frontier economics

Security of Supply monitor – market incentives study

Final documentation – public version

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Contents

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Background of the study

Background

- TenneT carries out an annual security of supply assessment for the Netherlands, the "Monitor Leveringszekerheid"
- In the context of the 2017 Security of Supply monitoring Report, TenneT commissioned UMS group with a study on “Value Drivers (De)-mothballing Conventional Generation”
- For this year’s SoS-Report TenneT has commissioned Frontier Economics to analyse the market development and the incentives for de-mothballing CCGTs in the Dutch market
- In the context of this analysis TenneT is interested in understanding
  - the current market incentives of power plant operators to reactivate power plants that are currently mothballed;
  - the key trends and factors in the energy system that might influence these incentives and the security of supply in the Dutch power sector

Approach

- We combine quantitative modelling of the business case and qualitative analysis of the market conditions
- … for the time period until 2024 (based on modelled prices*)
- Provide a conservative estimate of the business case → where assumptions have to be taken, we chose a conservative approach

** Modelled price curves based on „Frontier Economics (2018): „Research on the effects of the minimum* CO_2 *price“ – a report for the Ministry of Economic Affairs and Climate Policy*

Overview of our approach: We combine quantitative modelling with qualitative economic reasoning

The objective of the study is to assess

- the likelihood that market incentives are sufficient and
- timely enough for de-mothballing decisions to be taken by the market

Development of market incentives

- Assessment of market incentives and main trends that impact market prices and spreads for gas-fired power plants
- Forward price curves based on traded forwards in the short-term and modelled prices (medium-term)*
- Analysis of operator's expectation of future revenues
  - Forward spreads + Optionality
  - Other revenues

De-mothballing business case assessment

- Analysis of attractiveness of de-mothballing individual assets
  - Plant specific analysis of restarting the plant that is currently mothballed
  - Taking into account optionality scenarios and different time periods for restarting
  - Building upon previous analysis for 2017 "Monitor Leveringszekerheid"

Market incentive barriers and recommendations

- Qualitative assessment of potential barriers and market failures
- Identification of key risks,
  - Market risks;
  - Political risks;
  - External effects; and
  - International spill-over effects
- Development of recommendations how these barriers could be addressed and overcome

** Modelled price curves based on „Frontier Economics (2018): „Research on the effects of the minimum CO_2 price" – a report for the Ministry of Economic affairs and Climate Policy*

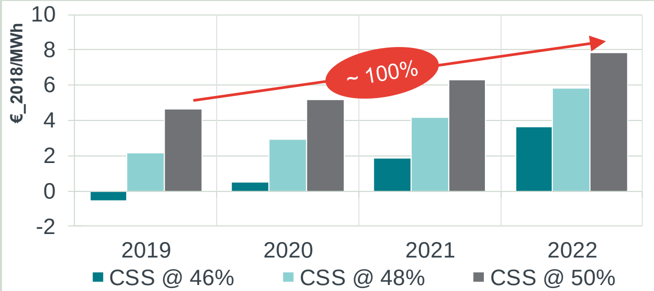
Executive Summary

De-mothballing becomes profitable in the medium-term

- In the short-term, the market does not provide incentives to restart mothballed plants
- The medium-term Clean Spark Spreads (CSS), however, are expected to increase following structural changes in the supply curve (e.g. nuclear phase out) and increasing fuel / CO_2 prices
- Hence, incentives increase and restarting of more efficient plants becomes profitable towards the year 2024, even under rather conservative assumptions
- In this period, restart costs can be recovered over 2-3 years of operation. More generally, cost recovery between 2-4 years is possible
- Assuming one year lead-time for the decision making and technical de-mothballing means that most required revenues can be realised during the time period with liquidly traded futures. There is some remaining uncertainty remaining regarding revenues when depreciation is extended to more than 3 years

Market has developed further since finalisation of the analysis

- Market incentives for de-mothballing improved over the last months, however, profitability of gas plants remains limited in the short-term
- Increasing power prices for the years ahead indicate that the market is reacting to higher fuel (gas) and CO_2 prices and/or is anticipating a tighter supply



Forward clean spark spreads (peak, 03/09/2018)

Market is able to deliver de-mothballing, however political stability required

- Political uncertainty around “Klimaatakkoord” and the introduction of a national carbon price floor represents the biggest barrier for reactivation at the moment: If a national CPF is introduced, de-mothballing becomes unprofitable → political stability and clarity about national or EU-wide climate action required
- Apart from this political uncertainty, there are no obvious incentive barriers that could hinder timely reactivation: The market has already delivered de-mothballing in the past (e.g. Rijnmond power plant was reactivated after 2 years of mothballing)

Market incentives approach – Detailed description of revenue analysis

Expected plant revenues y+1 … y+5 = [Forward Peak Spread y+1 … y+5 × Forward and spot market optimisation] + Additional sales on spot market (Off-Peak) + Ancillary services provision

Forward Peak Spread (1)

- Plant-specific peak spreads
- Short-term: Derived from current future prices for power, CO_2 and gas;
- Medium-term: Modelled forward prices from EZK scenario analysis
  - Reference Case
  - Coal ban
  - CPF & Coal ban
  - CWE scarcity scenario

Optionality factor to take optimisation of position closer to real time into account (2)

- Operator enters position on forward market (intrinsic value) and
- … optimises his position on a rolling basis (weekly “make or buy” / “re-sell”) → risk-free!
- Optimisation is possible until delivery (“day-ahead / intraday make or buy” + “sell peak if not sold”)

Potential revenues not taken into account quantitatively*:

Off-Peak spot sales

- Forward market optimisation focuses on peak product
- However, operator can expect to make additional margins in some off-peak hours

Ancillary services

- Ancillary services provision represents substitute to Forward / Spot market optimisation
- Capacity prices can be realised if bids are accepted
- In addition, passive-balancing to optimise position is possible

** Revenue streams less predictable than (1) and (2); risk adverse operator would not take these into account*

1

Underlying assumptions of EZK scenario analysis

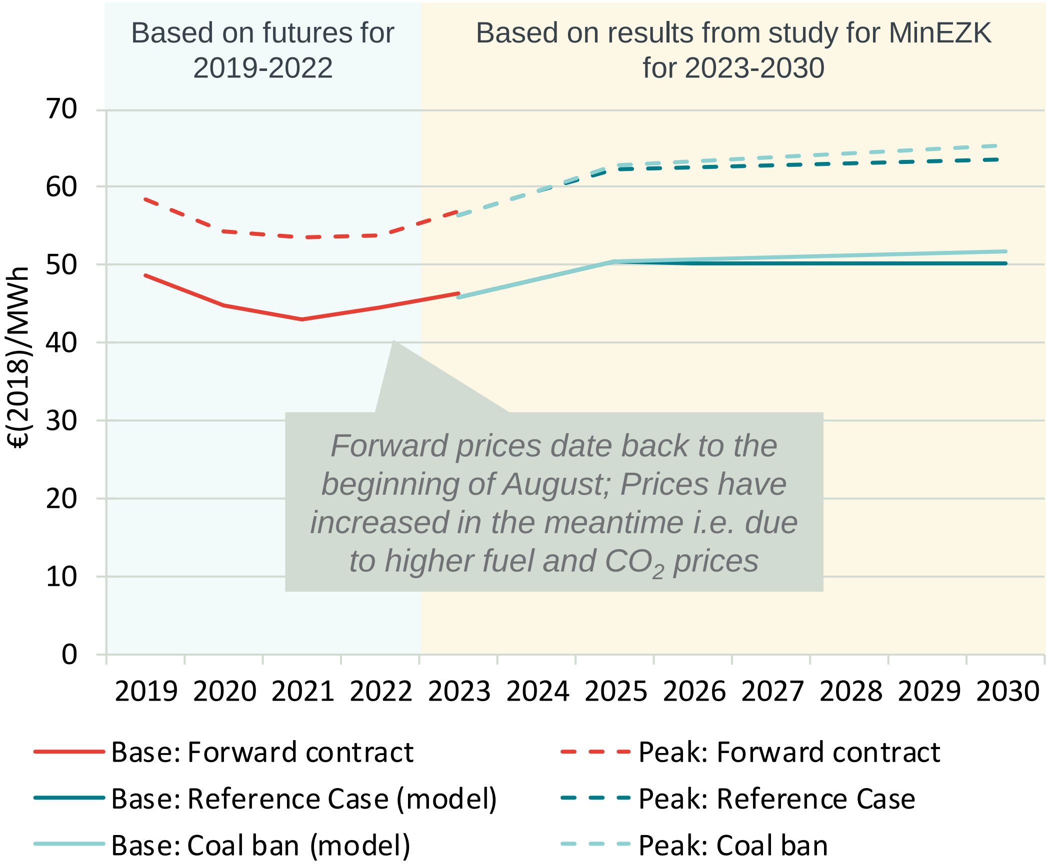
	Approach / Sources	Assumption
Fuel & CO_2 prices	▪ Coal and gas prices: Current future prices, medium- to long-term using heat-equivalence ratios and the IEA WEO NP 2017 oil-price ▪ CO_2-price: Current futures, IEA WEO NP 2017 & EU Ref Scen in 2050	▪ Moderate increase in the medium-term (coal 12 €/MWh* / gas: 28 €/MWh* in 2035) ▪ CO_2 prices increase to 40 €/tCO_2 in 2040 and 79 €/tCO_2 in 2050 (real, 2016)
Power Demand	▪ NL- power demand based on TenneT SoS Monitoring report (extrapolated into the future) ▪ EU: National statistics and grid-development plans	▪ NL: moderate increase by 0.3% p.a. to 126 TWh in 2050 ▪ DE: sector coupling increases demand after 2030 until 2050 (790 TWh)
RES-E growth	▪ NL: NEV 2017 "vastgesteld beleid" (co-firing subsidies until incl. 2027) ▪ EU: National targets for RES-E Growth / ENTSO-E TYNDP 2018 (Sustainable Transition)	▪ NL: Significant increase until 2030 (+65 TWh) mainly driven by offshore wind ▪ Overall increase in RES-E across all modelled countries
IC-capacities	▪ NL: TenneT SoS Monitoring Report ▪ EU: ENTSO-E TYNDP / National grid development plans	▪ NL: increase to c. 10 GW (average import/export) in 2035 ▪ EU: doubling of cross-border capacities in the long-run (2050)

** Real 2016, LHV*

1

We expect increasing forward prices in the medium-term

Power price projection



Source: Frontier Economics
Futures date from 2nd August 2018

Projection of forward peak prices

- Until 2022: Forward peak prices are based on traded forward contracts
- From 2023: Forward peak prices are calculated based on model results from study for MinEZK (snap-shot years 2023, 2025, 2030):
  - Historical peak-base spread (for products from 2019-2022) is used to calculate peak prices from 2023 onwards
  - Peak price for 2024 and 2026-2029 are interpolated

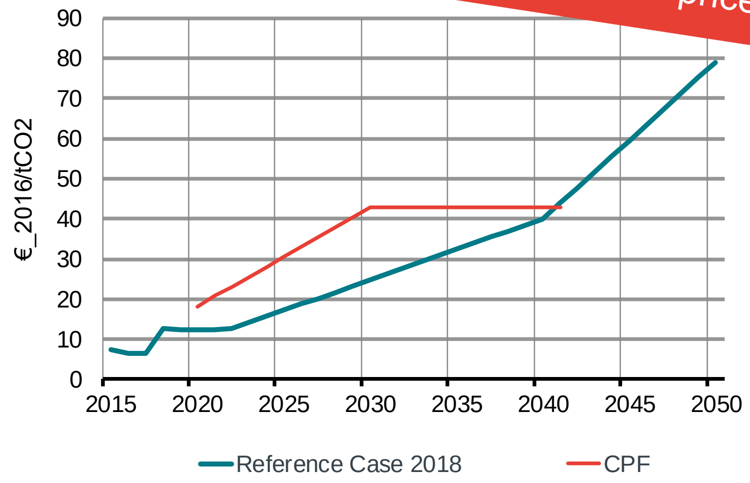
1

Additional price scenarios: Higher scarcity in CWE and CPF in the Netherlands

Input for modelled prices

CPF & coal ban in NL

- We assume that the CPF is introduced as envisaged in the coalition agreement of the Rutte III government
- Starting level is at 18 €/tCO_2 and increases to 43 €/tCO_2 after 2030
- We consider this scenario for the period after 2023 due to inconsistency with forward prices until 2023



Alternative policies in CWE & coal ban in NL

- We assume that policies in CWE change in a way that scarcity in neighbouring countries increases (moderately)
  - **Germany**: -2 GW lignite in 2020, -3.5 GW lignite in 2025 and -5.4 GW in 2030 (more comparable to German NDP 2030 Scenario C) – compared to the reference case
  - **France:** -5 GW nuclear in 2030 – compared to the reference case
- However, the model can compensate for missing capacity by investing or reactivating mothballed capacities (notably gas) also in other countries
- This scenario is analysed in combination with a Dutch coal ban

1

Power price projections for scenarios with CPF in NL and with higher scarcity in CWE

The scenario with higher scarcity in CWE (in combination with the coal ban in NL) increases peak prices from 2025 onwards moderately

- by c. 1 €/MWh in 2025; and
- by c. 3 €/MWh in 2030 compared to the coal ban scenario

The scenario has limited short-term price impact due to existing overcapacities. Longer-term price impact is partly driven by French nuclear phase-out

The CPF increases prices from 2021 onwards (in 2020, current CO_2-forwards are almost as high as the CPF)

- by c. 2 €/MWh in 2023; and
- by c. 2.4 €/MWh in 2025 compared to the coal ban scenario

In the longer-run until 2030 prices converge

1

Sensitivity of the results to changing market framework

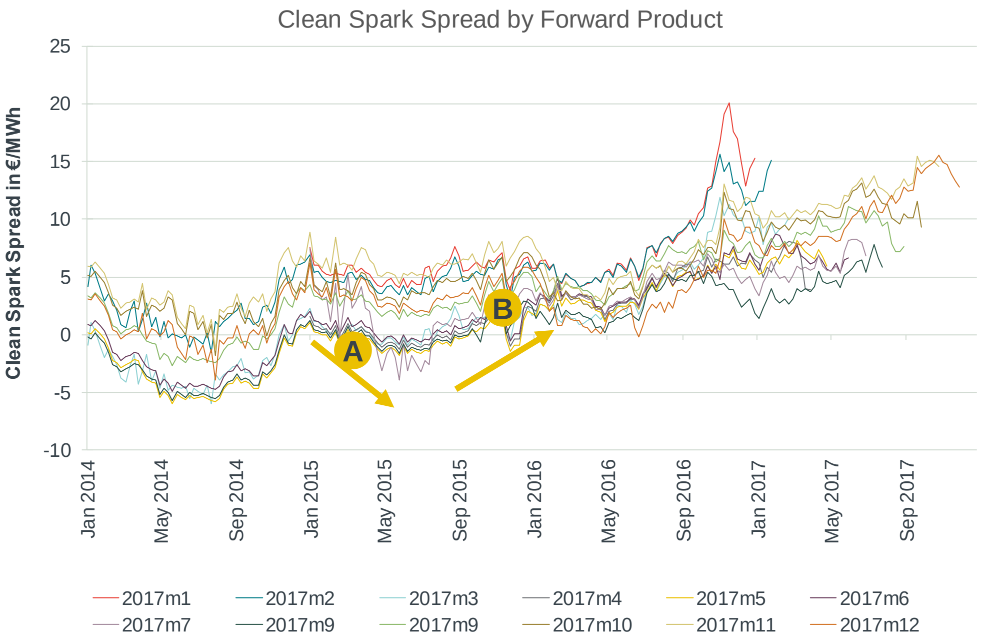
	Qualitative analysis	
Fuel & CO_2 prices	▪ Fuel and CO_2 prices represent one of the key-drivers of the CCGT's profitability ▪ Increasing coal/gas price ratio beneficial for gas plants ▪ Higher CO_2 prices (relevant for all thermal plants that might set the Dutch power price) are beneficial for gas plants if more carbon-intense generation sets the price → see current CSS	
Power Demand	▪ Increasing demand from a higher degree of electrification c.p. improves the business case for de-mothballing ▪ An increase in demand flexibility, however, acts as competition for (mothballed) gas-plants as peaking plants	Compared to our modelling assumptions Klimaatakkoord aims at higher RES-E but also higher electrification of other sectors, e.g. industrial processes
RES-E growth	▪ Higher renewable infeed moves the merit-order outward and the average clearing price on wholesale markets decreases ▪ At the same time, volatility of prices increases and more flexible plants are required when renewable energy sources are not available	
IC-capacities	▪ Interconnection capacity and interconnected capacity represent competition for (mothballed) gas-plants, if interconnected countries are characterised by overcapacity ▪ If neighbouring countries are short in power supply, Dutch plants can benefit from increasing interconnection levels as opportunities for sales in neighbouring countries increase	
Groningen gas	▪ The Groningen field has historically supplied a large share of Dutch gas needs ▪ Phasing out the exploration will shorten power supply as those power plants supplied by the field face prohibitively high costs for establishing an alternative gas supply → beneficial for de-mothballing business case of the plants analysed	

Rolling intrinsic evaluation - methodology

Optimisation of position closer to real time

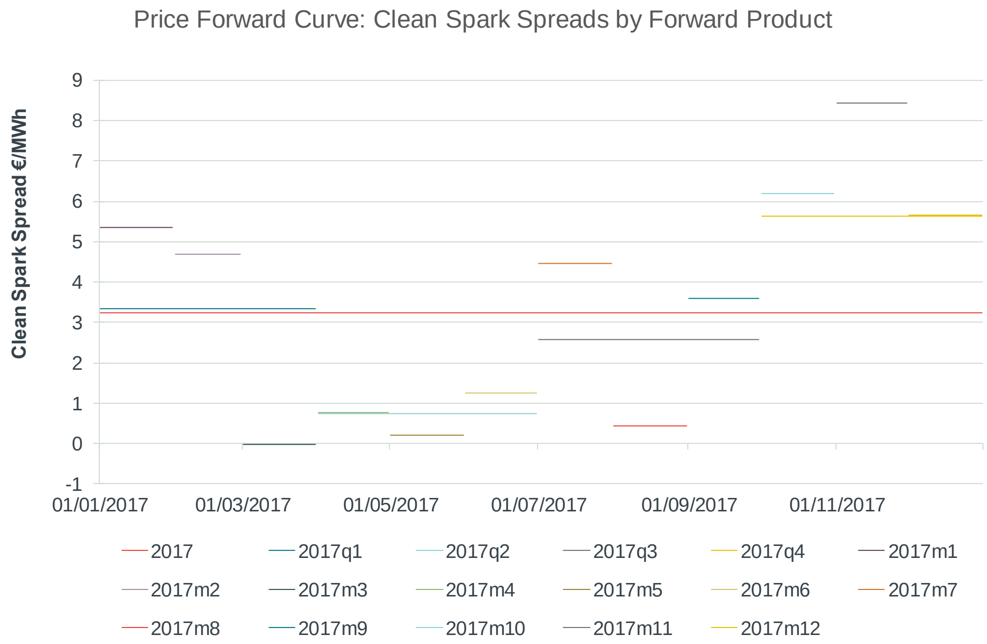
- Power prices on forward markets are volatile over time – therefore, plant operators can trade forward contracts based on the volatility of the prices of a forward product *over time.*
- In practice, plant operators adjust their "selling/buying position" on a rolling basis ("rolling intrinsic") on the forward market:
  - "buy-back" when CSS becomes negative → point A on chart
  - "re-sell" when CSS becomes positive again → point B on chart
- Hece, operators can sell the generation capacity multiple times without producing 1 MWh

Evolution of price forward curves for 2017



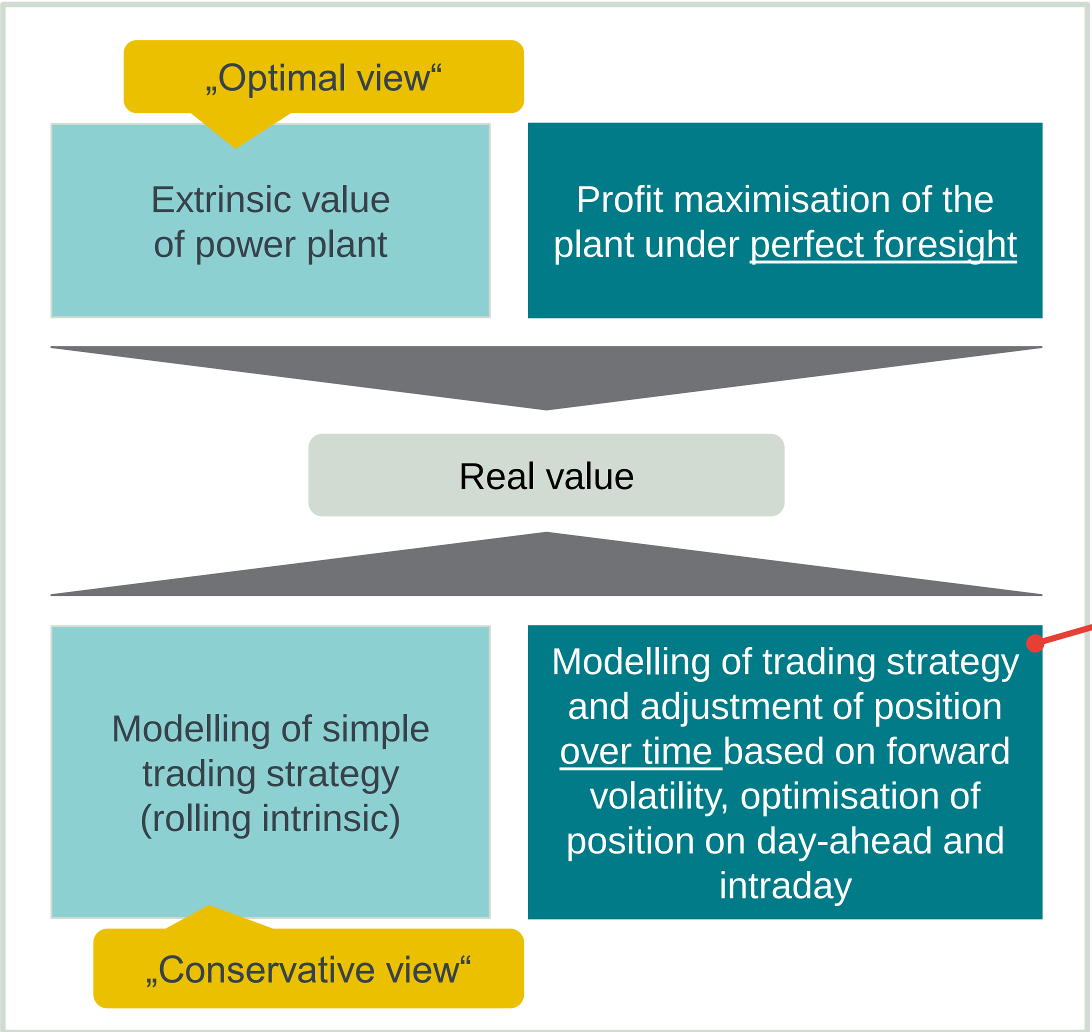
Source: Frontier Economics

Price forward curve for given trading day



Source: Frontier Economics

How do we model the operator‘s expectation about future revenues?



“Rolling intrinsic” modelling of expected plant revenues:

- We follow a more conservative approach in order to get a realistic picture of the operator‘s expectations of future revenues

Basic procedure:

- Time period: operators form expectation c. 3 years in advance
- Forward market peak spread are basis for assessment
- We take optimisation of position on forward and spot market until real-time (restricted to peak-products) into account
- We provide additional qualitative reasoning about other revenue streams

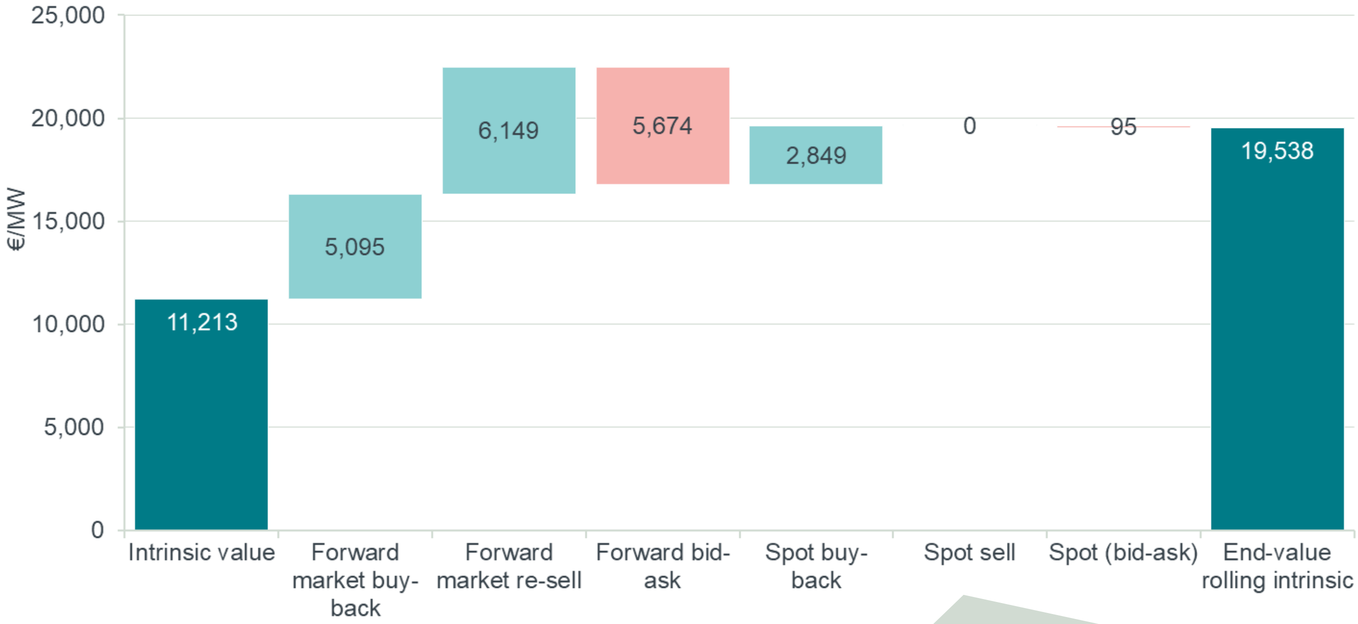
2

Forward and spot optimisation: We derive optionality factor based on historical forward price volatility

Optionality factor based on historical data

- Optionality factor is derived from
  - Intrinsic value based on average forward peak CSS 2014-2016 (annual product)
  - Re-buy and re-sell on forward market (based on monthly products)
  - Re-buy and sell on day-ahead market, re-buy on intraday market
- Example below: 50% net-efficiency and threshold of 0.3 €/MWh per trade

De-composition of rolling-intrinsic revenue elements (2017, efficiency 50%)



Source: Frontier Economics

For reason of simplicity, we assume that the plant is fully committed on forward market and no additional sales are completed on spot and intraday markets (off-peak not considered at all)

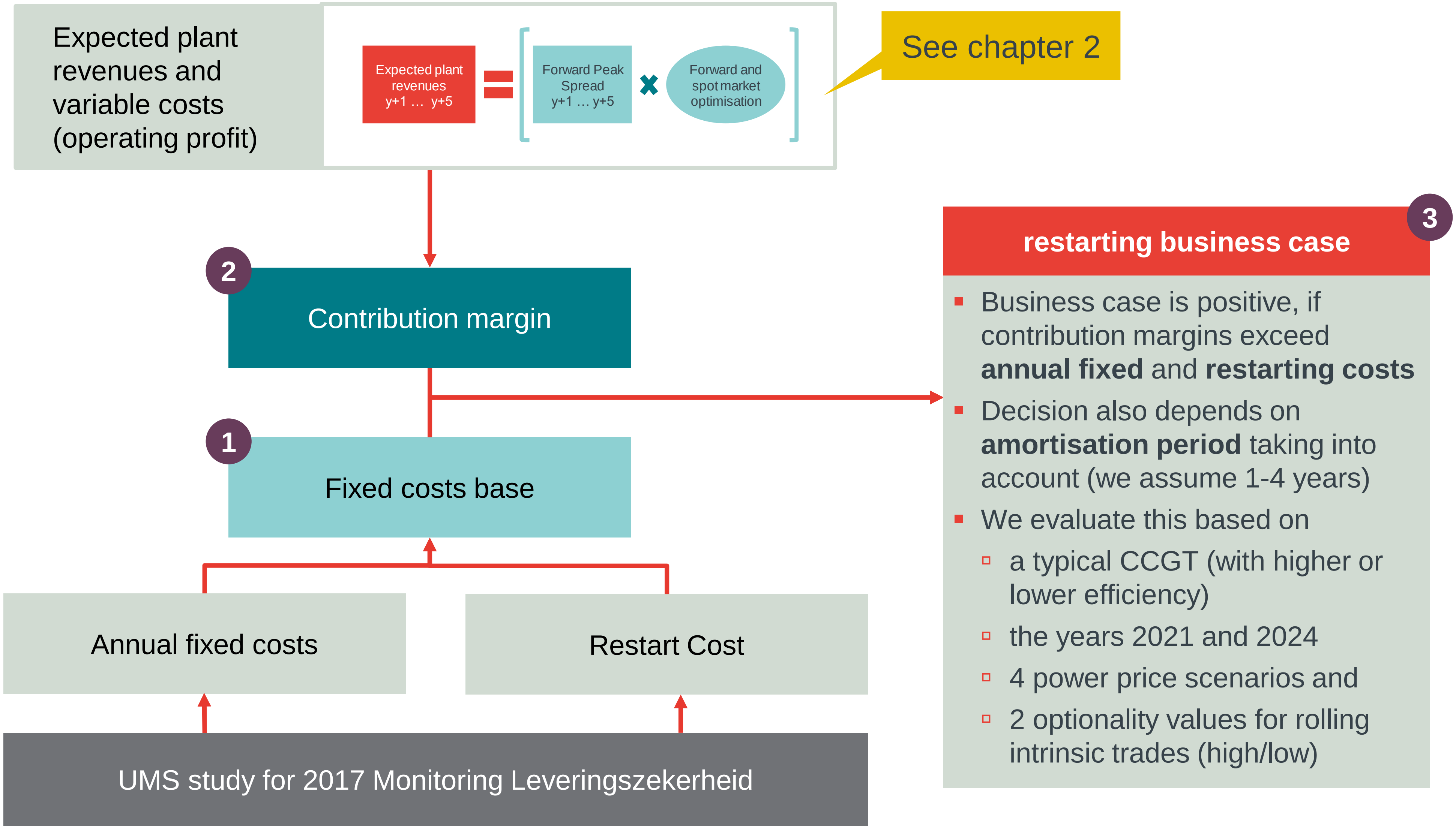
- Intrinsic value: Average peak CSS from 2014-2016 product for 2017: **11 k€/MW**

  \+ Additional forward market optimisation based on monthly products (buy-back and re-sell) 5.5 k€/MW

  \+ Spot buy-back: 2.8 k€/MW

  = Total forward and spot market (w/o off-peak sales) **19.5 k€/MW**
- Optionality factor = **1.74**

The restarting business case is evaluated based on the contribution margin and cost base of a typical CCGT



The business cases for reactivation can be clustered according to the following dimensions

4 pricing scenarios

Short-term perspective (year of delivery: 2021)

- CWE scarcity & coal ban in NL
- CPF & coal ban scenario
- Coal ban scenario
- Reference Case (no coal ban)

Optionality factor	Depreciation time for reactivation
High (1.7)	1 years
Low (1.2) based on 2017-study	2 years
	3 years
	4 years

Medium-term perspective (year of delivery 2024)

- CWE scarcity & coal ban in NL
- CPF & coal ban scenario
- Coal ban scenario
- Reference Case (no coal ban)

Optionality factor	Depreciation time for reactivation
High (1.7)	1 years
Low (1.2) based on 2017-study	2 years
	3 years
	4 years

1

Fixed costs and restart costs of a typical CCGT depend on the preservation status

- We focus on preservation modus 3 with more than 1 year standstill (most relevant scenario for the mothballed plants in the Netherlands) → Shorter preservation periods require lower investments into restarting the plant
- Typical CCGT of 2x400 MW based on study for 2017 monitoring leveringszekerheid

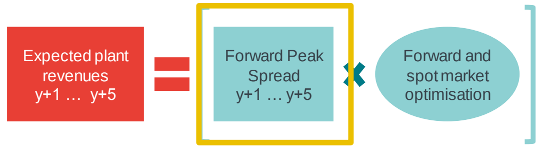
Preservation Modus	Description	Time horizon	Availability within…	Annual fixed costs	Restart Costs
2a - Wet	Preservation under nitrogen, keep water, avoid oxygen in system	months-year	days	14 mio. €	2 mio. €
2b - Dry	Remove all water, focus on avoiding moisture (dryers)	months-year	weeks	14 mio. €	2 mio. €
3 - Dry	Remove all water, disconnect, seal, min. monthly costs	> year	months/year	14 mio. €	3-15 mio. € **
4 – Dry & Cannibalized	Remove all water, disconnect, seal, min. monthly costs, sell parts re-actively	„forever“	years	14 mio. €	> 15 mio. €

In the following, we focus on preservation modus 3

Source: UMS 2017: analysis for monitoring leveringszekerheid

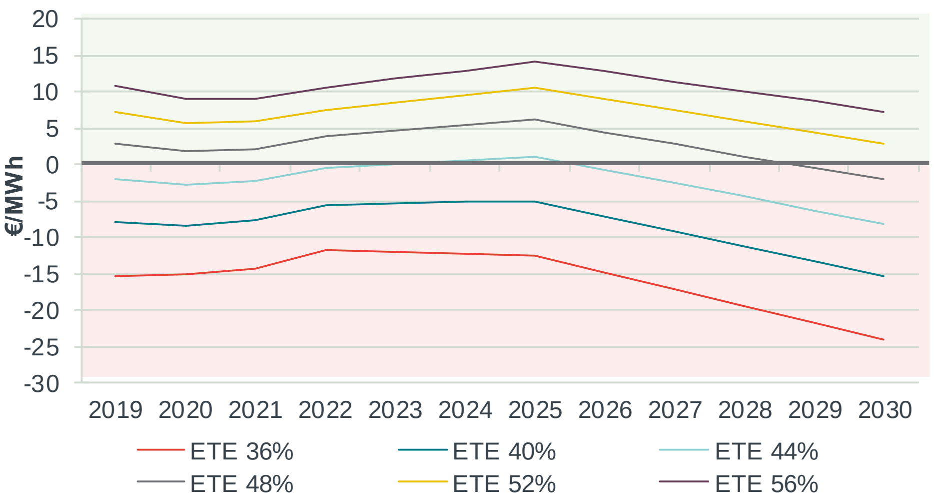
** Following UMS, we further include 14 mio. € runnig costs p.a. in all cases*
*** After 3-4 years standstill, major overhaul required*

2

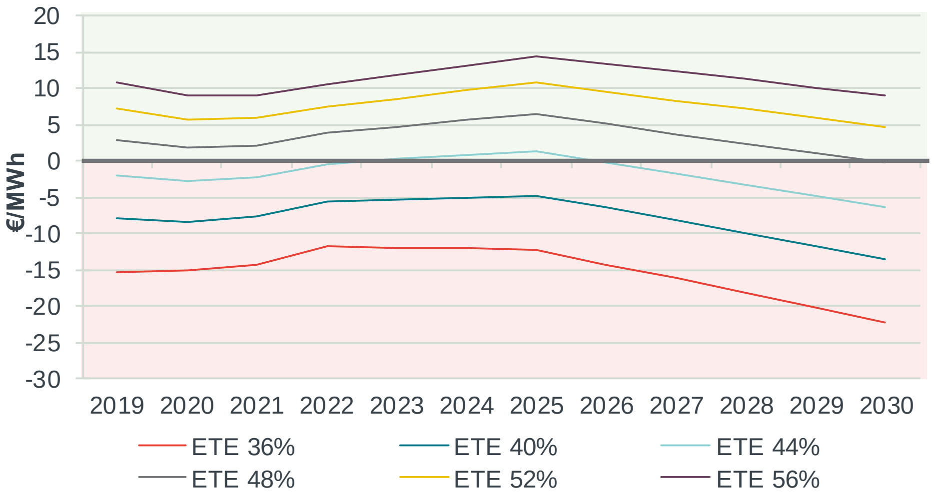


The **clean spark spreads** differ between scenarios and assumed efficiencies of the plants

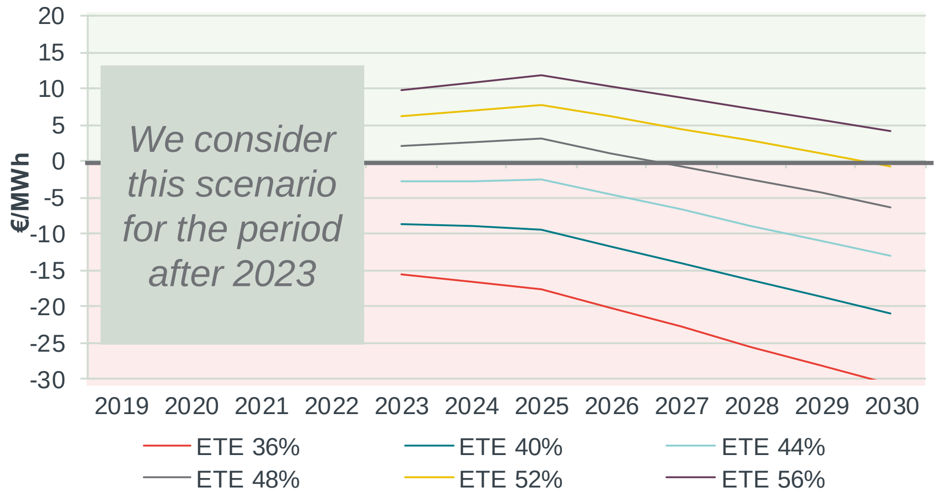
Reference Case (no coal ban)



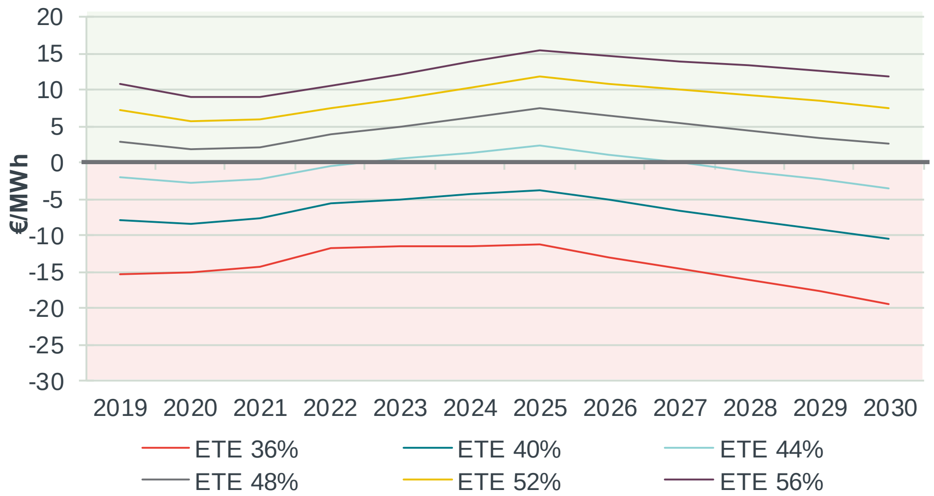
Coal ban



CPF & coal ban

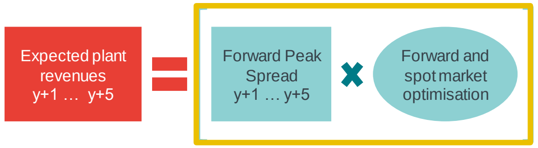


CWE-scarcity & coal ban (NL)



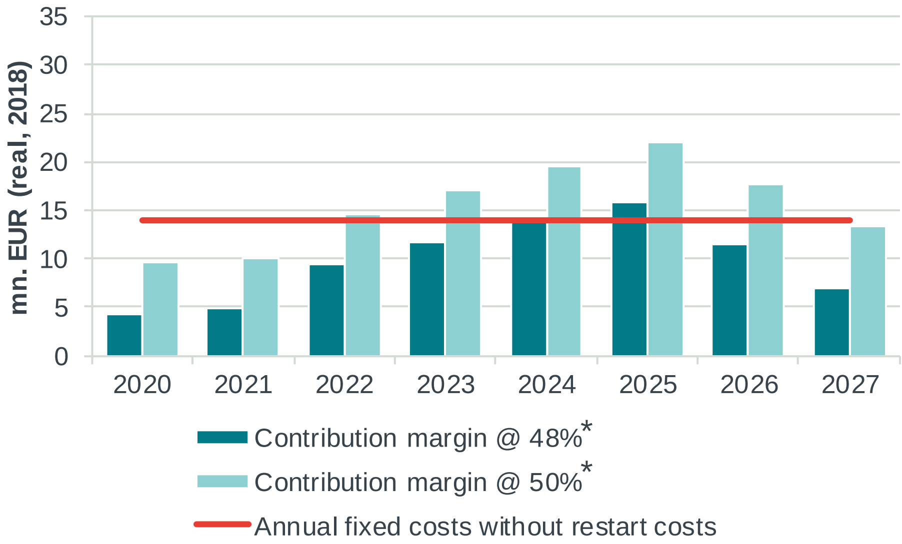
Source: Frontier Economics

All values expressed in real terms (base year 2018)
ETE: net-efficiency (grid infeed to fuel input, incl. start-up fuel and part-load losses)



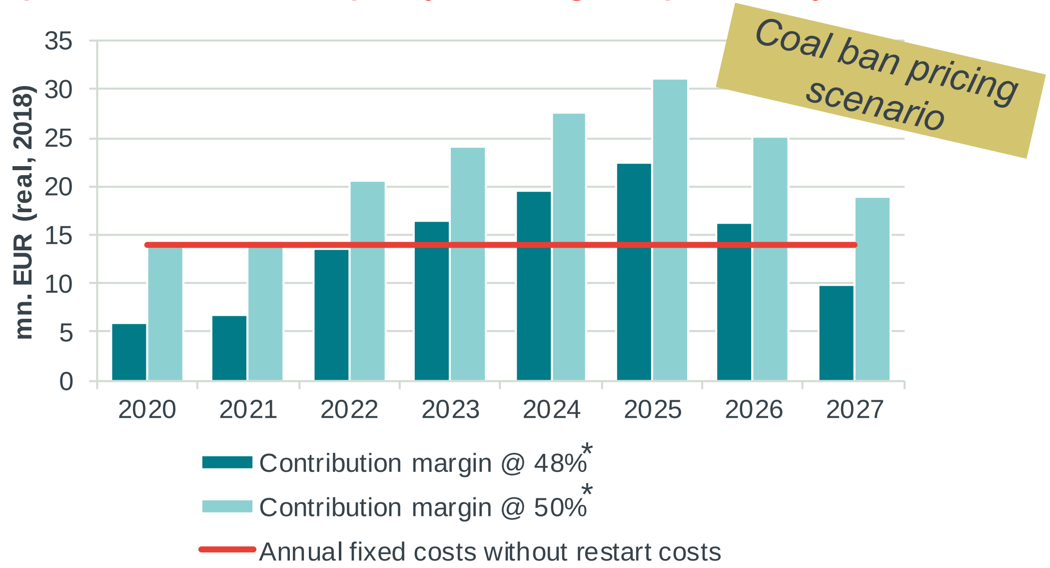
From these CSS we derive expected revenues per year of the CCGT based on „low“ and „high“ optionality factor

Expected revenues per year “low” optionality



Source: Frontier Economics

Expected revenues per year “high” optionality



Source: Frontier Economics

- From the two optionality scenarios we derive a bandwidth of expected revenues (high-low optionality)
- If expected revenues exceed annual fixed costs a contribution to the financing of restart costs can be made
- For the reactivation operating profits (= contribution margin – annual fixed costs) are accumulated over 1, 2, 3 or 4 years and compared to the restart costs of 15 Mio. €
- If accumulated operating profits exceed restart costs then the business case is positive

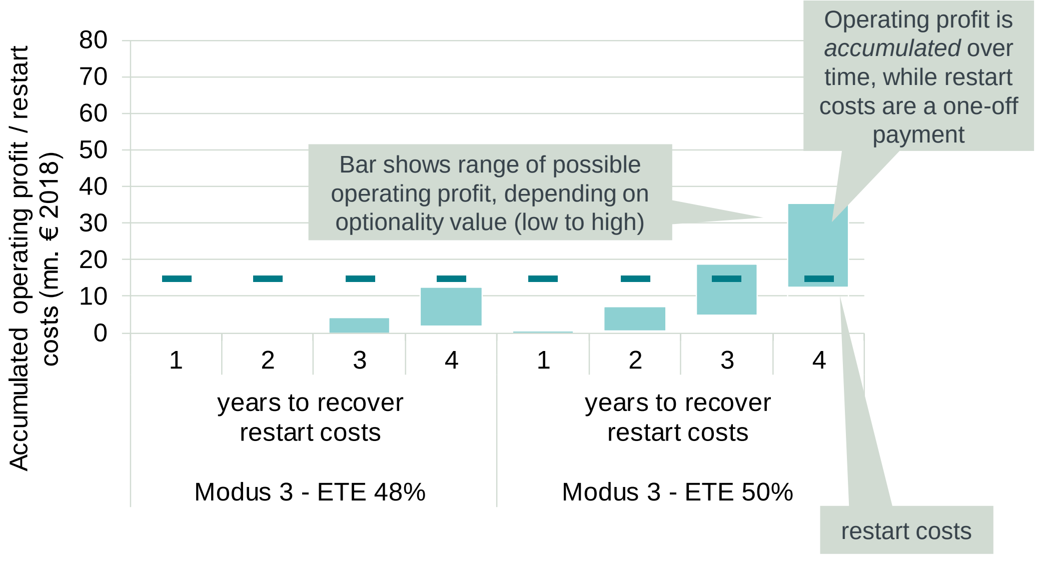
* *net-efficiency (grid infeed to fuel input, **incl. start-up fuel and part-load losses**)*

Reference Case: Incentive to reactivate long-term preserved plant only in the medium-term

… in the short-term (reactivation until 2021)

- In the short-term reactivations are unlikely in the conservative scenario (low optionality value)
- In the optimistic scenario (high optionality value), efficient plants are more likely to be reactivated, especially when restart costs are recovered during a period >3 years (e.g. after a lifetime extension)

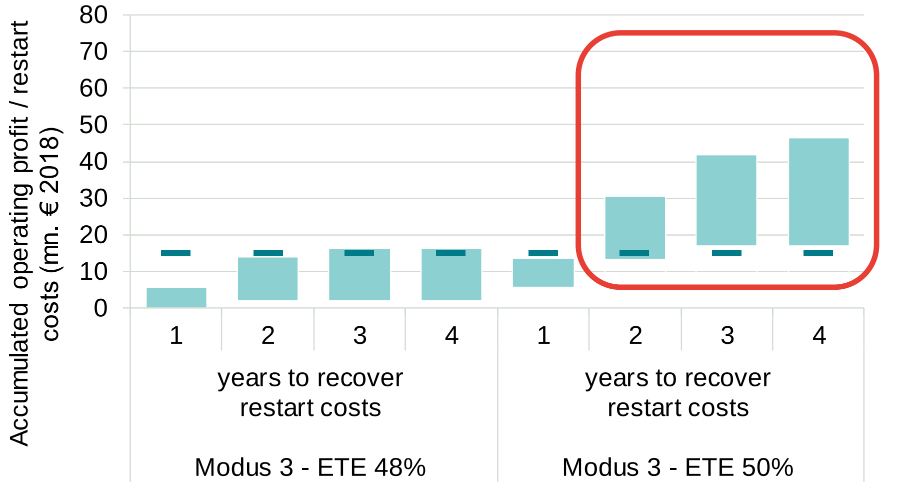
Accumulated operating profit vs. restart costs



… in the medium-term (reactivation until 2024)

- Scarcity in CWE increases until 2024, consequently, there are higher incentives to reactivate gas plants in the medium-term, in particular for more efficient plants
- More efficient plants can recover restart costs after 2-3 years, depending on the scenario (low/high optionality value)

Accumulated operating profit vs. restart costs



Source: Frontier Economics

Operating profit (range based on high and low optionality value)

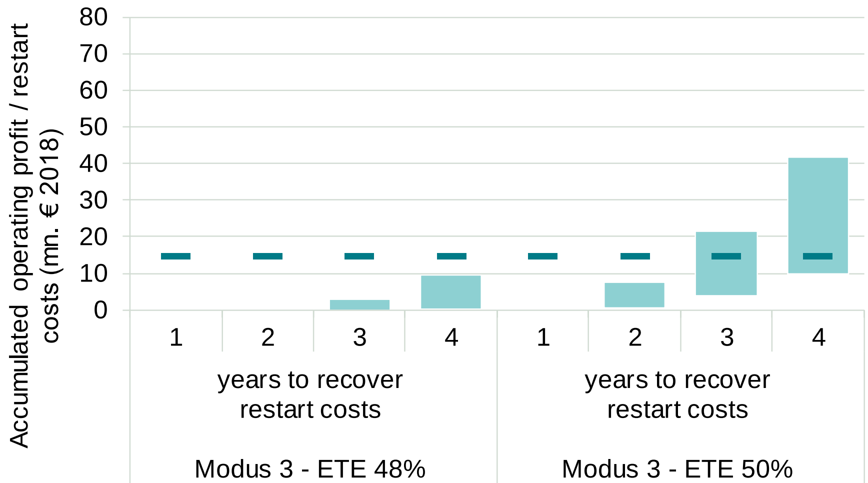
Restart costs

Coal ban scenario: Incentive to reactivate long-term preserved plant increase moderately, main effect of ban in later years

… in the short-term (reactivation until 2021)

- The short-term outlook with a coal ban is similar to the Reference Case as there is no short-term impact of the coal phase-out
- In the conservative scenario (low optionality value), reactivations are unlikely; In the optimistic scenario (high optionality value), efficient plants have moderate incentives to reactive

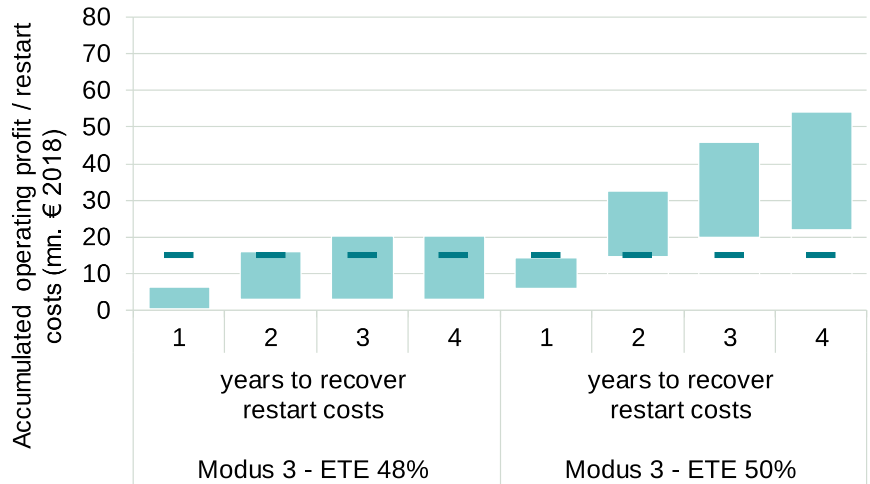
Accumulated operating profit vs. restart costs



… in the medium-term (reactivation until 2024)

- In the medium-term the incentives to reactivate gas plants increase as the coal phase-out leads to slightly higher scarcity and power prices in the NL
- In the conservative scenario (low optionality value), efficient plants might be reactivated; In the optimistic scenario (high optionality value), efficient plants are likely to be reactivated

Accumulated operating profit vs. restart costs



Source: Frontier Economics

Operating profit (range based on high and low optionality value)

Restart costs

CPF & Coal ban scenario: No incentives to reactivate mothballed plants when a national carbon price floor is introduced in the Netherlands

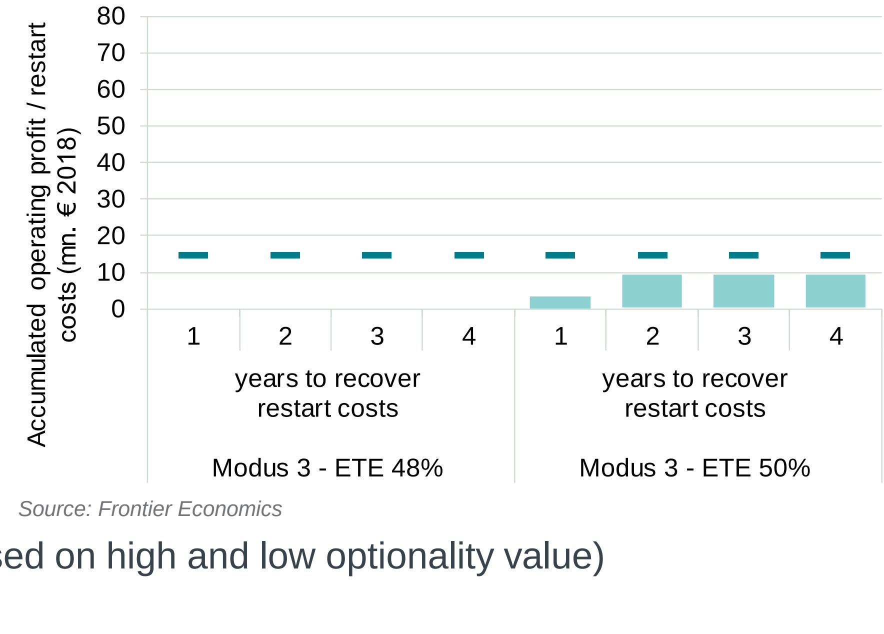
Latest CO_2 forwards exceed the CPF in the first years of its introduction. If the level of the CPF is exceed by CO_2 market prices, the results will equal those of the „coal ban“ scenario.

However, if the CPF is adjusted upward, a negative impact on profitability will prevail.

… in the medium-term (reactivation until 2024)

- Reactivations are unlikely in the medium-term as the CPF increases generation costs for domestic gas plants
- In the interconnected power markets lower domestic power generation is replaced by imports, so that incentives to reactivate gas plants remain low

Accumulated operating profit vs. restart costs



Source: Frontier Economics

CWE scarcity & coal ban: Tighter supply in neighbouring countries increases incentives to reactivate plants in the Netherlands

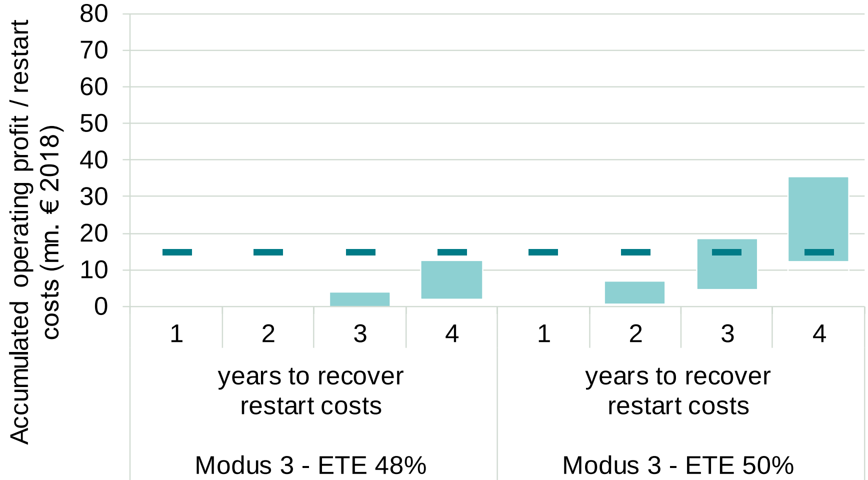
… in the short-term (reactivation until 2021)

- In the short-run there is little impact on the incentives to restart gas plants by the scarcity in CWE power markets and by the coal ban in NL
- There are moderate incentives to reactivate more efficient gas plants, which might be able to recover the restart costs after 3-4 years

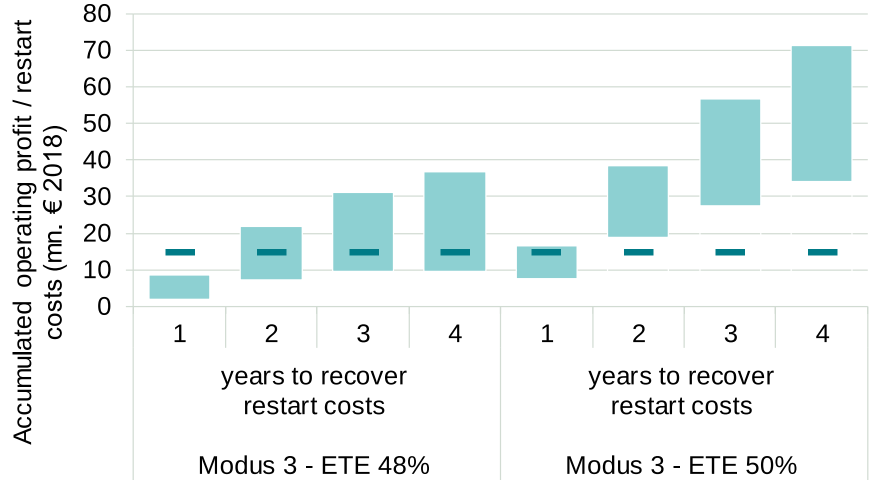
… in the medium-term (reactivation until 2024)

- The scarcity in CWE plant parks increases the overall price level in the region in the medium-run and thereby increases the incentives to reactivate gas plants
- In particular more efficient plants can realise revenues which are significantly higher than restart costs (see figure below)

Accumulated operating profit vs. restart costs



Accumulated operating profit vs. restart costs



Source: Frontier Economics

Operating profit (range based on high and low optionality value)

Restart costs

Conclusions and lessons learnt from business case assessment

Some gas plants are able to generate revenues from heat supply – these revenues have not been included in this assessment of the incentives to restart the plants

Short-term evaluation (2019-2021)

- In the short-term incentives to reactivate remain low under the all pricing scenarios scenario:
  - CSS increase only slowly and margins are not sufficiently high to recover restart costs in the short-term
  - However, forward prices show an increasing trend and profitability is improving
- Currently, CWE power market is still characterised by overcapacity → no need and no incentive to reactivate

Medium-term evaluation (2022-2025)

- In the medium-term incentives to reactivate more efficient plants improve under the Reference Case and "Coal-ban" scenario
  - More efficient plants can recover their start costs even in the low-optionality case
- This is consistent with overall understanding that market will become tighter following nuclear phase-out in BE and DE; if scarcity increases further, e.g. following a coal-phase out in DE, incentives to reactivate increase as well
- With a national CPF in NL reactivations are unlikely due to higher generation costs

Lessons learnt and further considerations

- Evaluation of business case should take option value of the plant and the possibility to undertake quasi-risk free trades on forward market into account
- We consider an optionality factor that is more optimistic than the one used in the 2017 analysis; However, not all possible revenues are factored into the business case (e.g. ancillary services, day-ahead off-peak sales, portfolio effect, etc. → hence, our estimate is "conservatively optimistic")
- Results are in line with model-based analysis for EZK: reactivation of gas plants between 2023-2030 in the "Coal ban" scenario and no reactivations before 2030 in the "Coal ban & CPF" scenario

Context: Decision to reactivate a mothballed plant represents an investment under uncertainty

	Sources of uncertainty for investors	Ability to cope with uncertainty	Impact on decision to reactivate
a	Market based uncertainty regarding fuel prices and cost base of plant	Operators can hedge against market risks	**Low**: Operators can trade forward products and hedge risk
b	Uncertainty about development of RES-E	Operators cannot hedge against "merit-order" effect and resulting in missing money for conventional plants	**Medium**: Development over next 2-5 years reasonably well known
c	Political interventions into market framework, e.g. fuel prohibitions	Operators cannot hedge against political interventions	**High**: Short-term interventions impact certainty significantly
d	Development in neighbouring countries (spill-over effects)	Operators cannot hedge against spill over effects from other countries	**Medium**: Impacts are only indirect through prices

- For new investments in capital intensive industries (like power generation) with longer depreciation periods (> 20 years), uncertainty and risks may potentially represent a barrier (especially policy risks)
- De-mothballing decisions are less affected by long-term uncertainty:
  - Investment is less capital intensive (reactivation cost c. 19 €/kW, new-investment up to 900 €/kW)
  - Also, depreciation periods are much shorter and only the 3 years are relevant (with lifetime extension > 3 years are reasonable)

a

Market risks: Power price, fuel price and CO_2 price volatility can be managed by risk managament instruments

Possible market barrier	Plant operators face uncertainty about future power price, fuel and CO_2 price levels ▪ **Power prices**: Prices likely to become more volatile with an increase in RES-E, peak/off-peak structure especially affected by higher PV infeed (lower peak prices due to high infeed during the day) ▪ **Fuel prices**: Fuel prices (gas) impacted by seasonal trends (heat demand), but also availability of storage capacities and global demand/supply balance, increasing integration of global gas-markets through LNG should lower volatility ▪ **CO_2 prices**: Volatility of EUA prices has been low and price movements follow structural changes to the market framework (→ political uncertainty) ▪ **Market entry:** New market entry from competing units (gas / unconventional generation) or demand side management could lower spreads for mothballed plants
Assessment	▪ **Market risks are of limited relevance as investment in reactivation can to a large extent be re-financed during liquidly traded time horizon,** some remaining uncertainty for the period after the liquid time period of the forward market ▪ Price volatility and uncertainty around future price levels for power and fuels does not represent a market imperfection ▪ If required, market participants will develop and use products to handle risks from short-term price volatility (options, forwards, etc.) – risk management tools available
Potential remedy	▪ No remedy required ▪ If market risks increase a higher return on investment will be requested

b

Political risk: Development of renewables represents a source of uncertainty, political stability is required

Possible market barrier	The power system is undergoing fundamental changes and the deployment of RES-E has been the key driver in the past ▪ Increasing infeed from RES-E pushes conventional generation out of merit order and utilisation of peak/mid-merit plants decreases ▪ At the same time, volatility increases and prices should become more peaky (this requires peaking plants to be more flexible in shorter start-stop cycles) ▪ So far reality has often surpassed expectations when it comes to future renewable infeed
Assessment	▪ **Development of renewables is of limited relevance as investment in reactivation can to a large extent be re-financed during liquidly traded time horizon,** some remaining uncertainty for the period after the liquid time period forward market ▪ Discussion in the context of the Klimaatakkoord aim at more stable long-term strategy ▪ Even if prices become more volatile, this does not represent a fundamental issue in markets where prices can peak **without price cap.** Currently, there is no legal price cap in place in the Netherlands (only technical price limits at exchanges)
Potential remedy	▪ Political stability for renewable support and climate policy increases investor's certainty ▪ However, less relevant in the context of de-mothballing due to short depreciation periods

C

Political risk: Discretionary political interventions increase risk for investors

Possible market barrier	Dutch political Debate around **Klimaatakkoord** involves key stakeholders in different “sector tables”, e.g. one discussion group for the electricity market ▪ Until recently, the EU ETS and renewable support schemes acted as main instrument to steer climate change in the power sector ▪ Over the last years, national policy initiatives, like the Dutch coal ban, have moved the focus from EU-coordinated climate policy to a nationally focussed policy setting ▪ Danger of entering a “slippery slope”: negative unintended side effects of discretionary measures often lead to further political interventions (again with unintended effects)
Assessment	▪ National policy initiatives are less predictable for investors, as the discussion around the coal ban proves: Three modern coal plants have been set-up in 2015/2016 following government requests ▪ The decision to force a shut-down on short-notice may lower investor’s trust in the Dutch legal framework ▪ In the context of gas-fired generation, operators may fear similar intervention (such as the implementation of a national CPF) and therefore may abstain from investment or reactivation
Potential remedy	▪ Climate policy should be rule-based and follow long-term trajectories ▪ This allows investors to form reasonable expectations and evaluate business cases realistically ▪ For the reactivation of gas plants, a stable political framework - at least for the depreciation period of 2-4 years plus decision lead time - is favourable

d

Spill over effects: Developments in neighbouring countries can impact incentives positively or negatively

Possible market barrier	Developments in neighbouring countries can increase or decrease incentives for reactivation: ▪ If power generation capacity abroad (e.g. in Germany) is shut down and therefore scarcity in power generation is exported from these countries to neighbouring countries (e.g. the NL) the markets should signal this through higher prices → incentives to reactivate increase ▪ Developments that lead to a surplus of capacity, e.g. through the introduction of a capacity market that overstates capacity requirements, lower incentives to reactivate ▪ In the event of a simultaneous scarcity situation in neighbouring countries, asymmetric balancing incentives could move supply to the country with lower balancing penalty ▪ Price signals may become more volatile due to increasing RES-E infeed abroad
Assessment	Spill-over effects from other countries currently do not represent a barrier for reactivation ▪ Generation capacity abroad is becoming tighter increases the incentive for reactivation; capacity markets in neighbouring countries currently don't create overcapacities ▪ Scarcity from neighbouring countries can be expected to translate into higher prices in the Netherlands: no price caps on wholesale power markets, cross border participation on day-ahead market through market coupling has increased the market efficiency ▪ The incentives from the Dutch balancing system are strong – power can be expected to be delivered in the Netherlands in the event of a simultaneous scarcity ▪ Market participants can deal with increasing price volatility e.g. through hedging instruments
Potential remedy	▪ No remedy required, however capacity markets in neighbouring countries should be closely monitored ▪ Further development of standards and processes for correlated scarcity events (on-going process within ENTSO-E / Pentalateral Energy Forum)

Summary: We do not see obvious obstacles and barriers to reactivation

Conclusion	

Conclusion

- Investments in reactivation are relatively small in size (compared to investments in new capacities) and have relatively short pay-back periods (2-4 years)
- Therefore, long-term policy and market risks do not apply to reactivations. Uncertainty only affects smaller share of cash flow required to finance reactivation
- This is supported by the fact that in the current market framework, reactivation of mothballed plants has already taken place
- Market risks can be borne most efficiently by the investors themselves (higher risks might lead to higher prices)
  - Further increase in granularity of traded products (e.g. forward markets) can ease the hedging of risks
- Political risks should be avoided by following a rule-based approach to policy setting
  - Discretionary political interventions under short notice should be avoided
  - Strong push for EU-harmonised approach w.r.t. climate policy
- Further cross-border coordination is required in the context of security of supply (simultaneous scarcity events), and market design in neighbouring countries should be closely monitored (i.e. regarding capacity mechanisms)
- Further general improvements to the market design can be achieved
  - Avoid barriers to unconventional generation or DSR / Definition of commercial settlement rules in the case of brown-outs / Implementation of cross-border processes for Security of Supply events

… however, energy market debate has increased political uncertainty for investors (coal ban, national CPF…)