NEA
onderdeel van Panteia

Training Programme CBA

Case study: Energy

Klaas Westerkamp, 18 April, 2007

Translating facts into vision

NEA
onderdeel van Panteia

Content

Wind energy on the North Sea

- Objective of case study
- The seven steps of CBA
- Conclusions

NEA
onderdeel van Panteia

Objective of the case study

Give an insight in:

- How such a case is set up
- Which parameters play a role
- How these parameters are estimated

Step 1: Objective

EU obligation

- 9% of total electricity from sustainable sources in 2010

NL Ambition

- 15% of total electricity from sustainable sources in 2020

Step 2: Project identification

- 6000 MW Wind Energy parks in North Sea
- Start in 2005
- In 2010 9% of total electricity
- Complete realisation in 2020
- Time period 2040
- 100 metres high, 22 km off-shore

Step 3: Feasibility / Alternatives

- Two economic scenario's: GE / SE
- Zero variant
- Three alternatives
  1 6000 MW
  2 Same result but with sources chosen on financial indications
  3 As 1, but realisation in 2030

Step 4: Financial Analysis

- Learning effects
- Increased capacity network
- Investment and maintenance
- Reserve capacity
- Benefits

Step 5: Economic Analysis

- Diversification
- First mover
- Excess burden of taxes
- Maritime sector / Fishery
- NOx, SO_2, PM10
- Noise
- Landscape, birds

Step 6: Multi criteria Analysis

- Not done

Step 7: Sensitivity & Risk Analysis

- GE and SE variants
- Diversification, benefits 6%
- Reserve capacity, +10%
- Learning effects, + 10%
- Oil & Gas prices
- Oil crises
- Double NOx
- Investment & maintenace +10%

16 mei 2011
Registratienr:

Results – GE – Project alternative 1

Cost wind energy	12313	CO2	349
Costs biomass	1342	Other Benefits	6573
Total	13655	Total	6921
Balance business case	-6733		
		NOx	512
		SO2	91
Nature	Pm	PM10	121
Landscape	Pm	Indirect	Pm
Total costs	13655	Total benefits	7645
Balance	-6010		

Results – Global Economy

Total financial costs 13660, Total financial benefits 6920	Balance business case -6730 External benefits 720 NPV 6010 (P.A.1)		
Variant	P.A.1	P.A.2	P.A.3
Basis	-6010	-4410	-3420
Learning +10%	-5000	-3740	-2720
Investment +10%	-6770	-4920	-3900
Benefits 6%	-5060	-3410	-2600
Benefits+Learning	-4050	-2740	-1900
Higher CO2 rights			
Higher CO2, lower investment			
Higher CO2, benefits 6			

Results – SE – Project alternative 3 6% and high learning

Cost wind energy	6894	CO2	2413
Costs biomass	1204	Other Benefits	6304
Total	8098	Total	8717
Balance business case	-619	NOx/SO2/PM10	384
Nature	Pm		
Landscape	Pm	Indirect	Pm
Total costs	8098	Total benefits	9101
Balance	+1003		

Results – Strong Economy

Total financial costs 13660, Total financial benefits 6920	Balance business case -6730 External benefits 720 NPV 6010 (P.A.1)		
Variant	P.A.1	P.A.2	P.A.3
Basis	-3000	-2540	-950
Learning +10%	-1770	-1600	-120
Investment +10%	-3700	-3060	-1400
Benefits 6%	-1660	-1270	+170
Benefits+Learning	-430	-330	+1000
Higher CO2 rights	-2450	-1970	-540
Higher CO2, lower investment	-1220	-1030	+290
Higher CO2, benefits 6	-1060	-650	+610

NEA
onderdeel van Panteia

Conclusions - 1 CBA

- Viable investment in wind energy at sea requires strong international climate policy and slow capacity build-up
- World oil prices in the long term do NOT give enough perspective
- Wind energy possibly financial viable after 2025 with consequences for "sea space"

Conclusions - 2 CBA

- Reserve capacity is not a bottleneck
- Possibly low impact on nature
- Wind energy at sea financial better than biomass at coal installations