using order simulations for the next 30 years
- Nelectricity market models^{*)}
- Hourly merit umerous of simulations

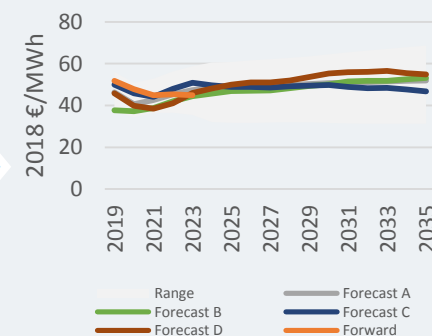
Price drivers

- Fuel and CO2 prices
- Weather conditions
- Energy balance- generation and demand
- Generation technology- investment cost
- Interconnections and grid constrains,
- Political targets (new RES, closure old capacity)
- GDP, currency and cost of capital...

Merit Order Curve



Long term market expectations



The CO2 costs to the marginal producer is embedded in the long term prices

Technology development and strong decrease of RES investment costs

RES technology costs

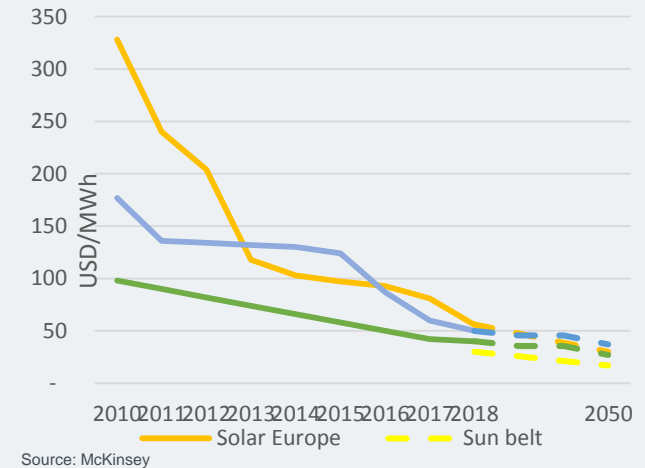
- RES investments has until recently, not been market competitive
- Strong decrease of RES technology costs
- Improving business case for renewables investment

Huge variation in design of support schemes

- From full support with no income risk
 - Onshore wind auction price increasing in Germany) while decreasing in other MSs
- To more market based and uncertain support
 - Offshore wind auction has been cleared at zero subsidy in Germany, and low in other MSs as well

Commercial PPAs in schemes with uncertain (low) support

- Investments exposed to market prices increase investors risk
- High carbon and market price risks lead to higher cost of capital and constrains access to finance
- Uncertain income increase the projects financing costs



Wind developers and consumers market options

All options are considered when market based long term PPAs are agreed

