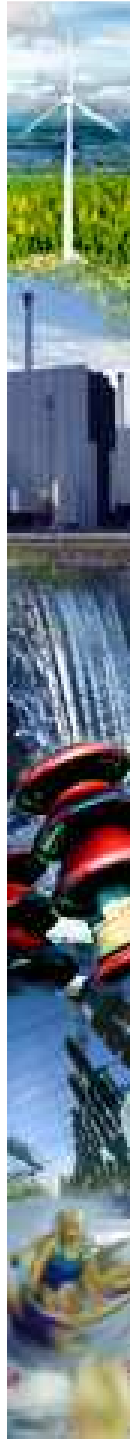


Wind energy – opportunities and limitations in a Swedish context

Maria Sunér Fleming
Head of Unit - Generation



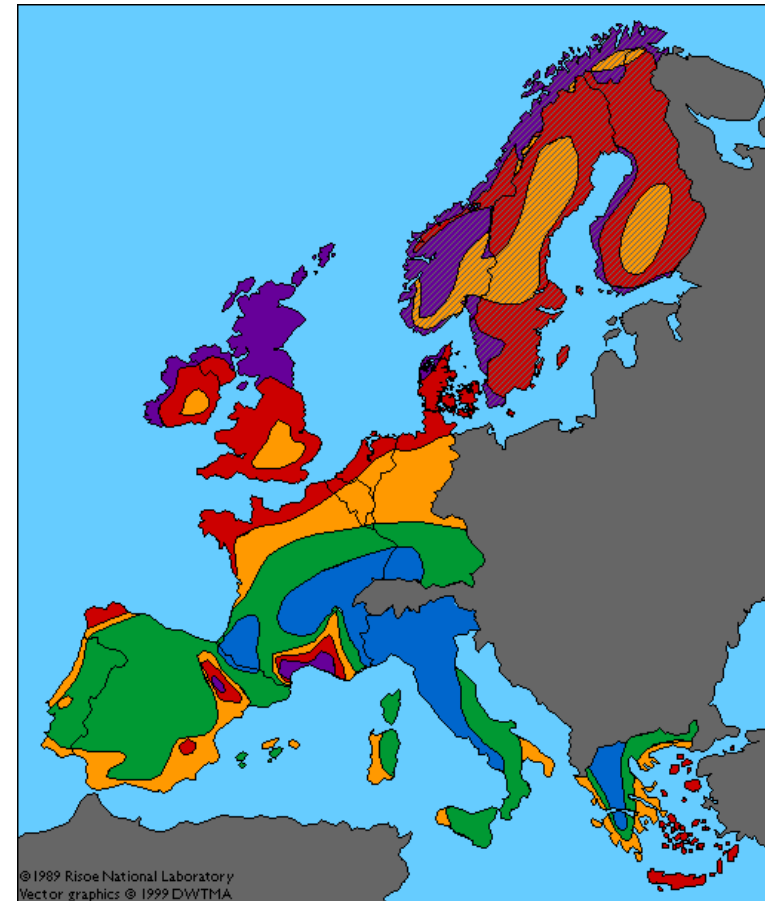
Svensk Energi - Swedenergy

- Industry organization representing companies involved in
 - generation,
 - distribution and
 - trading of electricity in Sweden
- 171 member groups - 355 individual member companies.
- Include state-owned, municipal and private sector companies

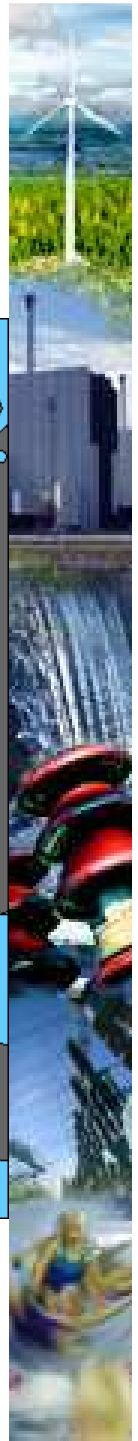


Opportunities in wind power in Sweden

- Huge opportunities
 - Good wind
 - Space
 - Few people
- One study* shows theoretically:
 - 510 TWh/year on shore
 - 46 TWh/year off shore

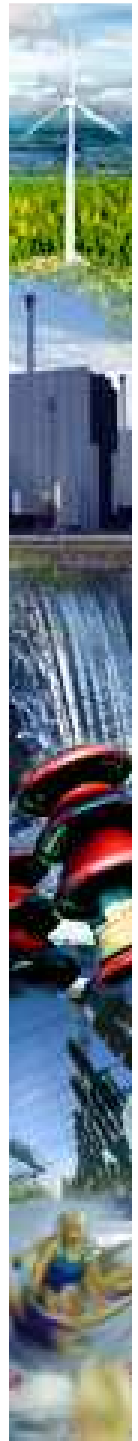


*Vindkraft i framtiden: Möjlig utveckling i Sverige till 2020, Elforsk rapport 08:17



High political ambitions for new renewable power and wind power

- Current support scheme: 17 TWh new RES 2016
- Suggested: 25 TWh new RES 2020
- Current frame for spacial planning: 10 TWh
- Suggested frame to 2020: 20 TWh land + 10 TWh off shore
- Opposition ambitions:
 - 30 TWh new RES in the support scheme until 2020
 - 55 TWh new RES in the support scheme until 2030

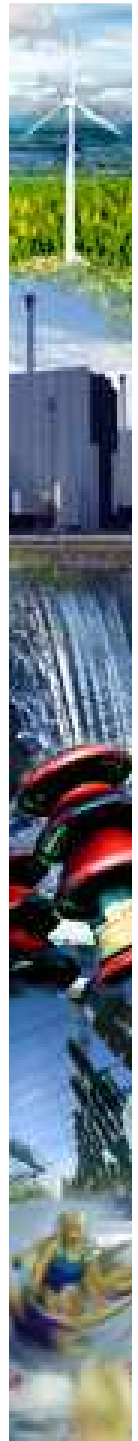


Possible new electricity generation in Sweden up to 2020

- Wind Power 15-20 TWh
- Hydro Power – 3 till +5 TWh
- CHP 9 TWh (6 TWh renewable)
- Nuclear 8-9 TWh
(efficiency improvements)

⇒ **29-40 TWh** new climate neutral power

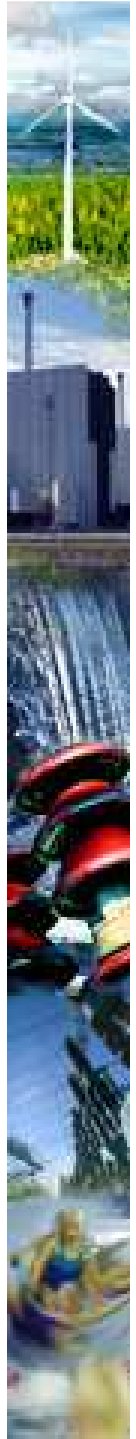
⇒ **21-31 TWh** new renewable power



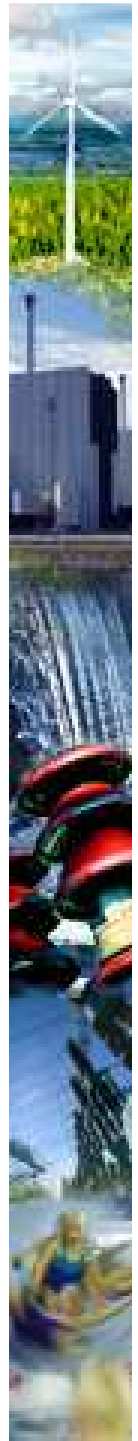
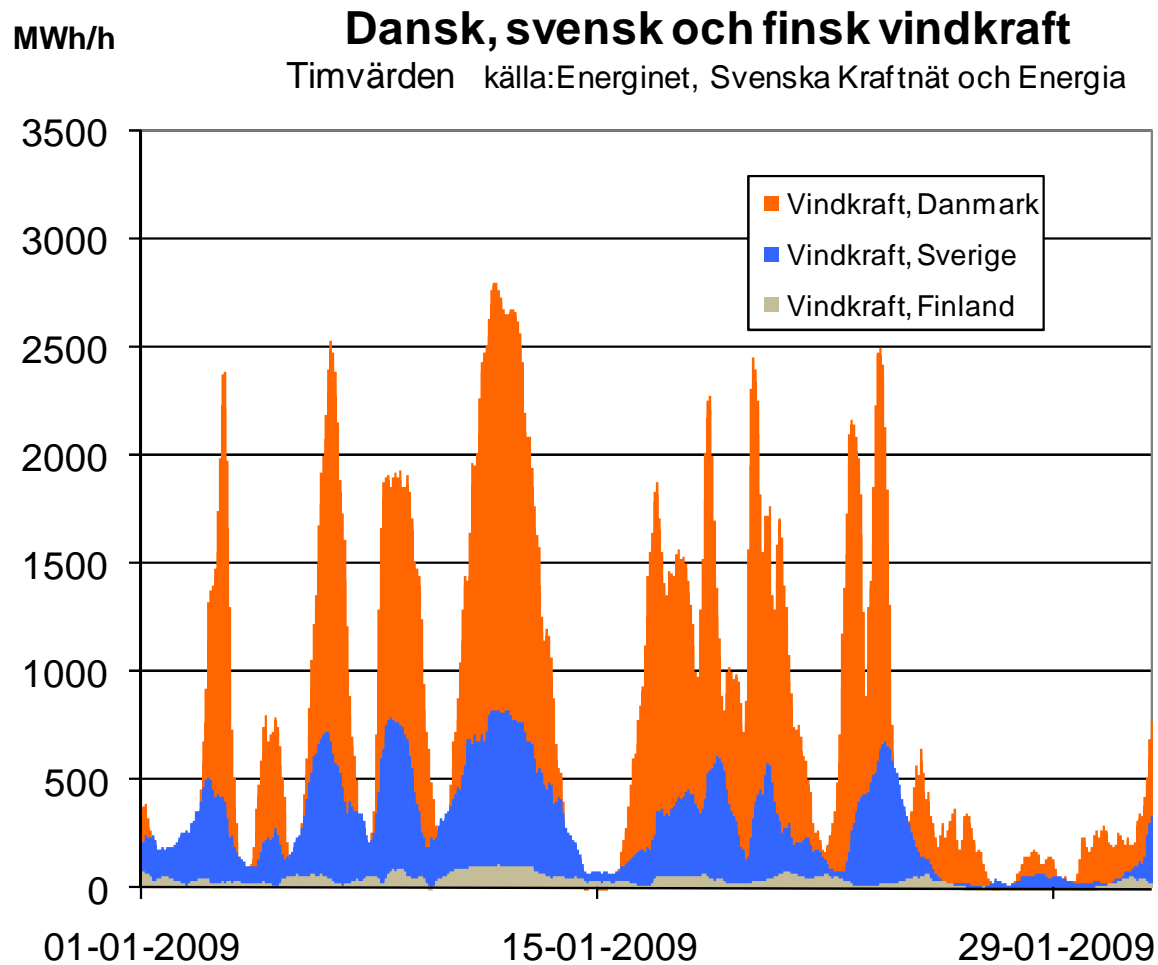
What are the limitations for wind power?

- Political decisions
- Permitting processes – public acceptance
- Support schemes - financing
- **Grid aspects - Transmission and distribution possibilities**
- **Regulating power**
- **Market aspects**

Power system issues

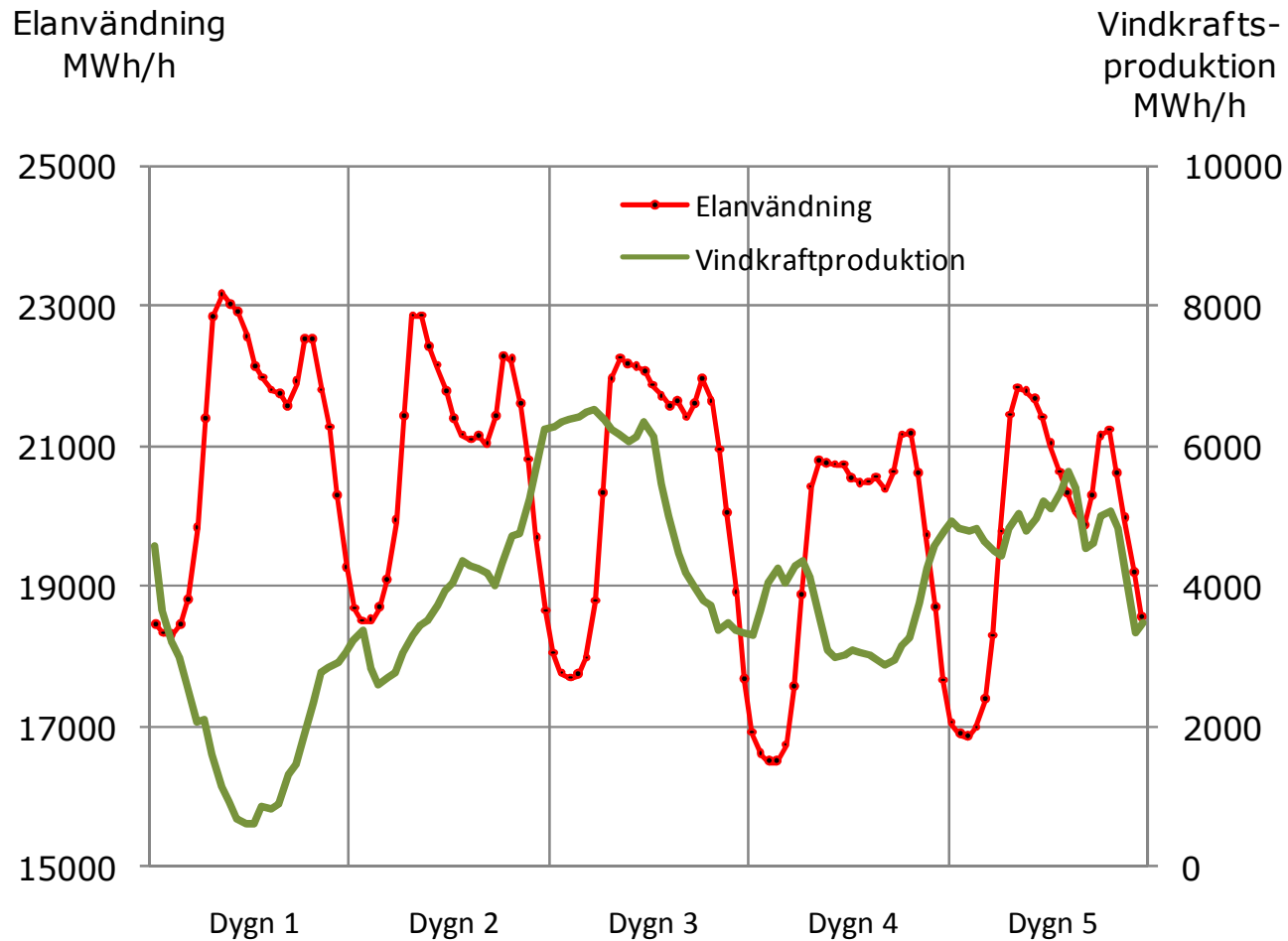


Wind power generation January 2009



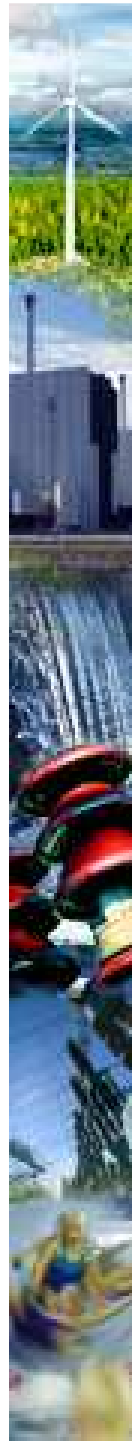
Use of electricity and wind power generation - a scenario for a few days in Mars 2020

(10 000 MW installed wind power, 25 TWh/year)



Regulating Power needed

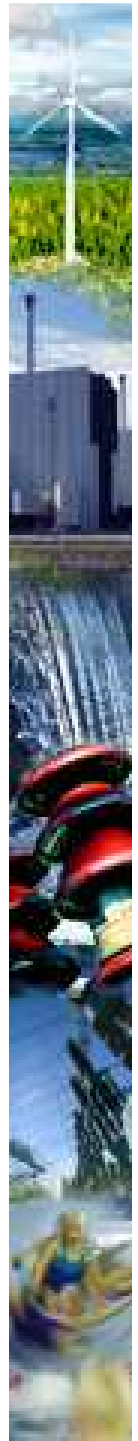
- The system has to be in balance every second, hour and day
 - Electricity use equals generation
- More regulating power is needed, and less base load
 - Hydro power is ideal – renewable, carbon free and easy to regulate
 - Demand Side Management and “Smart Grids” is a possibility for the future



Grid capacity needed

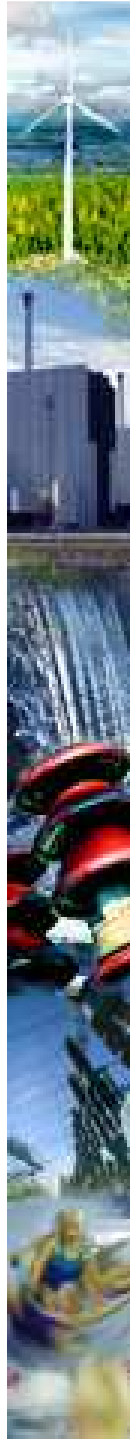
- New transmission line from north to south of Sweden will be needed
- New interconnectors to the continent
- Stronger regional grids
- Stronger local grids

- This takes time!



Effects on the market with more intermittent power

- Higher price volatility
- Price areas more often
- Negative electricity prices
- New market structures needed – regulating power has to be valued
- ...



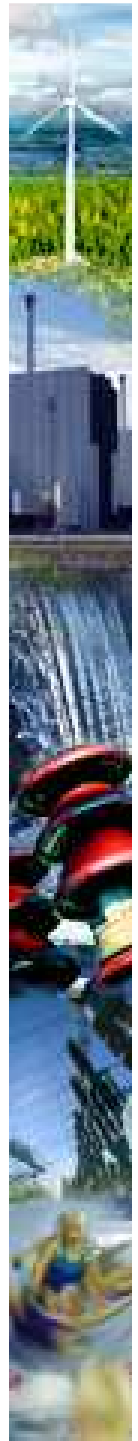
In summary

- Huge potentials for wind power
- Several limitations
 - Support scheme, permitting process and political risk
 - Grid capacity and if the pace of enforcements is keeping up with the wind power expansion
 - Access to regulation power might become a problem
 - Effects on the market – less possibility to earn money?



1 wind power plant
connected to the grid is
better than 10 in the
forest...

to achieve this there are
business opportunities!



Thank you!

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