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THE STATE'S ROLE IN INVESTMENT IN MORE RENEWABLE ENERGY: THE NORWEGIAN EXPERIENCE

Professor Lars Sørgard*
Norwegian School of Economics and BECCLE

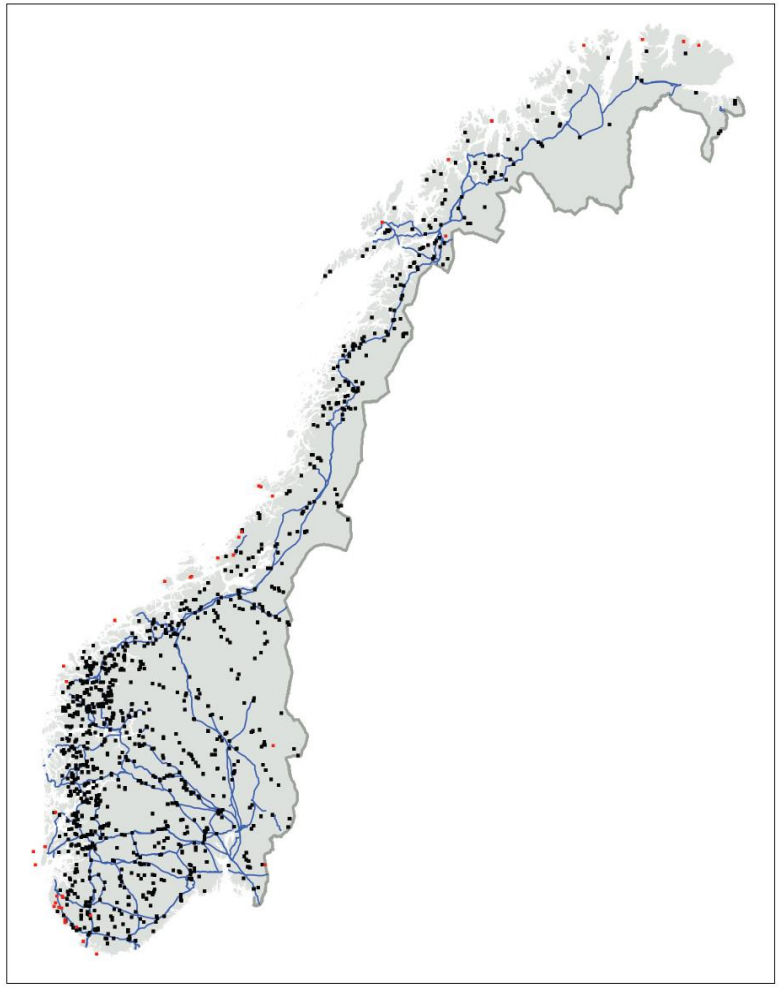
*These are my views, and not necessarily the views of other members of Energy Commission

Background and motivation

- A unique electricity market in Norway
  - Almost 90 % hydropower production
  - Flexible in the short run, but dependent on large variations in inflow of water each year
- A need for more investment in renewables
  - NOU 2023:3: *'More of everything – faster'*
  - Climate change and green transition
- But how should the state be involved?

The Norwegian electricity system

- Historically, almost 100 % hydropower
  - Publicly owned
  - Plants spread out (black dots)
- Transmission lines to foreign countries
  - First in 1960, to import in dry years
  - Now 17 transmission lines
- Spot market in 1992 in Norway
  - Norway-Sweden in 1996, and then gradually extended further
- Onshore wind power last ten years
  - 10 % of total production (red dots)
  - 2/3 foreign owned



A favourable energy mix until now

- Combination of regulated (reservoir hydropower) and unregulated (wind and river hydropower)
- More stable prices than we see abroad
  - Hydropower holds back on production when it is blowing
  - Wind power has experienced relatively high prices
- Onshore wind power producers signed commercial contracts
  - PPA viable since prices are relatively high
- Wind power a good supplement to regulated hydropower
  - Can save water in dams when wind power is producing
  - Can also save water in dams when importing from neighboring countries producing from wind power

Challenges with more renewables

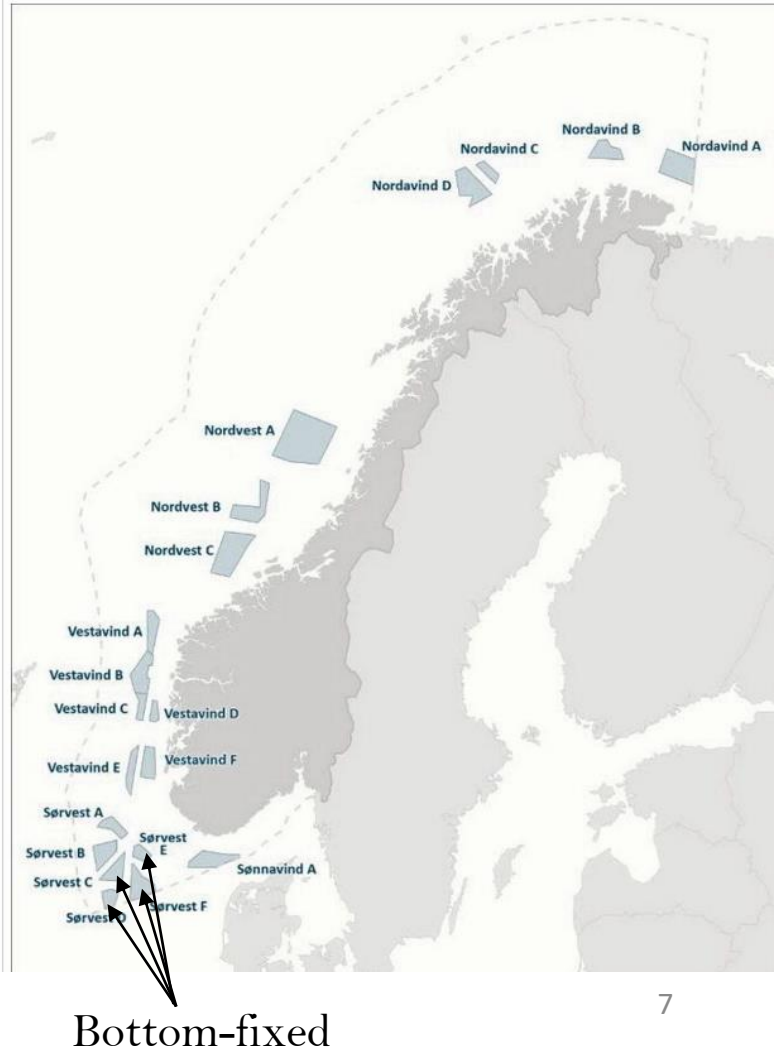
- Many sources not so easy to exploit
  - Hydropower expansion not possible with '*vernet plan*'
  - Popular resistence against onshore wind power
  - Solar power of limited scale; a need for regulation
  - Nuclear power discussion; whether we should consider it
- A goal of 30.000 MW offshore wind in 2040 (appr. 140 TWh)
- Two areas will be awarded in late 2023
  - Sørlige Nordsjø II: Fixed-bottom offshore wind
    - 1500 MW (appr 7 TWh) awarded in an auction
  - Utsira Nord: Floating offshore wind
    - 1500 MW (appr 7 TWh) awarded on qualitative criteria

Two-way CfD at Sørlige Nordsjø II

- Prequalification, and then bidding on a contract price
- Maximum strike price set to 66 øre/kWh for 15 years
  - If avg monthly spot price lower, receives support from govm.
  - If higher, winner pays the difference
- Maximum 15 BNOK in public support
- Complaints from potential bidders that they need more favorable terms
  - Deep water in this bottom-fixed area
  - Cost increases last years
- Indicates a need for even larger public support than max 15 BNOK?

20 potential areas for offshore wind

- More than needed for 30.000 MW offshore wind
- 4 areas in the South North Sea for (deep) bottom-fixed offshore wind
- Remaining areas for floating offshore wind
- At a very early stage right now
  - No plans for the network
  - No analysis of the economics of potential projects
  - Need for a more detailed analysis of possible conflict of interests



Pros and cons of offshore wind alternatives

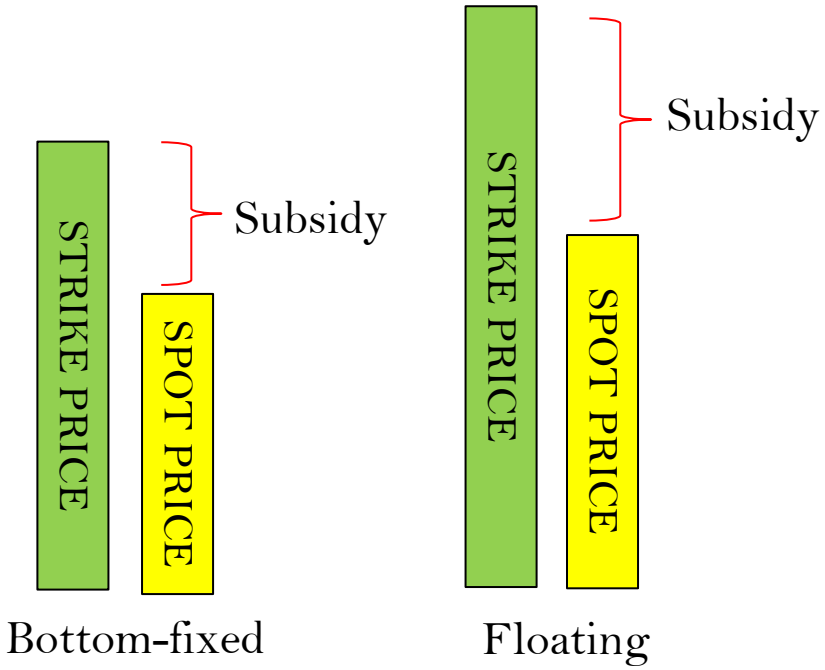
Bottom-fixed

- Rather well known technology
  - Some potential for lower costs
- Increased costs recently
- Illustration:
  - Complaints about 66 øre/kWh as max strike price
- Only in the North Sea
  - Low spot price since much wind power in the North Sea

Floating

- New technology
  - More potential for lower costs
- Very expensive right now
  - NVE in 2021: 117 øre/kWh
  - Warning: Costs have increased a lot since 2021
- More potential areas, many not in the North Sea
  - Higher spot price since wind asynchron with Europe

The strategic choice



- Will it ever be profitable for society?
  - Learning by doing will lead to lower costs?
    - Especially for floating?
  - Network costs?
  - More regulated power to balance wind power?

PRESENT

FUTURE

- Should the state go for 30.000 MW, at any costs?
  - 300 BNOK in max subsidy if same as Sørlige Nordsjø II
  - In addition, nature, network and regulated power costs

Revise the ambitious plans?

1. Go for 30.000 MW…!
   - First then to learn about the future costs savings
   - Can secure electricity for green industry and cleaning of economy
2. … or downscale the goal
   - Limiting the demand expansion
     - No subsidies to green industry (not matching IRA)
     - Priority on decarbonization, for example platforms in the North Sea not operated by electricity
     - Average price not lower than in neighboring countries
   - Import more from neighboring countries that are already scaling up (rather cheap) bottom-fixed offshore wind
     - Win(d)-win(d) when we buy from our neighbours in situations of oversupply and low spot prices

A race, or a coordinated effort?

- Norway had a comparative advantage on electricity production
- Not clear to me that large scale offshore wind is optimal for Norway
- Can risk subsidies in 'both ends'
  - Offshore wind to supply …
  - …green industries
- Should then adjust down ambitions
  - Not stimulate demand
  - Exploit import possibilities
- If neighbors build up, good for them and us that Norway import more?

Medlemmene Heia, Lundberg, Sørgard, Tennbakk mener:

Selv om en nå setter retning mot en raskere økning i produksjon, energieffektivisering og nettutbygging, kan mange drivere endre seg. Klimapolitikken er blant annet stadig i utvikling, noe som har en sterk påvirkning på energipolitikken. De store planene om utbygging av vind- og solkraft i landene rundt oss, kombinert med et handelsregime som viser seg å være i tråd med norske interesser, kan innebære at vi om få år kan få tilgang på billig kraft i lange perioder. Det kan redusere behovet for et stort netto kraftoverskudd. Det kan vise seg at det ikke er mulig å realisere betydelige mengder vindkraft på land og at utviklingen av havvind går saktere og blir mer kostbart enn forventet. For eksempel kan naturødeleggelsene bli for store eller det kan bli for kostbart å bygge ut tilstrekkelig nettkapasitet. Da blir det et spørsmål om, og i så fall i hvor stor grad, vi skal justere kursen ved å redusere våre ambisjoner for utbygging av ny kraftproduksjon. Det viktige nå er derfor å sette en retning på utviklingen, men det gir uheldige signaler å sette mål som innen kort tid kan vise seg å være langt fra det vi ønsker eller har mulighet til å realisere.

That's it!

SYSENDAMMEN