Nordic Energy Research Forum: Sustainable Energy for All

Julia Kirch Kirkegaard, Senior Researcher, DTU Wind Energy
Section for Society, Market & Policy (SMP)

Paradigm shift in Danish wind power

Wind power in Denmark: a paradigm shift

Growing opposition to wind power in Denmark…

Is it all due to 'NIMBYism'?...or three entangled 'shifts' happening without public discussion?

Kirkegaard, J. K., Cronin, T., Nyborg, S. & Karnøe, P. (2021): 'Paradigm shift in Danish wind power – the (un)sustainable transformation of a sector'. *Journal of Environmental Policy and Planning*, Volume 23, Issue 1, pp. 97-113, DOI:10.1080/1523908X.2020.1799769.

Green transition: it's all about technology, isn't it?!

- The material dimension of projects should not be left aside as they are often the very subject of disagreement and controversies

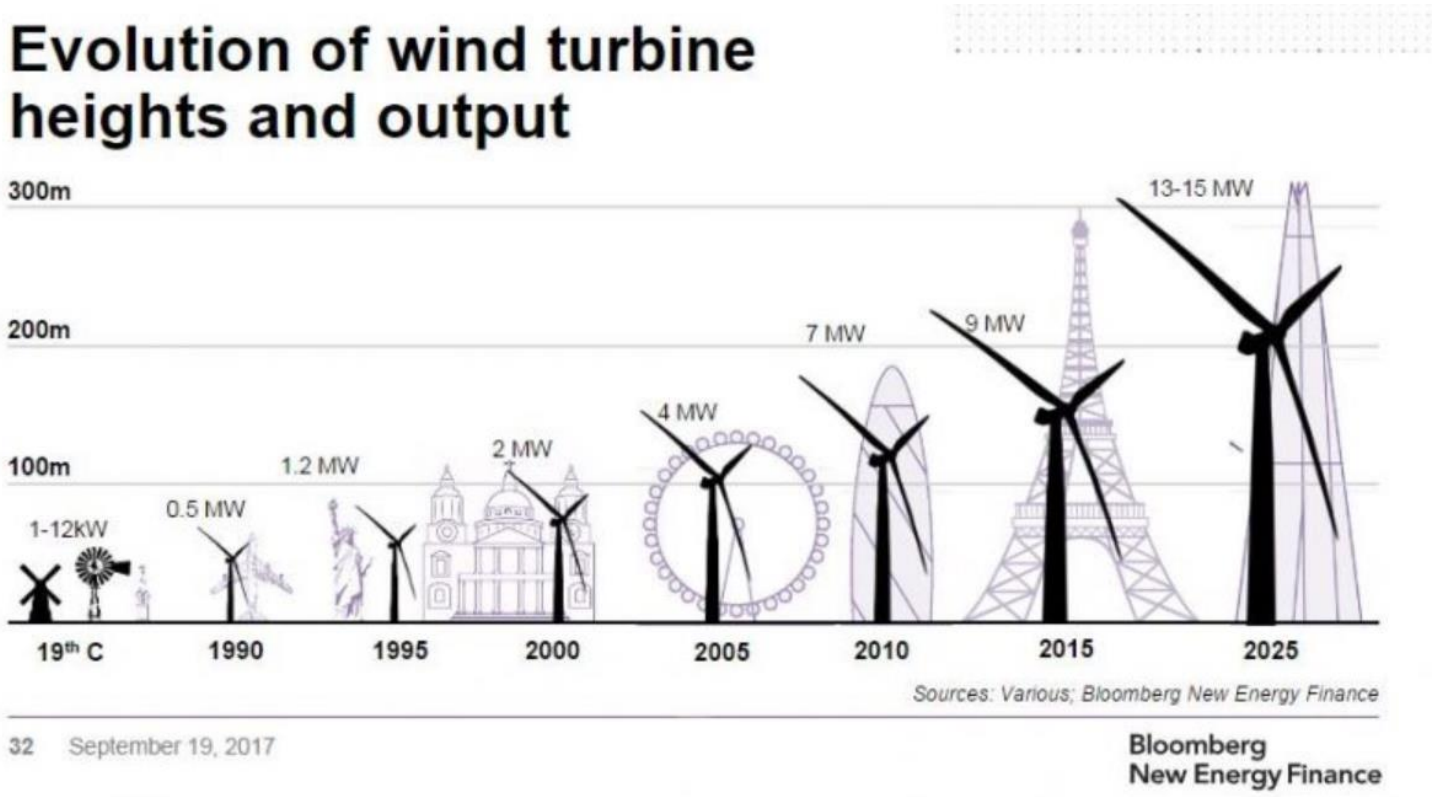
- Capturing the technicalities and socialities, as well as the local context in which they are implemented, remains conceptually challenging

- Wind turbines as hybrid engineering problem

⇒*Socio-technical lens…wind power market as a socio-technical assemblage (STA) that must be mobilised and maintained*

How did we get to where we are today?

$$P = \frac{1}{2}\rho C_p A V^3$$



Denmark's unique story of wind power development

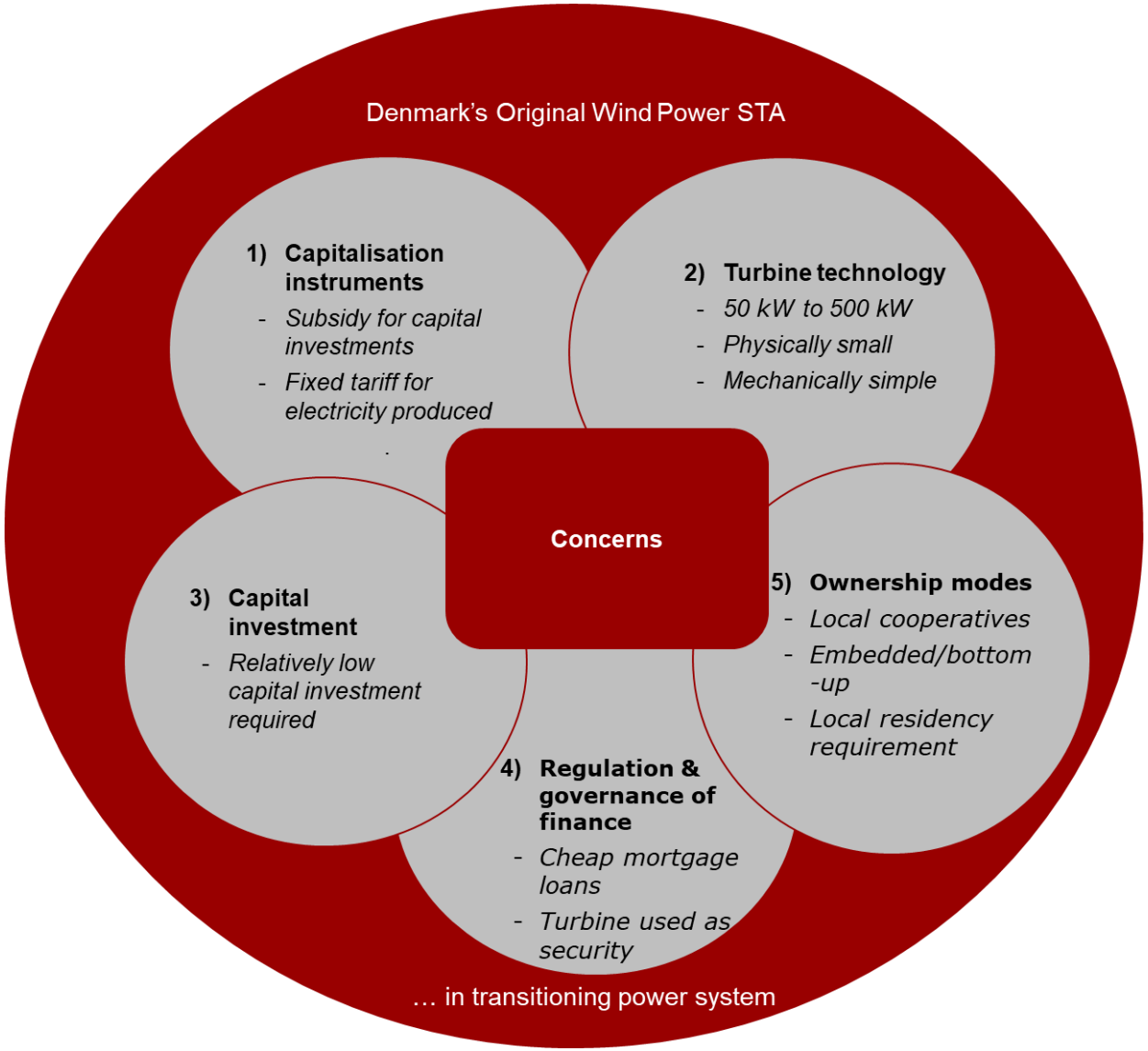
Historical roots:

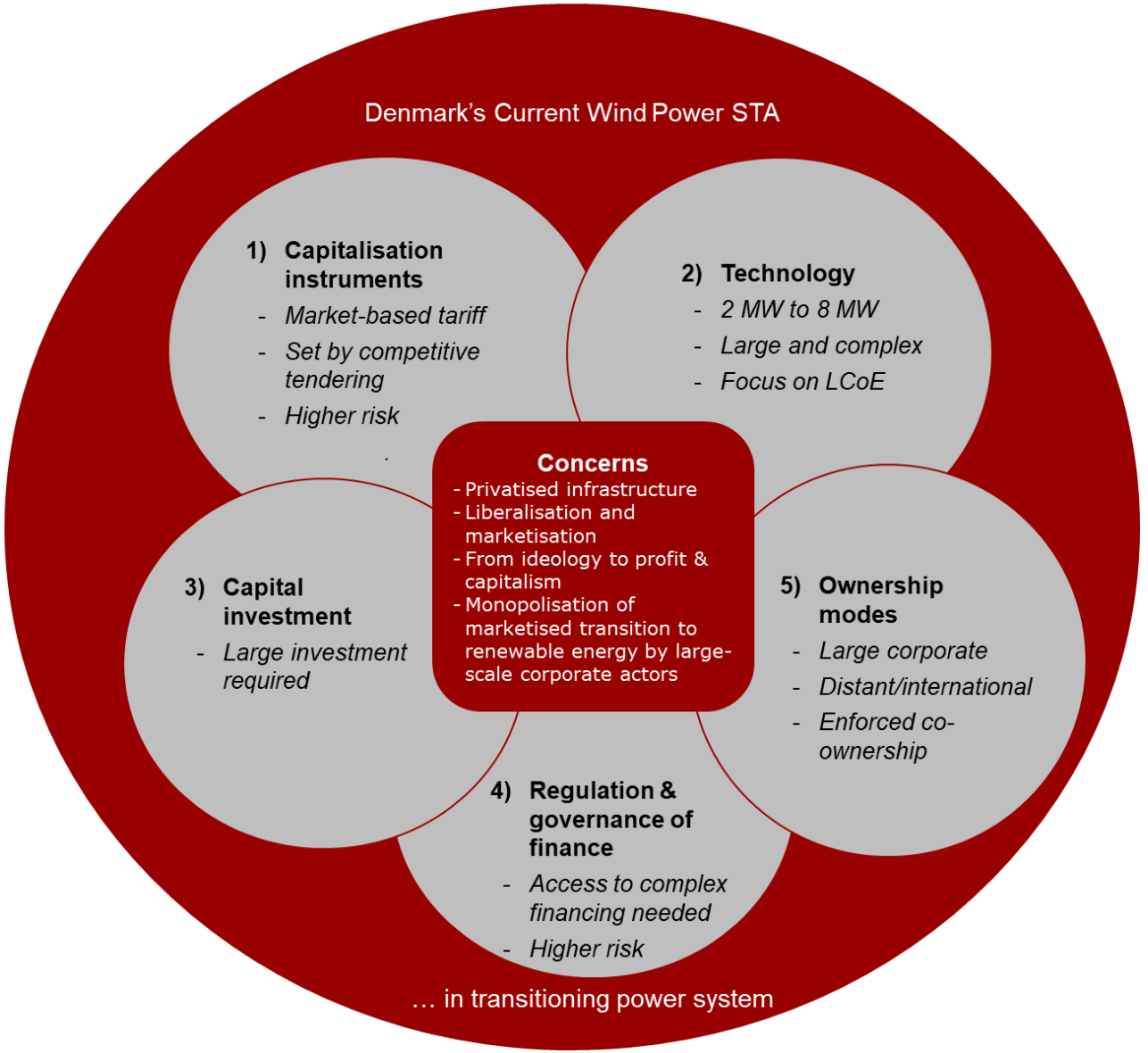
The Danish folk high-school tradition (Grundtvig)

- 'folksy democracy'
- The cooperative movement
- Social movement forming against nuclear power and fossil fuels
- Small-scale developments

Today:

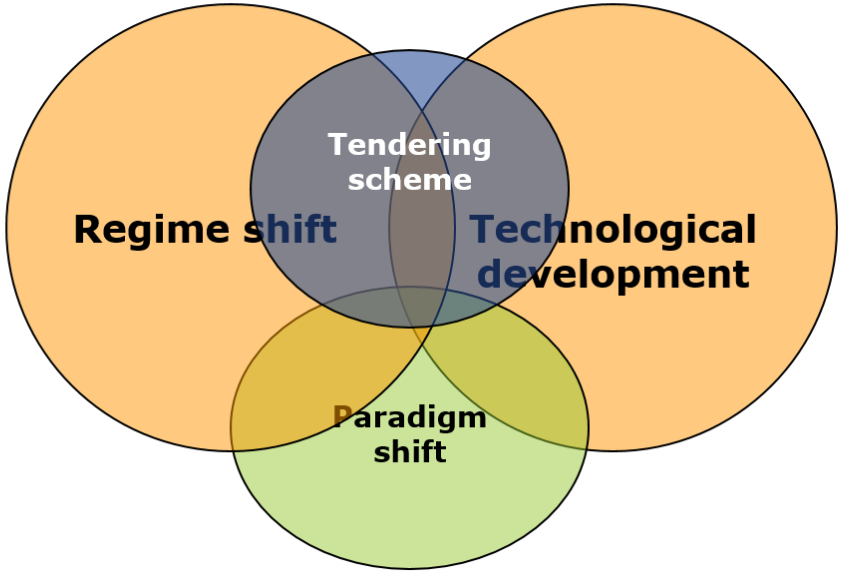
- Emerging social opposition in the 'socio-technical assemblage' (STA) around wind power
- Debate over 'pure ideology' vs. 'pure capitalism'
- Wind as a common good or a tradable commodity to be capitalised
- Debates over who should own the wind?


Denmark's Original Wind Power STA
1) Capitalisation instruments
- Subsidy for capital investments
- Fixed tariff for electricity produced
2) Turbine technology
- 50 kW to 500 kW
- Physically small
- Mechanically simple
Concerns
3) Capital investment
- Relatively low capital investment required
4) Regulation & governance of finance
- Cheap mortgage loans
- Turbine used as security
5) Ownership modes
- Local cooperatives
- Embedded/bottom -up
- Local residency requirement
… in transitioning power system


Denmark's Current Wind Power STA
1) Capitalisation instruments
- Market-based tariff
- Set by competitive tendering
- Higher risk
2) Technology
- 2 MW to 8 MW
- Large and complex
- Focus on LCoE
Concerns
- Privatised infrastructure
- Liberalisation and marketisation
- From ideology to profit & capitalism
- Monopolisation of marketised transition to renewable energy by large-scale corporate actors
3) Capital investment
- Large investment required
5) Ownership modes
- Large corporate
- Distant/international
- Enforced co-ownership
4) Regulation & governance of finance
- Access to complex financing needed
- Higher risk
… in transitioning power system

Concluding remarks

- Need for renegotiating the paradigm shift (i.e., shift from local cooperatives to corporate players)
- Awareness of socio-material implications of techno-economics:
  - technology can be an enabler for a transition to a sustainable energy system, but it can also very much exclude certain actor groups (NB the progressive and regressive forces of technology)
- Situated and contextual reflexivity



Wind turbines as hybrid engineering problem – creating 'wicked problems'?

Discussion

Need to "explore the position, degree of engagement and influence of the entities that are affected by these processes, the extent to which they are concerned, impacted, implicated, or even redefined through these processes, sometimes without having a say in this, while at other times being related or even actively engaged in it" (Labussiere & Nadai 2018: 18)


DTU