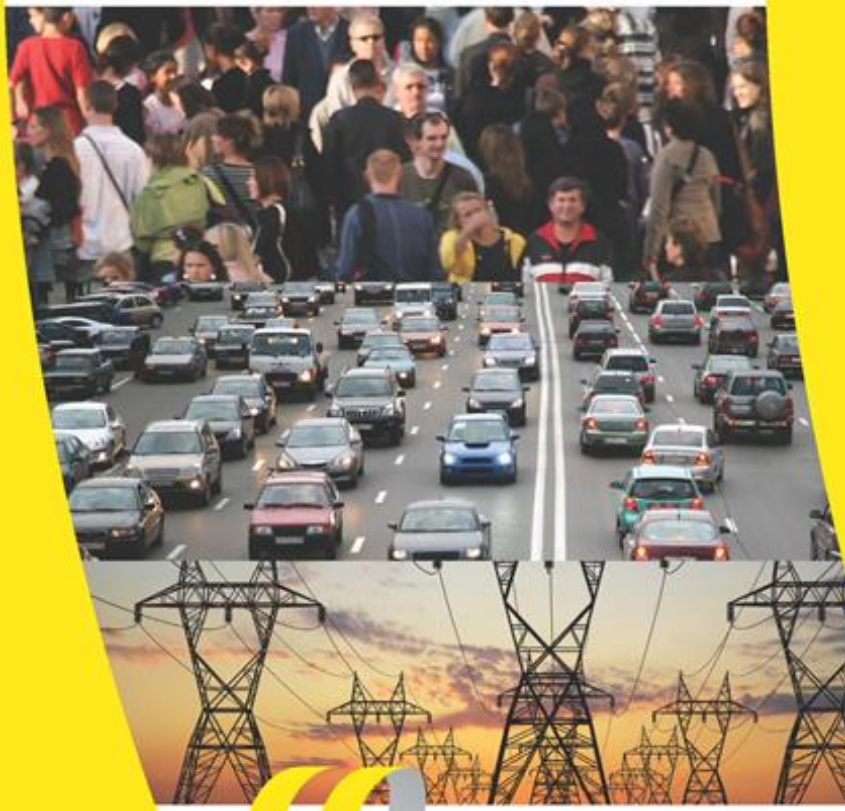
Alternatives for co-firing biomass in coal plant

'Quick Scan' analysis of subsidy costs and other impacts of alternative policies under the Dutch Energy Agreement



CE Delft

Committed to the Environment

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Summary

Background and aim

Under the Netherlands' national Energy Agreement, parties have agreed that 14% of the country's energy is to be renewably sourced by 2020. Besides use of solar, wind, geothermal and hydroelectric options, it has also been agreed that (direct or indirect) co-firing of biomass in coal-fired power plant may contribute a maximum of 25 PJ to the 14% target.

A number of parliamentary motions have recently been adopted that could, in the near future, lead to closure of the country's last five coal-fired power plants. There would then no longer be any capacity for co-firing biomass. Against this background, CE Delft has been commissioned by the Netherlands Society for Nature and Environment (Natuur & Milieu) and energy company Eneco to:

- investigate whether there are alternatives for biomass co-firing that have not yet been agreed to under the Energy Agreement;
- calculate the subsidy costs and other impacts of such alternatives for the Netherlands.

Potential alternatives

This study shows that there are indeed alternatives for co-firing biomass in coal plant. For the period 2016-2020 the following two alternative scenarios are deemed realistic:

1. A package comprising four renewable energy options, in which half the 25 PJ is implemented by greening the electricity market and half by greening the heat market. More specifically: an additional 700 MW wind farm, 0.6 Gigawatt peak capacity (GWp) solar, 7.5 PJ industrial bio-steam and 5 PJ biomass for district heating.
2. The second alternative scenario involves converting the Amer 8 power plant in Noord-Brabant to burn 100% biomass. This would likewise secure the 25 PJ 'renewables' target.

In both the reference scenario (25 PJ biomass co-firing in coal plant) and the two alternative scenarios the Netherlands' last five coal plants are assumed to remain operational, i.e. the three new plants and the two older plants from the 1990s. The present study is concerned solely with the impacts of the two alternatives for fleshing out the 25 PJ renewables target in comparison with 25 PJ co-firing of biomass. This means that the costs and benefits of closing the last five coal plants are not included in any of the scenarios.

Comparison of impacts

The subsidy costs and other impacts are summarized in Table 1. In this table "SDE+" refers to the Netherlands' renewable energy subsidy scheme.

Table 1 Comparison of impacts

	Co-firing	Offshore wind, solar, bio-steam & biomass for district heating (Alternative 1)	Coal plant conversion (Alternative 2)
SDE+ (€ mln.)	490	410	600
SDE+ outlay over 8 years at constant market prices (€ billion)	3.9	3.3	4.8
Impact on SDE+ surcharge for households (€/a)	46	38	56
Number of one-off full-time jobs (during investment) (fte)	3,000	10,000	2,000
Number of structural full-time jobs (maintenance) (fte)	700	2,300	1,000
Input to Dutch economy (added value) (€ mln.)	50	200	35
Impacts on energy transition	Negative	Positive	Negative
CO_2 impact, Dutch territory (Mt/a)	-5.5	-2.5	-3
Impact on air quality	Less emissions (particulates, SO_2, etc.)	Less emissions in electricity market, more in heat market	More emissions in both electricity and heat market
Grid mismatch	Little impact	Greater mismatch	Little impact
Impact on electricity price	Little impact	Downward	Little impact

As the table shows, Alternative 1 scores best on virtually every indicator. The cost of the SDE+ subsidy scheme is around € 80 mln./a lower than with biomass co-firing, while the input to the national economy is four times greater. This renewable package also yields over three times the number of jobs, as well as being beneficial for the energy transition and reducing the electricity price.

In Alternative 1, CO_2 emissions on Dutch territory are reduced by 2.5 Mt, moreover. More solar and offshore wind also mean an improvement in air quality in connection with the electricity market. In the heat market, though, air quality deteriorates somewhat, because biomass replaces mainly gas for heat generation, implying increased air-pollutant emissions. However, Alternative 1 scores relatively worse than co-firing of biomass, because in this scenario more coal is burned, given our assumption that the last five coal plants remain open. With respect to grid mismatch, too, Alternative 1 scores worse than co-firing.

Alternative 2, converting an old coal plant from the 1980s for biomass firing, scores worse than co-firing on the majority of indicators. This alternative means more SDE+ subsidies and yields less added value for the Dutch economy and fewer one-off jobs. It is only structural employment that is boosted, because of the additional maintenance required in the older power station.