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Summary of the DGEMP study of reference costs for power generation

– The first part of the 2003 study of reference costs for power generation has been completed. It was carried out by the General Directorate for Energy and Raw Materials (DGEMP) of the French Ministry of the Economy, Finance and Industry, with the collaboration of power-plant operators, construction firms and many other experts. A Review Committee of experts including economists (Forecasting Department, French Planning Office), qualified public figures, representatives of power-plant construction firms and operators, and non-governmental organization (NGO) experts, was consulted in the final phase. The study examines the costs of power generated by different methods (i.e. nuclear and fossil-fuel [gas-, coal-, and oil-fired] power plants) in the context of an industrial operation beginning in the year 2015.

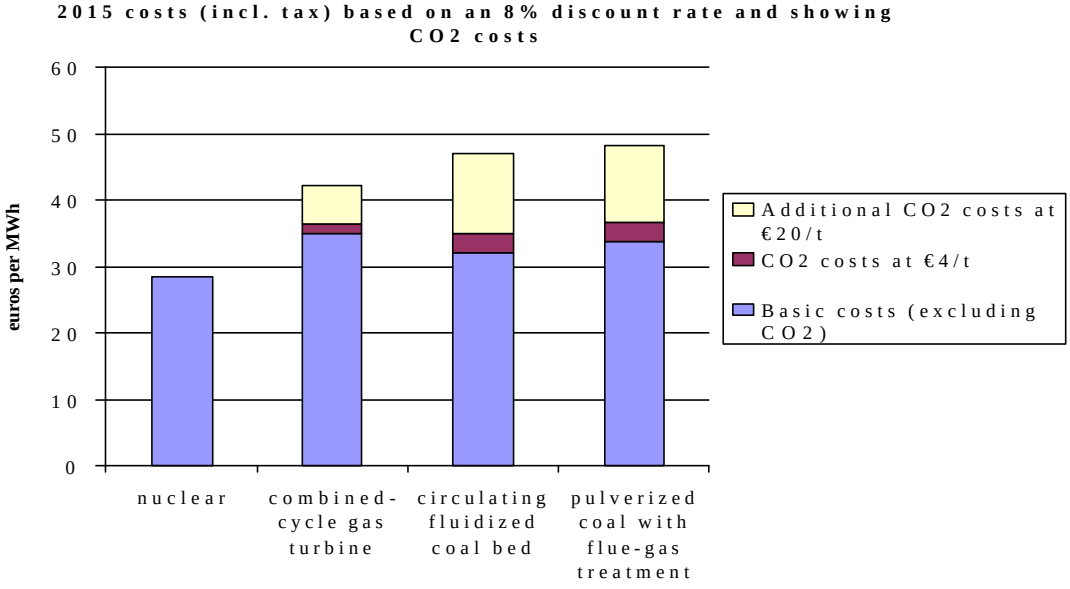
– The second part of the study relating to decentralized production methods (wind, photovoltaic, combined heat and power) is still in progress and will be presented at the beginning of next year.

1. Study approach

The study is undertaken mainly from an investor's perspective and uses an 8% discount rate to evaluate the expenses and receipts from different years.
In addition, the investment costs are considered explicitly in terms of interest during construction.

2. Plant operating on a full-time basis (year-round)

The following graph illustrates the main conclusions of the study for an effective operating period of 8000 hours.



(Figure 1: Production costs (incl. tax), discounted at 8% and including CO_2 costs, for a full-time operation in 2015; company perspective)

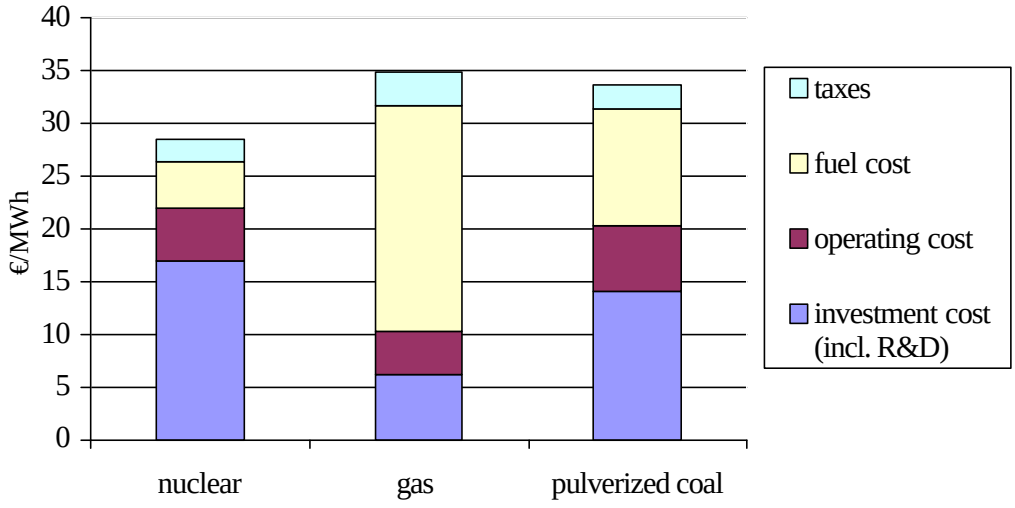
It can be seen that nuclear is more competitive than the other production methods for a year-round operation with an 8% discount rate applied to expenses. This competitiveness is even better if the costs related to greenhouse-gas (CO_2) emission are taken into account in estimating the MWh cost price. Integrating the costs resulting from CO_2 emissions by non-nuclear fuels (gas, coal), which will be compulsory as of 2004 with the transposition of European directives, increases the total cost per MWh of these power generation methods. Two hypotheses are considered in terms of CO_2 costs over the life span of the oil- and coal-fired power plants: €4/t CO_2 and €20/t CO_2. The hypothesis of €4/t CO_2 can be considered as very low — it will be significantly more expensive in 2015 and beyond (post-Kyoto period).

The following table gives variants on the discount rate for the best technologies for each fuel, i.e. nuclear, gas and coal.

2015 – Mean value	**Nuclear EPR** (European Pressurized water Reactor)	**Combined-cycle gas turbine**	**Pulverized coal**	**Circulating fluidized coal bed**
8% discount rate	28.4	35.0	33.7	32.0
5% discount rate	21.7	33.4	29.5	28.1
11% discount rate	37.0	36.9	38.5	36.4
CO_2 costs (€4/t and €20/t)		1.4-7.1	2.9-14.6	3-15

(Table 1 – Full-time production costs in 2015, with individualized CO_2 costs (2001€/MWh, $1 = €1)

The following graph details the components of the tax-inclusive cost per MWh in 2015 for the different production sources (without CO_2 costs and with an 8% discount rate).

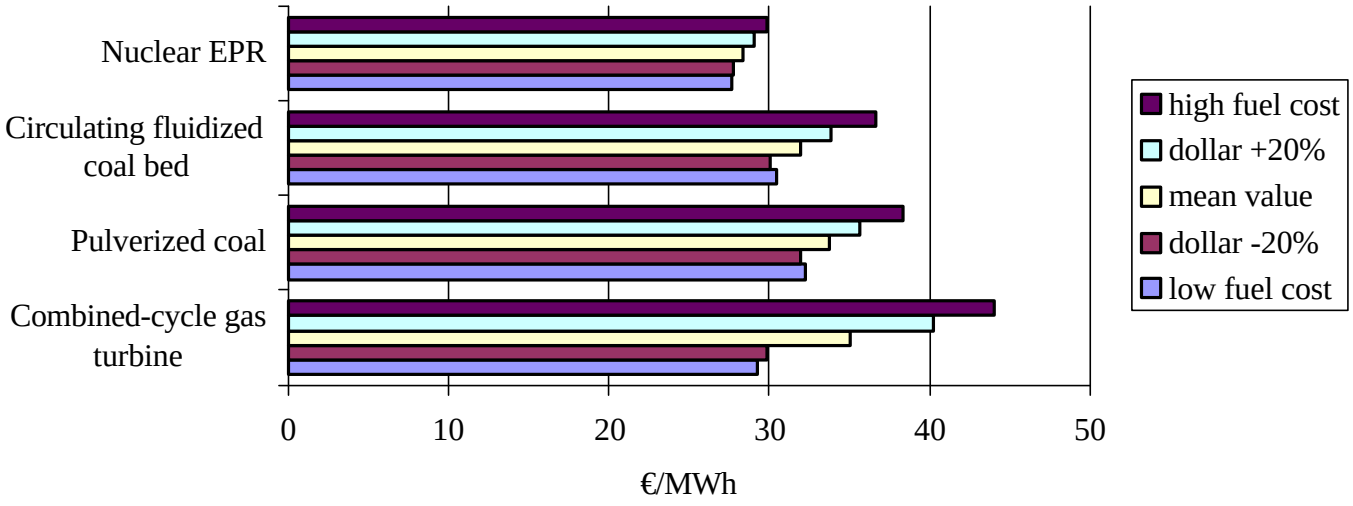


(Figure 2: Components of the discounted cost per MWh in 2015, without CO_2 costs and for a full-time operation)

The choice of a discount rate respectively lower or higher than the baseline hypothesis of 8% will increase, or decrease, the competitiveness of nuclear-based power production compared to fossil-

fuel methods of power production because the investment load, which is higher for nuclear than for the other methods, decreases or, conversely, increases.

The 8% discount rate adopted here was the rate used by the French Planning Office and is compatible with the profitability requirements currently noted in the electricity sector.
The following graph shows the sensitivity of the production costs, exclusive of tax and exclusive of externalities, to fuel prices (see wide range in the appendix) and to the euro/dollar exchange rate.

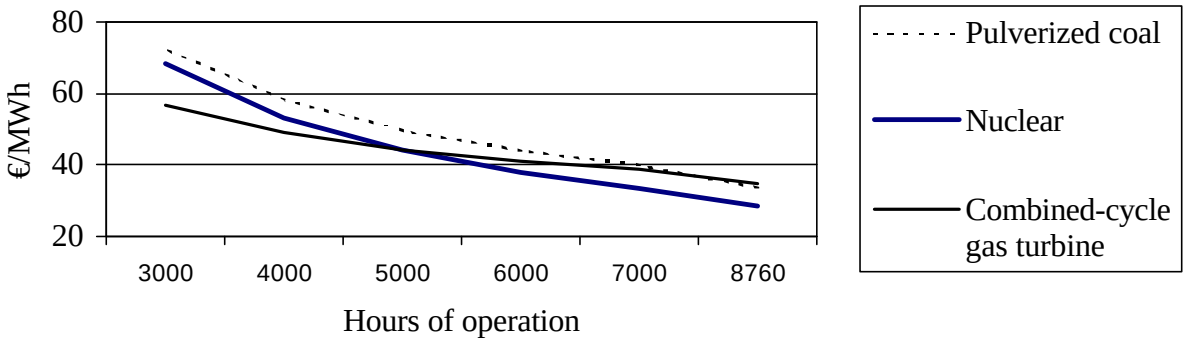


(Figure 3: Sensitivity of production costs (excl. tax) to dollar rate and fuel cost for a year-round production [2015 and 8% discount rate])

The different variants do not bring into question the order of competitiveness of the production methods.

3. Plant operating on a half-time basis (less than 5000 hours/year)

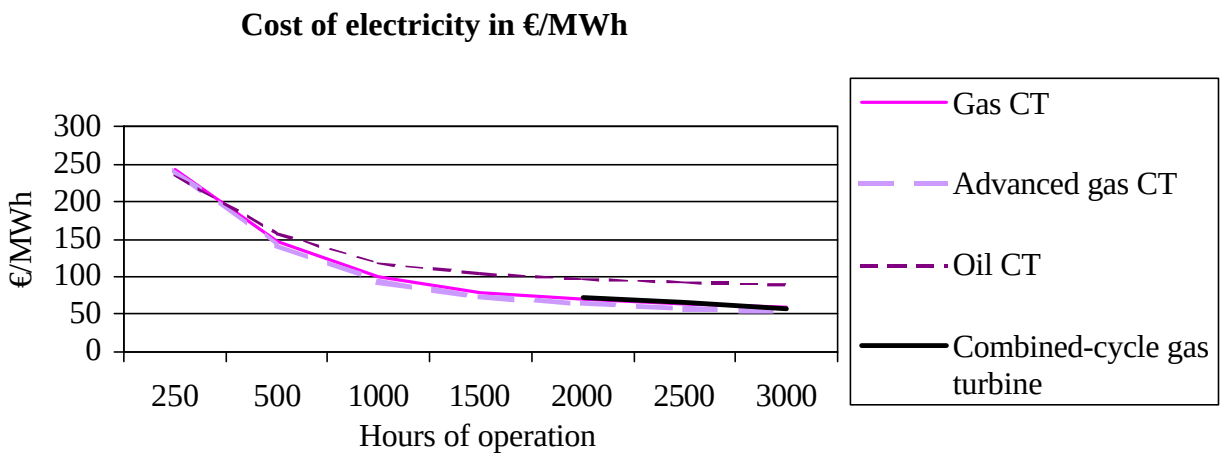
Considering the size of the initial investment, a nuclear power plant's competitiveness requires that it operate all year round. Should the nuclear power plant be operational for a shorter duration, then its competitiveness fades in favour of gas-fired power plants. More specifically, gas is more competitive than nuclear power (excluding externalities) for operating periods of less than 5000 hours.



(Figure 4: Competitiveness of centralized power production methods in 2015 [incl. tax; excl. externalities])

4. Plant operating on a minimum basis (less than 3000 hours/year)

The following graph details the costs for the different methods when used on a top-up basis. For short periods, the gas turbine is more competitive than the oil-fired turbine. The oil-fired turbine, however, is competitive for durations of less than 250 hours.



CT: combustion turbine

(Figure 5: Competitiveness of various power production methods, for short duration operations)