

Inventory and Analysis of Impacts of Power Plants in the Wadden Sea Region – Presentation of Results 16.06.2009 –

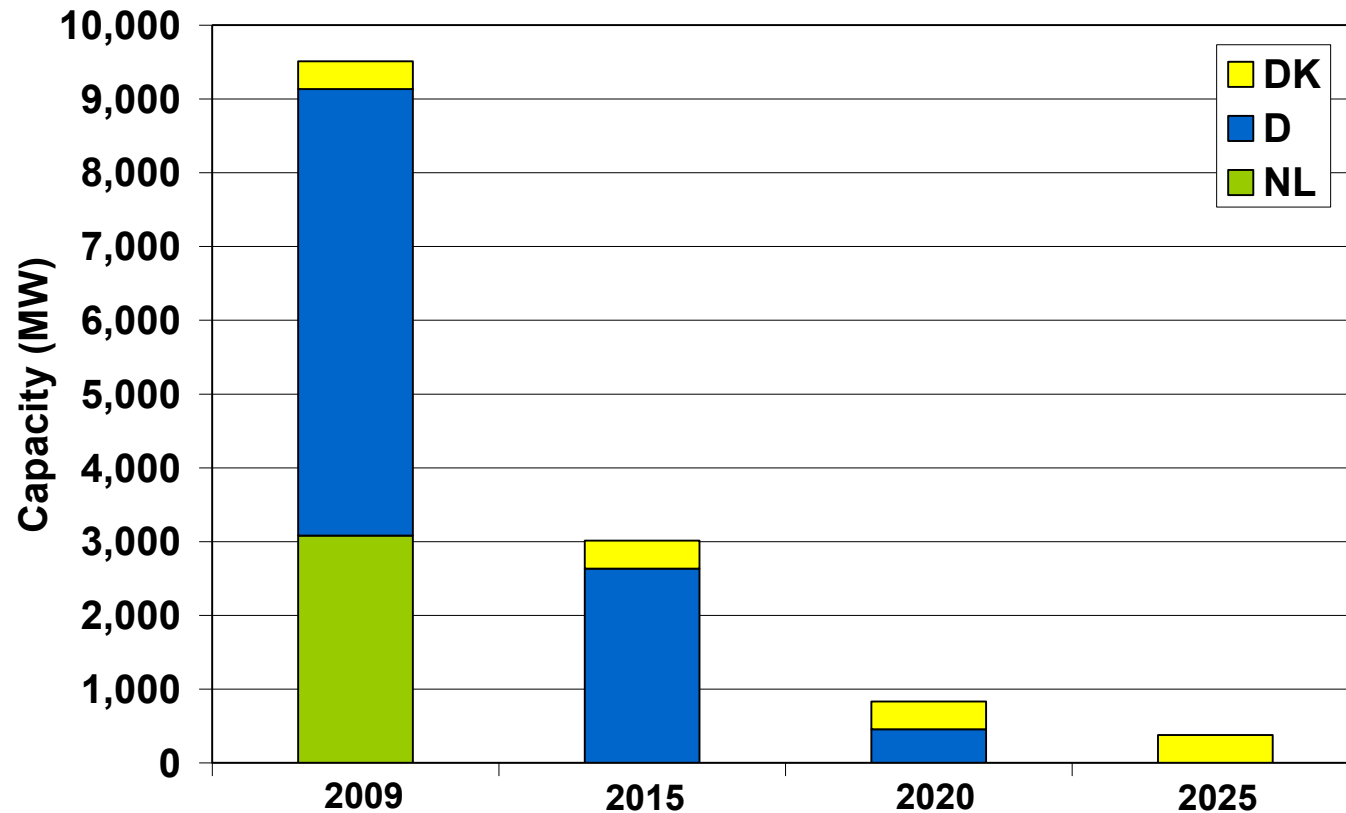
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1. Objectives of the Research
2. Inventory and Analysis of Power Plants in the Wadden Sea Region (WSR)
3. Sustainable Electricity Supply in the WSR
4. Employment Effects
5. Effects on Energy Relevant Sectors
6. Summary

Objectives of the Research

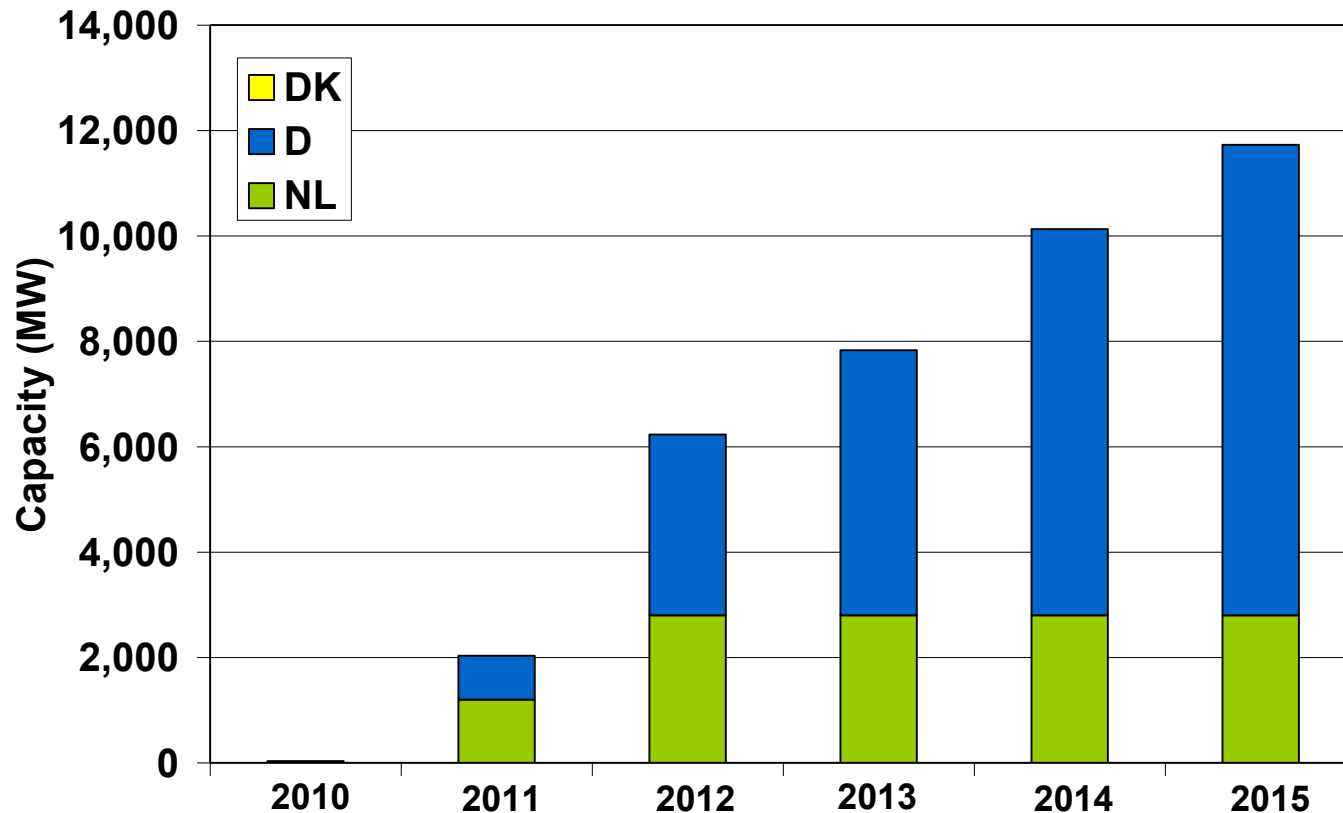
1. **Inventory and analysis of all existing and planned power plants in the Wadden Sea Region (WSR) and the adjacent Southern North Sea Exclusive Economic Zones (EEZs)**
2. **Assessment of the development of electricity consumption and sustainable electricity supply in the WSR**
3. **Evaluation and assessment of potential impacts and economic consequences of electricity production in the WSR**

Conventional Power Plants: Installed Capacity



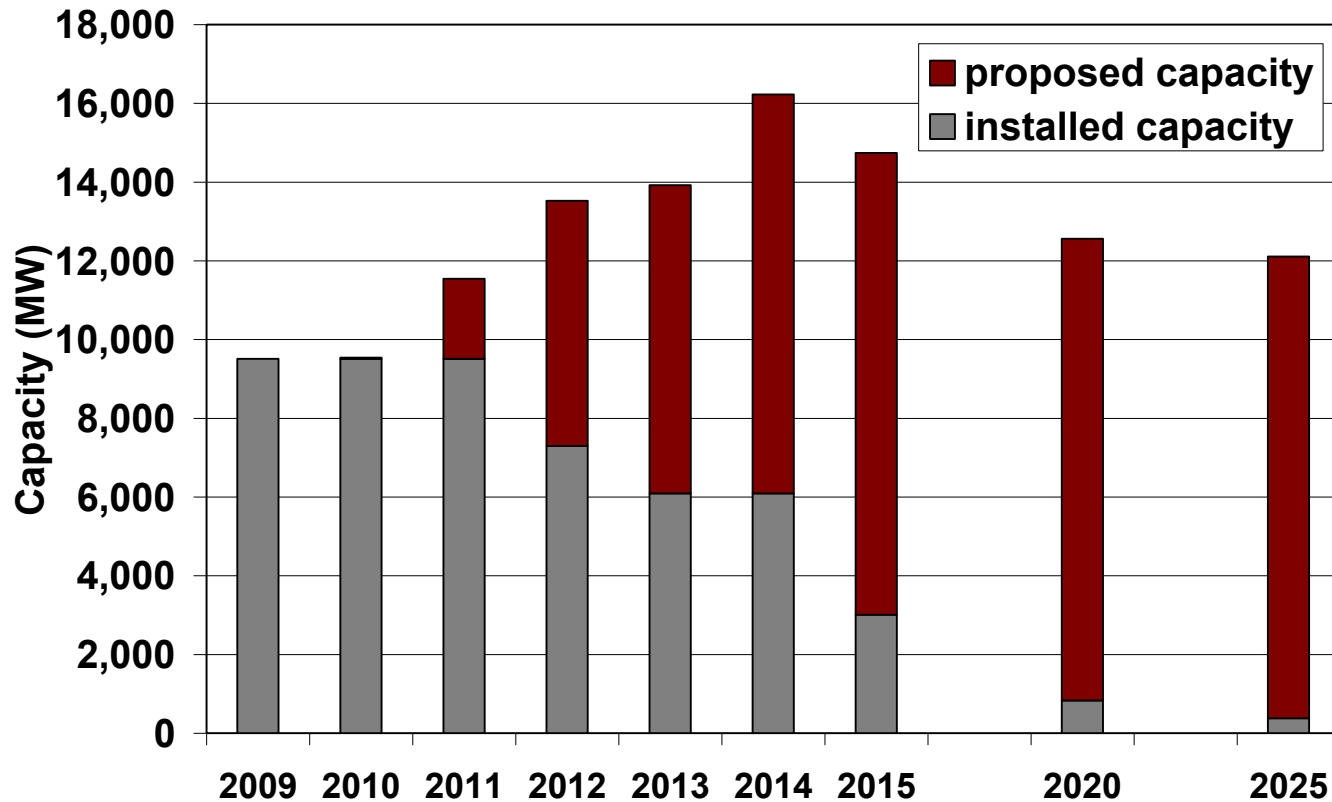
Conventional power plants in operation – development of installed capacity in the WSR until 2025

Conventional Power Plants: Expected Capacity



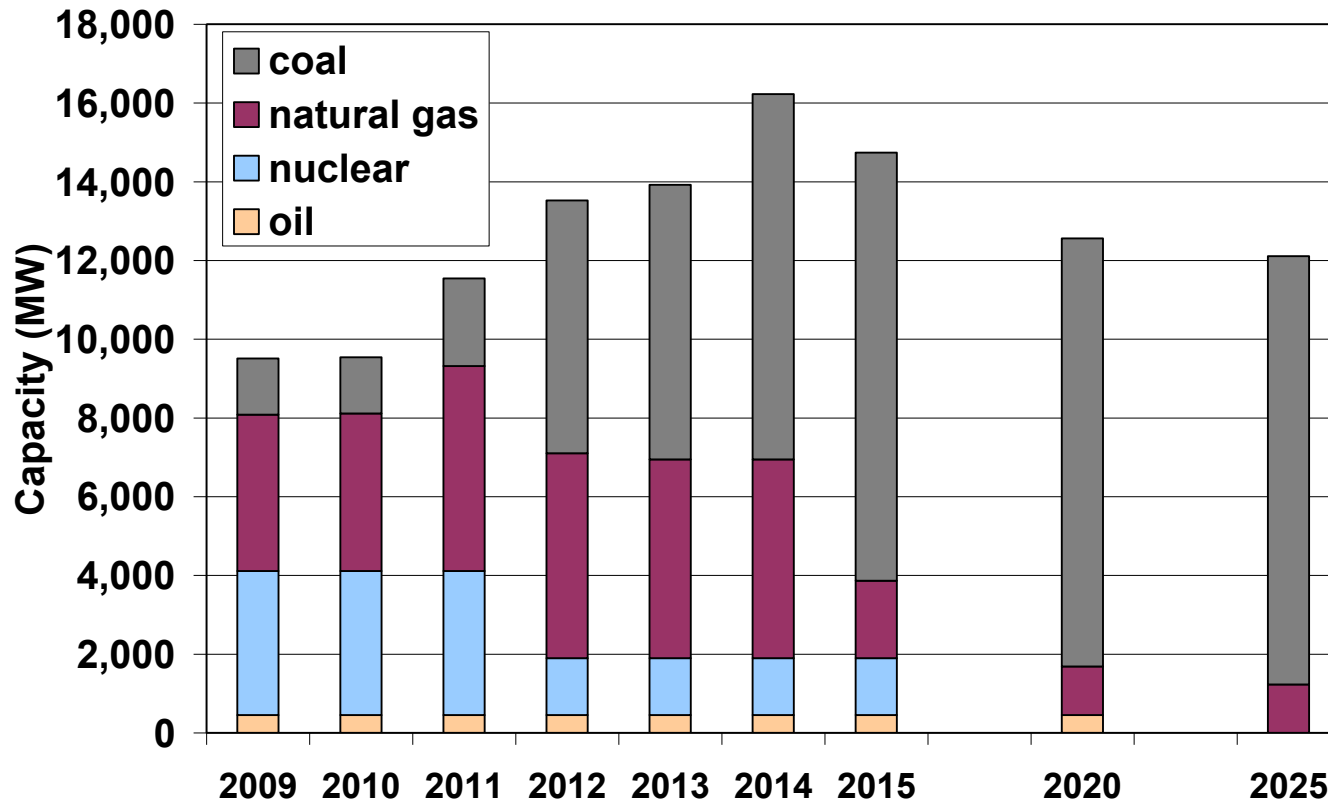
Conventional power plants in planning – development of expected capacity in the WSR until 2015

Conventional Power Plants: Total Capacity



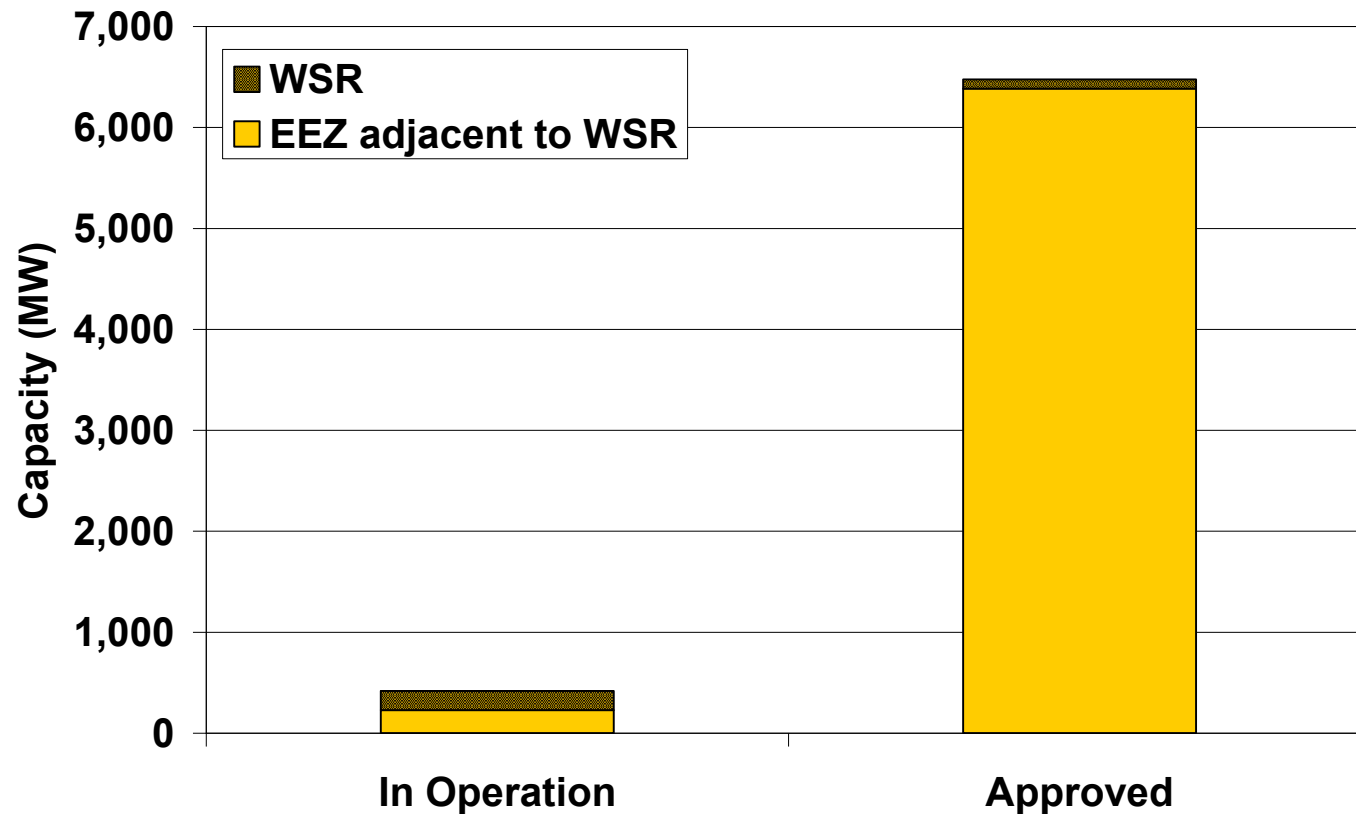
Conventional power plants – development of capacity in the WSR until 2025

Conventional Power Plants: Energy Sources



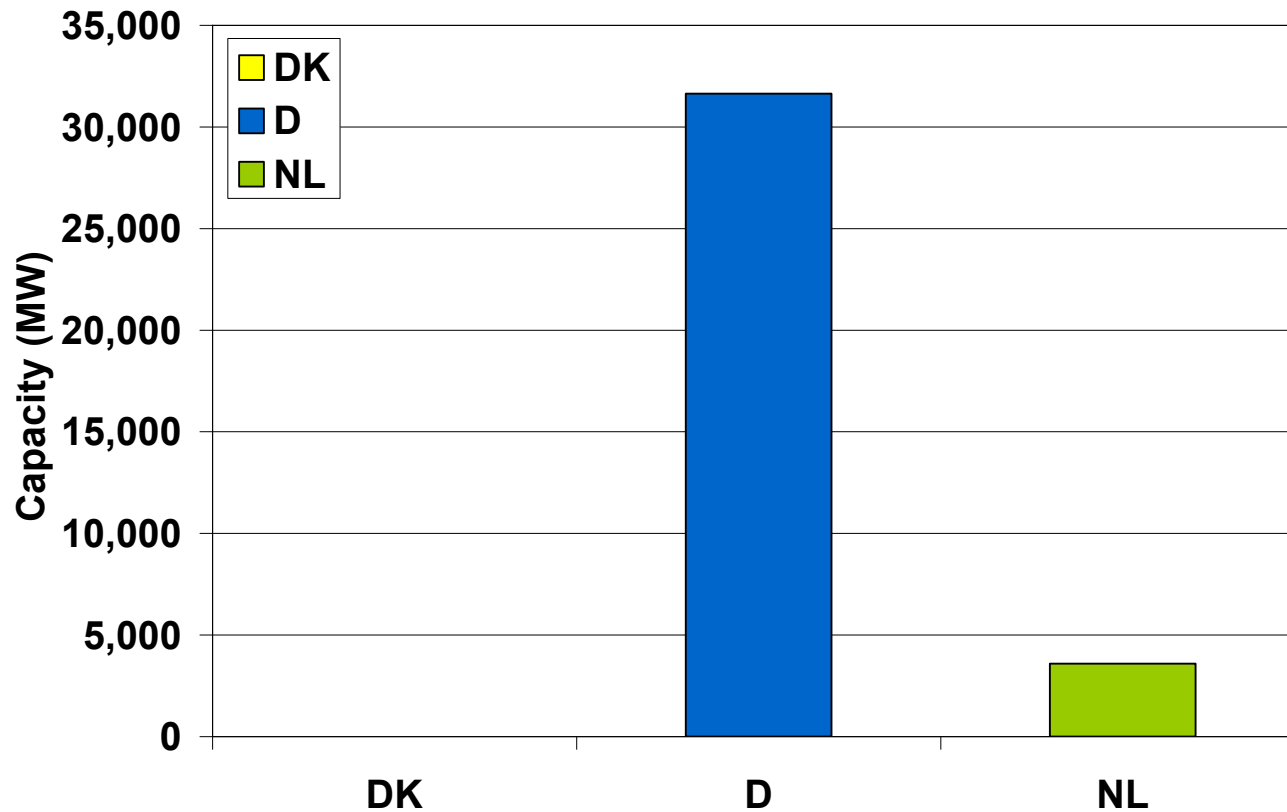
Conventional power plants – shares of energy sources in the WSR until 2025

Development of Offshore Wind Farms – I



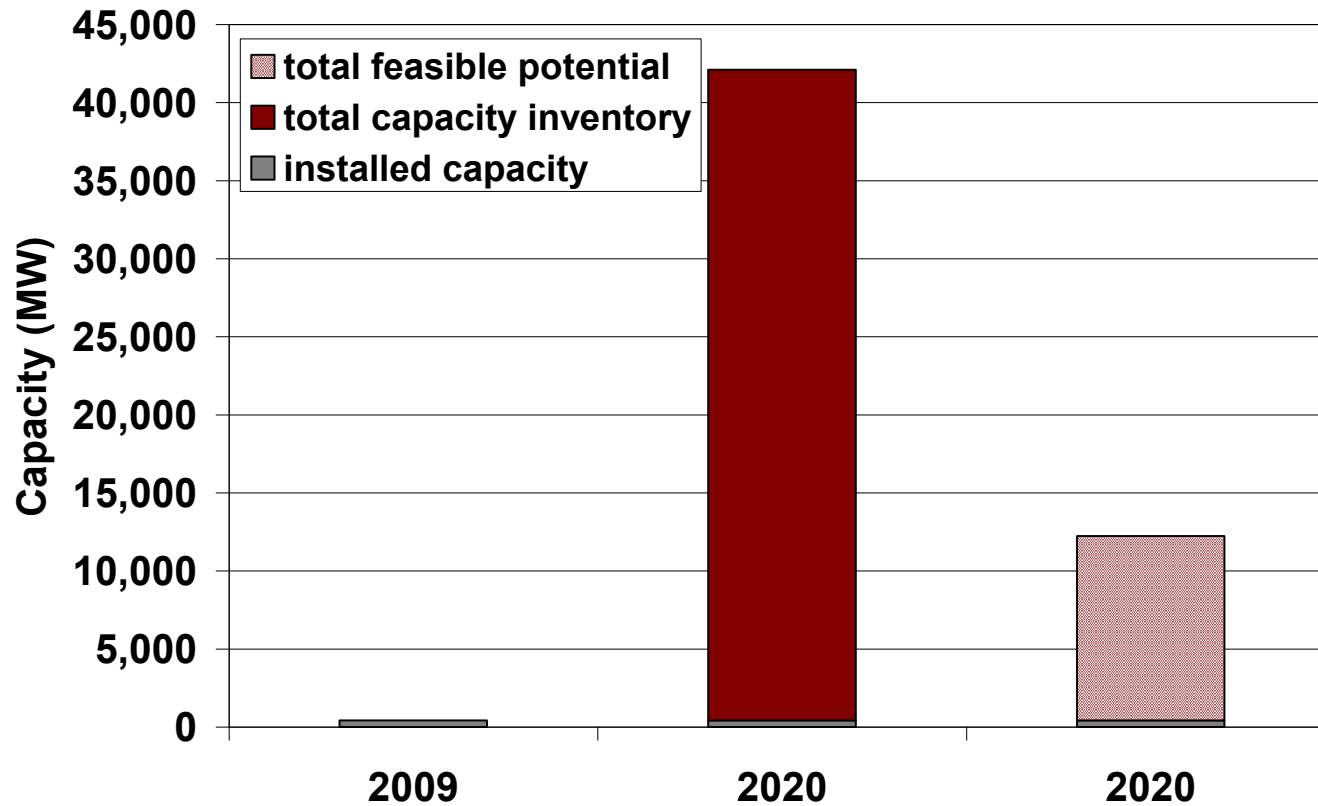
Development of approved offshore wind farms in the WSR and in the EEZs adjacent

Development of Offshore Wind Farms – II



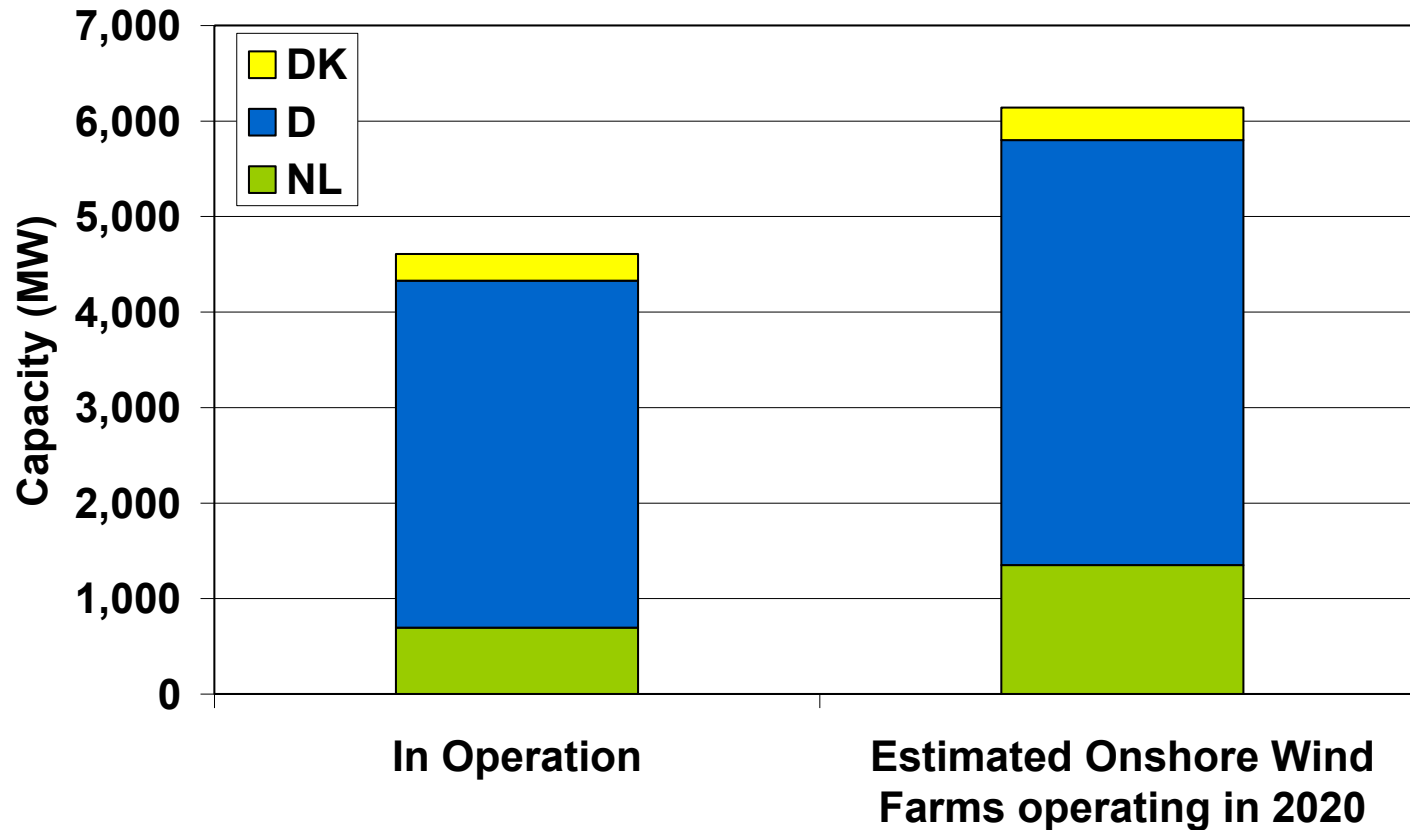
Announced offshore wind farms in the WSR and in the EEZs adjacent

Development of Offshore Wind Farms – III



Offshore wind farms – development of capacity in the WSR and in the EEZs adjacent until 2020

Development of Onshore Wind Farms



Development of onshore wind farms in the WSR

Feasible Power Plant Capacities until 2020

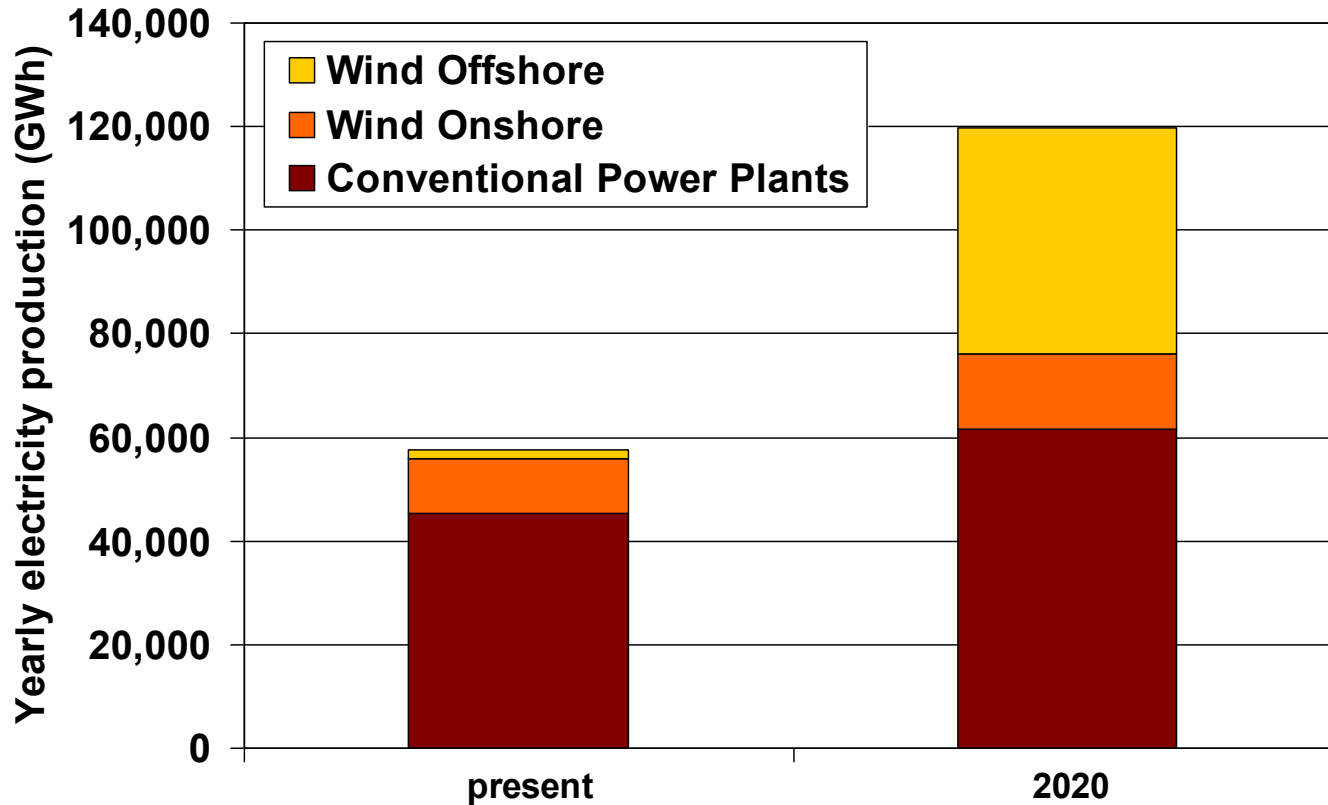
Total potential according to inventory until 2020

Total WSR	Conventional Power Plants	Onshore Wind Farms	Offshore Wind Farms	Overall result
Capacity (MW)	12,560	6,140	42,100	60,800
Proportion	21%	10%	69%	100%

Total feasible potential until 2020

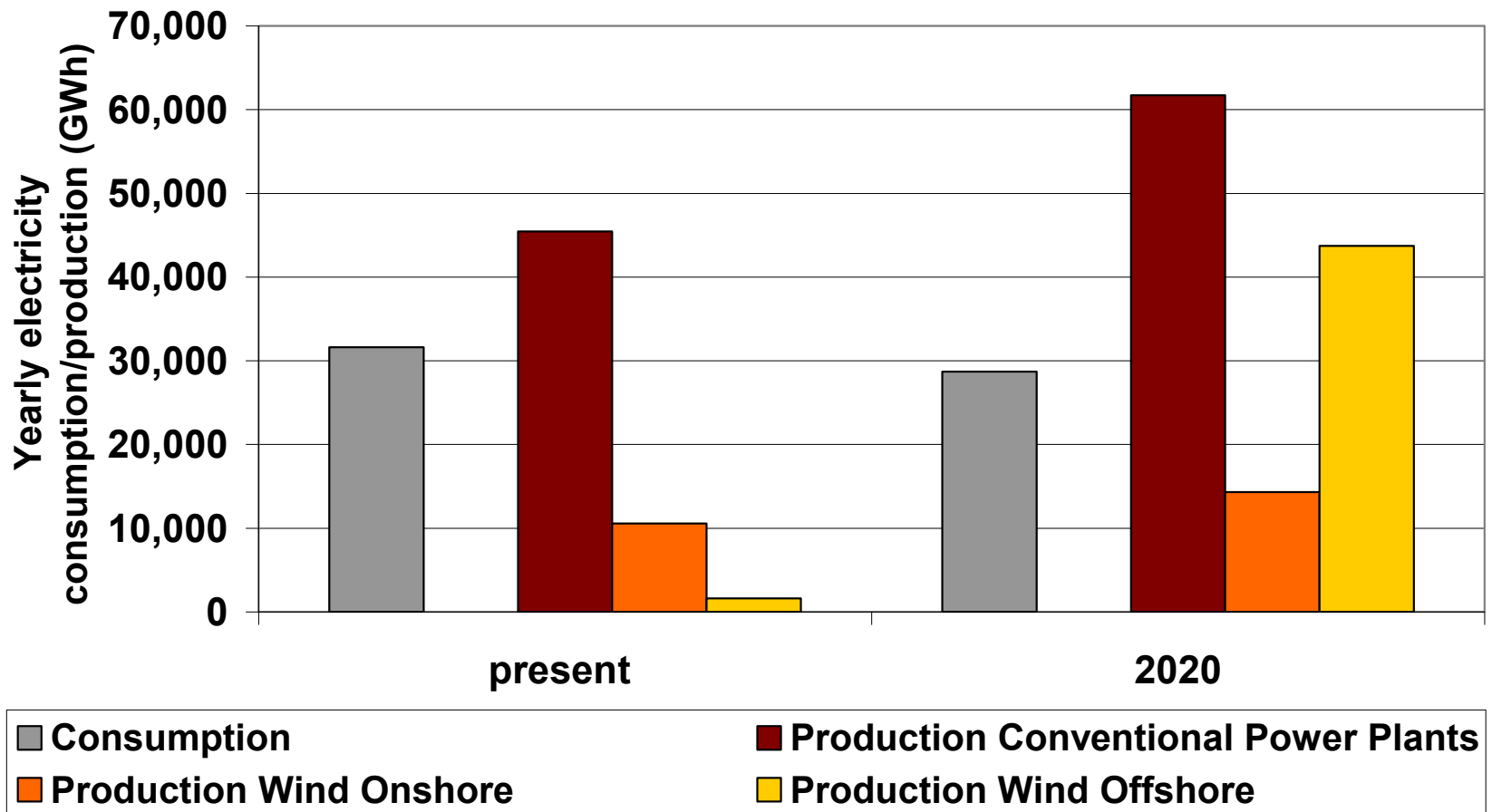
Total WSR	Conventional Power Plants	Onshore Wind Farms	Offshore Wind Farms	Overall result
Capacity (MW)	10,960	6,140	12,230	29,330
Proportion	37%	21%	42%	100%

Electricity Production in the WSR



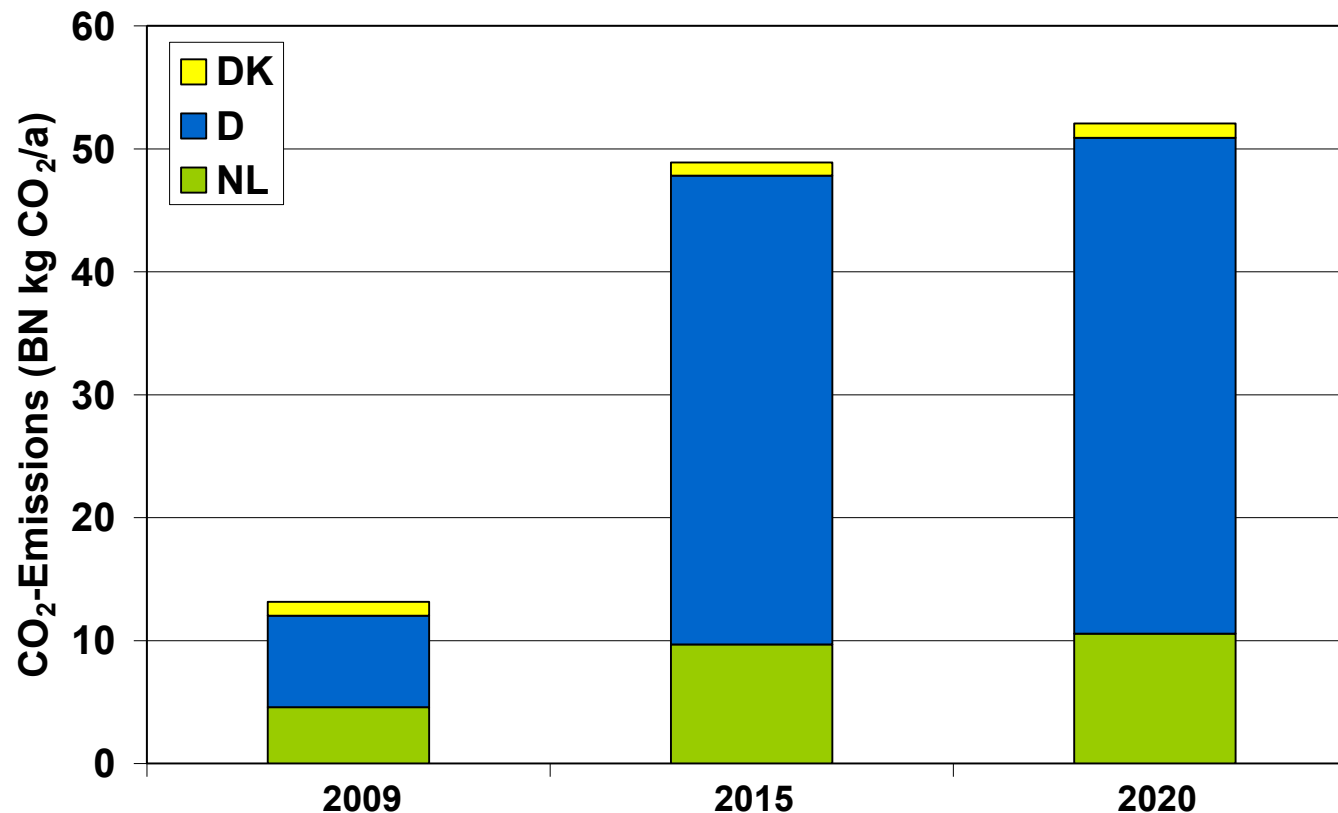
Estimated yearly electricity production in the WSR by type of power plant: present and 2020 (GWh)

The WSR: Export of Sustainable Electricity?



Electricity consumption and electricity production by type of power plant in the WSR 2009 and 2020 (GWh)

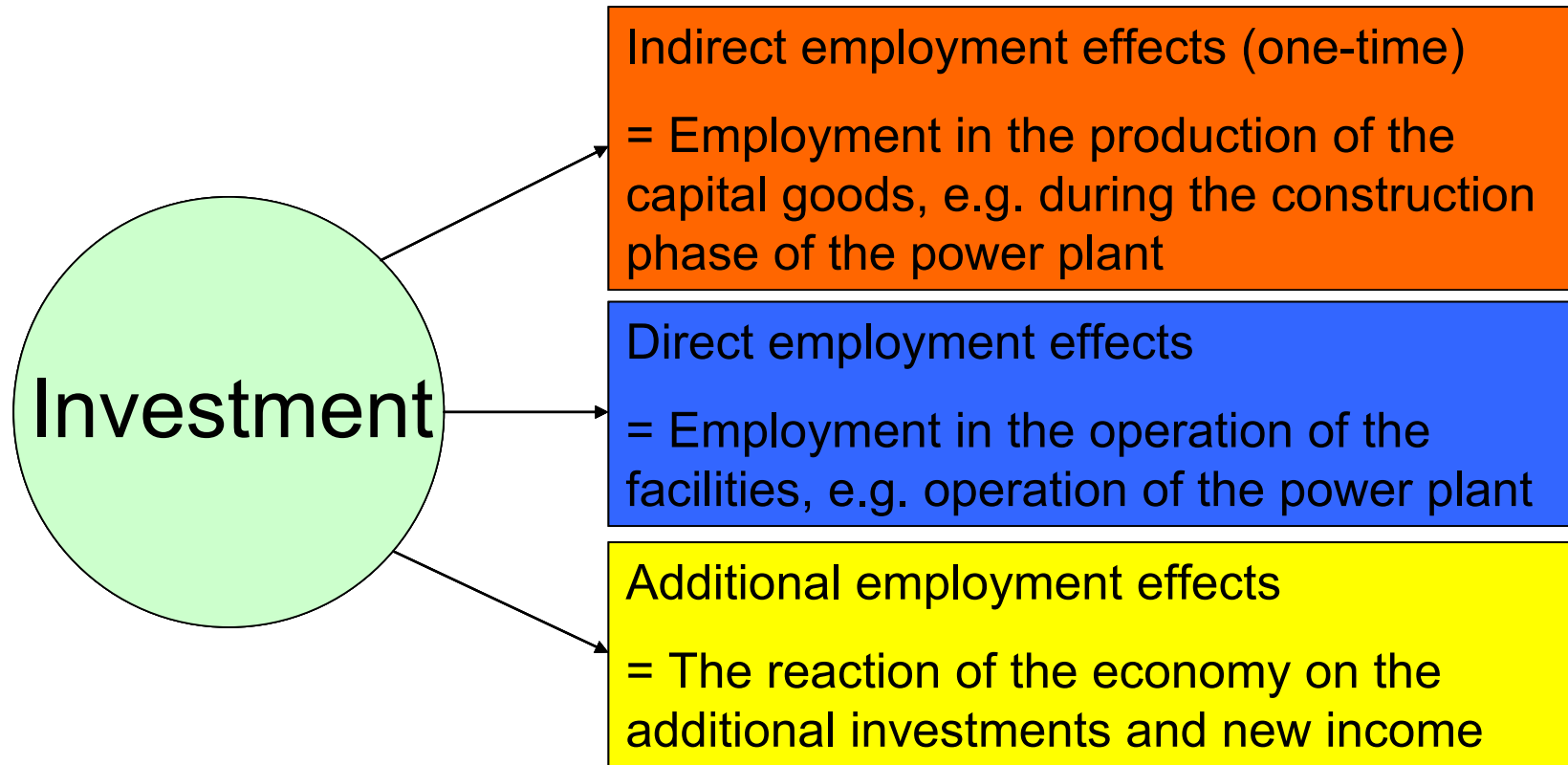
CO₂-Emissions from Electricity Production



CO₂-emissions until 2020 from electricity production in the WSR

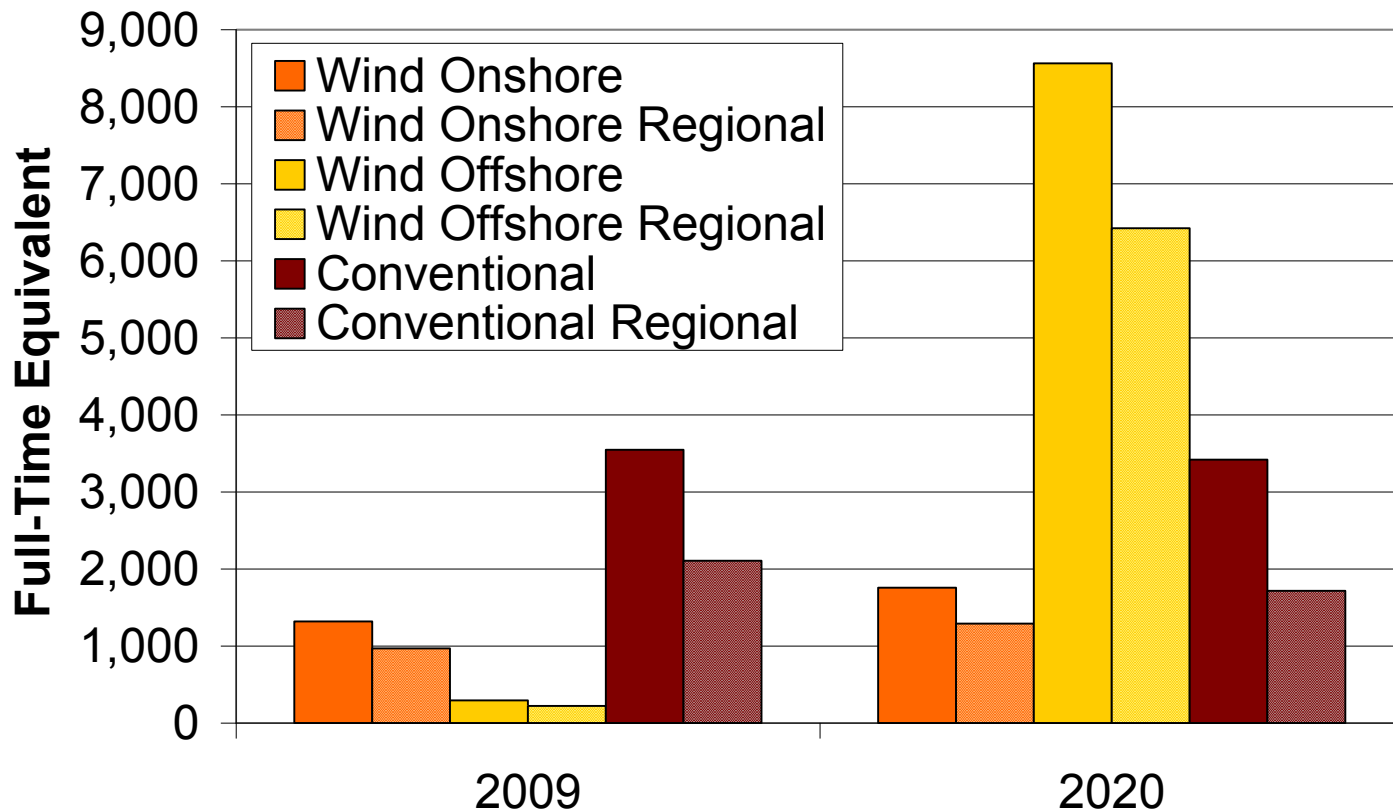
Employment Effects: Theory

Three types of employment effects:



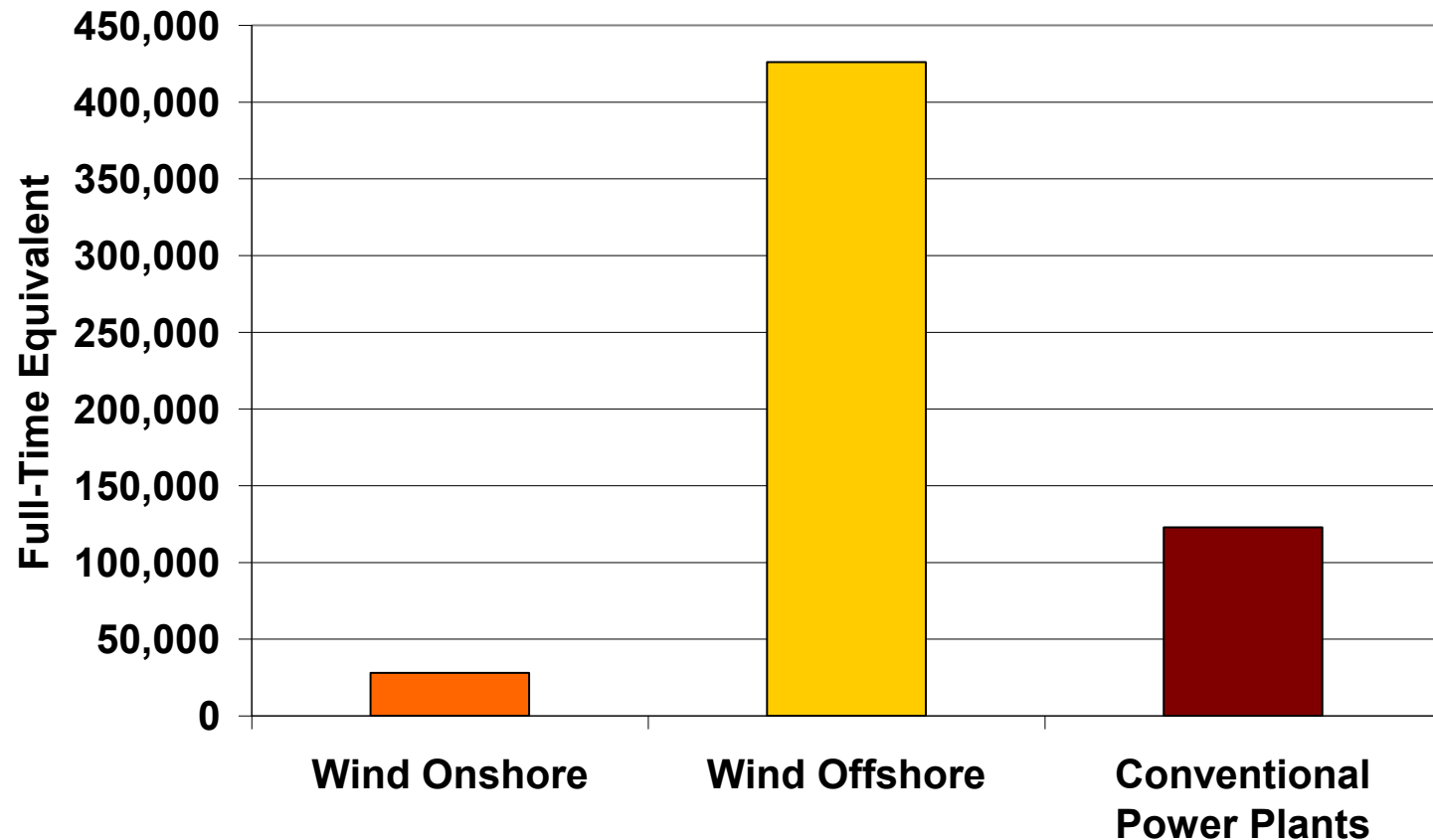
- Concentration on the direct and indirect employment effects
- Additional effects were not included in the study

Direct Employment Effects



Direct employment effects due to the operation of onshore and offshore wind farms and conventional power plants in the WSR 2009 and 2020

Indirect Employment Effects



Indirect employment effects from the construction of new conventional power plants (2009–2015) and the development of onshore and offshore wind farms (until 2020)

Effects on Energy Relevant Sectors: Infrastructure

- Increasing importance of offshore wind energy
→ growth of logistics, transport and supply
- Difficulties in transport of big and heavy offshore wind energy plant components
- Transfer of OWF production to seaside or transport via inland water routes (rivers/canals)
- Need to expand current harbour infrastructure and special transport infrastructure
- Significant increase in the coal fired conventional power plant capacity expected
- No significant increase of shipping transport due to resource supplies for coal power plants

Offshore wind energy: An important business field for harbours

- Expansion of offshore harbour infrastructure
 - New industrial areas for producers of turbines and suppliers
 - Expanded infrastructure for maintenance and service
- Harbour competition for offshore contracts
 - Competition among domestic and foreign harbours
 - Specialisation on different steps of the value added chain
- Emergence of “offshore sea harbours”
 - Distance of new OWF from the coast will increase
 - Demand for “support bases on the open sea”
 - Cost reductions in construction and operation of OWF
 - Offshore harbours: also emergency and recreational harbours

Effects on Energy Relevant Sectors: Shipping

Competition for areas between OWP and sea transport sectors

- Area Restrictions for shipping routes
- Relocation of the shipping routes

Danger for the safety on sea

- Increased crossings between construction and shipping traffic
- Increased risk of collisions

Measures reducing the risk of collisions

- Risk analysis in the approval procedure
- Improved security measures on the ships (e.g. double hull)
- Intensive monitoring (radar, Automatic Identification Systems, etc.)
- Entry of OWF into maps, signalisation, construction measures

Establishment of emergency plans

- Emergency measures, capacities and management
- Safety and security concepts introduced by wind farm operators

Construction and operation of specialised ships

Possible Sources of Conflict

Potential conflict partners

- Politics and administrations (local, regional and national level)
- Shipping and fishery industries (area use)
- Other interests present in the WSR (army, coast protection, etc.)

Implications on construction and operation of power plants

- Delays in the approval procedure
- Restrictions on the construction projects
- Delays in grid construction and in grid connection of power plants
- Profitability losses (due to financing, high restrictions, etc.)

Challenges for the WSR

- Ability to avoid, resp. solve these conflicts
- Balancing and integration of economic/social and environmental concerns
- Development und application of sustainable strategies

Summary

Drastic increase of electricity production capacities

- 2009: 14,540 MW (80% conv.) → 2020: 29,330 MW (50% conv.)
- ➔ Increase: offshore wind: 2020: 41,700 MW (planned) 12,230 MW (feasible)

Increasing electricity export from the WSR

- Production/consumption: 2009: 2:1 → 2020: 4:1
- Share of WSR production in consumption of the WSR-states: 20% in 2020

Chances – WSR – producer of sustainable electricity

- On- and Offshore: 2009: 12,200 GWh → 2020: 58,000 GWh
- Share in production in WSR: 2009: 20 %; → 2020: 50%

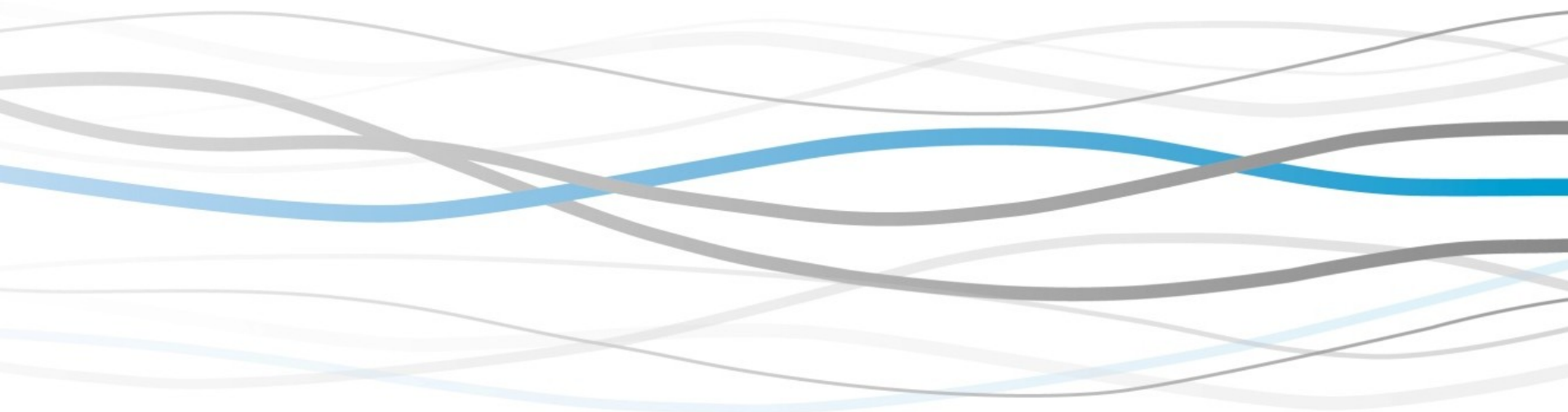
Chances – more employment in WSR

- Direct employment: 2009: 5,200 FTE → 2020: 13,700 FTE
- ➔ 2/3 of newly created working places expected within the WSR: 9,400
- Indirect employment: from 2015: 50.000 job positions, 50% in WSR

Risks

- Uncertainty factors: grid expansion, success of first offshore wind farms
- WSR-Challenges: strategies for conflict resolution (e.g. shipping, tourism)

Thank you for your Attention



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