



ENERGY

Future-proof renewables

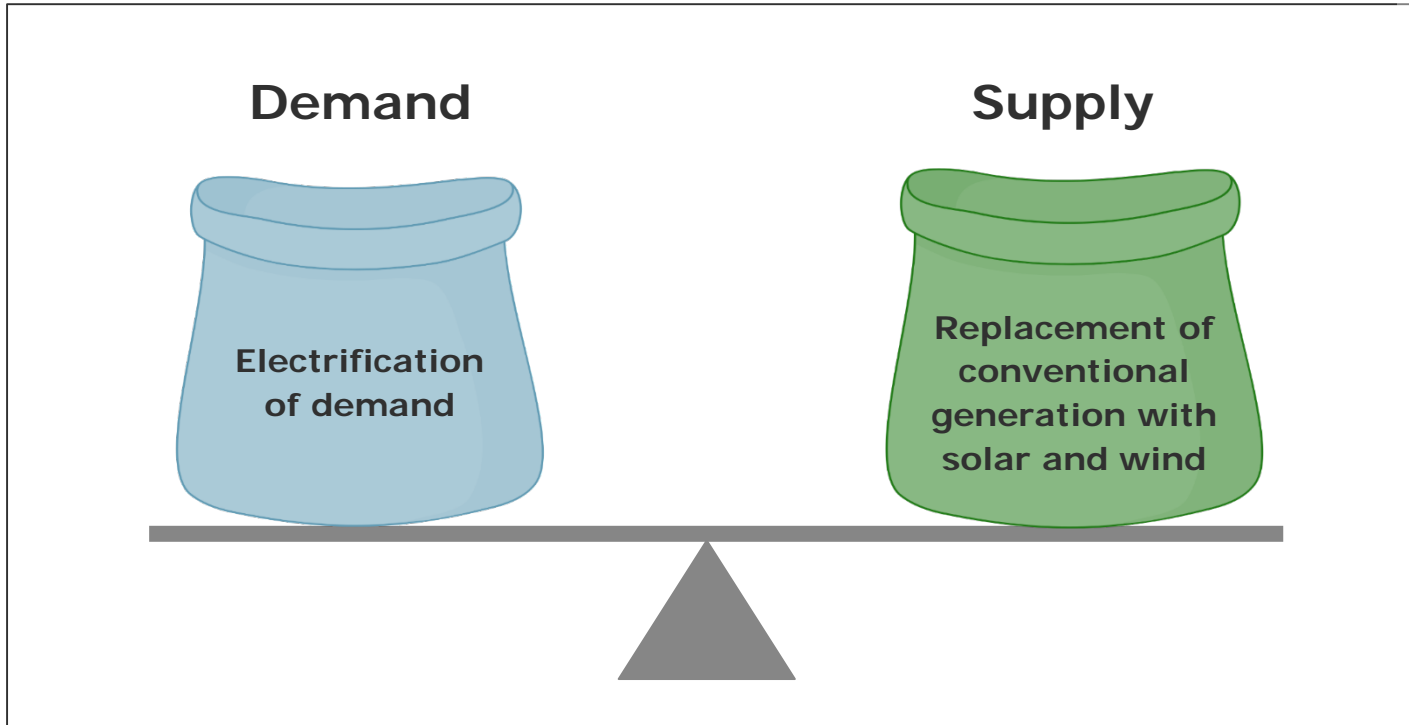
Implications of a high percentage solar and wind in the power system

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Wednesday, June 13, 2018



The energy transition hits the power system on both sides



FOUR INSIGHTS

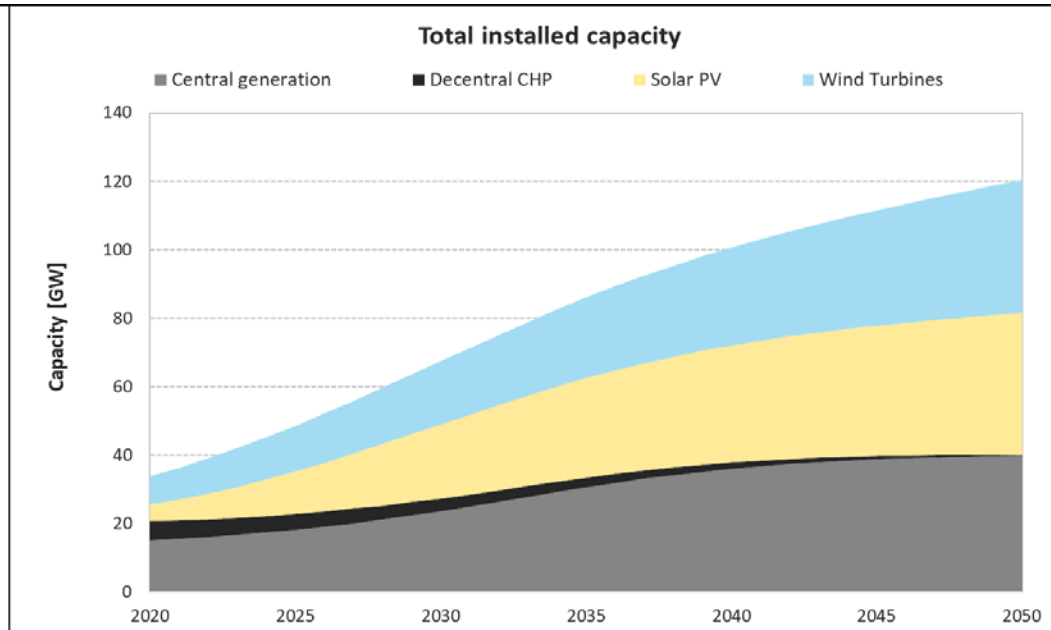
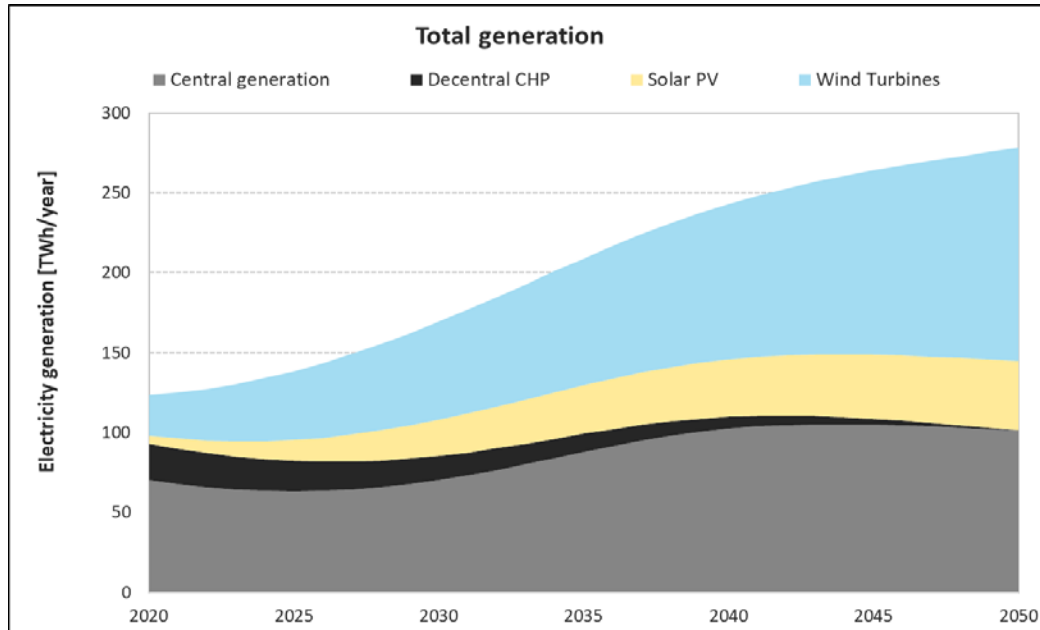
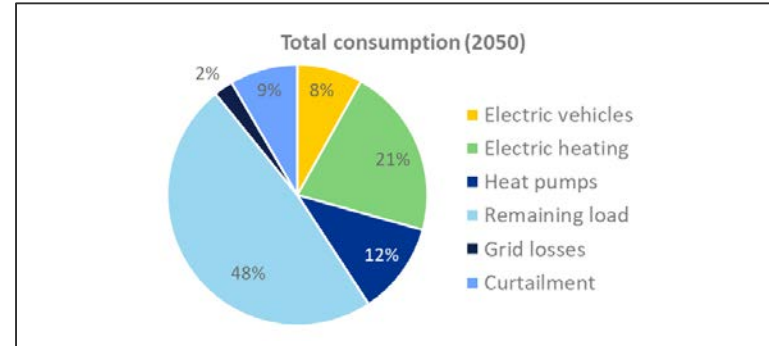
- 1 Electricity price setting
- 2 Carbon price impact
- 3 Storage impact
- 4 Dealing with oversupply



OUR QUESTION: What is the impact of a high percentage of variable renewable energy sources like solar PV and wind turbines on our electricity market (pricing) system?

The impact of high renewable penetration

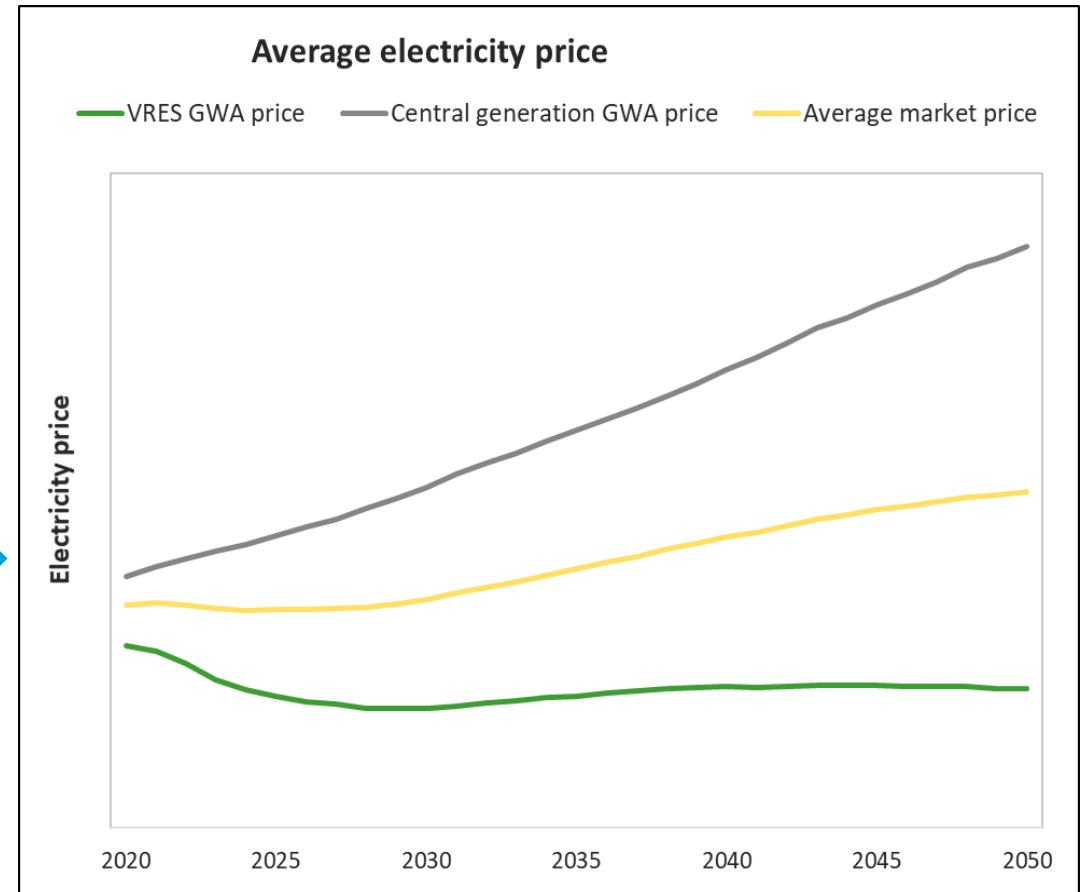
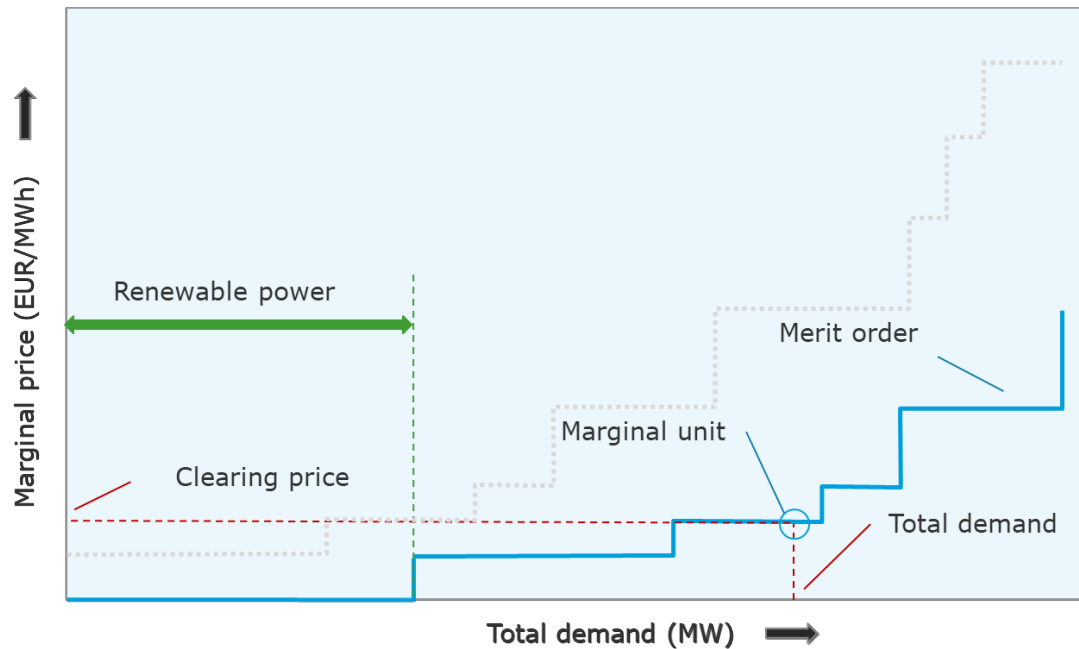
- Isolated system, illustrative European region
- Electrification of mobility and heat demand
- Assumptions for carbon price, learning curves and fuel prices based on our Energy Transition Outlook report



Setting the price of renewable electricity

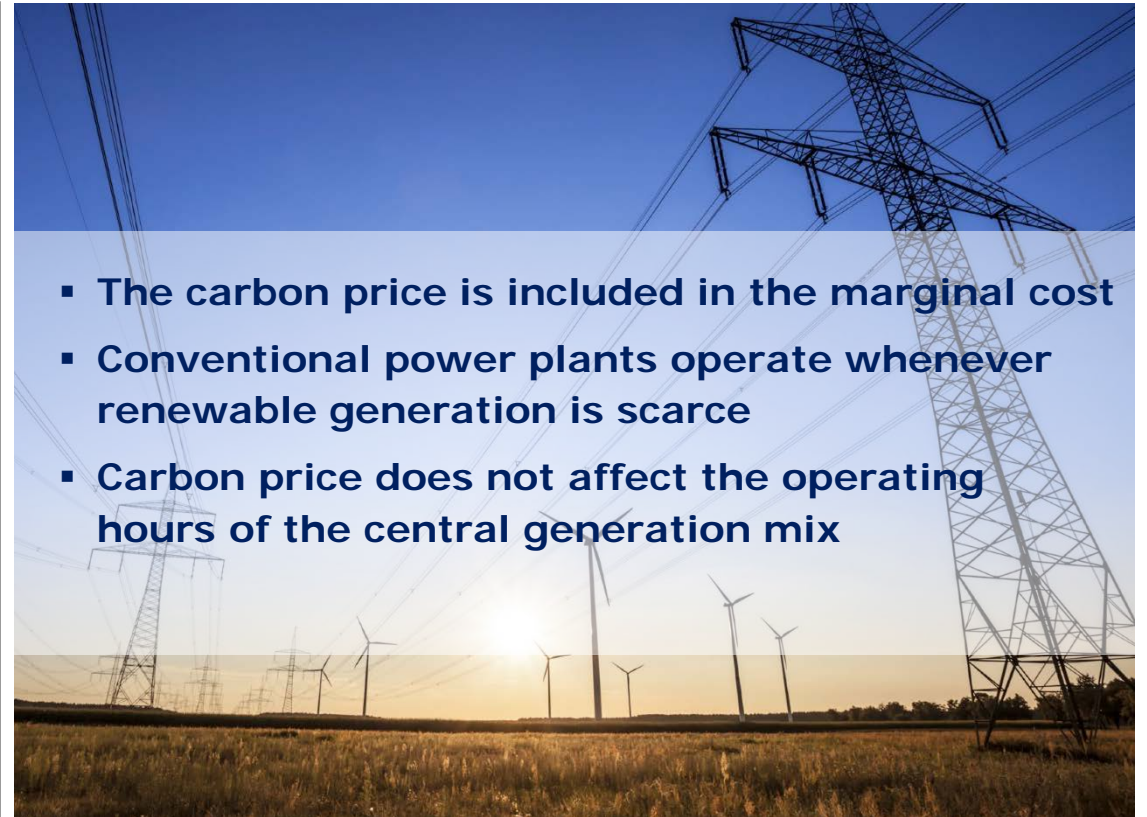
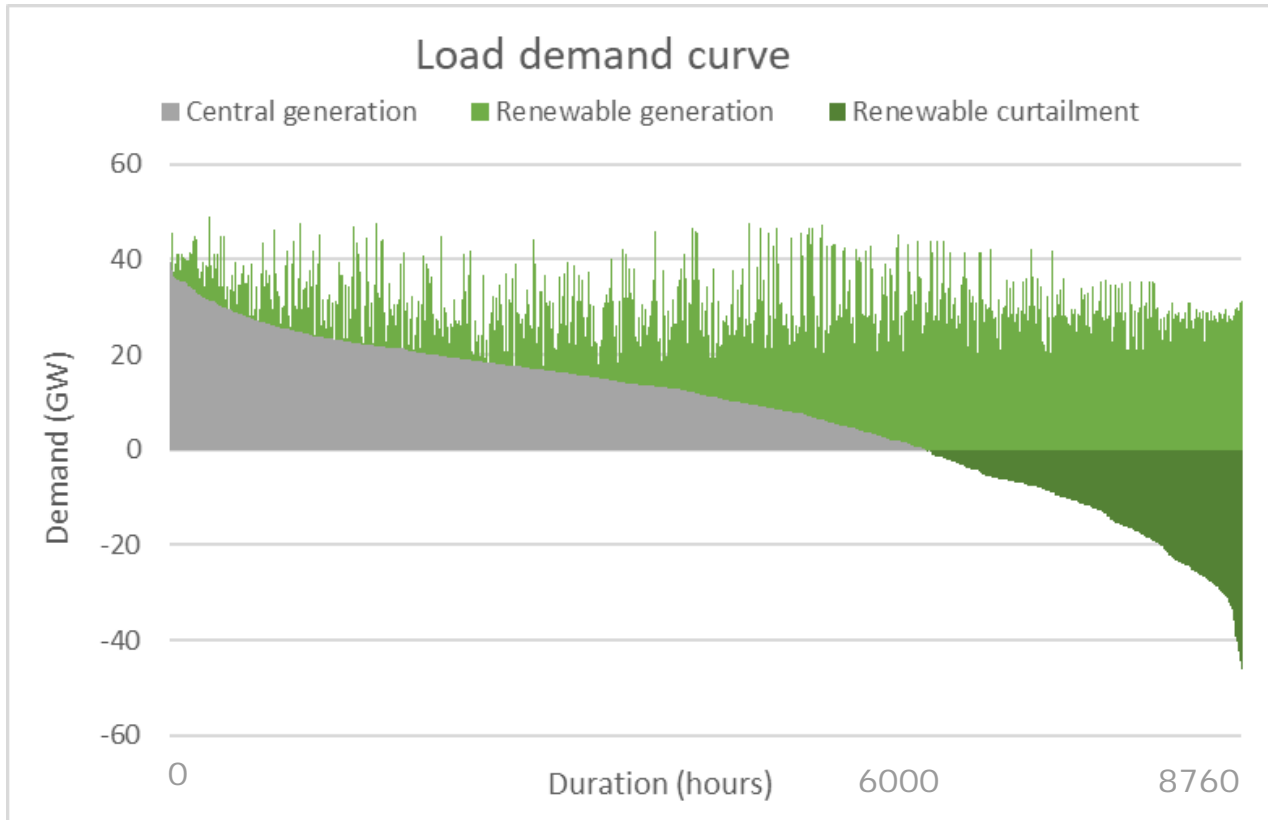
The electricity price of renewables is set by the units they are meant to replace

- Economic theory dictates that power plants bid in based on their marginal cost
- Marginal cost are based mainly on fuel cost, carbon cost and plant efficiency



Carbon price impact

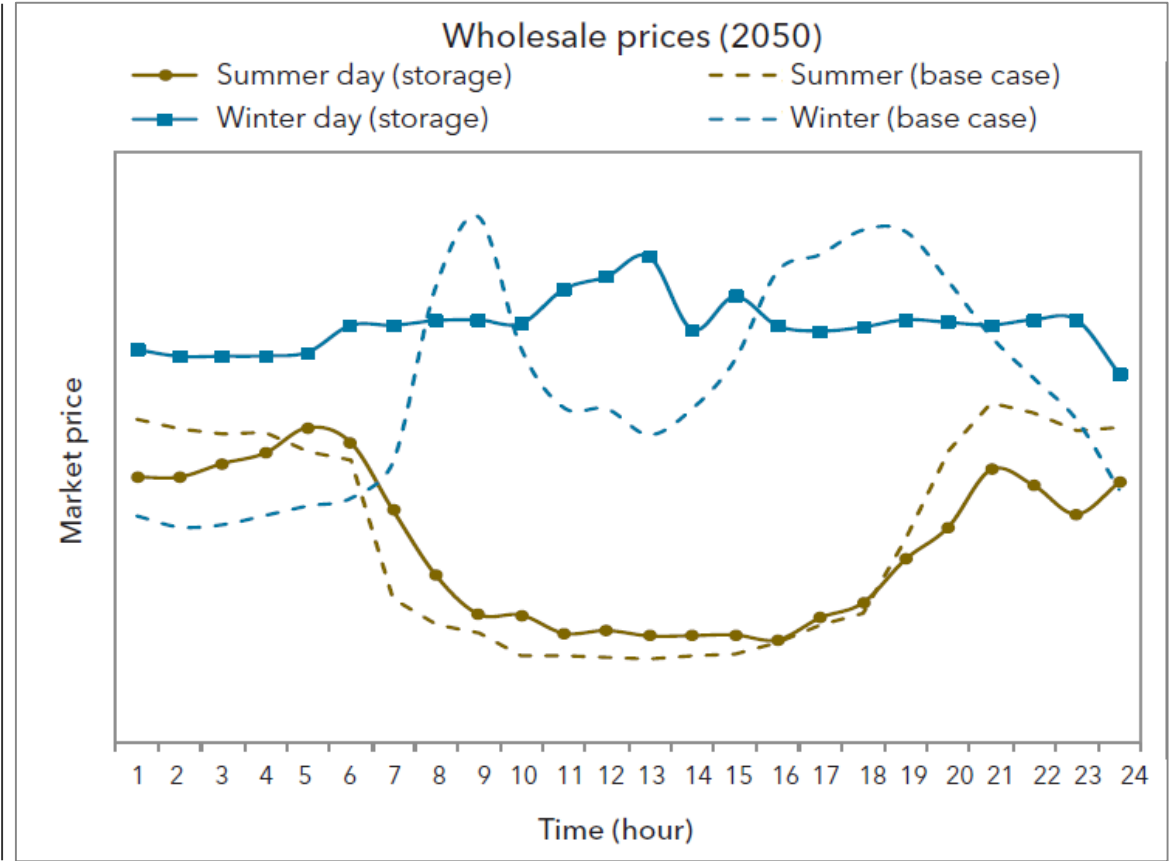
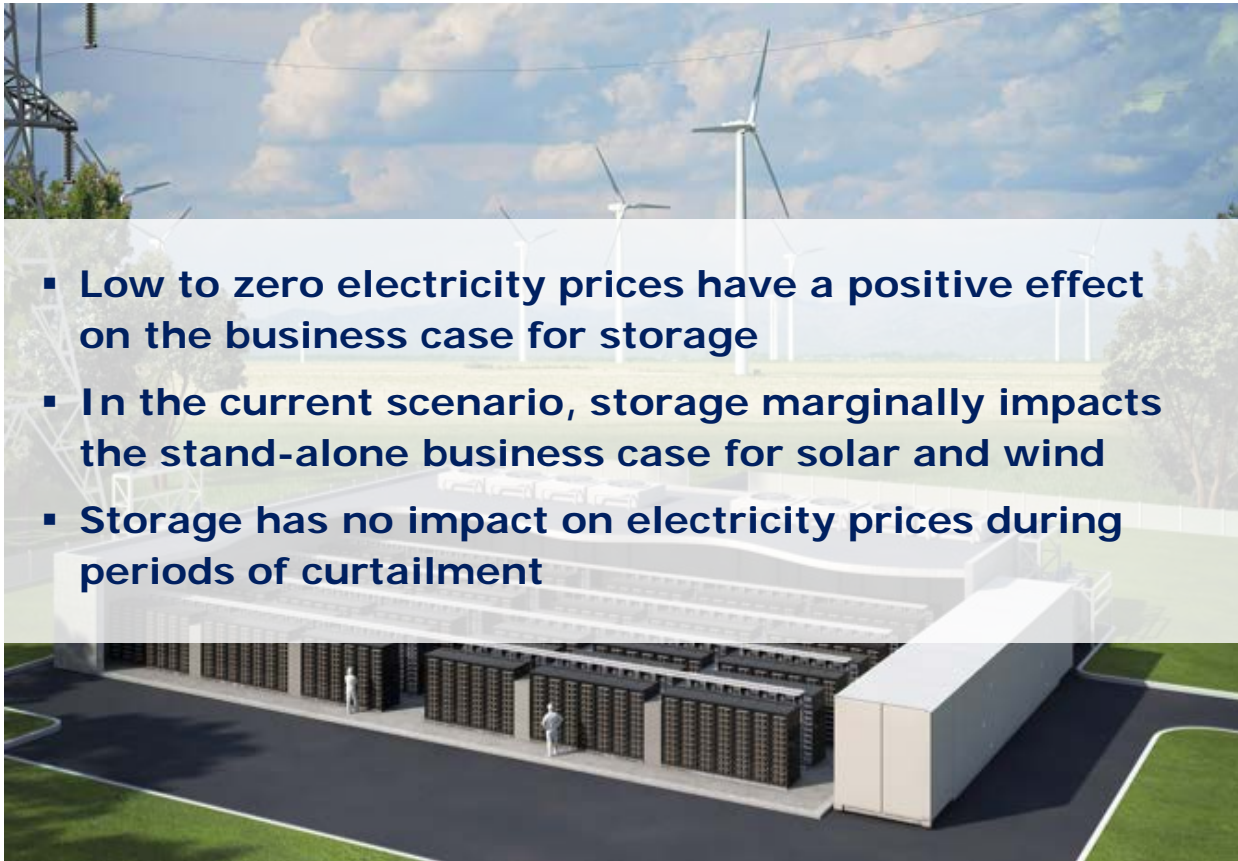
A carbon price increase has a limited impact on the GWA price for renewables



- The carbon price is included in the marginal cost
- Conventional power plants operate whenever renewable generation is scarce
- Carbon price does not affect the operating hours of the central generation mix

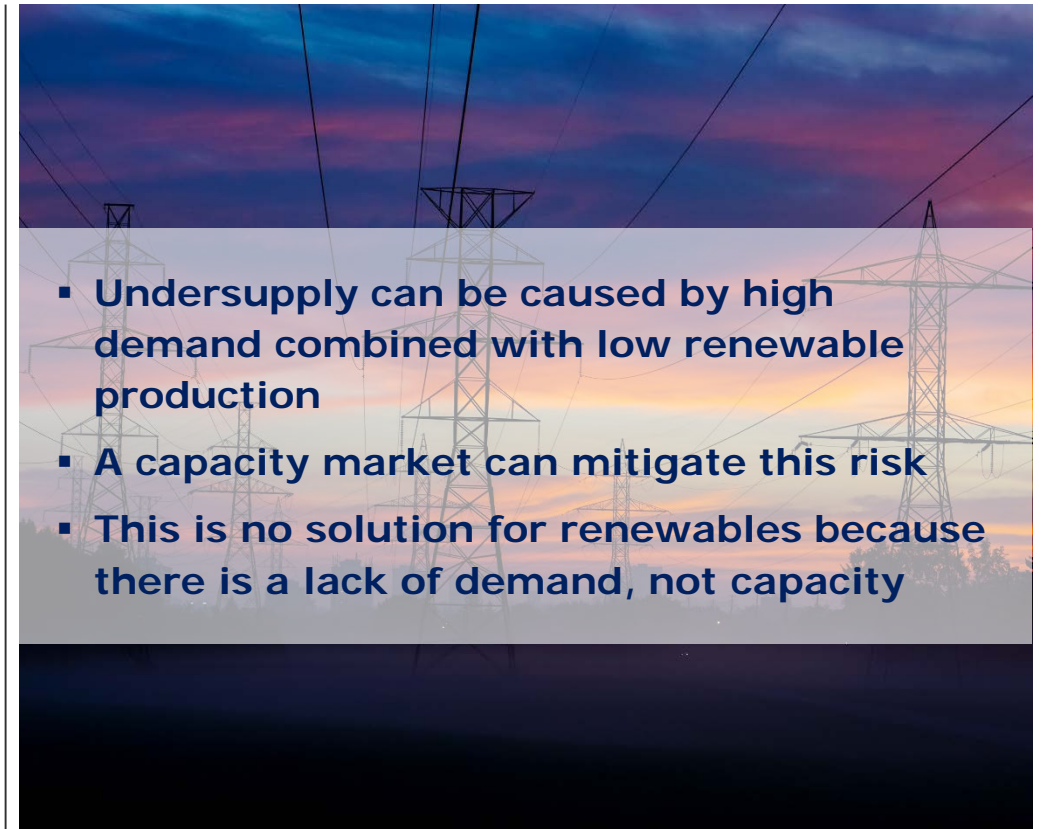
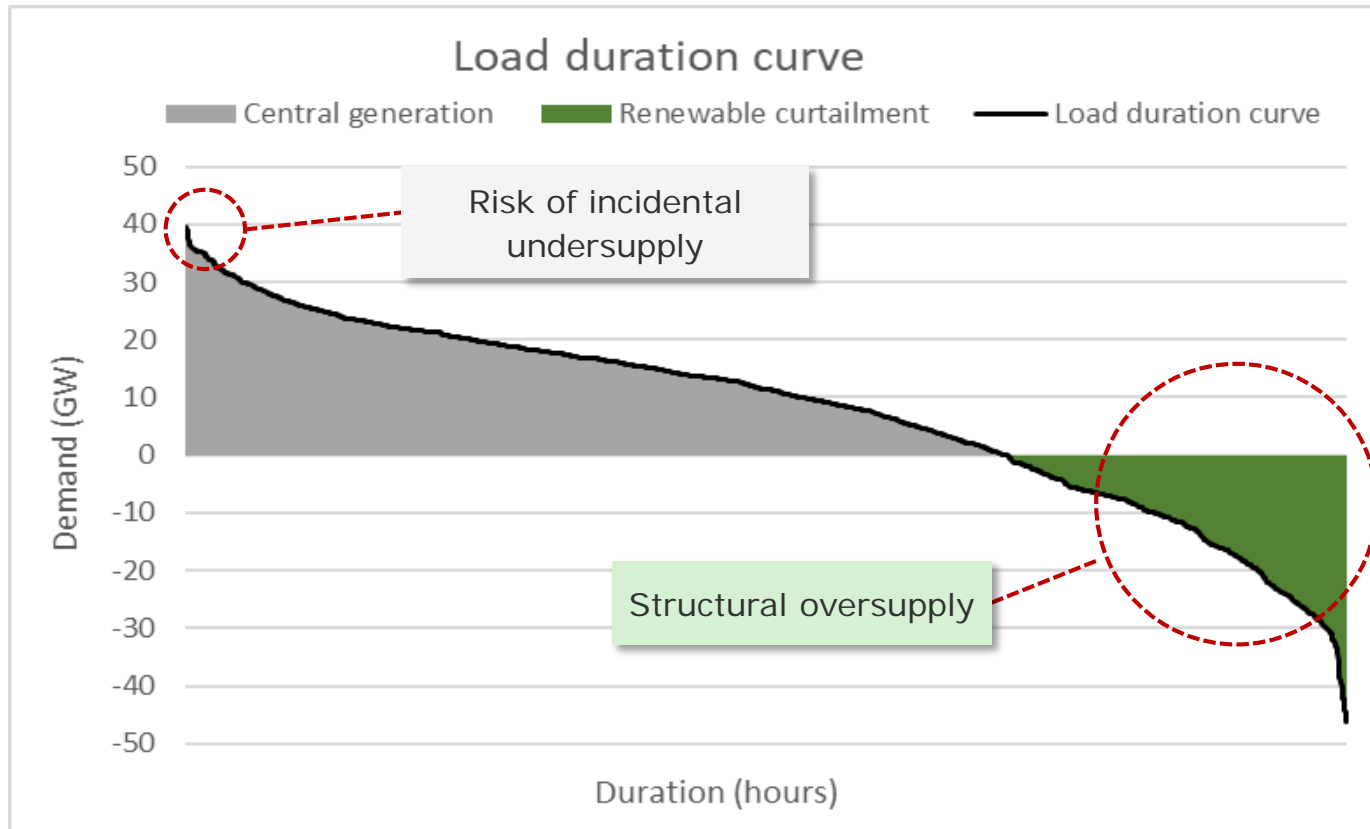
Storage impact

Storage business case profits from cheap renewable electricity

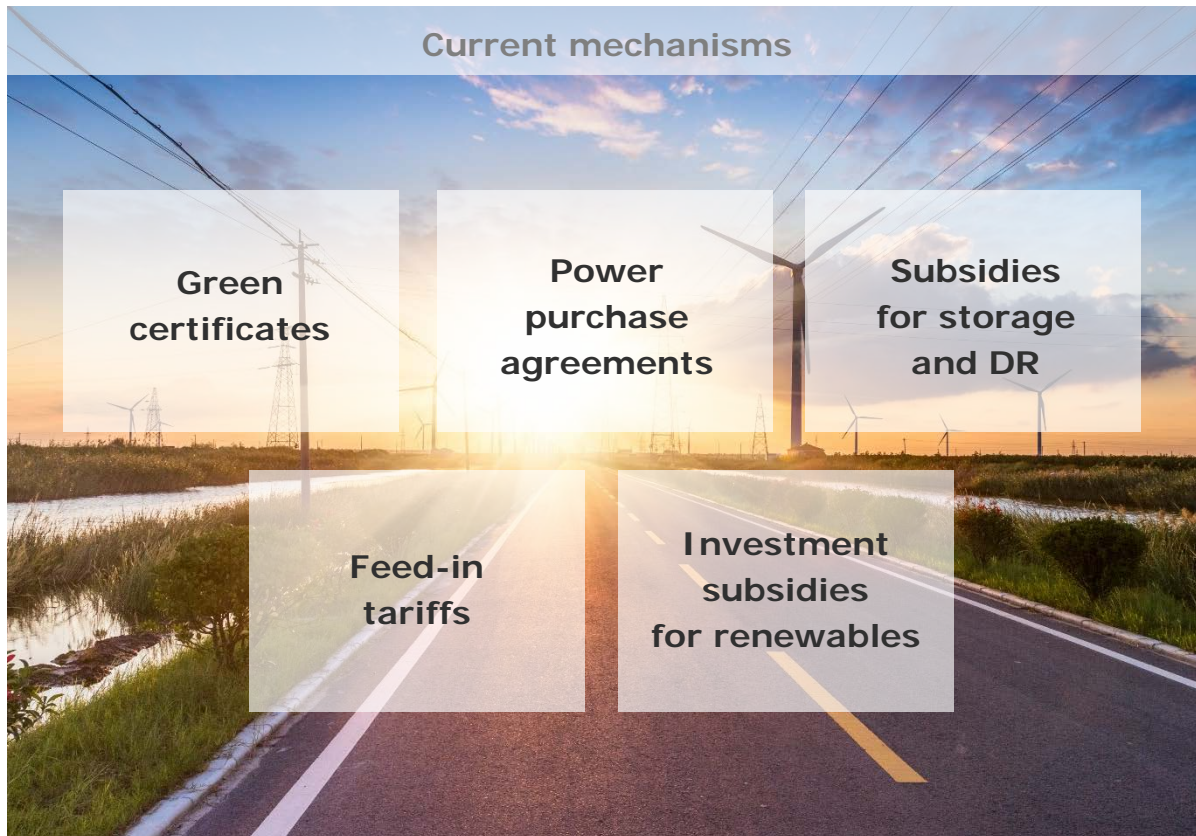


Dealing with oversupply

The current market pricing mechanism seems less apt to cope with oversupply



How to secure the renewable value of electricity?



Thank you for your attention

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