



NORDIC PPA: EFFECTS ON RENEWABLE GROWTH AND IMPLICATIONS FOR ELECTRICITY MARKETS

2021-05-19

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- Advisory & analysis around:
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 - Market design
 - Policy
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- ...and how these affect each other
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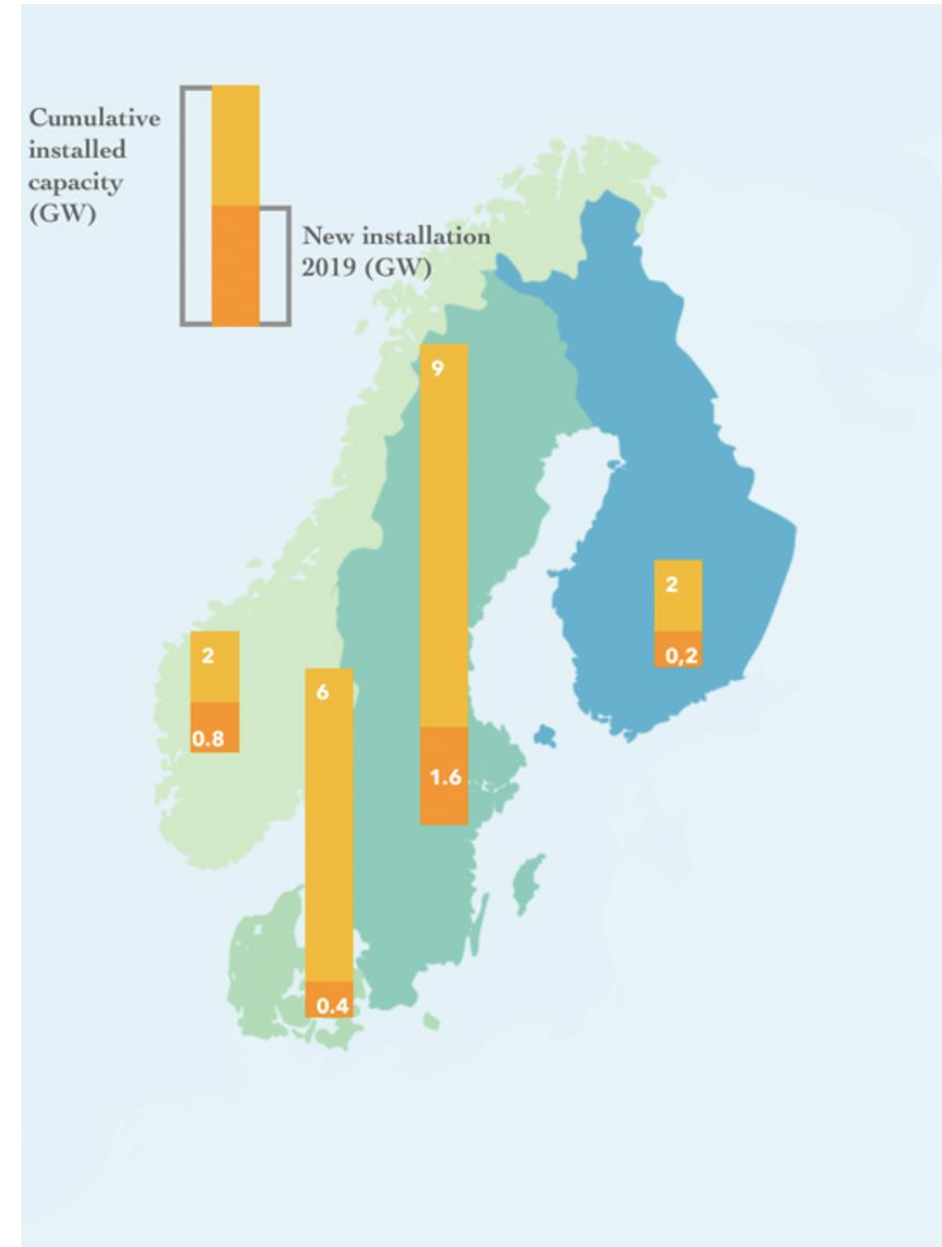
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An energy-focussed advisory helping clients through the transition

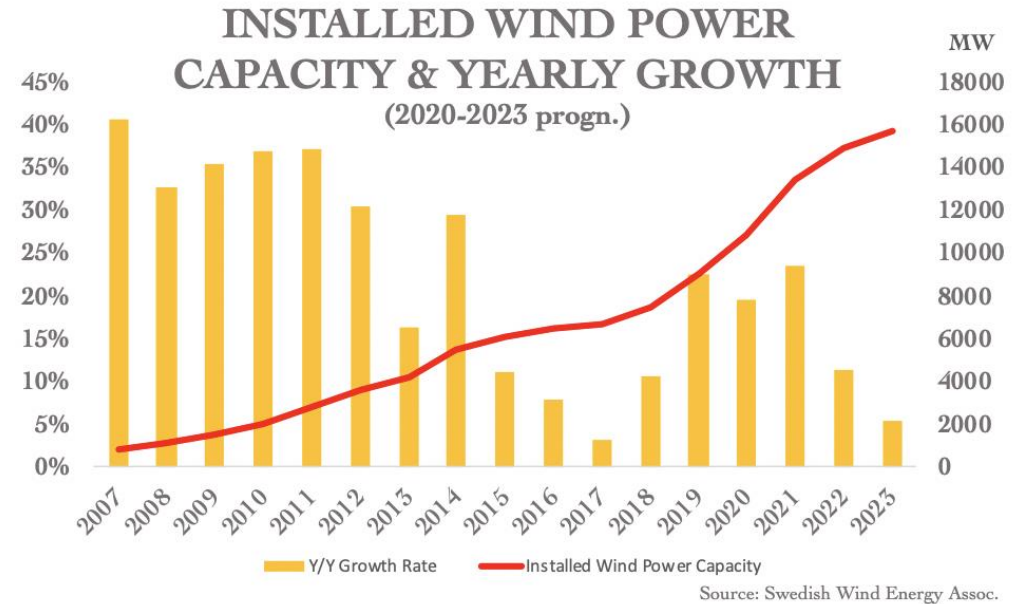
PPAs – DRIVING NORDIC RENEWABLE GROWTH

- De-regulated markets – Nordic PPAs struck between commercial actors
- Has become fundamental to Nordic, particularly Swedish, wind power growth
- A specific concept of “additionality” has developed in the Green Certificate standards
 - Additionality = new production capacity, raising overall renewable market share



PPAs – DRIVING NORDIC RENEWABLE GROWTH

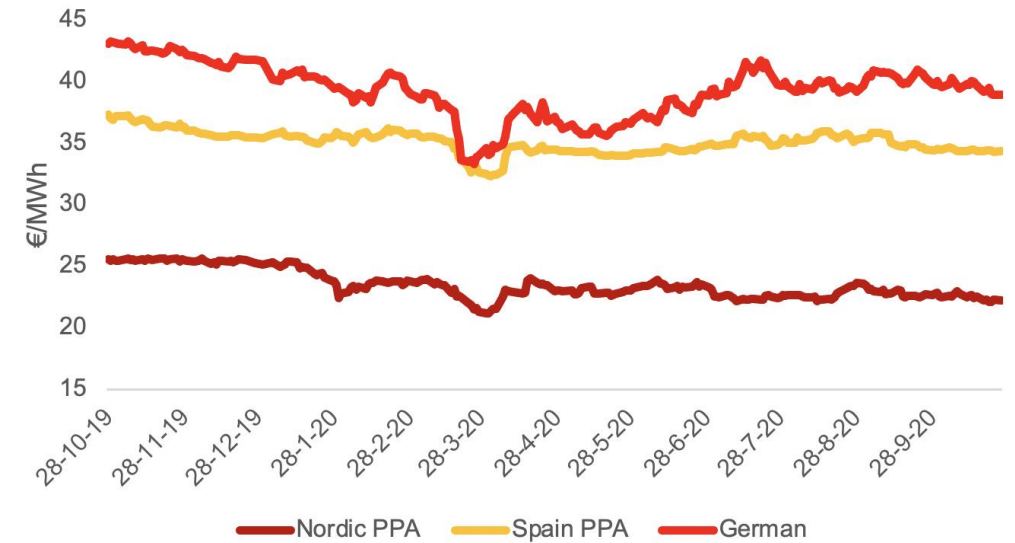
- Early Swedish Green Certificate (Elcertifikat) prices helped set off the boom
- Lost relevance after -09. Regained brief relevance after regulatory tightening in 2013 and experienced weather-related “blip” in 2018/19
- PPAs increasingly relevant after 2013/14 and primary driver post-2016
- 2020 growth seems to have surpassed 2019 (prel.)
 - Revision of 2021-2023 expectations upward likely in order
- Official Green Certificates trade close to zero in 2021 too



PPAs BECOME PREMIUM PRODUCT

- PPA prices in the Nordics assessed stable as power prices start collapsing late 2019
- New long-term PPAs signed at premium to spot price for power
- ...even as network stability concerns emerge
- PPA buyers willing to pay premium for:
 - Certificates of Origin / "commercial green certificates"
 - Certainty of renewable supply

REGIONAL PPA PRICES (NOMINAL)

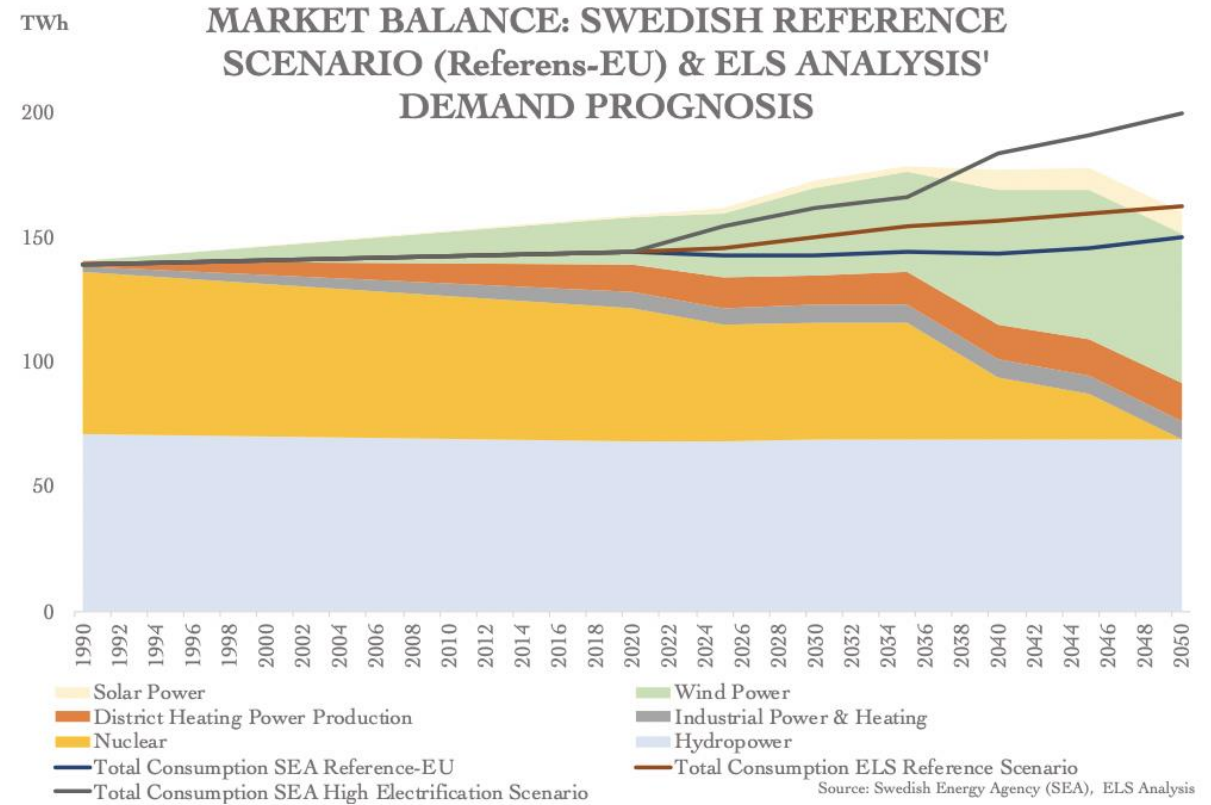


NORDIC SYSTEM PRICE & PPA PRICE LEVEL



SYSTEM EFFECT

- Wind growth (and solar) continues unabated as spot price collapses, underwritten by PPA
- Other power sources edged out
 - No official Swedish de-nuclearisation policy
 - Nuclear de-commissioning commercial decision
 - Heating & power observed to step back from power market
- Meanwhile electrification is starting to result in rising power demand
- 2019- government forced to enter into short-term capacity purchases to secure supplies, system services, across country
 - Sweden plagued by transmission bottle-necks
 - Wind built largely in the north



CONCLUSIONS

- PPAs crucial enabler of renewable growth
- Sound financial reasons, as well as PR and CSR reasons, underpin PPA demand
- PPA buyers can insure themselves against much of the volatility caused by higher intermittent production in the power mix by securing much of their power prices long-term, feeding the rush for PPAs
- PPAs with tightly defined green additionality can insulate their power producers from substantial amounts of the market signal in case of over supply
- Other sources of supply struggle to attract long-term financing, suffer from frequently depressed power market prices
- The systemic effects can become considerable over time – may require market design amendments
 - I.e. need for system service market/price for producers supplying those or other measures creating price for stability, storage etc.





THANK YOU

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