



Middelgrunden Wind

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Förenar besöksnäring med elproduktion

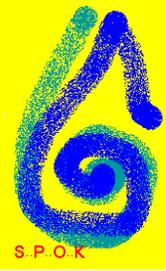
by

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Background Hans Chr. Sørensen



Business and university background

- PhD, 40 years with business development

Project management large projects

- Ocean wave energy (Wave Dragon), Tidal current (Tideng)
- Offshore wind (Middelgrunden 40 MW, Samsø 23 MW, Hvidovre 7.2 MW)

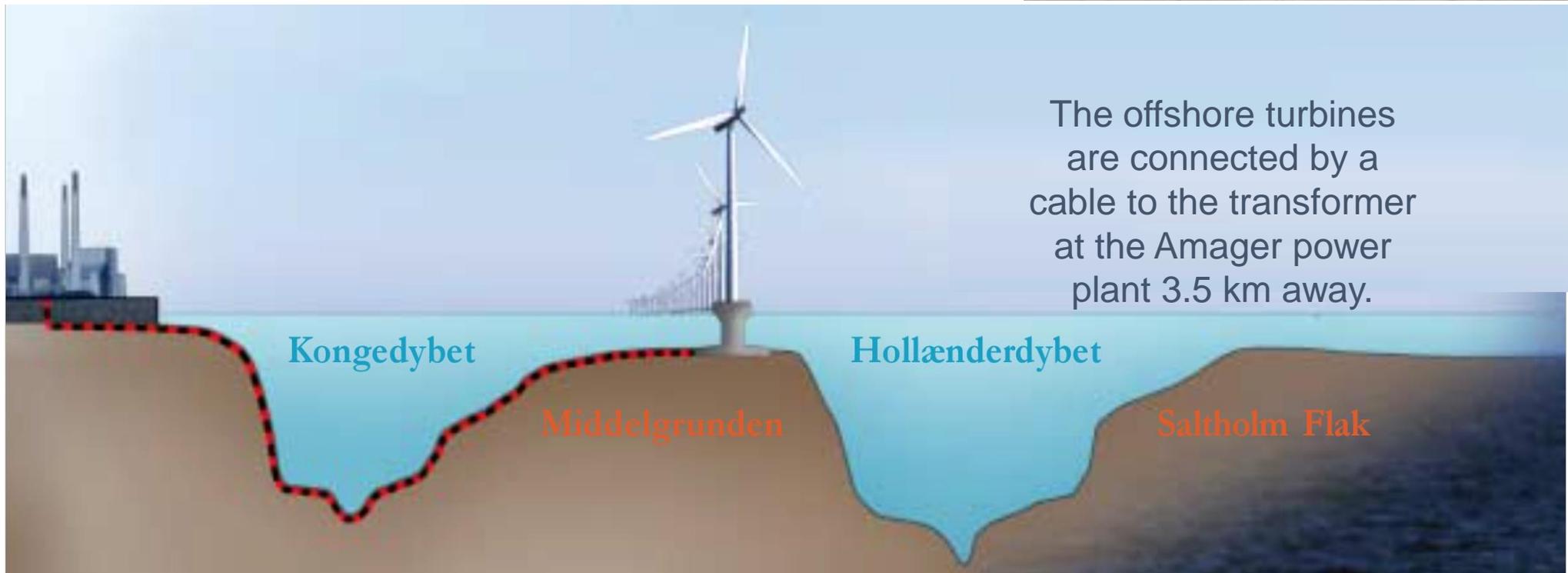
Committees

- Danish Wind Turbine Owners Association, board to 2018
- European Ocean Energy Association, vice president to 2011

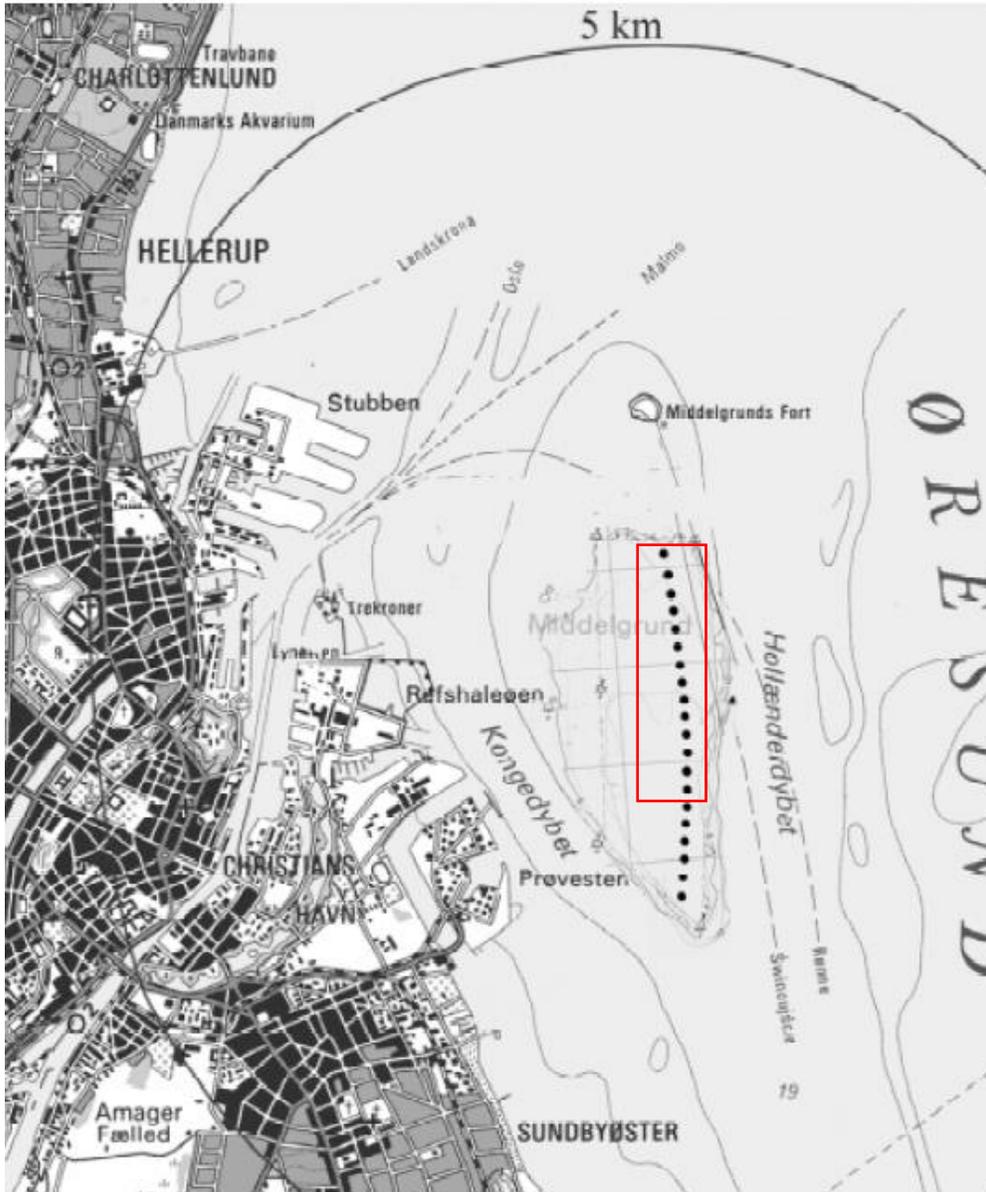
Middelgrunden - The Reef



- 3 to 6 m water depth
- The site: old waste disposal with some hazard materials
- Concrete foundation, gravity type



The planning process and public involvement



3 rows in the north part, 27 turbines –

Changed to one line over the whole length, 20 turbines

Why?

Public protests

Our closest 1997 – potential neighbor



Visual Impact - Two alternatives



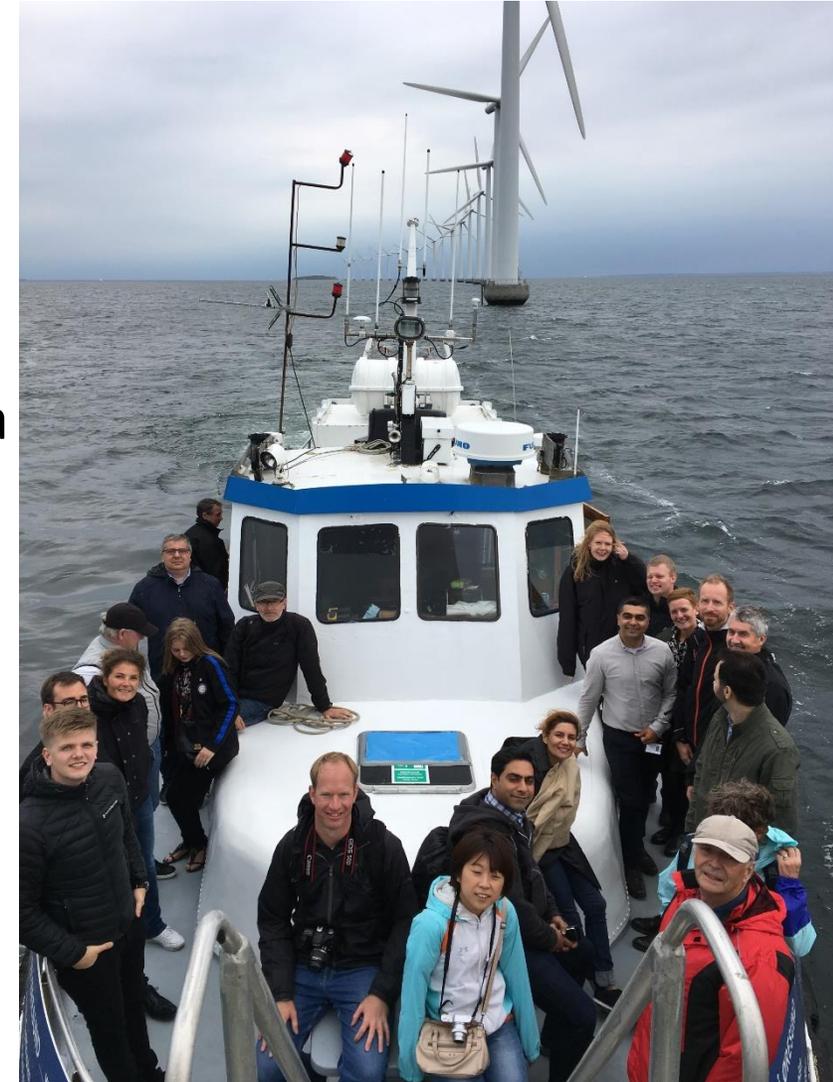
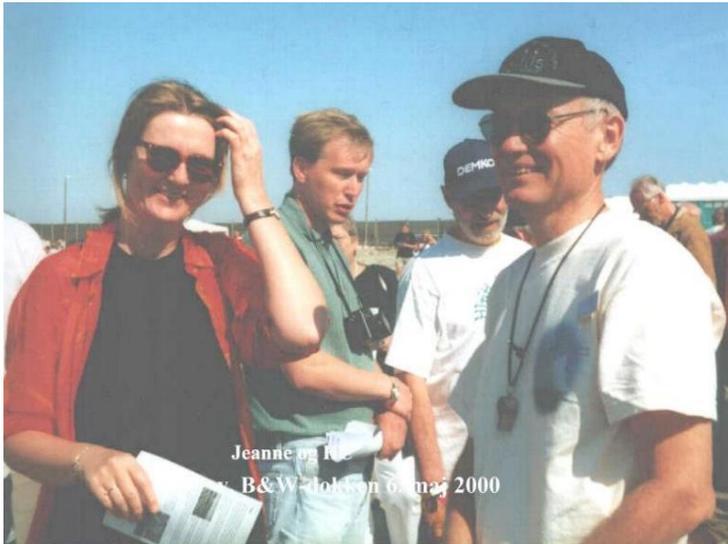
Visualization seen from the beach of Amager



Visiting the windfarm is an old tradition in Denmark

Since 2000 at Middelgrunden Wind

- We started already during the construction phase having 1600 people visiting the building site.
- Owners have been invited to visit their wind farm 3rd Sunday in June (windmill day).
- At the open day: we have 150-200 people every year on a sailing trip including climbing the turbine.





Why tourism in combination with offshore wind?

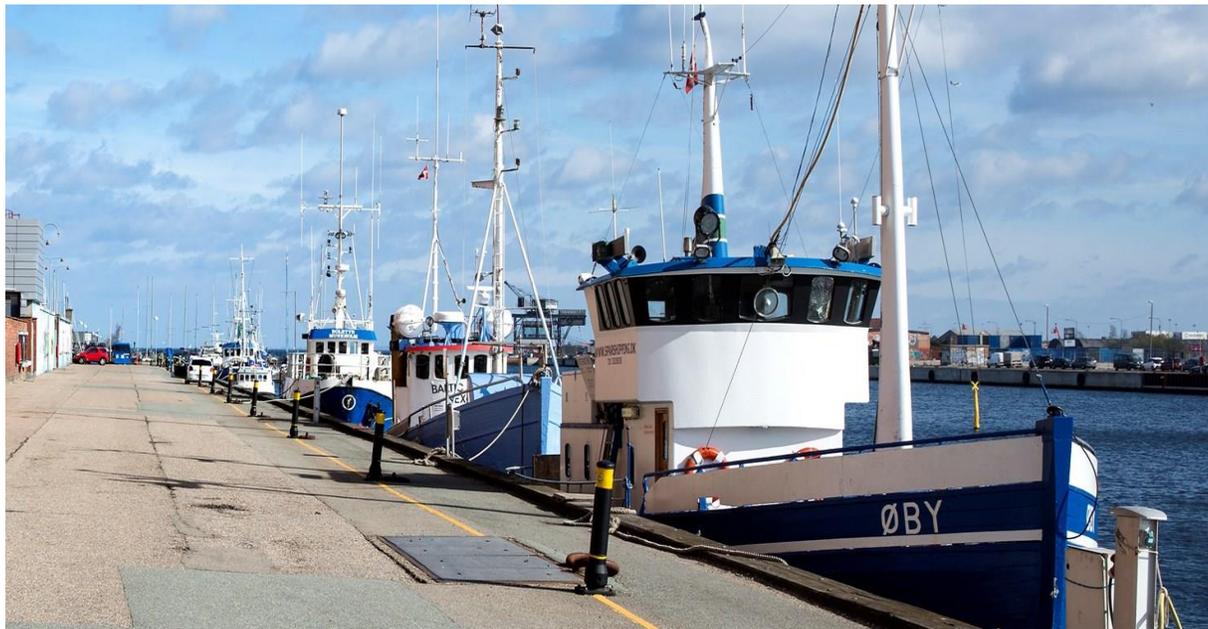
And whom could do it

- Promoting wind
 - The owner of the wind farm
 - An association related to wind or RE
- Boat operators and tourism agencies
 - Can add business to already existing boat and guided tours



What do you need

*Boat operators willing to invest a little
and
guides to tell the story*



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<p>Early Bird 🕒 60 min.</p> <p>Price Fighter Early Bird https://ribalex.dk/webshop/product/early-bird-en/?lang=en</p>	<p>Fifty-Fifty 🕒 120 min.</p> <p>Special Fifty-Fifty</p>	<p>Off-Shore Windmill Climbing 🕒 90 min.</p> <p>Special Offshore Windmill Climbing</p>
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Activities 2017-2023

Number of tours

Business	2017	2018	2019	2020	2021	2022	2023
Trips	31	35	48	4	13	75	90
Guests	676	930	1117	130	246	1687	1912
1.000 €	38,9	44,3	55,6	4,4	19,5	102,1	136,1

In 2022-23 50% of the tours included climbing.
 In 2017 - 2019 only 30% were climbing.





If visits are not possible

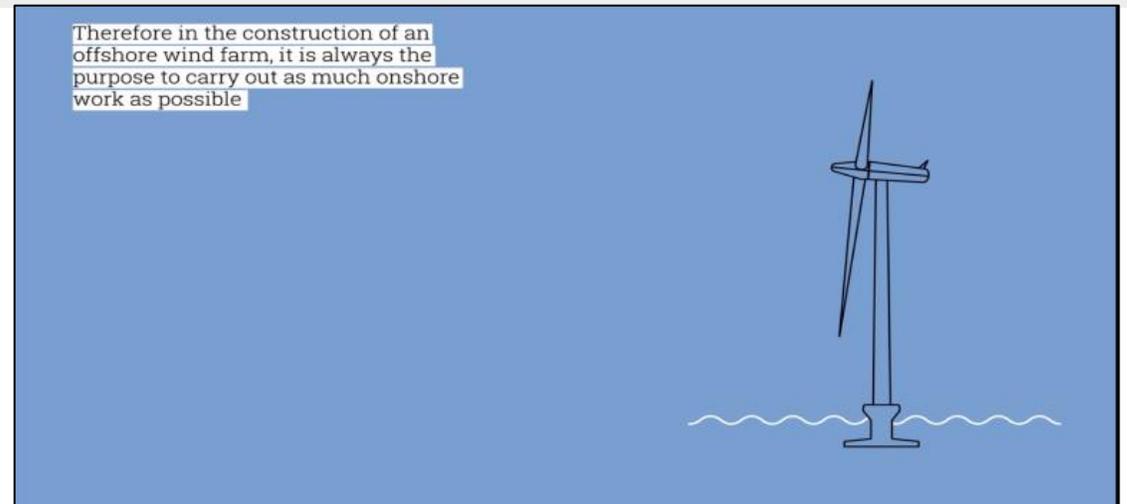
Virtual visits

Three videos in Danish and English about

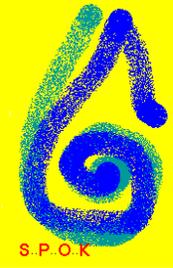
- The visit
- The construction



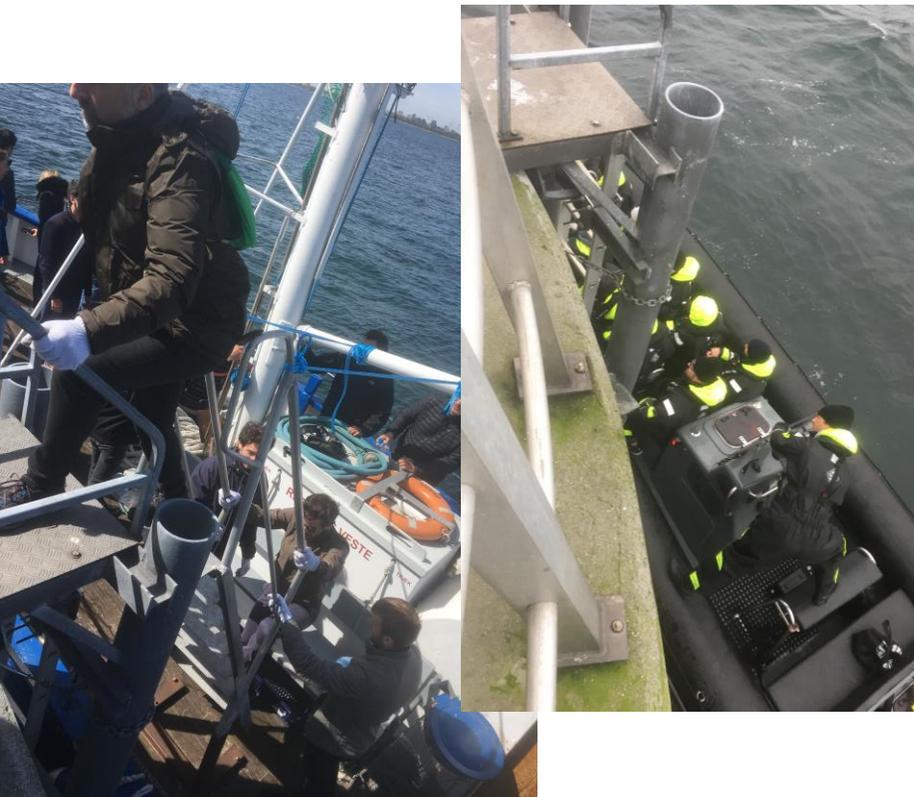
<https://www.h2020united.eu/pilots-denmark>



Offshore wind and tourism



- Slowly visits by shareowners every 2 years turned out to be tourism
- We had before UNITED 30 boat trips every year visiting – about 30% of them including climbing the turbine
- To develop further we are part of the UNITED project



Source: <https://www.h2020united.eu/>

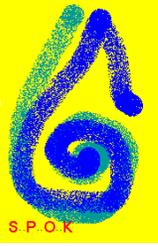
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European Union funded project as part of the Horizon 2020 Initiative : Grant Agreement 862915



Offshore wind and tourism

UNITED: societal interactions and engagement



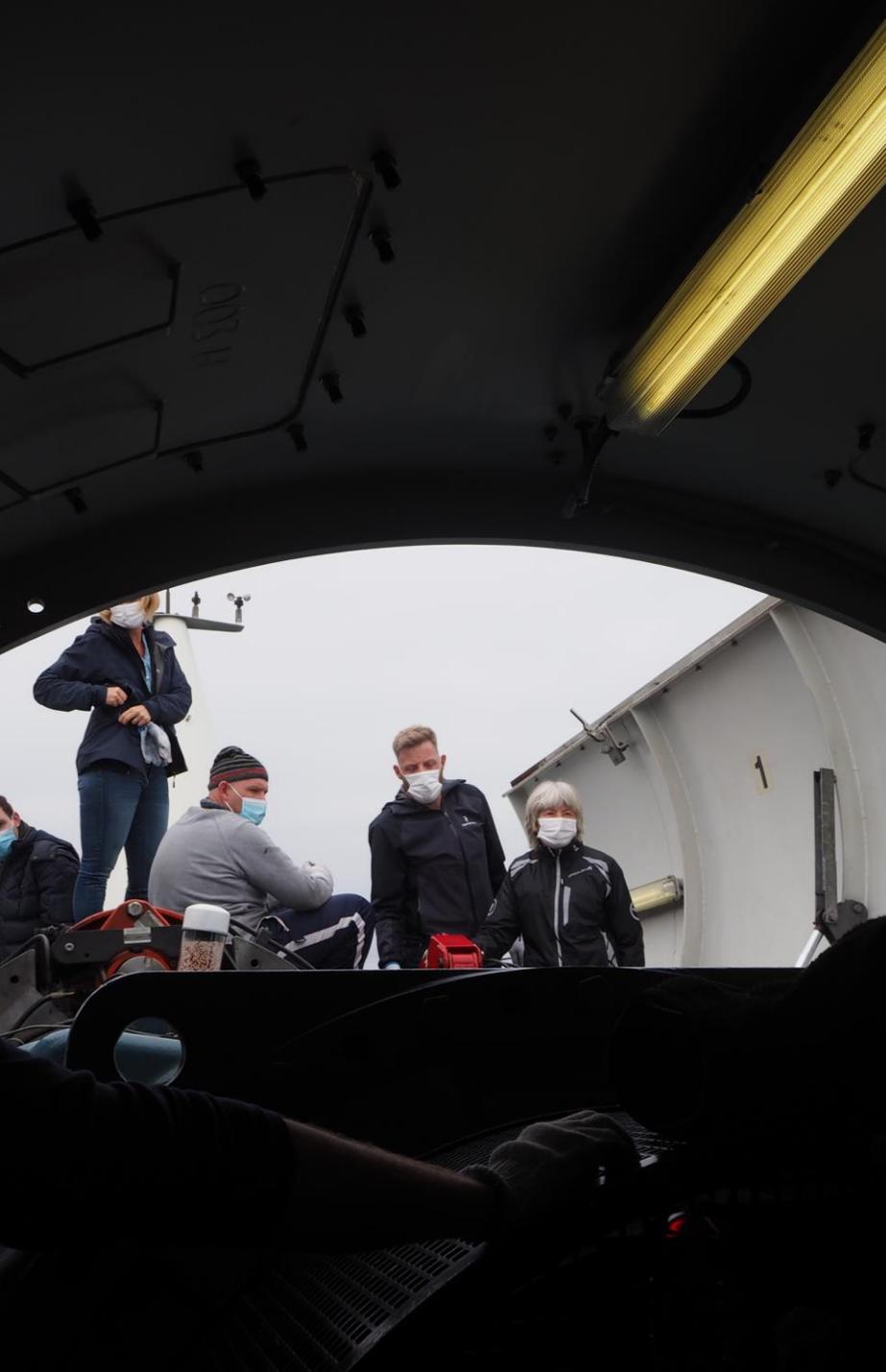
- 120 participants at open house September 20th, 2020 during the COVID-19

- New UNITED video at:

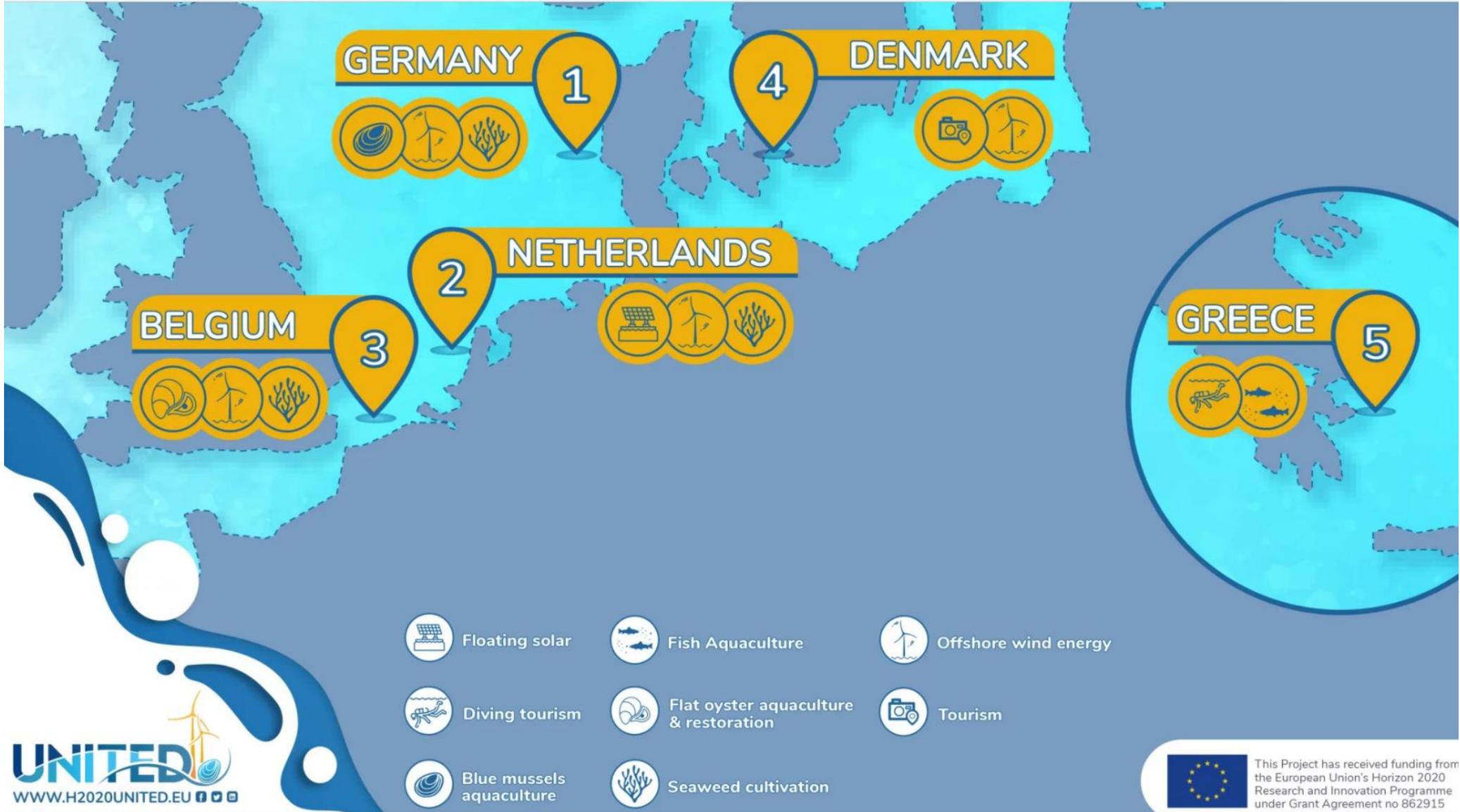
<https://www.youtube.com/watch?v=Lb5HDBWtzJQ&t=4s>



Mouth protection was a requirement



The UNITED demonstration Multi-Use Platform project



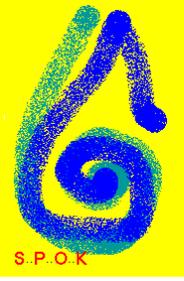
Source: <https://www.h2020united.eu/>

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The Perspectives of Multi-Use Platforms



- Space offshore is limited
- Synergies can be found

- Examples from other combinations than UNITED
 - ✓ MUSICA, multi-use use of space solutions for the small islands; <http://musica-project.eu/>

Source: <https://www.h2020united.eu/>



General Facts

- Total Installed Capacity: 40 MW
- 20 turbines
- 2 MW turbines of Bonus Wind Turbines (now Siemens Gamesa)
- Total expected power output: 90 – 100 GWh/y
- Provides about 3% of the electricity of Copenhagen
- Average wind: 7.2 m/s
- Estimated project costs: 45MEUR
- Final project costs: 48.55 MEUR



General Facts

Project Timeline:

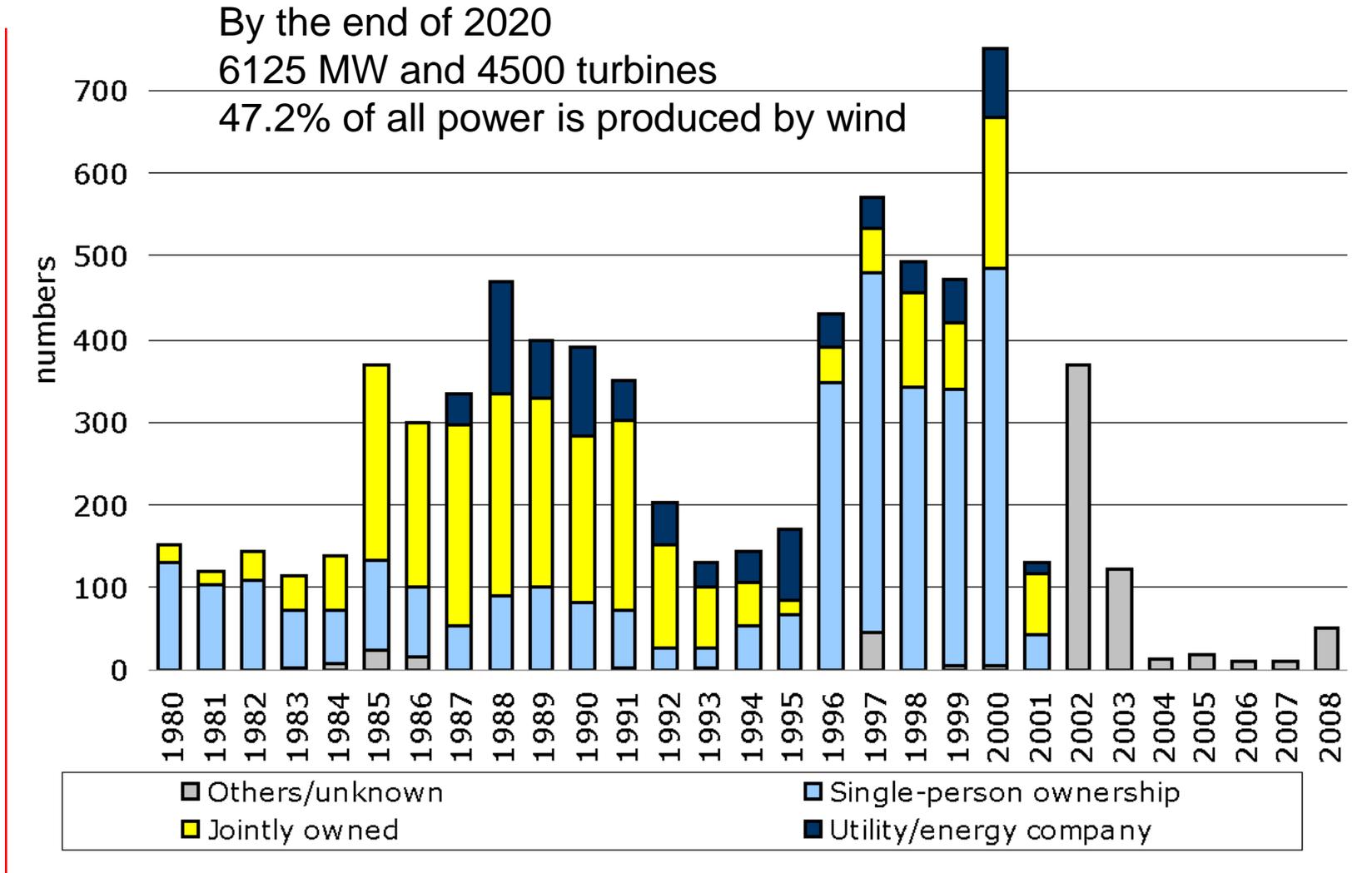
- **1996:** idea from Copenhagen Environmental Energy Agency and Project Application
- At the same time **Ørsted/HOFOR** had started own search for setting up a wind farm at the reef
- Agreement of a common group: the NGO and Ørsted to build and later split in two separate operational units
- **1997:** Middelgrunden Cooperative is formed
- **2000:** Construction starts
- First power generation in **December 2000**
- **2001:** Farm inauguration
- **Current Owners:** Middelgrunden Cooperative (8,500 people) and HOFOR



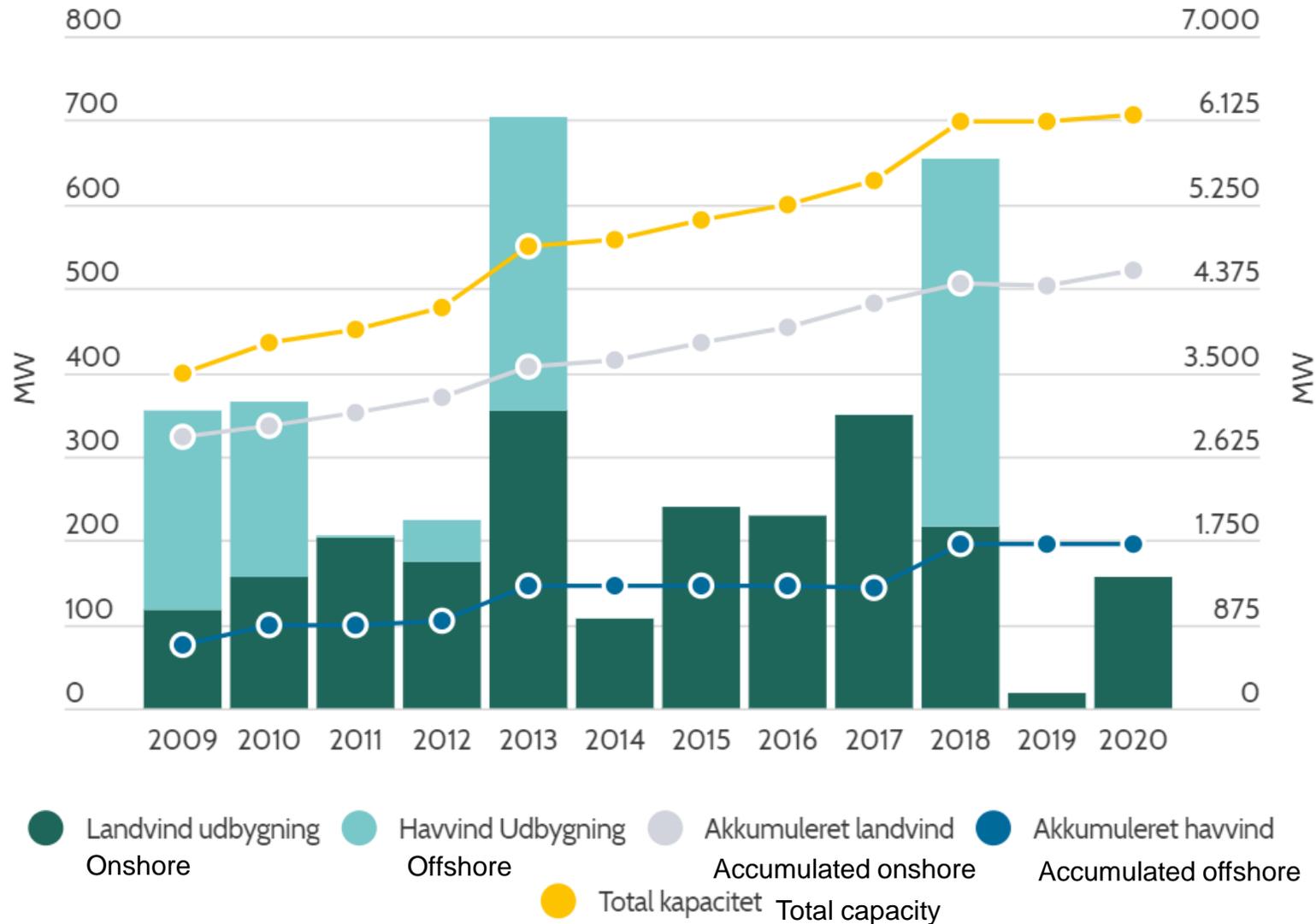
Wind energy to 2008



- The tradition for wind development in Denmark from 1980 to 2000: Local people took the initiative
- Utilities build only what government asked them to build
- In Copenhagen we joint with the local utility (political pressure and practical reasons)



The wind turbines in Denmark 2020



Source:
www.winddenmark.dk

The cooperative approach - Benefits



Advantages

- Local and earlier involvement
- Profit stays locally

Disadvantages:

- Upfront payment even before consents
- Dependency of manufacturers when no grants

Incentive for local people: From 2009-2018 onshore:

- Minimum 20% local ownership to be offered within 4.5km, thereafter to local county

Incentive for local people: From 2019 onshore (and near shore):

- Incentives to local people within a distance of 4-8 times the height of the turbine: about 670€/year depending of production from the turbines
- Incentives for local county: 11,812€/MW installed.

The Copenhagen cooperative projects



	Lynetten	Middelgrunden	Hvidovre	Prøvestenen
Year	1995/96	1996/2000	2007/2009/ 2011	2013
Power	7 x 600kW	20 x 2MW	3 x 3.6MW	3x2MW
COOP/Utility	4/3	10/10	1/2	1/2
Shares/owners	3,600/902	40,500/8,552*	10,700/2,268	4,055/1,800+
Price/share	604€	570€	670€	663€
Upfront work	Coop/Utility	Coop & Utility	Coop & Utility	Utility/Coop
Upfront payment	Coop/Utility	Grant/Utility	Utility	Utility
Cost	4.1mill€	49.5 mill€	22 mill€	8,07 mill€

* Today 7,899

COOP's in Denmark today



- Agriculture: about 50% ; 15-20% of Danish industry
- Shops: 42% of turnover; 35.000 people
- Water supply: 2.600 (330/2.300 public/private)

Energy:

- Power distribution: most companies
- Power production – wind 18% / 850 MW
- District heating : 460 plants
- Biogas COOP's: 190 plants