

Reference Plants in the NER 300 process

Scaling generic reference plants to
match innovative projects

Additional guidance following meeting
with MS on 10th January 2010

SECTION 1:
Electricity Generation

Approach

- Worked example reference plants are provided in subsequent slides.
- The examples (860MW CCGT, 2MW onshore wind) do not match the scale of the innovative project.
- Reference plant assumptions (costs etc) should be down-scaled or up-scaled to match the energy output of the innovative project.
 - It is recognised that a 5MW CCGT plant does not exist, but the costs associated with it can be used to determine the relevant cost of the project

Methodology

- Determine costs and benefits per unit of installed capacity.
- Determine annual electricity generation of reference plant & innovative project
- Calculate level of installed capacity of reference plant required to deliver equivalent MWh as innovative project
 - Multiply cost (and benefit) variables by that factor.
 - Add details to Submission Form 4

Option 1 - Combined Cycle Gas Turbine

Key assumptions (illustrative only)

- 860MW, 70% load factor
- €649 / KW installed capacity; total capex: €558m
- Annual generation: 5,273,520 MWh
- 350kg/MWh CO₂, €15 / tCO₂ cost
- O&M €24/KW/yr (or ~3.5% capex)
- Fuel €7/GJ Fuel cost at 70% load factor
- Other €9/kW/yr (staff, administrative and insurance costs)

(Detail to be provided in Submission Form 4)

Option 1 worked example: CCGT compared with 40MW Offshore Wind

- Annual Generation:
 - Refplant CCGT (70% load factor): $860\text{MW} \times 8760 \text{ hours} \times 70\% = 5,273,520 \text{ MWh}$
 - Offshore wind (30% load factor): $40\text{MW} \times 8760 \times 30\% = 105,120 \text{ MWh}$
- Size of Reference Plant =
 - Annual generation replant / annual generation project x capacity of replant
 - $105,120/5,273,520 \times 860 = 17.14 \text{ MW CCGT replant}$
- I.e. a 17.14 MW CCGT at 70% load factor produces an equivalent amount of energy to a 40MW offshore wind plant at 30% load factor
- Down-scaled CCGT costs:
 - Capex: € 11.125 million ($17.142 \times 649 \times 1000$)
 - Annual operation & maintenance: € 411,427
 - Annual Staff & other costs: € 154,285
 - Annual Fuel Cost: €5.07 million **
 - Annual CO2 emissions costs:
 - $105,120 \text{ MWh} \times 0.350 \text{ tCO}_2/\text{MWh} = 36,972$
 - $36,972 \times €15 / \text{tCO}_2 = € 551,880$

** 1MWh = 3.6GJ, 105,120 MWh annual generation, 58% conversion efficiency of CCGT, €7 / GJ, 1.11(lhv to hhv conversion factor)

$105,120\text{MWh} \times 3.6 \times 1.11 / 0.58 \times 7$

Option 1 worked example: CCGT compared with 40MW Offshore Wind-2

- Down-scaled CCGT reference plant operating benefits:
 - Calculate the full discounted production cost of the CCGT plant (EUR/MWh) as a proxy for the pool price obtainable on the market; and then
 - Multiply the result with the generation of down-scaled reference plant to determine operating benefits over the 5 years (i.e., revenues for the electricity generated).

Option 2 - Onshore Wind

Key Assumptions (illustrative only)

- 2MW onshore wind turbine,
- 30% operating factor
- €1227 / KW installed capacity, capex €2.454m
- Annual generation: 5256 MWh
- O&M: 1.2 - 1.5 €/kWh (average €/kWh) : €70,956 / year

(Detail to be provided in Submission Form 4)

Option 2 worked example: Onshore Wind compared with 40MW Offshore Wind - 1

- Annual Generation:
 - Refplant onshore wind (30% load factor): $2\text{MW} \times 8760 \text{ hours} \times 30\% = 5,256 \text{ MWh}$
 - Offshore wind (30% load factor): $40\text{MW} \times 8760 \times 30\% = 105,120 \text{ MWh}$
- Size of Reference Plant =
 - Annual generation replant / annual generation project x capacity of replant
 - 40MW
- I.e. with the same load factor the onshore wind reference plant needs to be x20 the size to compare against the innovative project
- Up-scaled on shore wind costs:
 - Capex: € 49.08 million
 - Annual opex: € 1,419,120
 - Annual Fuel Cost: € 0
 - Annual CO2 emissions costs: € 0

Option 2 worked example: Onshore Wind compared with 40MW Offshore Wind- 2

- Up-scaled onshore wind reference plant operating benefits:
 - Take the full discounted production cost of the onshore wind plant (EUR/MWh) as a proxy for the pool price obtainable on the market; and
 - Multiply the result by the production of down-scaled reference plant to determine operating benefits over the 5 years (i.e., revenues of the electricity generated).

SECTION 2:
Biofuel Reference Plant

Conclusions biofuels

- MS may compare cost per unit energy of innovative project with gasoline price to determine relevant costs (modify Submission Form 4)
- The full investment costs and operating costs and benefits, as described in Article 3, can be inferred from the gasoline price (per unit energy).
- Gasoline price more consistent across the EU
 - Level playing field when evaluating CPUP
 - Overcome challenge of conventional refinery cost structure
 - Similar approach used so far in ENV State aid guidelines
- Bioethanol costs more sensitive
 - Relevant costs are more sensitive to wheat price than crude price
 - Bioethanol capital costs more variable
- Projects likely to receive more financial support from NER 300 under gasoline price RefPlant