Pressemeddelelse

Randers, den 10. januar 2007
Pressemeddelelse nr. 1/2007

Vindkraft er konkurrencedygtig

En nylig analyse udarbejdet af Emerging Energy Research (EER) på vegne af Vestas Wind Systems A/S konkluderer, at ud fra en analyse af økonomi og risici ved fremstilling af elektricitet kan vindteknologi ikke længere marginaliseres i energimikset. For at sikre en renere og mere balanceret energiforsyning i fremtiden bør vindkraft således indtage en større rolle i elforsyningen.

Analysen (engelsk udgave vedlagt) kommer frem til følgende resultater:

- I en verden der skal begrænse sin CO_2-udledning, kan vindkraft være konkurrence-dygtig med flere konventionelle teknologier til produktion af el afhængigt af prisen på udledningen af CO_2. EER's analyse vurderer prisen på CO_2-udledning til at være 30 euro pr. 1.000 kg.

- Meget af den produktionskapacitet, som vi i dag bruger i Europa, er mere end 20 år gammel og er som sådan fuldt afskrevet, og denne analyse er derfor interessant, da den foretager en lige sammenligning mellem nyetablerede vindkraftværker og nyetablerede konventionelle kraftværker.

Når alt tages i betragtning er vindkraft et glimrende supplement til det nuværende energimiks, da vindkraft øger elforsyningen, reducerer forbruget af konventionelle energikilder, har minimal eller ingen CO_2-udledning og er en uudtømmelig lokal ressource.

Evt. spørgsmål vedrørende denne pressemeddelelse bedes rettet til Peter Brun, Senior Vice President for Governmental Relations, telefon 9730 0000.

Med venlig hilsen
Vestas Wind Systems A/S

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emerging energy research

Vestas

Comparative Costs of Energy

Coal, CCGT, Wind

6 October 2006

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About the Economic Comparison

- Three price scenarios have been provided: Low Case, Base Case, and High Case. For each of these scenarios, the price of electricity includes and excludes a €30 carbon penalty for the generation of CO_2 from fossil fuels.

- Estimates of the cost of electricity have been calculated using EER's in-house financial model. Our assumptions, presented in the following, are derived from various industry sources and internal judgments.

- The information provided is based on our estimates of the cost of building a new facility in continental Europe. Actual plant costs can vary significantly based on technology, supplier and location.

- Low and high cost scenarios define a broad range of market conditions to reflect price sensitivity to changes in capital, operating, commodity and fuel costs.

- Economics exclude the potential impact of financial distorters including grants and subsidies. Our assumptions also exclude the cost of land and taxes.

Key considerations in anticipating future electricity production costs

- **Natural Gas - CCGT**
  - Fuel prices will be the single most critical factor contributing to the cost of electricity from new build CCGT plants.
  - Efficiency of new CCGT plants is improving, in some cases exceeding 55%, with the industry targeting 60% in the short- to-medium term.
  - Increased commodity prices and more advanced NOx control systems are adding to the investment cost of newer facilities.

- **Wind**
  - Industry scaling and technology improvements have reduced capital and operating costs significantly over the last decade.
  - Supply chain shortages and increased commodity prices have led to increased capital costs over the last 2-3 years.
  - As the industry adjusts to greater demand globally, capital costs are expected to retrench somewhat.
  - Costs are very site specific with costs impacted strongly by wind speed and variability.
  - Wind can have relatively short planning and construction times helping to reduce overnight capital costs incurred and planning risk compared with other generation projects.

Key considerations in anticipating future electricity production costs

- **Pulverised Coal Combustion**
  - New build coal in Europe must meet the EU Large Combustion Plant Directive (LCPD), which requires Flue-Gas Desulphurization (FGD) increasing the cost of new plants over those built in the previous decade.
  - The efficiency of new combustion plants is improving, approaching 40%, helping to offset higher capital and fuel costs.
  - Plant performance, and sensitivity to fluctuating carbon prices, will be impacted by the quality of coal used as the feedstock (ie anthracite, bituminous, sub-bituminous, lignite).
- **IGCC with carbon capture**
  - A great deal of uncertainty surrounds true costs as no commercial plants have operated in this configuration.
  - As with any novel technology, availability and performance will be crucial to realising theoretical costs predicted from engineering and design studies.
  - Logistics and regulatory requirements associated with CO_2 storage have not yet been fully defined, and will have an important impact on actual future costs of operation.
  - In some instances, value added end markets for CO_2, such as for use in EOR, may help to offset the required capital and operating costs associated with capturing, storing and transporting CO_2.
  - Other technologies, such as Oxyfuel combustion, could become attractive for near zero emission coal fired generation, but due to the current high price of oxygen separation, this is likely to be more expensive than IGCC with carbon capture in the short-term.

Fixed Assumptions

	Nominal Capacity (MW)	Discount Rate	Economic Lifetime	Energy Content of Fuel
Pulverised Coal Combustion	1,000	8.6%	30	27 MJ / Kg
IGCC	600	8.6%	30	27 MJ / Kg
IGCC w/ CCS	600	8.6%	30	27 MJ / Kg
CCGT	500	8.6%	25	37 MJ/ m^3
Onshore Wind	100	8.6%	20	N/A
Offshore Wind	100	8.6%	20	N/A

Variable Assumptions – Base Case

Base Case

	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Pulverised Coal Combustion	1,100	9.0	38%	.80	€ 50 / Tonne
IGCC	1,400	13.0	41.5 %	.75	€ 50 / Tonne
IGCC w / CCS	1,800	14.0	39 %	.75	€ 50 / Tonne
CCGT	550	3.8	55%	.80	€ 4.75 / GJ
Onshore Wind	1,150	3.0	N/A	.30	0
Offshore Wind	1,750	4.0	N/A	.40	0

Variable Assumptions – Low Case

Low Case

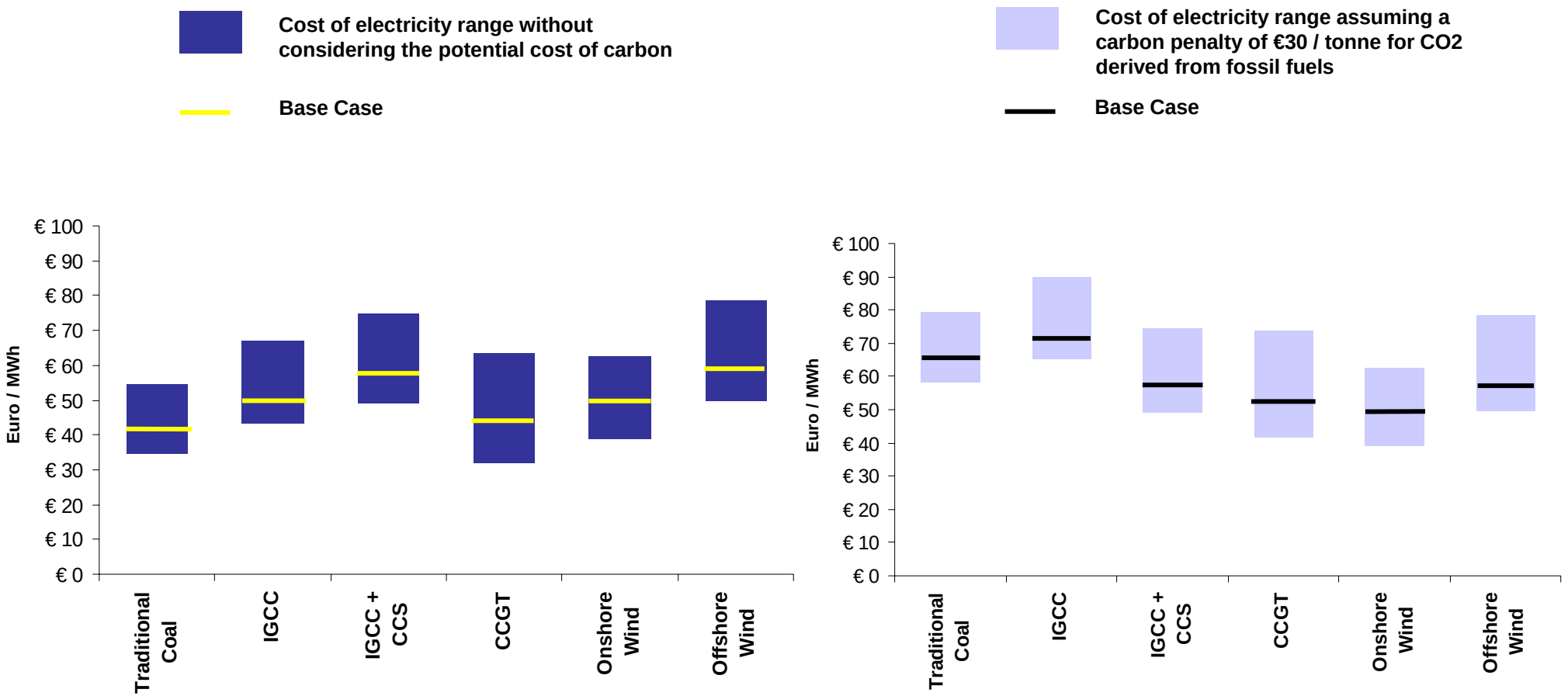
	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Pulverised Coal Combustion	1,000	8	39%	.80	€ 40 / Tonne
IGCC	1,350	12.5	42%	.80	€ 40 / Tonne
IGCC w / CCS	1,650	13.5	39.5%	.80	€ 40 / Tonne
CCGT	500	2.8	57%	.80	€ 3.50 / GJ
Onshore Wind	1,050	2.5	N/A	.35	0
Offshore Wind	1,650	3.0	N/A	.43	0

Variable Assumptions – High Case

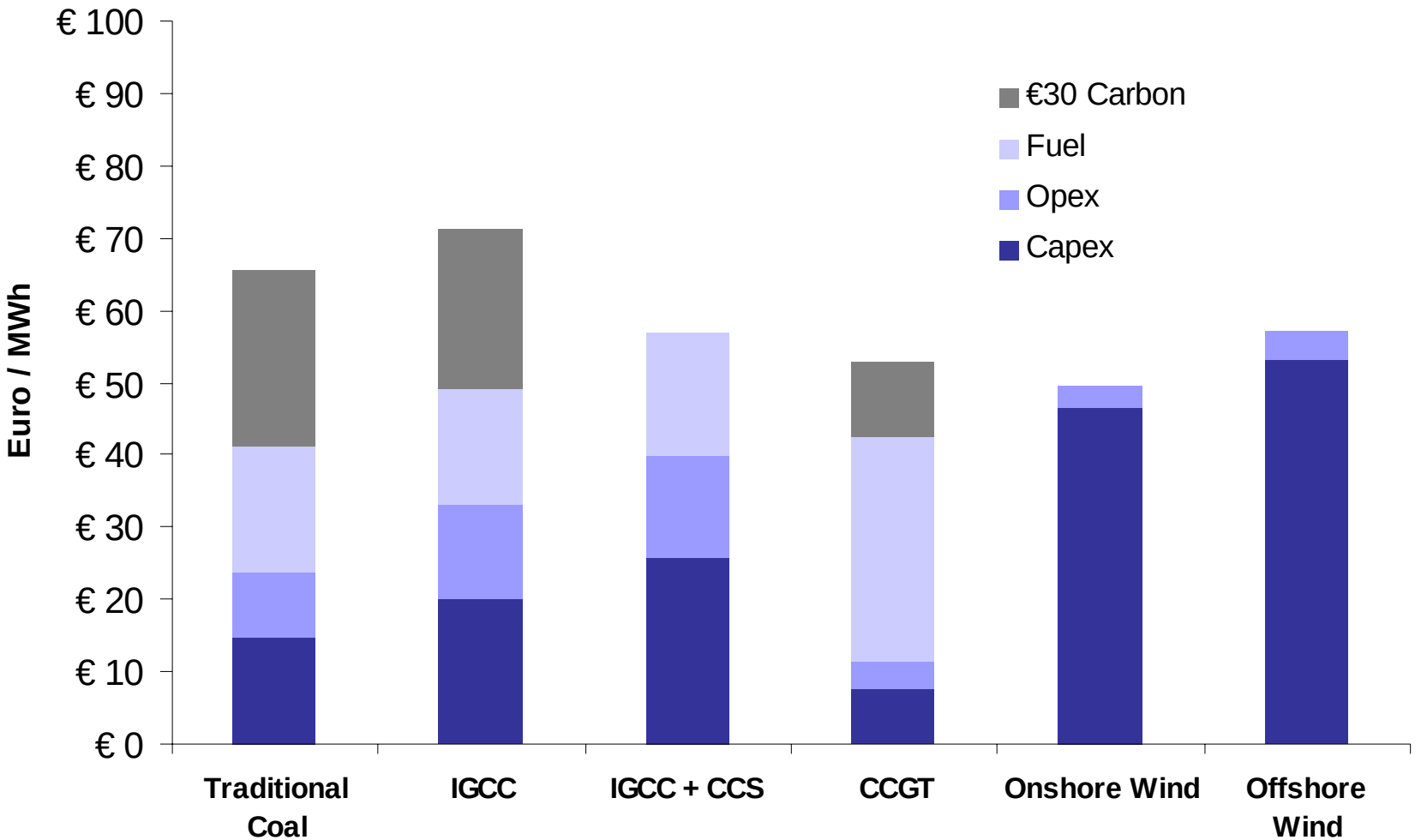
High Case

	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Pulverised Coal Combustion	1,350	11.0	37%	80	€ 70 / Tonne
IGCC	1,700	15.5	40%	.65	€ 70 / Tonne
IGCC w / CCS	2,000	16.5	37%	.65	€ 70 / Tonne
CCGT	600	4.0	55 %	.80	€ 8 / GJ
Onshore Wind	1,350	4.0	N/A	.28	0
Offshore Wind	1,950	4.5	N/A	.32	0

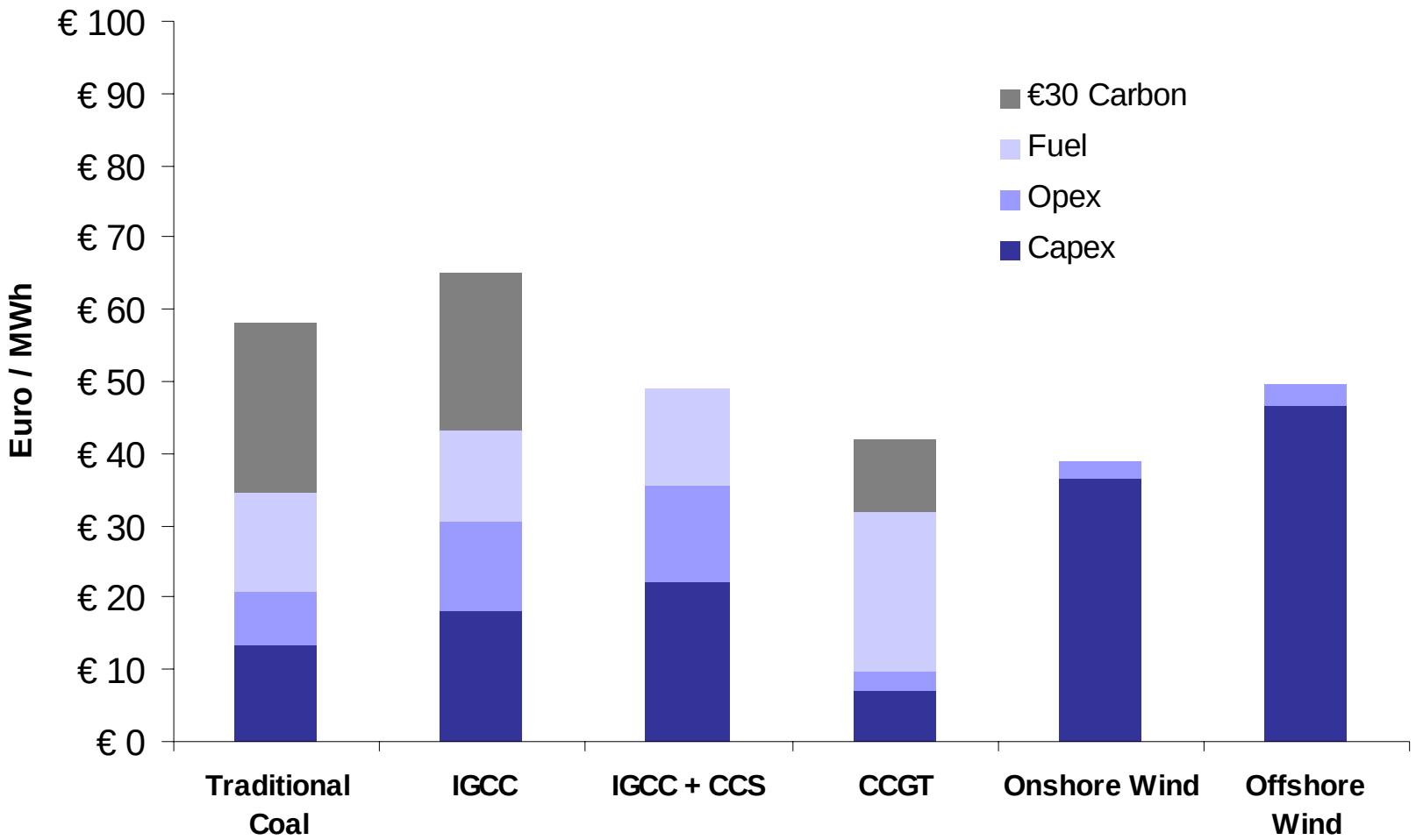
Range of Potential Electricity Costs from Various New Power Plants



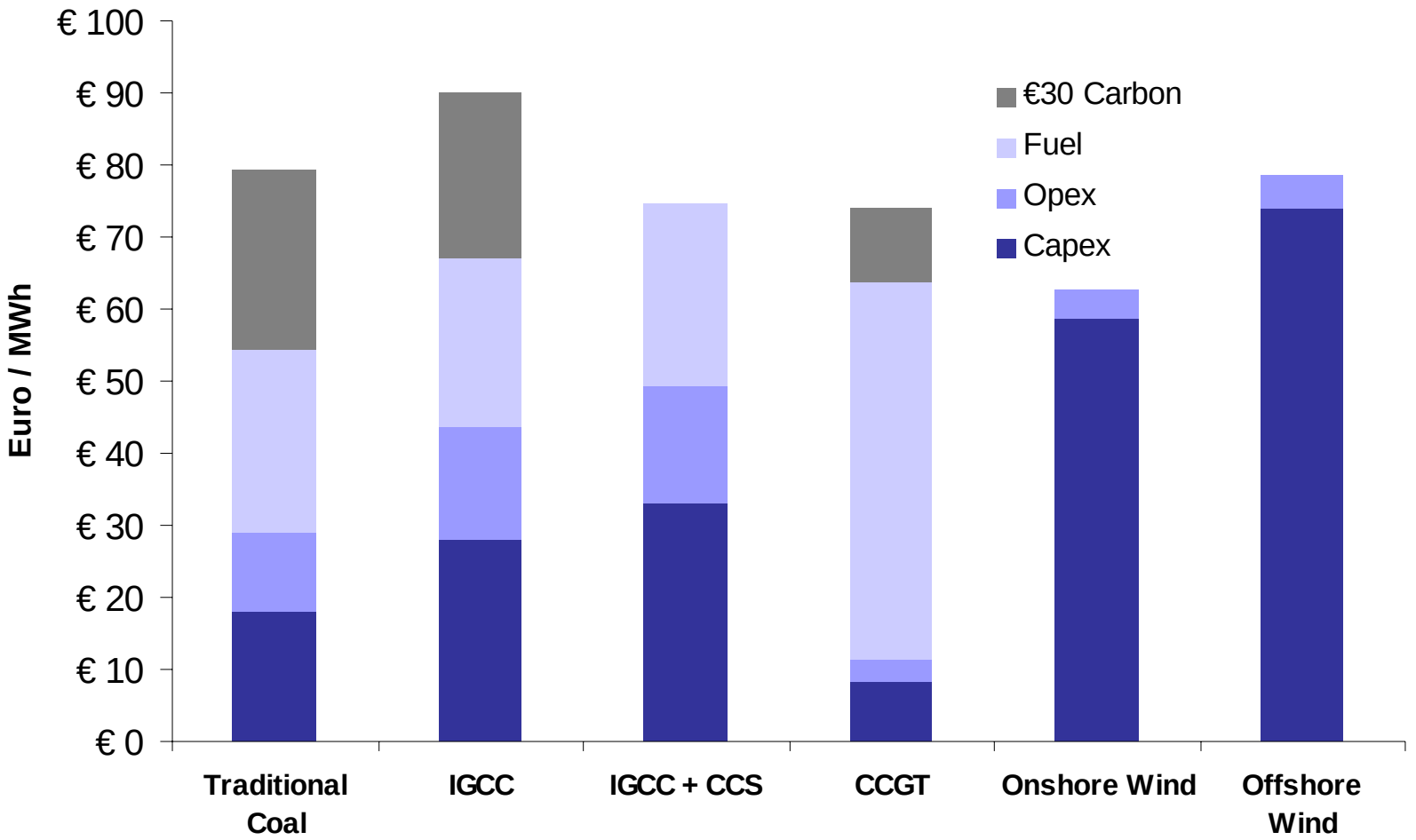
Cost of Electricity – Base Case Comparison w/ €30 Carbon Penalty



Cost of Electricity – Low Case Comparison w/ € 30 Carbon Penalty



Cost of Electricity – High Case Comparison w/ € 30 Carbon Penalty



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Emerging Energy Research provides analyst-directed advisory services on an annual subscription basis, providing market intelligence, competitive analysis and strategy advice in response to the specific needs of our clients. These services provide value-added support of clients' competitive and market strategies, and are intended to be interactive, offering clients direct access to EER experts.

Advisory service clients receive a stream of market and company briefs, ongoing market data and forecast support, telephone inquiry privileges, and regular analyst briefings. While much of the content is syndicated, clients also receive ongoing individual support of market assessment and strategy development needs.

For more information on EER's advisory services, please contact Marcel van Galen at mvangalen@emerging-energy.com, or contact one of our offices:

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emerging energy research

Vestas

Comparative Costs of Renewable Power Generation

22 December 2006

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About the Economic Comparison

- **Estimates of the cost of electricity have been calculated using EER's in-house financial model. Our assumptions, presented in the following, are derived from various industry sources and internal judgments.**
- **The information provided is based on our estimates of the cost of building a new facility in continental Europe. Actual plant costs can vary significantly based on technology, supplier and location.**
- **Low and high cost scenarios define a broad range of market conditions to reflect price sensitivity to changes in capital, operating, commodity and fuel costs.**
- **Economics exclude the potential impact of financial distorters including grants and subsidies. Our assumptions also exclude the cost of land and taxes.**

Fixed Assumptions

	Nominal Capacity (MW)	Discount Rate	Economic Lifetime	Energy Content of Fuel
Biomass	**10**	**8.6%**	**30**	**18 MJ / Kg**
Geothermal	**50**	**8.6%**	**25**	**N/A**
Solar PV	**10**	**8.6%**	**25**	**N/A**
Solar CSP	**50**	**8.6%**	**25**	**N/A**
Onshore Wind	**100**	**8.6%**	**20**	**N/A**
Offshore Wind	**100**	**8.6%**	**20**	**N/A**

Comparative Costs of Renewable Power Generation

Variable Assumptions – Base Case

	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Biomass	1,550	20.0	23%	.75	€ 50 / Tonne
Geothermal	2,200	13.0	N/A	.85	0
Solar CSP	3,800	40.0	N/A	.23	0
Solar PV	6,100	7.0	N/A	.17	0
Onshore Wind	1,150	3.0	N/A	.30	0
Offshore Wind	1,750	4.0	N/A	.40	0

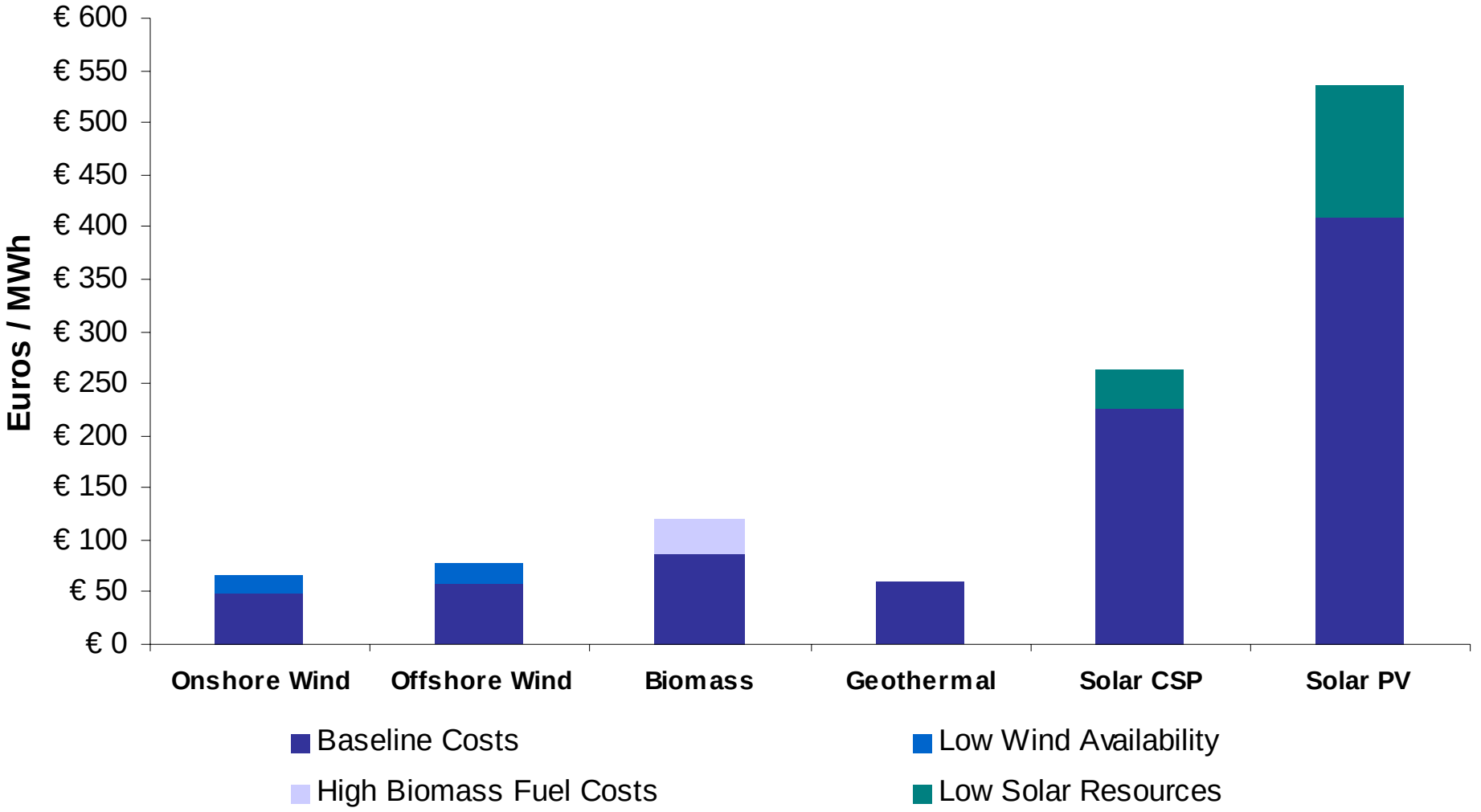
Variable Assumptions – Low Case

	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Biomass	1,500	16.0	25%	.80	€ 40 / Tonne
Geothermal	1,800	20.0	N/A	.90	N/A
Solar CSP	3,500	30.0	N/A	.24	N/A
Solar PV	5,600	5.0	N/A	.19	N/A
Onshore Wind	1,050	2.5	N/A	.35	0
Offshore Wind	1,650	3.0	N/A	.43	0

Variable Assumptions – High Case

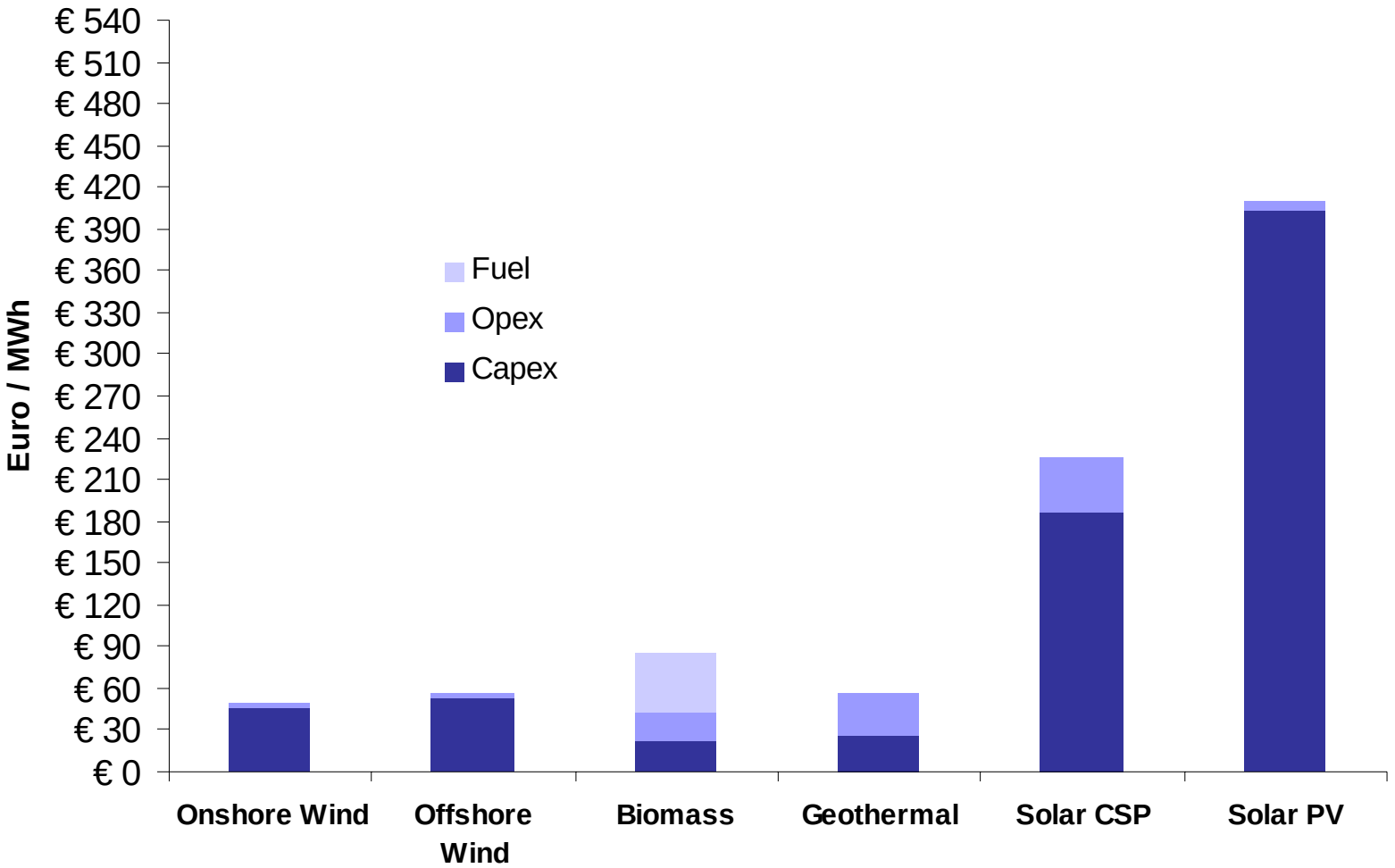
	Capex (€ / kW)	Opex (€ / MWh)	Plant Efficiency	Capacity Factor	Fuel Cost
Biomass	1,650	24.0	22%	.70	€ 85 / Tonne
Geothermal	2,300	30.0	N/A	.85	N/A
Solar CSP	4,000	50.0	N/A	.21	N/A
Solar PV	7,000	12.0	N/A	.15	N/A
Onshore Wind	1,450	4.0	N/A	.28	0
Offshore Wind	1,950	4.5	N/A	.32	0

Costs under varying conditions



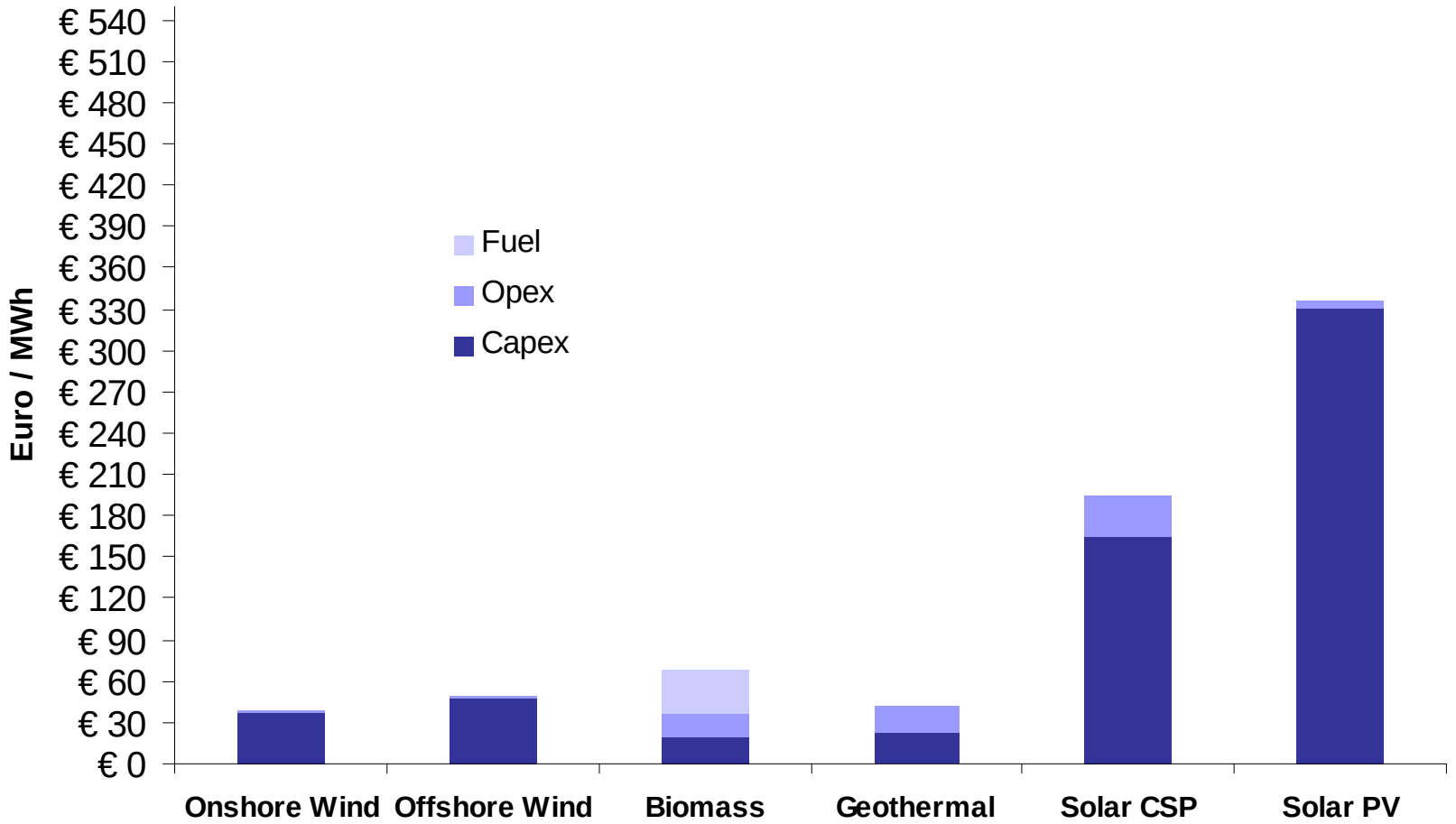
Source: emerging energy estimates

Comparative Costs of Renewable Power Generation
Base Case



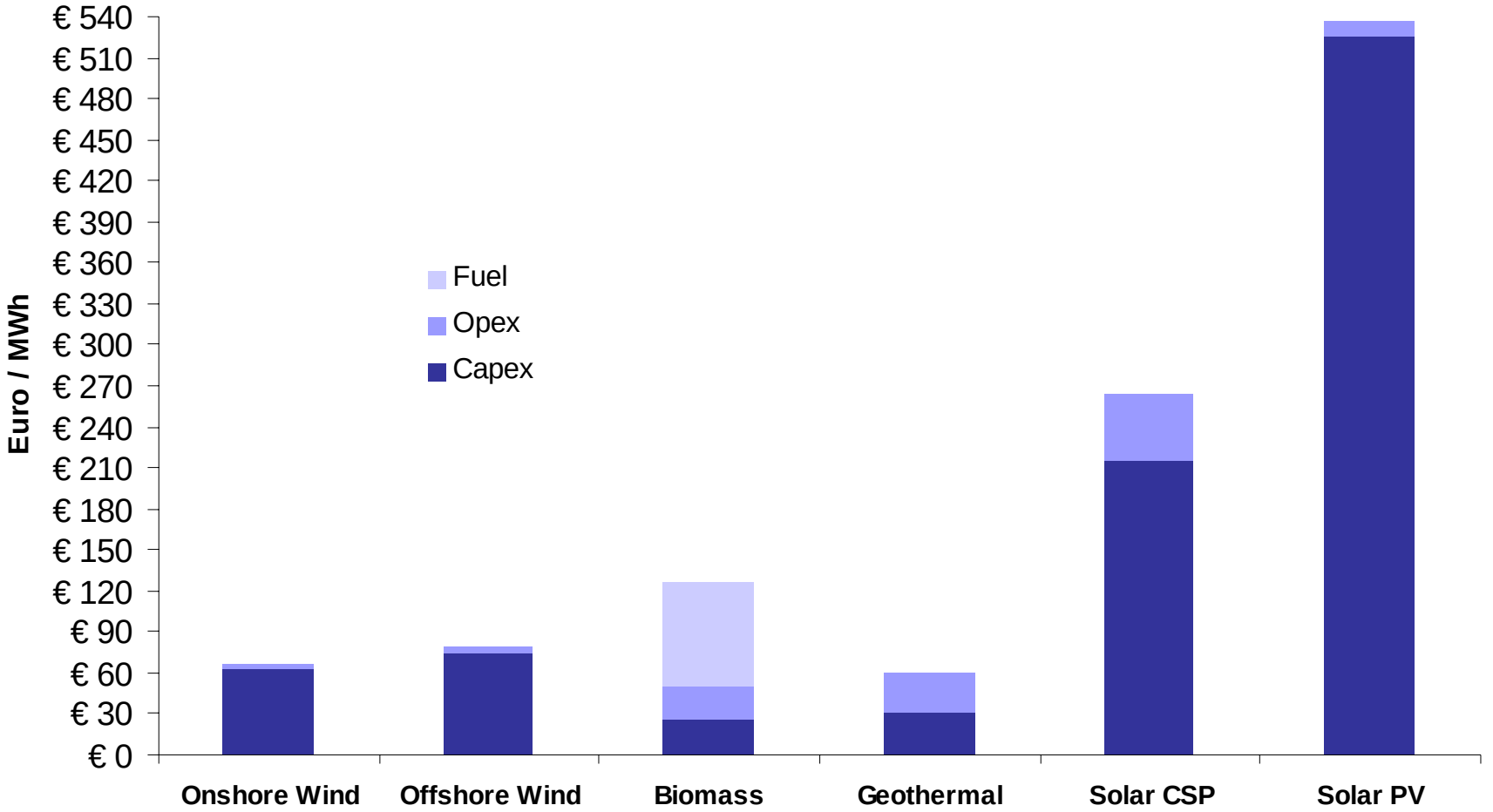
Source: emerging energy estimates

Comparative Costs of Renewable Power Generation
Low Case



Source: emerging energy estimates

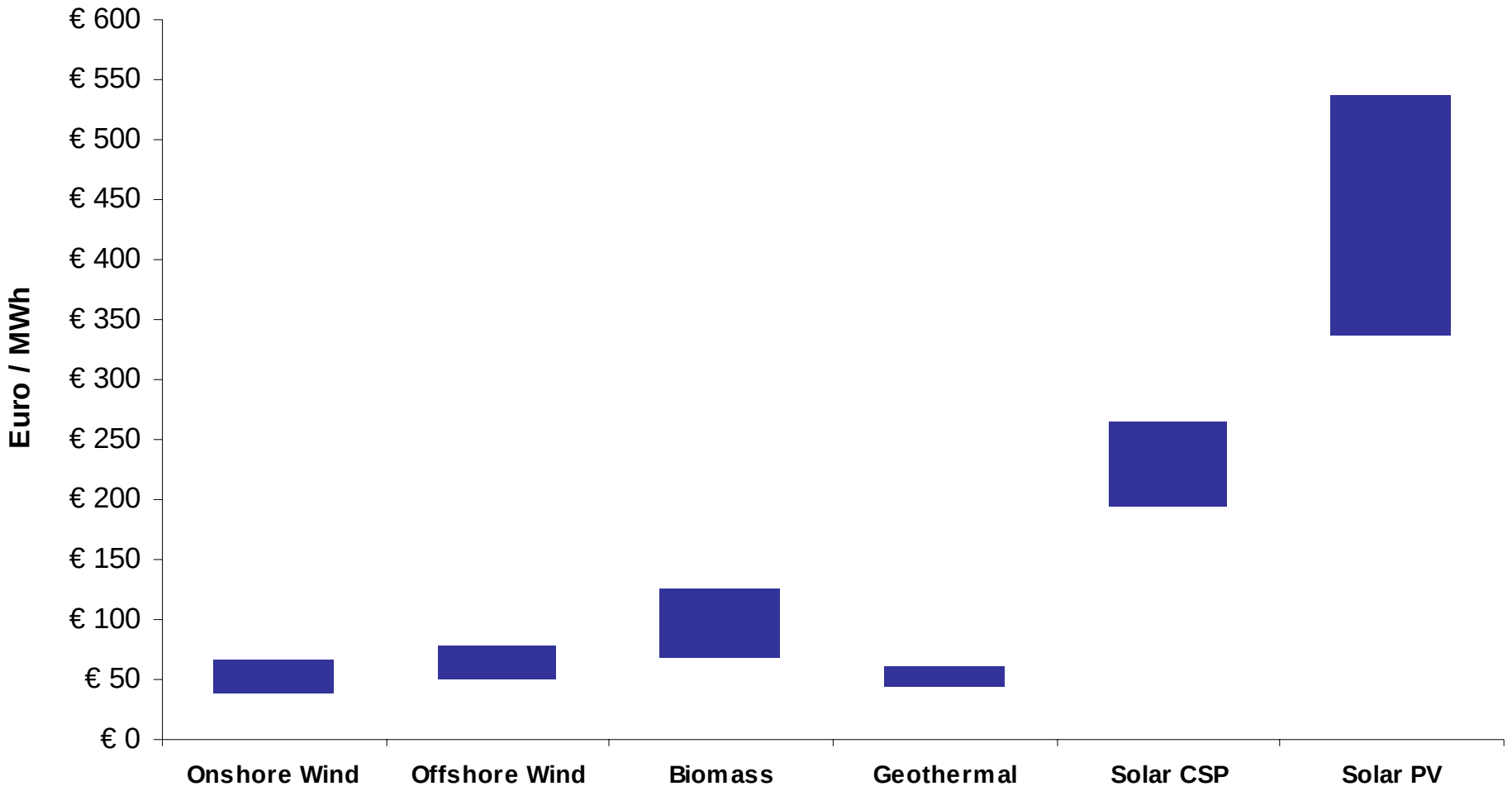
Comparative Costs of Renewable Power Generation
High Case



Source: emerging energy estimates

Comparative Costs of Renewable Power Generation

Range of Potential Energy Costs



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