



## One of the Largest Off-shore Wind Farms in the World Powers 150,000 Danish Households

### City

Copenhagen, Denmark

### Population

1,401,883

### Project Start Date

2002

### Annual CO2 Reductions

660,000 tons

### Annual Financial Savings

NA

### Initial Investment

2 billion DKK roughly equivalent to \$348,997,504 USD

### Project Status

4th year of operation

### SUMMARY

The world's second largest offshore wind farm with a total capacity of 160 MW, enough to power 150,000 Danish households. Offshore turbines produce 150 percent more electricity than land-based turbines.

### WHAT IS IT?

Horns Rev is the second largest off-shore wind project in the world with 80 wind turbines and a total capacity of 160 MW located 14-20 kilometers into North Sea, off the west-coast of Denmark's Jutland Peninsula.

### ENERGY EFFICIENCY

The turbines produce an annual output of 600,000,000 kilowatt-hours, which corresponds to the consumption by 150,000 Danish households, nearly 2% of Denmark's total electricity consumption.

### HOW DOES IT WORK?

- Elsam, an independent transmission system operator, installed Horns Rev in 2002. Swedish Vattenfall bought out Elsam in July 2006 and today owns 60 percent of the facility, with DONG Energy owning 40 percent.
- Creating Farm:
  - Foundation is placed: a cylindrical steel pipe with a diameter of about 4 meters.
  - Wind turbines are mounted by means of large specially built vessels with submersible legs. A crane on the vessels lifts the turbines into place.
  - Wind turbines are connected via submersible cables to the offshore transformer substation, which collects the power.
  - The substation platform is designed as a tripod construction with a steel building placed some 14 m above mean sea level.

- After stepping-up to 150 kV, the power is conveyed to shore.
- Via a submarine cable, the substation is connected to the onshore power transmission grid.
- All households and industries in all cities and all rural areas are connected to the same grid from Sicilia to West Denmark (the continental transmission system).

### NEXT STEPS

The farm has a lifetime of 25 years. The farm has been in operation for 4 years so it has not financially broken even yet. Projected to earn profit at the end of farm's lifespan.

### APPLICATION

- Location must have:
  - Good soil conditions for the foundations
  - Shallow water
  - Good wind potential
  - Short distance to the grid
  - No other stakeholders who has great interest in the area (shipping, leisure, air traffic, oil and gas)
  - No environmental issues (birds, fish issues, visual impact)
  - A government process for the pricing of the renewable electricity produced

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