Corporate Sourcing of Intermittent Renewables in Europe: How to Ensure the Growth of RES PPAs

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2nd June 2021
Three topics in the next 10-15 minutes

1. Why and how we are signing long term PPAs with intermittent RES (Wind and solar) in the Nordic Market (Norway & Sweden)

2. Why not elsewhere?
   Conditions needed to unlock RES PPAs beyond the Nordic market

3. Recommendations
   Practical actions to encourage more RES PPAs
1. Decarbonisation of Power in Europe
EU 2050 Vision for the Power Market: Wind and solar deployment to decarbonise

‘By 2050, the share of electricity in final energy demand will at least double, bringing it to 53%’

Of this electricity will be **80%** wind and solar
2. Intermittent 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

Norsk Hydro in ‘biggest’ deal to secure wind farm energy

New renewables PPAs in our industry:

- **~ 9 TWh/year**
  Hydro and Wind Power contracts in Norway beyond 2021
- **~4.5 TWh/year**
  Wind Power contracts
- **~ 2.6 TWh/yr**
  3 Wind PPAs for 15 yrs
- **~ 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.

**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
A wind PPA does not differ from other PPAs

The expected market price is the basis for agreeing a PPA

A PPA from coal, gas, nuclear, hydro or wind generation are all based on the market prices inclusive the markets emission costs- not the sellers cost.

If parties agree, a PPA could be win-win for investors and consumers
But the CO2 compensation regulation must not distort the market ...

Merchant wind investors

- A PPA could offer predictable income & reduce the financing cost
- Purchaser must be attractive with long term perspective
  ✓ Acceptable guarantees from the consumer is essential, to obtain better financing
- Negotiated price based on alternatives market price & all contractual elements

Wind developer will maximize NPV

<table>
<thead>
<tr>
<th>Expected market price</th>
<th>PPA price</th>
<th>LCOE wind, competitive PPA close to market price</th>
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<tbody>
<tr>
<td>Alternative 1</td>
<td>Alternative 2</td>
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<td>Alternative 2b</td>
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LCOE wind, too high, no PPA

Consumers

Interested in achieving a long term predictable price

- Cost competitive price is essential
- All alternative sourcing (PPA from wind and coal and other generation plants) have the same expected market price reference,
- Additional specific risk elements related to wind PPAs must also be considered *)
  - Project risk, guarantees the offtake for the entire contractual period etc.

* e.g Cost of changing the production profile from variable wind production to consumers profile; project risk and counter party risks; guarantees costs etc.
Why are RES PPAs happening in the Nordics?

Credit support schemes
- Reduces the costs of the bank guarantee

Stable Regulatory Framework
- Knowledge that indirect costs of the EU ETS will be compensated

Competitive electricity costs
- Especially when accounting for the regulatory component of the final electricity costs

Competitive firming costs
- To adapt from wind profile to a baseload profile of aluminium smelters
  - i) liquid electricity markets and
  - ii) prominent role played by hydropower

Competitive price of the Energy Component
- Norway and Sweden are a cost effective wind and hydro location

5 Reasons
Indirect Carbon Costs with renewable PPAs??

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

Example – Green Aluminium Production in Norway

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
3. Challenges faced in other parts of Europe
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
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
- To more market based and uncertain support

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

Source: McKinsey
4. Conclusion
How can we unlock more RES PPAs
Recommendations: How to incentivize more RES PPAs in the future?

3 things are needed

1. Indirects compensation
   - Indirects costs of the EU ETS embedded in PPAs

2. Market-based support schemes
   - Long-term climate & energy policy
   - Financial markets in Europe & power market (in the Nordics) function well.

3. Predictability
   - With market-based cost-efficient support schemes, RES will keep on being more effective and thus, less important to set up new structures

Many things already work well...

How to promote demand of low-CO2 products?

Our companies have green-product offerings:

ECOLUM™
Alcoa

Tonnes of CO₂

Potential for well-designed public procurement, standards & corporate procurement to play a role
THANK YOU

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