RWE AG and RWE Eemshaven Holding II B.V. v. Kingdom of the Netherlands

ICSID Case No. ARB/21/4

Expert Report

by

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COMPASS LEXECON

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I. INTRODUCTION

I.1. INSTRUCTIONS

1. We have been instructed by De Brauw Blackstone Westbroek ("**Counsel**"), counsel to The Kingdom of the Netherlands (Ministry of Economic Affairs and Climate Policy) ("**Respondent**"), to review the expert report of Mr. Dan Harris and Ms. Serena Hesmondhalgh of The Brattle Group (hereinafter "**Brattle**") dated December 18, 2021 ("**Brattle Report**"). We have also been instructed to review the expert report of Mr. Tomas Nikolaus Haug and Mr. Bastian Gottschling of NERA Economic Consulting GmbH (hereinafter "**NERA**") dated December 18, 2021 ("**NERA Report**").

2. We understand that the Brattle Report and the NERA Report were submitted by RWE AG ("**RWE**") and RWE Eemshaven Holding II B.V. ("**RWE Eemshaven**") (hereinafter jointly "**Claimants**") in support of their claim for compensation for losses purportedly suffered by RWE Eemshaven as a result of the ban on the use of coal in the Netherlands for generating electricity by 2030 (the "**Coal Ban**"), regulated by the Electricity Production Prohibition Act, dated December 20, 2019 (the "**Coal Ban Act**").

3. In addition, we have been instructed to:

    a. Quantitatively review Brattle's estimation of damages as of Brattle's chosen date of valuation, October 9, 2017, the day immediately before the newly elected government published their Coalition Agreement ("**2017 Coalition Agreement**"). For such purposes we have been instructed to adopt Brattle's implicit assumption that as of such date the market expected, with certainty, that there would be no financial compensation to Eemshaven for an alleged loss of value due to the Coal Ban.

    b. Assess whether using a recent date of valuation, reflecting more recent market expectations than in Brattle's chosen date of valuation of October 9, 2017, would affect the estimate of alleged damages.

4. The lack of any comments on the approaches, assumptions or opinions put forward by Brattle and NERA should not be interpreted as our agreement therewith.

5. Our opinions in this report are based on our general knowledge of economics and finance as well as on our review of multiple documents related to the issues in this arbitration. Insofar as the facts or assumptions on which we rely are not within our own knowledge, we have identified the source of those facts or assumptions. This report must not be construed as expressing opinions on matters of law, which are outside of our expertise. We reserve the right to update the opinions rendered in this report in the light of additional information that may be made available to us in the future.

I.2. SUMMARY OF OPINION

I.2.1. Developments in Efforts to Combat Climate Change and Impact on Coal-Fired Power Plants

6. Since the early 1990s policymakers have agreed on a global response to combat climate change. While global targets were set to reduce "greenhouse gas" emissions, the European Union (EU) has continually set ever stricter targets. One of the key tools used by the EU to achieve these targets is the EU emissions trading system ("**ETS**"), which is a cap-and-trade system where participants buy and redeem emission allowances ("**EUAs**"). EUAs give the holder the right to emit one ton of carbon dioxide ("**CO_2**"). The EU, by controlling the supply of EUAs, sets a price for EUAs and thus a price to emit a ton of CO_2, introducing a cost to polluters for every ton of CO_2 emitted.

7. While emission reduction targets have become increasingly more ambitious since the 1990s, a milestone achievement was reached in December 2015 with the Paris Agreement that set the goals of "*holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*."

8. Since then, the EU has further increased its emission reductions targets—the latest target, agreed in 2021, aimed at reducing emissions by at least 55% by 2030, compared to 1990 levels, up from the 40% target set since 2014.

9. Carbon pricing schemes such as the EU ETS and increasing commitments to combat climate change meant higher costs and an erosion of profitability for coal-fired power plants. Market analysts in 2017 highlighted the uncertainties surrounding coal power plants, with Carbon Tracker, a not-for-profit think tank, estimating that 54% of coal-firing plants in the EU were loss-making by 2017. Carbon

Tracker also forecasted the percentage of loss-making EU plants to rise to 97% by 2030 because of ever-tightening environmental compliance regulations and expected increases in coal power plants' operating costs relative to renewable technologies, and it stated that plants would avoid losses by being phased out.

10. The deterioration in the expected market conditions for coal-fired power plants was further evidenced by the substantial impairments that owners of these plants recorded in their financial statements already since [redacted], several years before coal bans. For instance, RWE recorded [redacted] and [redacted] impairments in its RWE Eemshaven plant in [redacted] respectively. These amounts represent [redacted] of the estimated construction cost of the plant at €3.2 billion. RWE indicated that impairments recorded in its financial accounts were "*mainly due to the current assessment of the medium to long-term development of electricity prices, the regulatory environment, and the lower utilisation of parts of the fossil-fuelled power plant portfolio*."

I.2.2. Brattle's Assessment Indicates That Eemshaven Is [redacted] to Suffer Losses as a Consequence of the Coal Ban Act

11. Brattle have been instructed to measure the change in the value of Eemshaven by reference to the change in its fair market value ("**FMV**"). For this purpose, Brattle propose a methodology that envisages generating 100 possible simulations of the future evolution of prices of coal, gas, and CO_2 using a so-called Monte Carlo technique. For these 100 different simulations of the future, using a discounted cash flows approach, Brattle compute the FMV of Eemshaven under each of the 100 Actual (*i.e.*, with the Coal Ban in place, with operations not allowed to fire coal from 2030 on) and But-for (*i.e.*, with operations limited only by the end of the plant's useful life in 2054) scenarios. The difference between the Actual and But-for value is the alleged loss suffered by Claimants in each simulation.

12. Brattle's calculations provide no certainty that the Coal Ban would effectively impact the value of Eemshaven. Under Brattle's own modeling and assumptions, the plant would suffer no damages in [redacted] of the 100 simulations. Thus, it stems from Brattle's results that it is [redacted] that Eemshaven would shut down before 2030, even absent the Coal Ban or any other national policy instrument.

13. In addition, in the [redacted] simulations when Eemshaven would continue operating beyond 2030, the plant would not necessarily shut down as a consequence of the Coal Ban (as Brattle assume), as it would still be allowed to operate with alternative fuels. Under Brattle's own assumptions and including the possibility to convert Eemshaven to run on biomass, we find that the probability of Eemshaven shutting down as a consequence of the Coal Ban would [redacted].

14. As we summarize in more detail next, Brattle's assumptions and modeling suffer from several fundamental flaws that lead to an overestimation of the impact of the Coal Ban. After resolving these fundamental flaws, for example, by assuming CO_2 prices in line with efforts to meet the commitments of the Paris Agreement, or taking into account information on expected renewable capacity deployment, it would be [redacted] that Eemshaven would operate beyond 2030, even in the absence of any additional national policy instrument. In the [redacted] simulations where Eemshaven would operate beyond 2030, these operations would be substantially less valuable than Brattle's estimates.

I.2.3. Brattle's Estimation of Losses Is Flawed, Overstating the Impact of the Coal Ban

15. As noted in paragraph 11 above, Brattle's estimation of losses involves 100 different Monte Carlo simulations of coal, gas, and CO_2 prices. It leads to an alleged loss suffered by Claimants of €[redacted], as of Brattle's chosen date of valuation—October 9, 2017.

16. Brattle's analysis relies on a plethora of assumptions, including on the distribution, correlation, and volatility of coal, gas, and CO_2 prices, together with projections of electricity demand and supply and hourly electricity prices in the Netherlands up to 2054. In addition, they make assumptions on Eemshaven's technical characteristics, expected costs and plant closure decisions (if the plant incurs continued losses) as well as on trading activities, taxation, capital expenditures, and discount rate, among others. Brattle's analysis, however, suffers from several key flaws that result in an overestimation of the alleged damages to Claimants.

17. *First*, Brattle choose inputs on fuel and CO_2 prices, electricity demand, and installed capacity that are outdated as of Brattle's chosen date of valuation, and furthermore do not comply with the EU's international commitments by being inconsistent with the goals of the Paris Agreement. In doing so, Brattle ignore the expectations of additional policies (*e.g.*, they underestimate the expected evolution

of CO_2 prices) that would further deteriorate the market conditions of coal power plants in Europe. More specifically, Brattle base their forecasts of:

a. Commodity prices, on the "New Policies" scenario of the 2016 World Energy Outlook ("**WEO**"), published by the International Energy Agency ("**IEA**"). The 2016 WEO presented three scenarios: the so-called "Current Policies", "New Policies" and "450" scenarios. Neither scenario, however, complies with the targets of the Paris Agreement. The "Current Policies" accounts only for the policies or measures in place as of mid-2016 assumed to last until 2040 without any changes. The "New Policies scenario," which Brattle primarily rely on, is based on the policies and measures already in place or that had been announced but does not assume any of the expected significant tightening of emission reductions over time required to achieve the long-term EU targets. The "450 scenario" (which Brattle use as an upper limit in their CO_2 price forecasts) sets a pathway of limiting long-term global warming at 2°C above pre-industrial levels with only a 50% chance. The Paris Agreement, however, had a stricter commitment of "*holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*." As such, the resulting CO_2 prices in Brattle's simulations would arise from emission restrictions that fall short of achieving the Paris Agreement's targets.

b. Electricity demand and installed capacity, on the EU Reference Scenario 2016 ("**EU Reference Scenario**"), published in July 2016, which was outdated as of Brattle's chosen date of valuation and ignored the implications of the EU's commitments to the Paris Agreement, as it only includes policies and measures adopted at the EU level and by the Member States by December 2014, thus pre-dating the Paris Agreement. As such, it materially underestimates the expected deployment of renewable capacity as of October 2017, which can be seen with reference to the projections of renewable capacity in the Netherlands by sources dated closer to Brattle's chosen of date of valuation.

18. Instead, a more appropriate source would be the draft 2018 Ten-Year Network Development Plan ("**TYNDP**") produced by the European Network of Transmission System Operators for Electricity ("**ENTSO-E**") as it was published on October 2, 2017 (*i.e.*, shortly before Brattle's chosen date of valuation) and provides commodity price forecasts based on long-term scenarios that assume

additional efforts to meet decarbonization goals. Such TYNDP also forecasted materially higher renewable capacity deployment than the EU Reference Scenario. By underestimating the deployment of renewable capacity in the future, Brattle's results underestimate the challenging future market conditions in which Eemshaven would operate.

19. *Second*, Brattle assume that with the Coal Ban (Actual Scenario), the Eemshaven plant would unequivocally shut down no later than 2030, ignoring the possibility of using alternative fuels that could extend the operations of the plant beyond 2030.

20. In particular, Brattle are instructed to assume that after 2027 Eemshaven would only burn coal and that operating Eemshaven with unsubsidized biomass would not be economically viable. Brattle "agree" that such an assumption is reasonable, without performing their own independent assessment. This assumption is also at odds with RWE's statements regarding its willingness to fully convert Eemshaven and the recent increase in the use of biomass at Eemshaven. Moreover, had Brattle performed an analysis of the viability of biomass operation in a fashion consistent with their valuation of Eemshaven (with 100 simulations of possible paths for electricity and commodity prices), Brattle would have obtained several simulations in which conversion and operation with unsubsidized biomass would be profitable. Consequently, in those simulations RWE Eemshaven would continue to operate from 2030 onwards even with the Coal Ban, and thus its Actual value would be higher than what Brattle estimated, resulting in reduced losses. Indeed taking Brattle's simulated electricity prices as given and using their assumption on biomass prices (*i.e.*, a 2018 level of [redacted] increasing at the rate of inflation) and NERA's estimate of investment costs, we find that, when the possibility to convert to biomass is included, the number of simulations where Eemshaven would shut down as a consequence of the Coal Ban would decrease to [redacted] (out of Brattle's [redacted] simulations where Eemshaven would operate beyond 2030).

21. *Third*, Brattle underestimate the future risks faced by coal plants given the energy transition. As of October 2017, the European energy market was in the early stages of decarbonization, expected to accelerate in subsequent years with the shift away from fossil fuels to low-carbon technologies. Given the high carbon intensity of coal plants, such as Eemshaven, this energy transition posed significant risks to coal plants in the future.

22. The negative impact that risk has on the value of assets can be incorporated through the cash flows or via the discount rate. In their analysis, however, Brattle do not account for such energy transition risk in either fashion.

23. Specifically, Brattle's discount rate (WACC) calculation relies on *historical* risk of comparable companies, ignoring the *future* prospects of deteriorating market conditions. Brattle's resulting WACC of 3.85% is 3–4 percentage points below the WACCs used by market analysts and practitioners to value RWE. Brattle's WACC is also significantly below the WACC of 7.5% used by Germany to determine compensation for its own coal phase out, which the European Commission still seemed to find too low, stating that "*[i]t is questionable whether this discount rate is adequate or whether additional correction mechanisms would have to be foreseen to account for the high risks and uncertainties linked to the forecasts*." Given that Brattle allocate [redacted] of the value of Eemshaven to the period between 2030–2054, which is more than 10 years away from their date of valuation (*i.e.*, in October 2017), and that the discount rate applies to future cash flows, Brattle's choice of the discount rate ultimately has a profound impact on their valuation of losses.

24. *Fourth*, in assessing what the value of the Eemshaven plant would be to a willing buyer, Brattle incorrectly assume that such buyer would be risk-neutral. This is observed in Brattle's calculation of the But-for value of the plant as the simple average of the net present value of the relevant Monte Carlo simulations and obtaining a value of €[redacted].[1] This is equivalent to stating that absent the Coal Ban a willing buyer would be willing to pay €[redacted] to acquire RWE Eemshaven. The distribution of potential values across the simulations, however, is significantly skewed, with [redacted] of them having a FMV that is less than €[redacted]. [redacted] A presumption that a buyer would pay €[redacted] with certainty for a gamble like the one just described, where the investment is [redacted] to turn loss-making, is not economically reasonable for most potential risk averse investors.

[1] Excluding the bottom and top 5% of their simulations, Brattle estimate the losses to Eemshaven (of €[redacted]) as the difference between the FMV of the plant in the But-for scenario (which they estimate at €[redacted]) and Actual scenario (which they estimate at €[redacted]).

25. *Fifth*, Brattle's calculations contain multiple other modeling flaws:

a. As noted above in paragraph 11, Brattle's valuation approach entails using a so-called Monte Carlo technique. While Monte Carlo experiments are a theoretically valid method to incorporate uncertainty and randomness in price and cash flow projections, Brattle fail to provide any evidence that as a practical matter, Monte Carlo simulations are commonly used in real-life acquisitions of companies, and that investors would rely on and prefer a valuation averaged from random simulations, rather than using a "central" (*i.e.*, most-likely) or "scenario-based" cash flow forecast.

b. In addition, as Brattle themselves highlight, by relying on a range of possible price paths they include some simulations in which coal-fired plants could be very profitable or even "extremely favorable" simulations (as Brattle refer to them), but they fail to test the reasonability of their most extreme simulations. In particular, Brattle ignore that simulations resulting in high electricity prices carry a higher risk of regulatory state intervention to modify market situations that regulators may deem undesirable (*e.g.*, due to affordability concerns or climate concerns).

c. Brattle also overestimate Eemshaven's value by including asset-backed trading revenue from trading coal, gas, CO_2, and electricity (together so-called "**CAO**" revenues), assumed to be equal to a fixed percentage (around [redacted]) of commodity margins, when such an assumption is not grounded in economic reality.

26. Finally, Brattle's estimation of value fails reasonability checks. Indeed, Brattle's damages estimate of €[redacted] is inconsistent with contemporaneous evidence as of their chosen date of valuation. Brattle were instructed to use a date of valuation immediately before the Coal Ban became sufficiently clear to affect the value of RWE Eemshaven. Brattle chose October 9, 2017, the day before the 2017 Coalition Agreement. According to Brattle, the announcement in the 2017 Coalition Agreement included a formulation of the Coal Ban. Brattle indicate that this announcement "*was sufficiently defined and foreseeable to affect the valuation of coal-fired plants.*" Such a date, however, did not "sufficiently define" the impact on coal-fired plants. In fact, the RWE 2017 financial accounts indicate that "*[a]t present, it is impossible to predict the ramifications of the coalition agreement for the energy sector.*" In addition, we have found no contemporaneous market analysis of RWE's stock

that comments on this announcement or on any impact that it had on the value of RWE's assets, let alone an impact of the magnitude estimated by Brattle.

27. Brattle also discard looking at RWE's share price movements to measure the alleged loss in value resulting from the Coal Ban, which can serve as a useful reasonability check. While Brattle estimate RWE Eemshaven's loss to be €[redacted] as of October 9, 2017 (Brattle's chosen date of valuation), RWE's total market value of equity as of the same date stood at €12.2 billion. Thus, Brattle's estimated losses represent [redacted] of RWE's market value, a material impact that would not have been unnoticed by the market. Had market analysts covering RWE believed that the announcement in the 2017 Coalition Agreement had such a detrimental impact on RWE, we would expect such analysts to issue commentaries in this regard. As mentioned, however, we have not identified any analyst making such commentaries in October 2017 or shortly after.

28. Brattle also discard as a reasonability check the evidence from RWE's closure of coal-fired power plants in Germany, and the compensation received for an early closure in 2020. Brattle indicate that such compensation only covered the period [redacted], *i.e.*, RWE's German plants are compensated for [redacted] years of lost operations between [redacted]. We are unaware of RWE having claimed compensation from the German State for the period beyond [redacted]. One possible reason for a lack of such claim could be that post-[redacted] operations are expected to have little-to-no value. If this is the case, it would contradict Brattle's estimation of significant value for Eemshaven beyond [redacted].

I.2.4. Resolving Basic Flaws in Brattle's Analysis Leads to a Significantly Lower Valuation

29. We have been instructed to quantitatively review Brattle's estimation of damages using Brattle's chosen date of valuation—October 9, 2017, and adopting their implicit assumption that in the Actual scenario market players expected, with certainty (*i.e.*, were sure), that there would be no financial compensation to Claimants for their loss of value due to the Coal Ban.

30. Using Compass Lexecon's Electricity Modeling Team's dispatch modeling capabilities, we run Brattle's Monte Carlo simulations replacing some of their key flawed assumptions:

   a. We replaced Brattle's scenarios from the 2016 WEO with inputs from the TYNDP 2018, which are dated closer to Brattle's chosen date of valuation. We use the TYNDP 2018's "Global

Climate Action" and "Distributed Generation" scenarios, since these scenarios have forecasted prices that are expected to be consistent with efforts to meet the EU's contemporaneous long-term decarbonization targets. We performed 200 simulations of electricity price projections and Eemshaven's commodity margins (100 simulations for each scenario), as opposed to Brattle who use only one scenario of inputs (the 2016 WEO New Policies scenario) and perform 100 simulations for that single scenario.

b. We incorporated the possibility of converting Eemshaven to fire 100% of its capacity using biomass, for those simulations with sufficiently high electricity prices that make such conversion profitable.

c. We replaced Brattle's underestimated WACC with a WACC of 8.01%, based on Germany's estimate of WACC, and which accounts for increasing risks to coal plants due to the energy transition.

d. We removed CAO revenues and removed the top 5% of results to account for the risk-aversion of a potential willing buyer.

31. With the cumulative impact of the above-mentioned adjustments, Brattle's estimate of damages as of October 2017 would be nil in both the "Distributed Generation" scenario and in the "Global Climate Action" scenario.

32. If instead of using the Monte Carlo technique we were to use a "central" or "scenario-based" analysis, and applying the above-mentioned adjustments, Brattle's estimate of losses would also be nil in both the "Distributed Generation" scenario and the "Global Climate Action" scenario.

33. Finally, Counsel has instructed us to assess whether using a recent date of valuation, reflecting more recent market expectations than as of Brattle's chosen date of valuation of October 9, 2017, would affect the estimate of alleged damages. Brattle's valuation of losses as of December 19, 2019 (prepared in the context of the Dutch legal proceedings) already provides such an indication, since Brattle conclude that alleged damages to Eemshaven would decrease, compared to October 2017, by

[redacted].[2] Later market developments, taking place after December 2019, are expected to further deteriorate Eemshaven's financial performance in the medium to long term, and to result in even lower damages, if any.

I.3. Experts' Qualifications

I.3.1. Pablo T. Spiller

34. Pablo T. Spiller, Ph.D. is a Senior Consultant at Compass Lexecon. He is also the Jeffrey A. Jacobs Distinguished Professor Emeritus of Business and Technology at the Haas School of Business, University of California, Berkeley; research associate at the National Bureau of Economic Research; and former president of the International Society for New Institutional Economics.

35. Previously, Professor Spiller was a Director at LECG. He has written extensively on regulatory, antitrust, and institutional issues, having published more than 100 academic articles and nine books.

36. Professor Spiller also has extensive consulting and expert testimony experience and has contributed to the design and implementation of economic regulatory reforms. He has consulted extensively with the World Bank, United Nations, and the Inter-American Development Bank, as well as governments and private companies on business valuation, damage analysis, and regulatory analysis of infrastructure projects in multiple countries including Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Croatia, Cuba, the Commonwealth of Dominica, the Czech Republic, the Dominican Republic, Ecuador, El Salvador, Egypt, Guatemala, Hungary, Italy, Jamaica, Korea, Malaysia, Mexico, Norway, New Zealand, Panama, Peru, the Philippines, Poland, Romania, Russia, Senegal, Spain, Trinidad and Tobago, Turkey, Ukraine, the United States, Uruguay, Uzbekistan, and Venezuela.

[2] Brattle prepared expert reports and valuation models for the Dutch legal proceedings in support of RWE Eemshaven Holding II B.V.'s claim for compensation for losses purportedly suffered as a result of the Coal Ban. Brattle's Report in the Dutch legal proceedings of February 19, 2021 and their report of December 18, 2021 in the present ICSID proceedings are nearly identical. Brattle's Reply Report in the Dutch legal proceedings of April 28, 2022, however, contains some minor amendments to the financial model and additional analyses. In addition, in contains a valuation of losses as of December 19, 2019. *See* CL Reply Report (Dutch proceedings), ¶53 **(S&R-004).**

37. He has participated as a valuation expert in multiple international arbitration cases involving both treaty and contractual disputes, several of which involve renewable energy assets in European countries. He was the co-editor and editor-in-chief of the Journal of Law, Economics, & Organization for 19 years, and has been an associate editor of multiple academic journals, including the Journal of Applied Economics, the Regulation Magazine, the Journal of Comparative Economics, the Journal of Economics, Management & Strategy, the Journal of Policy Reform, and the Journal of Industrial Economics.

38. Professor Spiller has also served as the chair of the Business & Public Policy Group at the University of California, Berkeley for five years. On leave from Haas, he has also been a special advisor to the director at the Bureau of Economics of the Federal Trade Commission. He was also an elected member of the board of directors of the American Law & Economics Association.

39. Professor Spiller's *curriculum vitae* is enclosed as exhibit S&R-002, and it includes a summary of qualifications, publications, and major presentations in conferences and seminars.

I.3.2. Alan G. Rozenberg

40. Alan G. Rozenberg is an economic consultant with more than ten years of experience in international arbitration matters. At present, he is a Senior Vice President at Compass Lexecon. He has vast experience in business valuation and regulatory economics.

41. Mr. Rozenberg has participated in more than 40 international investment and commercial arbitration cases valuing assets in various industries and geographic locations. He has advised companies in mergers and acquisitions processes outside the international arbitration field and in State aid investigations.

42. Mr. Rozenberg has participated in cases in Argentina (manufacturing), Bulgaria (electricity generation), Costa Rica (hospitality), Croatia (renewable electricity), Cuba (hospitality), Dominican Republic (electricity generation), Egypt (oil and gas logistics, gas supply agreements), Guatemala (electricity distribution), Hungary (electricity generation, hotel, and casinos, water distribution), Italy (gas supply agreements), Japan (renewable electricity), Kuwait (shareholder disputes on conglomerates), Latvia (airports), Poland (pharmaceuticals, renewable electricity), Spain (renewable

electricity), Trinidad and Tobago (methanol production), Ukraine (gas supply agreements), and Venezuela (wholesale distribution).

43. He has a degree in Economics from the Universidad Nacional de Cuyo and a Master's degree in Finance from the Universidad del CEMA (UCEMA), both in Argentina.

44. Mr. Rozenberg has been recognized by Who's Who Legal as a Future Leader in Arbitration.

45. Mr. Rozenberg's *curriculum vitae* is enclosed as exhibit S&R-003, and it includes a summary of qualifications and publications.

II. GENERAL OVERVIEW OF THE DEVELOPMENTS IN EUROPEAN EMISSIONS TO COMBAT CLIMATE CHANGE

46. In this section we discuss key international treaties and mechanisms that have been shaping the development of climate policies and market expectations. Global efforts aimed at climate mitigation through emissions regulation had a major impact on the energy industry, including conventional fossil fuels, such as coal. As a result, the business models, financial performance and earning prospects of coal-firing electricity generators have been undergoing an accelerated transformation.

47. In Section II.1 we summarize main developments of climate policies in the EU. In Section II.2 we focus on the expected impact of European regulations on the market conditions for conventional fossil fuel plants. Finally, in Section II.3 we review evidence reflecting the expected further deterioration of market conditions for coal-firing electricity generators.

II.1. THE EU'S INCREASING INTERNATIONAL AND EUROPEAN COMMITMENTS FOR THE LONG-TERM REDUCTION OF GREENHOUSE GAS EMISSIONS

48. Since the early 1990s policymakers have recognized climate change—driven by greenhouse gas ("**GHG**") emissions and CO_2—as a worldwide problem requiring a global response. In 1992 the first international agreement, the United Nations Framework Convention on Climate Change ("**UNFCCC**"), was signed by 158 countries.[3] The United Nations' Intergovernmental Panel on Climate Change ("**IPCC**") has been quantifying and tracking the carbon budget, *i.e.*, the maximum amount of cumulative CO_2 emissions that would allow to limit global warming with a given probability.

49. The first agreement under the UNFCCC was the 1997 Kyoto Protocol. It set binding national targets and carbon pricing initiatives, which aimed to reduce industrialized countries' overall emissions of GHG by at least 5% below the 1990 levels by 2008–2012.[4] The EU ratified the Kyoto Protocol on May 31, 2002 and agreed upon a reduction of 8%, which was subsequently divided among the EU's

[3] *See* UN General Assembly. 1992. *United Nations Framework Convention on Climate Change*, FCCC/INFORMAL/84, Art. 4, ¶2(a) **(S&R-005)**.

[4] *See* UN Chronicle. 2007. *From Stockholm to Kyoto: A Brief History of Climate Change* **(S&R-006)**.

Member States.[5] For the Netherlands, this resulted in an emission-reduction target of 6% below the emissions level of the base year.[6]

50. Since adopting the bloc-wide target, the EU continued with its efforts to reduce GHG emissions by launching in 2005 the emissions trading system (ETS).[7] The EU ETS is a carbon market where participants buy and sell emissions allowances (European Union Allowances or EUAs). EUAs are the 'currency' of the EU ETS, each allowing the holder the right to emit one ton of CO_2 or the equivalent amount N_2O and perfluorocarbons.[8] In the early phases of the ETS the EU allocated EUAs to power plants for free, but by 2013 the EU switched to allocating EUAs via auctions.[9] In this way, the EU manages the supply of the ETS, setting a cap on the number of EUAs available and thus giving them a value.[10]

51. The EU has progressively revised its ETS to align it with the UNFCCC's and its own increasingly more ambitious emission reduction targets.

52. In 2011, the EU published its Energy Roadmap 2050 committing to reduce GHG emissions to 80%–95% below 1990 levels by 2050.[11] Since October 2014 the EU has had a medium-term binding target of at least 40% reduction in GHG emissions by 2030 compared to 1990 levels.[12] In December 2015, the representatives of 196 States, including the EU, negotiated and adopted a long-term plan: the Paris Agreement on climate change, to replace the expired Kyoto Protocol.[13]

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[5] *See* European Council. 2002. *Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder*, 2002/358/CE, Annex II **(S&R-007)**.

[6] *Ibid*.

[7] *See* European Union. 2003. *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC* **(S&R-008)**.

[8] *See* European Commission. 2016. *The EU Emissions Trading System*, p. 2 **(S&R-009)**.

[9] In Phase 2 (2008–2012) the proportion of free allocations fell to around 90%; in Phase 3 (2013–2020) auctioning became the default method for allocating allowances. *See* European Commission. *Development of EU ETS (2005-2020)* **(S&R-010)**.

[10] *See* European Commission. 2016. *The EU Emissions Trading System*, p. 2 **(S&R-009)**.

[11] *See* European Commission. 2011. *Communication from the Commission: Energy Roadmap 2050*, COM(2011) 885 final **(S&R-011)**.

[12] *See* European Council. 2014. *Conclusions on 2030 Climate and Energy Policy Framework* **(S&R-012)**.

[13] *See* UNFCCC. Paris Agreement (December 12, 2015) **(S&R-013)**.

53. The Paris Agreement set the goals of "*holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*."[14] The EU officially ratified the Paris Agreement in October 2016, with the agreement entering into force in November 2016.[15]

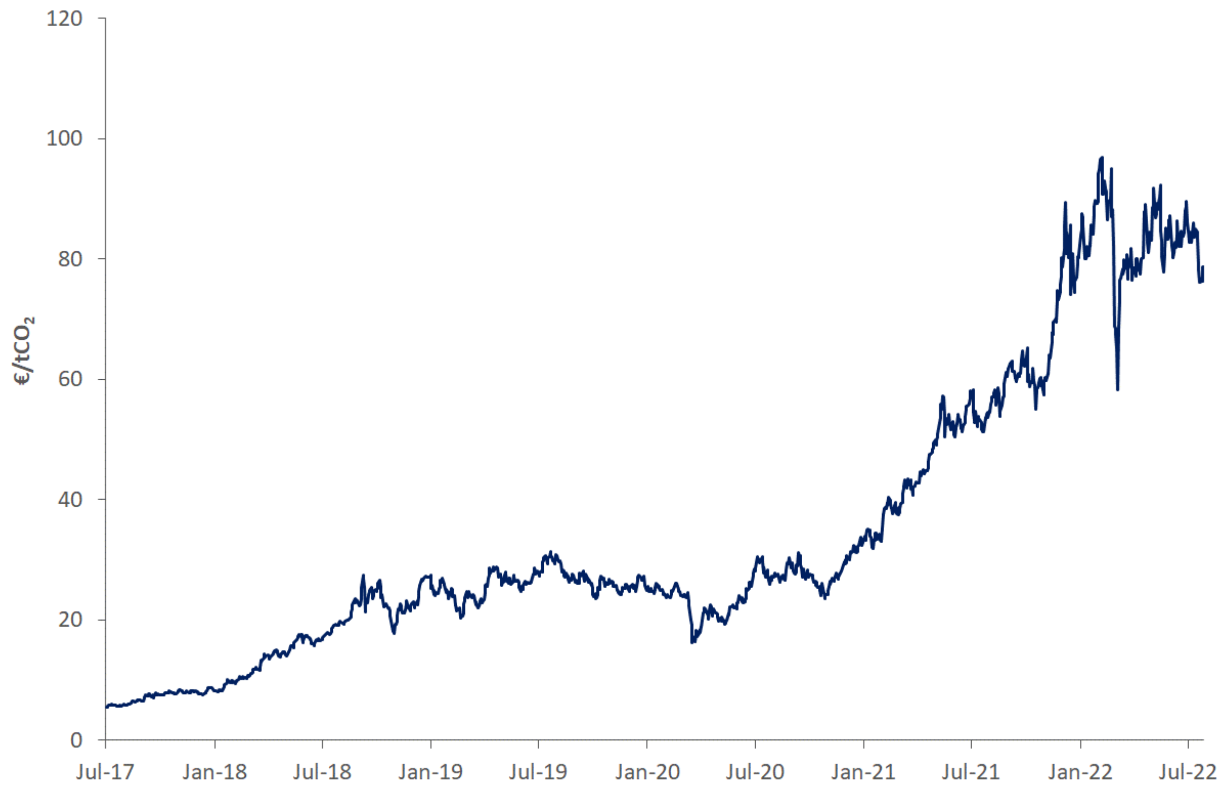
54. Also in November 2016, the Netherlands Environmental Assessment Agency ("**PBL**") published its 2016 National Energy Outlook (Nationale Energieverkenning or "**NEV**").[16] In the 2016 NEV, PBL projected that, with the set of policies prevailing at the time, the Netherlands was significantly off-track with its medium-term targets of emission reduction: the 2016 NEV forecasted that emissions were expected to achieve only a 30% reduction by 2035, compared to 1990 levels.[17] This was significantly lower than the prevailing target for the Netherlands, and even the EU target of 40% by 2030.[18] The PBL thus indicated that it was "*plausible that additional reductions will have to be made in order to achieve the EU target by 2050.*"[19]

55. In February 2017, the EU Environment Council and the EU Parliament presented their ideas to align the ETS with the EU's targets for greenhouse gas emission reductions by 2030.[20] In November 2017 the EU Council endorsed the proposed reform which introduced, among other things, additional reductions to the number of EUAs to be available.[21] Notably, rules and mechanisms were introduced to better deal with the historic surplus of allowances, such as Market Stability Reserve.[22] The

[14] *See* UNFCCC. Paris Agreement, Article 2 (December 12, 2015) **(S&R-013)**.
[15] *See* European Council and Council of the European Union. 2020. *Paris Agreement on climate change* **(S&R-014)**.
[16] *See* PBL. 2016. *National Energy Outlook 2016*. English summary **(S&R-015)**.
[17] *See* PBL. 2016. *National Energy Outlook 2016*. English summary, p. 5 **(S&R-015)**.
[18] Note that in May 2018 the individual country target for the Netherlands was set higher than EU's average for the period of 2021–2030, to balance the considerations of fairness and solidarity among the Member States. *See* footnote 25 for more details.
[19] *See* PBL. 2016. *National Energy Outlook 2016*. English summary, p. 5 **(S&R-015)**.
[20] *See* RWE. 2017. *Interim Report on the First Half of 2017*, p. 10 **(S&R-017)**.
[21] *See* Council of the EU. 2017. *Reform of the EU emissions trading system – Council endorses deal with European Parliament*, press release 632/17 (November 22, 2017) **(S&R-017)**.
[22] To manage the volume of surplus allowances, the EU ETS has used a "Market Stability Reserve" that can reduce the total number of allowances in circulation by absorbing the excess over the predefined threshold. *See* European Commission. 2021. *Market Stability Reserve* **(S&R-018)**. The Market Stability Reserve also allows the ETS to handle the potential impact on EUA demand arising from coal phase out policies. *See* European Commission. 2021. *Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757*, COM(2021) 551 final, Impact Assessment Report, part 1/4, p. 12 **(S&R-019)**.

reformed EU ETS directive entered into force in April 2018.[23] As can be seen in Figure I below, this initially contributed to a steep growth in the price of EUAs.

Figure I. Historical Price of EUAs, €/tCO₂, 2017–2022



Source: Brattle Report, Figure 51 and Compass Lexecon Analysis ***(S&R-001)***.

56. In 2019, the EU formalized its most long-term strategy under the European Green Deal, which has a main goal of making Europe climate-neutral (a net-zero emitter of greenhouse gases) by 2050.[24] As part of the European Green Deal, in September 2020 the European Commission (EC) proposed raising

[23] *See* European Union. 2018. *Directive (EU) 2018/410 of the European Parliament and of the Council of March 14, 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814* **(S&R-020)**.

[24] *See* European Commission. 2019. *Communication from the Commission: the European Green Deal*, COM(2019) 640 final **(S&R-021)**.

the 2030 emissions reduction target of 40% to 55% (compared to 1990 levels),[25] which prompted a rapid increase in CO_2 prices thereafter, as can be seen in Figure I above. In June 2021 the EU Parliament endorsed the Climate Law, making the European Green Deal a binding obligation.[26]

57. On July 14, 2021 the EC published a proposed package of reforms, labelled "Fit for 55," to reach the 2030 targets under the European Green Deal (*i.e.*, reducing net emissions by at least 55% by 2030).[27] This package included, among other things, a revision of the ETS with further reductions in the number of available EUAs.[28] The EC proposed to achieve this through: i) increasing the pace of annual reductions in the total quantity of allowances for the new emissions, with the reduction factor increasing from 2.2% to 4.2% per year; and ii) increasing the "intake rate" of the amount of allowances in circulation, allowing the ETS' Market Stability Reserve mechanism to gradually absorb and cancel any potential excess of allowances.

58. Following the onset of military conflict between Russia and Ukraine in February 2022, the EC presented the "REPower EU" plan with proposals to achieving a balance between a reduction of dependence on Russian fossil fuels by 2027 and the mid- and long-term goals of the EU's green transition.[29] The plan envisages the full implementation of the "Fit for 55" package and does not modify the ambition of achieving at least a 55 % reduction in GHG emissions by 2030 and climate

[25] This target is to be delivered collectively by the EU with all Member States participating in the effort. *See* European Council. 2014. *Conclusions on 2030 Climate and Energy Policy Framework*, SN 79/14, ¶2 **(S&R-012)**. The individual targets for Member States were defined in May 2018, with the restated 2030 target (compared to 2005 levels) for the Netherlands among the highest: a reduction of 36% compared to a 30% reduction for the whole EU. *See* European Union. 2018. *Regulation (EU) 2018/842 of the European Parliament and of the Council of May 30, 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013* **(S&R-022)**.

[26] *See* European Parliament. *EU Climate Law: MEPs confirm deal on climate neutrality by 2050*, press release, June 24, 2021 **(S&R-023)**.

[27] *See* European Commission. 2021. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality*. COM(2021) 550 final **(S&R-024)**.

[28] *See* European Commission. 2021. *Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a system for greenhouse gas emission allowance trading within the Union, Decision (EU) 2015/1814 concerning the establishment and operation of a market stability reserve for the Union greenhouse gas emission trading scheme and Regulation (EU) 2015/757*, COM (2021) 551 final, Impact Assessment Report, part 1/4, pp. 36–38 **(S&R-019)**.

[29] *See* European Commission. 2022. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: REPower EU Plan*, COM(2022) 230 final (**S&R-025**).

neutrality by 2050 in line with the European Green Deal. Furthermore, the EC is proposing to increase the renewable energy target to 45% by 2030, up from 40% assumed in "Fit for 55."

II.2. The Impact of Climate Change Policies on Coal-Fired Power Plants

59. With carbon pricing adopted in dozens of countries through either emission allowance cap-and-trade systems or carbon taxes, the costs of power plants started to reflect the use of polluting fuels to generate electricity such as coal.[30] As coal-fired power plants are large emitters of GHG, the commitments and policies to combat climate change described in Section II.1 are relevant to understand their expected future economic performance. The ever-increasing commitments to combat climate change and tightening of the EU ETS have resulted in higher EUA prices, increasing the carbon emission costs of coal-fired power plants, and eroding their profitability.

60. The market conditions for coal-fired power plants further deteriorated after the conclusion of the Paris Agreement in December 2015. Since then, market analysts have commented on the implications of climate change policy on coal power plants. For instance, Climate Analytics, a non-profit institute focused on scientific and policy aspects of climate change, indicated in 2016 that "*[f]or all regions in the world, CO_2 emissions from currently operating capacity largely surpass emissions budgets in line with the Paris Agreement and the Cancun Agreements goals*" and that "*[t]he cost-optimal pathways show that to be in line with the Paris Agreement, the OECD and the EU need to phase out coal the fastest – by around 2030.*"[31] When referring specifically to the EU, Climate Analytics indicated that "*[r]educing the power plants' lifetime to the minimum historically observed in the European Union would lead to a steep emissions decrease in the short-term. However, by around 2030 coal power plants would need to be switched off even earlier or their utilization rates would need to be decreased significantly.*"[32]

[30] *See* The World Bank. 2020. *Pricing Carbon* (**S&R-026**).
[31] *See* Climate Analytics. 2016. *Implications of the Paris Agreement for Coal Use in the Power Sector*, p. 12 **(S&R-027)**.
[32] *See* Climate Analytics. 2016. *Implications of the Paris Agreement for Coal Use in the Power Sector*, p. 13 **(S&R-027)**.

61. Similarly, Carbon Tracker, a not-for-profit financial think tank focused on the impact of the energy transition on capital markets and the potential investment in fossil fuels, stated in December 2017 that "*[c]oal power should be phased out in the European Union by 2030 to meet the Paris Agreement's target to limit the rise in global average temperature to below 2 degrees Celsius*."[33] Carbon Tracker described in its report that the overall economic viability of coal was also uncertain even under the status quo, with 54% of coal-firing plants in the EU estimated to be making financial losses as at 2017.[34] This percentage was forecasted to rise to 97% by 2030 because of ever-tightening environmental compliance regulations and expected appreciation in the operating costs of coal power relative to that of renewable technologies. Given the financial losses expected from operating such coal-firing plants, the study stated that companies could gain from phasing out coal by 2030, pointing specifically to RWE as the company that could gain the most from such a phase-out.[35]

62. By 2017 the phase-out of coal was already observed in several European countries, with Belgium being the first former coal-burning country to become coal-power-free in 2016.[36] In some countries, such as Austria, the coal phase-out was not driven by government bans, but rather by market forces.[37] While market forces alone could have continued phasing out coal (*e.g.*, as shown by Carbon Tracker with the majority of EU coal plants turning loss-making by 2017), several European countries announced, in addition, legal deadlines to phase out coal.[38] As of 2019, the majority of the countries that announced coal phase-outs have set the deadlines before 2030 (*e.g.*, France by 2022, UK by 2024,

[33] This is based on the NPV model that replicated the real-world economic and investment decisions associated with a phase-out of coal-fired power in the EU. In particular, it relied on the generation mix from the IEA's BD2D ("Beyond 2 Degrees Celsius") scenario and estimated the costs that the EU could save from the phase-out. *See* Reuters. 2017. *Nearly all European coal-fired power plants will be loss-making by 2030 – research.* December 8, 2017 **(S&R-028)**. *See also* Carbon Tracker. 2017. *Lignite of the living dead* **(S&R-020)**.
[34] *See* Carbon Tracker. 2017. *Lignite of the living dead* **(S&R-029)**.
[35] *See* Carbon Tracker. 2017. *Lignite of the living dead*, pp. 7–8 **(S&R-029)**. The study shows a substantial negative stranded value of the assets owned by various European utilities (of which RWE has the largest), and concludes that an earlier voluntary closure of the coal-firing plants will allow operators to gain by avoiding loss-making operations.
[36] *See* Ember. 2019. *Solving the coal puzzle. Lessons from four years of coal phase-out policy in Europe. Europe is on a journey to phase out coal* **(S&R-030)**.
[37] *Ibid*, p. 4.
[38] *Ibid*.

Italy by 2025), with only three countries setting phase out dates by 2030 or later (*i.e.*, the Netherlands and Hungary by 2030, and Germany by 2038).[39]

II.3. THE EXPECTED DETERIORATION OF MARKET CONDITIONS FOR COAL-FIRED POWER PLANTS WAS EVIDENCED IN THEIR FINANCIAL ACCOUNTS

63. Against the backdrop of increasing commitments to tackle climate change and carbon pricing negatively impacting the profitability of power plants, as well as increased competition from renewable technologies, the owners of coal-fired power plants in the Netherlands and Europe recorded substantial impairments on their annual accounts and justified them with deteriorated market conditions.[40] These impairments started taking place several years before the Coal Ban was announced in the Netherlands. For instance, already in [redacted] and [redacted] RWE Eemshaven booked impairments of €[redacted] and €[redacted], respectively.[41] These amount to a decrease of [redacted] compared to the amount RWE allegedly spent in Eemshaven's construction (€3.2 billion).[42] As we show next, these impairments were caused by the deterioration of the earnings prospects in the conventional electricity generation business.

64. RWE's 2012 annual report states that "*the significant deterioration in the prospects for electricity generation is already casting its shadow: we have recognized substantial impairments for our Dutch power stations*" and that "*[t]he 2012 financial statements include impairment losses totalling €2.3 billion. Of this, €1.7 billion is attributable to [their] Dutch power plants, the earnings prospects of which deteriorated considerably due to market conditions. Among other things, the significant expansion of German solar power capacity came to bear, which is also forcing conventional power stations out of the market in the Netherlands.*"[43] The same reasons are listed specifically for the

[39] *Ibid*. After the Dutch Coal Ban Act was passed, numerous European countries have formally announced or amended phase-out dates for coal. As of 2022, these include Bulgaria (2038), Croatia (2033), Denmark (2028), Greece (2025), Hungary (2025), Montenegro (2035), North Macedonia (2027), Poland (2049), Romania (2030), Slovakia (2030), Slovenia (2033), and Spain (2030). *See* Europe Beyond Coal. 2022. Coal Exit Timeline **(S&R-031)**.
[40] The other coal plant owners included Uniper, Vattenfall, and ENGIE. *See* Brattle Report, ¶20.
[41] [redacted] = (€[redacted] + €[redacted]) / €3.2 billion. *See* Brattle Report, ¶¶59, 61. *See also* Harris-Hesmondhalgh Workpapers, Tables G, sheet "Blad1", IFRS View section.
[42] *See* Brattle Report, ¶59.
[43] Emphasis added. *See* RWE *Annual Report 2012*, pp. 53, 67 **(S&R-032)**.

Eemshaven plant in the financial accounts of its holding company.[44] In turn, RWE's 2013 annual report indicates that impairments were also "*mainly due to the current assessment of the medium to long-term development of electricity prices, the regulatory environment, and the lower utilisation of parts of the fossil-fuelled power plant portfolio.*"[45]

65. Engie, another owner of a coal-fired power plant in the Netherlands, also recorded impairments in its 2013 financial statements for the thermal power plants in Germany, the Netherlands, Belgium, Luxembourg and France, indicating that these impairment losses were "*primarily attributable to tough economic conditions in Europe, which are durably affecting [their] midstream and downstream margins and the profitability of [their] power generation assets.*"[46]

[44] *See* RWE. *Annual Accounts 2012 and 2013*, p. 6 (**BR-69**).
[45] Emphasis added. *See* RWE *Annual Report 2013*, p. 155 **(S&R-033)**.
[46] *See* GDF Suez *Annual Report 2013*, p. 13 **(S&R-034)**.

III. BRATTLE'S ASSESSMENT INDICATES THAT EEMSHAVEN IS [redacted] TO SUFFER LOSSES AS A CONSEQUENCE OF THE COAL BAN

66. Brattle propose a methodology that envisages generating 100 possible simulations of the future evolution of prices for coal, gas, and CO_2 using a so-called Monte Carlo technique as of their chosen date of valuation, October 9, 2017. For these 100 different simulations of the future, using a discounted cash flow approach, Brattle compute the FMV (*i.e.*, fair market value) of Eemshaven under 100 "Actual" scenarios, with operations limited until 2029 and 100 "But-for" scenarios, with operations limited only by the end of the plant's useful life, 2054. The difference between the Actual and But-for value is the alleged loss suffered by Claimants in each simulation.[47] Brattle then compute the average of losses across the different simulations, to conclude on a total loss allegedly suffered by Claimants as a result of the Coal Ban. Brattle estimate the alleged loss suffered by Claimants at €[redacted] as of their chosen date of valuation, October 9, 2017.[48]

67. Brattle's own calculations, however, provide no certainty that the Coal Ban would effectively impact Eemshaven. Figure II below, which reproduces Figure 15 of the Brattle Report, shows the resulting losses from the 100 simulations. As Figure II shows, and as indicated by Brattle, in [redacted] of Brattle's 100 simulations the plant suffers no damages.[49] This is mainly because the plant would voluntarily shut down before 2030 as it would be loss-making in the midst of deteriorating market conditions faced by the plant.[50]

[47] As noted by Brattle, in the outcomes of their modeling up to 2030 "*[t]here is very little difference between the monthly baseload electricity prices in the actual and but-for cases.*" *See* Brattle report, ¶341. Thus, there would be minimal differences in cash flows between the Actual and But-for scenarios until 2030. The main difference in cash flow assumptions relates to the so-called "shut-down rule," where Brattle assumes Eemshaven to close after two years of cash losses in the But-for scenario, but after only one year of losses in the Actual scenario. *See* also Brattle Report, ¶¶197–198.

[48] This results from deducting an Actual value of €[redacted] from a But-for value of €[redacted] (excluding the simulations yielding the bottom and top 5% of the simulations). *See* Brattle Report, ¶14.

[49] *See* Brattle Report, ¶207.

[50] In the Dutch legal proceedings Brattle do not dispute that Eemshaven is [redacted] to close before 2030. *See* Brattle Reply Report (Dutch proceedings), ¶120 **(S&R-035)**.

Figure II. Distribution of Brattle's Estimation of Loss in Value of Eemshaven Due to the Coal Ban

[redacted]

Sorted price paths by Lost FMV

Source: Brattle Report, Figure 15. Black bars represent the top and bottom 5% of the distribution that Brattle do not include in their FMV computation.

68. Under Brattle's own modeling, even absent the Coal Ban, Eemshaven would close on or before 2030 in [redacted] out of Brattle's 100 simulations. In other words, under Brattle's own modelling it would be [redacted] ([redacted] in [redacted] out of Brattle's 100 simulations) that the plant would operate beyond 2030, even absent the Coal Ban or any other additional national policy instrument.[51]

[51] Brattle's analysis does not envisage any additional national policies that would impact the financial performance of Eemshaven, such as increasingly stringent emissions regulations requiring investments and additional operating costs (*e.g.*, establishment of stricter best available technique conclusions, implementation of carbon capture technologies).

69. In addition, in the [redacted] simulations when Eemshaven would continue operating beyond 2030, the plant would not necessarily shut down as a consequence of the Coal Ban (as Brattle assume) as it would still be allowed to operate with alternative fuels.

70. These simulations correspond to scenarios where market conditions would be very favorable (*e.g.*, of high electricity prices and high profitability), or in some cases "*extremely favourable*" as Brattle refer to them.[52] In Section IV.2 we provide additional details of how, by taking Brattle's simulations as given it would be profitable to convert Eemshaven to operate 100% with biomass in [redacted] of these simulations, avoiding the shut-down of the plant. Therefore, under Brattle's own assumptions, if the possibility to convert to biomass is taken into account, the number of simulations where Eemshaven would shut down as a consequence of the Coal Ban would be [redacted] out of 100 (*i.e.*, [redacted] minus [redacted]). In other words, it would be [redacted] that Eemshaven would shut down because of the Coal Ban (*i.e.*, the probability of shutting down Eemshaven as a consequence of the Coal Ban, according to Brattle's market assumptions would [redacted]).

71. In the following section (Section IV), we list several flaws in Brattle's modeling that overstate the impact of the Coal Ban. Resolving such flaws, the prospects of Eemshaven's profitability in the medium to long term would be worse, and hence:

    a. It would be [redacted] that Eemshaven would operate beyond 2030; and

    b. Even in the [redacted] simulations where Eemshaven would operate beyond 2030, operations with coal beyond 2030 would be less valuable than Brattle's estimates.

[52] *See* Brattle Report, ¶230.

IV. BRATTLE'S ESTIMATION OF LOSSES IS FLAWED, OVERSTATING THE IMPACT OF THE COAL BAN

72. As mentioned at the beginning of Section III, Brattle's proposed methodology involves 100 Monte Carlo simulations of coal, gas, and CO_2 prices as of their chosen date of valuation, October 9, 2017. Brattle's analysis relies on a plethora of assumptions, including on the distribution, correlation and volatility of the projected prices, as well as on projections of electricity demand and supply and hourly electricity prices in the Netherlands. Brattle extend these assumptions over a very long horizon, for approximately four decades into the future (up to 2054). In addition, Brattle's assumptions include Eemshaven's technical characteristics and expected costs, assumptions on rationale to close the plant if it incurs continued losses, assumptions on trading activities, taxation, capital expenditures, and discount rate, among others.

73. Brattle's analysis contains several flaws that result in an overestimation of the alleged damages to Claimants. These flaws include:

   a. A choice of inputs on fuel and CO_2 prices, electricity demand, and installed capacity, that i) are inconsistent with the selected date of valuation, and ii) assume that the EU would not attempt to comply with its climate commitments (in particular, to the Paris Agreement), which is at odds with market expectations as of Brattle's chosen date of valuation. We provide more details on this in Section IV.1.

   b. A failure to consider the possibility of operating Eemshaven using alternative fuels beyond 2030. For example, in their Monte Carlo simulation approach Brattle fail to assess that under various simulations of future market evolution it would be profitable for Eemshaven to convert to biomass, and thus to continue operating past 2030 even in the presence of the Coal Ban. We provide more details on this in Section IV.2.

   c. An underestimation of the future risks faced by coal plants given the energy transition. We provide more details on this in Section IV.3.

   d. Additional flaws, such as the inclusion of extreme simulations (*e.g.*, with extremely high electricity prices) without a reasonableness assessment of such simulations or ignoring the increased regulatory risks in such simulations; incorrectly assuming that a willing buyer would be risk-neutral and would be willing to pay €[redacted] (in a But-for scenario) for a project expected to provide positive returns with only a [redacted] probability.[53] We provide more details on these flaws in Section IV.4.

74. In addition, Brattle's valuation fails reasonability checks. In particular, the magnitude of Brattle's estimate of damages is inconsistent with contemporaneous evidence available as of Brattle's date of valuation on October 9, 2017: while Brattle estimate damages amounting to €[redacted] with certainty, RWE's own contemporaneous statements do not indicate any impact from the Coal Ban, let alone a material one—indeed, RWE's contemporaneous statements only mention that the ramifications of the announcement in the 2017 Coalition Agreement were "*impossible to predict*." Moreover, RWE's equity price showed no such magnitude of reduction on October 10, 2017. We provide more details on this in Section IV.5).

IV.1. Brattle's Chosen Inputs Are Outdated and Assume That the EU Would Not Attempt to Comply with the Paris Agreement

75. The main inputs required to model the electricity market, and thus Eemshaven's profits, can be classified in two groups: i) commodity prices (*i.e.*, fuel and CO_2); and ii) electricity demand and installed capacity. It is paramount that the inputs used in the computation of damages be reasonable and fully reflective of market conditions expected as of the date of valuation. Brattle's chosen inputs are not, as demand and installed capacity are significantly outdated as of Brattle's date of valuation and, together with the commodity price forecasts, based on scenarios that assume the EU would not attempt to comply with its climate commitments, contrary to the market expectations of additional policies on climate change.

[53] [redacted]% probability computed as the number of simulations where Eemshaven's FMV is more than €[redacted] (*i.e.*, [redacted] simulations out of the 100 simulations computed by Brattle.

IV.1.1. Commodity Prices

76. For the purposes of forecasting the commodity prices in the long term, Brattle rely on the 2016 World Energy Outlook (the 2016 WEO) published by the IEA on December 5, 2016.[54]

77. The 2016 WEO presents three different scenarios with different commodity prices: i) the "Current Policies" scenario, ii) the "New Policies" scenario; and iii) the "450" scenario. Brattle use the prices from the "New Policies" scenario.[55] This scenario, however, only purports to reflect a situation with the policies that had already been in place or announced up to the date of the 2016 WEO report, without accounting for the additional policies that were expected to be implemented in line with the EU's commitments as per the Paris Agreement.

78. In particular, the 2016 WEO explains the different scenarios as follows:

   a. The "Current Policies" scenario depicts a path accounting only for the policies or measures in place as of mid-2016 assumed to last until 2040 without any changes.[56]

   b. The "New Policies" scenario starts from the policies and measures already in place and then takes into account, in full or in part, the aims, targets and intentions that had been announced.[57]

   c. The "450" scenario demonstrates a pathway to limit long-term global warming at 2 °C above pre-industrial levels, but only with a 50% chance.[58]

79. From the above description, it follows that neither the "Current Policies" scenario nor the "New Policies" scenario assume significant tightening of emission reductions over time to achieve the long-term EU targets. In other words, in neither of these scenarios does the reduction in emissions comply with the Paris Agreement.

80. The "450" scenario, on the other hand, is a scenario closer to being in line with the Paris Agreement targets. As explained in Section II.1 above, however, the commitments of the Paris Agreement mean

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[54] *See* Brattle Report, ¶92.
[55] *See* Brattle Report, ¶92. For the projection of CO_2 prices Brattle also rely on the "450" scenario to determine the upper limit of possible distribution, however, the mean is defined by "New Policies" scenario.
[56] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 34 (**BR-32**).
[57] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 33 (**BR-32**).
[58] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, pp. 31, 35 and footnote 3 (**BR-32**).

limiting the global warming to "well below 2 ºC" and aiming to limit it to 1.5 ºC. Thus, the "450" scenario has only a 50% chance of complying with the (upper bound of the) Paris Agreement targets, and hence cannot represent the evolution of prices that would be consistent with a target well below 2 °C.[59]

81. The main difference between these scenarios can be observed in the CO_2 prices, shown in Table I below, which reproduces Table 10 of the Brattle Report.

Table I. IEA CO_2 Price Forecasts

2015 $/€ exchange rate	[1]	1.11		
Scenario		2020 [A]	2030 [B]	2040 [C]
Current Policies 2015$/t	[2]	[redacted]		
New Policies 2015$/t	[3]			
450 Scenario 2015$/t	[4]			
Inflation	[5]			
Current Policies €/tonne	[6]			
New Policies €/tonne	[7]			
450 Scenario €/tonne	[8]			

Source: Brattle Report, Table 10.

82. Brattle claim that, according to the 2016 WEO, these projections were developed after the Paris Agreement had been reached, and hence the underlying assumptions for the projections reflect "post-Paris expectations." They further state that the "New Policies" scenario (referred to by the 2016 WEO as the "main scenario") takes into account the aims, targets and intentions that had been announced.[60]

[59] If the "450" scenario prices are used to set the mean of the distribution of commodity prices, the price trajectories of the EU emissions will meet, with a 50% probability, long-term emission reductions in line with a 2 ºC increase in temperature (the upper limit of the target set in the Paris Agreement). Thus, such a case already falls short of the Paris Agreement targets to limit global warming to "well below 2 ºC" or to 1.5 ºC. Brattle, however, use the "450" scenario to set the upper limit of their CO_2 prices (not even the mean)—specifically, Brattle assume that the "450" scenario prices are equal to the 97.5th percentile prices, meaning that 97.5% of prices remain below the "450" scenario level. Therefore, under Brattle's modeling, the CO_2 prices would fall even further short of meeting the Paris Agreement targets. *See* Brattle Report, ¶¶100, 306 and footnote 94.

[60] *See* Brattle Report, ¶93.

The temperature targets set out by the Paris Agreement[61] are not mentioned anywhere else in the Brattle Report.

83. Brattle's claim, however, is wrong for several reasons. The "New Policies" scenario is not compliant with the commitments of the Paris Agreement: as explained by the IEA, it starts from the policies and measures already in place and then takes into account, "*in full or in part, the aims, targets and intentions that had been announced by the governments.*"[62] In other words, while the "New Policies" scenario may factor in the pledges for short-term efforts to fulfil the Paris Agreement's goals, it does not assume significant tightening of emission reductions so as to achieve the long-term EU targets under the Paris Agreement.[63]

84. In contrast, the Paris Agreement envisages a constant process of tightening climate policies to achieve the ultimate climate target, which are achieved through the so-called "Nationally Determined Contributions" ("**NDCs**"), updated every five years.[64] As of 2017, the Paris Agreement signatories were submitting their first rounds of NDCs, so contemporaneous forecasts would reflect only these initial short-term efforts to fulfil the Paris Agreement's goals. These NDCs, however, would not be expected to contain all measures necessary to meet the long-term temperature goals set by the Paris Agreement. The changes needed in the mid- and long-term would be detailed in subsequent rounds of NDCs. Therefore, if early NDCs are not sufficient to meet the long term targets, more and stricter policy changes will be needed in the future as the carbon budget continues to decline, thus shaping the market expectations of the tightening future regulations. As noted by the IEA, "*[c]urrent country commitments, the Nationally Determined Contributions (NDCs), made under the Paris Agreement*

[61] As discussed in Section II.1, the Paris Agreement has a goal to hold "*the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*." *See* UNFCCC. Paris Agreement, Article 2 (December 12, 2015) **(S&R-013)**.

[62] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 33 (**BR-32**).

[63] Up until 2019, the IEA viewed the "New Policies" scenario (renamed as the "Stated Policies" scenario) as insufficient for achieving the goals of the Paris Agreement. More specifically, the IEA indicated that "*[t]he Stated Policies Scenario* [f.k.a. New Policies Scenario] *does not see a peak in energy-related CO2 emissions, […] still very far from the emissions reductions necessary to achieve the goals of the Paris Agreement.*" *See* International Energy Agency. 2019. *World Energy Outlook 2019*, p. 46 **(S&R-036)**.

[64] "*As nationally determined contributions to the global response to climate change, all Parties are to undertake and communicate ambitious efforts […] with the view to achieving the purpose of this Agreement […]. The efforts of all Parties will represent a progression over time […].*" "*Each Party shall communicate a nationally determined contribution every five years*." *See* UNFCCC. *Paris Agreement*, Article 4.1 and 4.9 (12 December 2015) **(S&R-013)**.

and domestic energy policy plans fail to bring about the rapid, far-reaching changes required to avert dangerous and irreversible changes in the global climate system. These are assessed in our Stated Policies Scenario and lead to total global energy-related CO_2 emissions growing steadily from today's levels before plateauing around 36 Gt after the mid-2040s."[65] The United Nations also makes this clear explaining that "*[e]ach new round of updates is expected to ratchet up ambition through steeper emissions cuts and more expansive adaptation measures.*"[66]

85. As shown by the IEA itself, this is the case with the 2016 WEO's "New Policies" scenario: "*Differences between the New Policies Scenario and the 450 Scenario highlight the extent to which the pledges made as part of the Paris Agreement fall short of the long-term ambition to limit global temperature rises to below 2 degrees Celsius (°C).*"[67] This means there was a consensus in the market that the policies already in place or announced prior to Brattle's date of valuation were not sufficient to meet the temperature targets envisaged by the Paris Agreement, and that additional measures were needed (and expected). This is confirmed by the United Nations Environment Programme (UNEP), which as of 2017 noted that "*current efforts are sufficient neither in speed nor in depth to keep global warming to the limit set in the Paris Agreement*."[68] By relying on the "New Policies" scenario, Brattle implicitly assume that there would be no additional policies or subsequent rounds of NDCs to pursue the Paris Agreement's goals.

86. Moreover, Brattle are wrong to assume that the IEA's projections under the "New Policies" scenario represent market expectations solely on the basis of the IEA referring to such projections as the "central case."[69] The goal of the WEO is to provide a benchmark for policymakers of what the world will look like with current and announced policies, so that they can assess what additional policies are needed to achieve the climate targets.[70] The "New Policies" being referred to as a central scenario can therefore be interpreted as this scenario being the focus of the 2016 WEO, but it should not be considered the main or central scenario in the sense of being an average of the possible simulations, let alone a central scenario of market expectations for forecasting. The 2016 WEO notes that "*[t]he*

[65] *See* International Energy Agency. 2019. *World Energy Outlook 2019*, p. 96 **(S&R-036)**.
[66] *See* United Nations. *All About the NDCs* **(S&R-037)**.
[67] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 111 **(BR-32)**.
[68] *See* United Nations Environment Programme (UNEP). 2017. *The Emissions Gap Report 2017*, p. 5 **(S&R-038)**.
[69] *See* Brattle Report, ¶92.
[70] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 3s **(BR-32)**.

expectation that commitments to more intensive action will be made over time is a critical element of the Paris Agreement,"[71] and that "*[m]ore stringent climate targets than those implied by current NDCs are not only conceivable, but are seen as an essential element of the next stage of the Paris Agreement's implementation*."[72] It is evident that the IEA foresees a ramp up in climate action in the future on top of current NDCs, which the "New Policies" scenario does not take into account.

87. In any case, the 2016 WEO refers to all three scenarios—that is, the "New Policies" scenario, the "Current Policies" scenario and the "450" scenario—as its "main global scenarios."[73] The 2016 WEO report makes it clear that the "New Policies" Scenario "*does not depict a future that the International Energy Agency (IEA) deems desirable or one that policy-makers or other stakeholders should try to bring into being*," while referring to the "450" scenario as a "*widely recognised benchmark for government policies and company strategies*."[74] The IEA scenarios therefore represent different views of the world, while the market expectations one must consider for forecasting would need to factor in the legal requirements and the policy gap between national climate pledges and the requirements of the Paris Agreement.

88. The IEA confirms this clearly by stating:[75]

> "*One major uncertainty concerns policy. A central tenet of the 'New Policies' Scenario is that it reflects only those policies that are either already in place or those that have been announced. As a scenario assumption this works well – it allows us to investigate the direction in which today's decision*-*makers are taking the energy system – and therefore to provide them with essential feedback on their choices and ambitions. But this would not be a sensible way to approach forecasting. There will undoubtedly be additional policy shifts between now and 2040, beyond those already announced by governments around the world. These could be in response to concerns about energy security (e.g. to offset rising import dependency) or affordability (e.g. to mitigate the effect of upward pressure on prices) or to temper rising emissions (e.g. via the*

[71] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 314 **(BR-32)**.
[72] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 340 **(BR-32)**.
[73] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 33 **(BR-32)**.
[74] *See* International Energy Agency. 2016. *World Energy Outlook 2016*, p. 35 **(BR-32)**.
[75] Emphasis added. *See* International Energy Agency. 2017. *World Energy Outlook 2017,* p. 40 **(S&R-056)**.

> *commitment in the Paris Agreement to update pledges every five years with the intention to increase climate ambition). If we did forecast, we would try and second-guess these future responses.*"

89. Based on the above it follows that Brattle's choice of scenarios for forecasting CO_2 prices is inconsistent with the EU's commitments to the Paris Agreement, and inconsistent with expectations of "*additional policy shifts…beyond those already announced.*"

90. Brattle's choice of scenarios from the 2016 WEO implies that the vast majority of the resulting CO_2 prices in their Monte Carlo simulations would arise from emission restrictions that fall short of achieving the temperature goals of the Paris Agreement.

IV.1.2. Electricity Demand and Installed Capacity

91. For the purposes of forecasting the electricity demand and installed capacity, Brattle rely on the EU Reference Scenario, published in July 2016.[76] Brattle's source for electricity demand and installed capacity is outdated as of their valuation date, and, as with their source of commodity price inputs, ignores the implications of the EU's commitments to the Paris Agreement.

92. While the EU Reference Scenario was published in July 2016, it states that it only includes policies and measures adopted at the EU level and by the Member States by December 2014.[77] In other words, the policies included in the EU Reference Scenario pre-date the Paris Agreement, and thus, naturally, the source does not reflect the implications of the Paris Agreement.

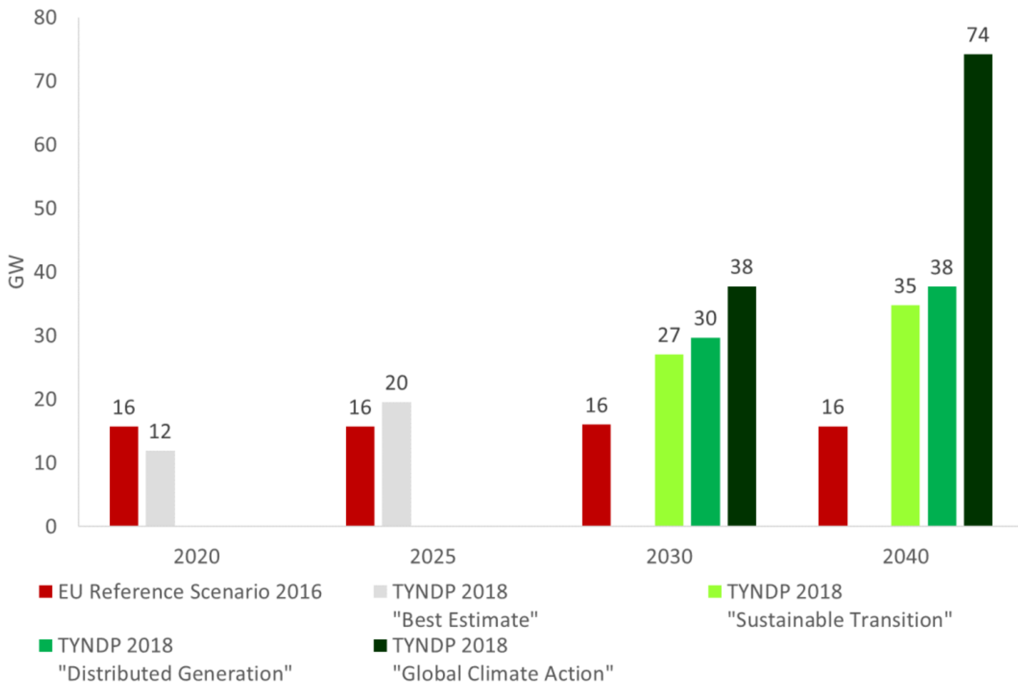
93. Furthermore, the EU Reference Scenario states that its purpose is to act "*as a benchmark of current policy and market trends. As such, it can help to inform future policy debate and policy making.*"[78] This means that the EU Reference Scenario does not reflect market expectations of the future evolution of the electricity market, but instead only presents an "as is" scenario, to serve as a benchmark for policymakers to determine the extent to which additional policy shifts are required.

[76] *See* Brattle Report, ¶109.
[77] *See* European Commission. 2016. *EU Reference Scenario 2016*, p. 14 **(BR-37)**.
[78] *See* European Commission. 2016. *EU Reference Scenario 2016*, p. 14 **(BR-37)**.

94. The lack of consideration of the implications of the Paris Agreement and the outdated nature of the EU Reference Scenario for the case at hand contrast with contemporaneous projections (as of Brattle's chosen date of valuation) of the deployment of renewable capacity. Indeed, projections of renewable capacity in the Netherlands from sources dated closer to Brattle's chosen date of valuation than the EU Reference Scenario show that the expected deployment of renewable capacity in the EU Reference Scenario (and thus in Brattle's analysis) is materially underestimated as of October 2017. For instance, the draft 2018 Ten-Year Network Development Plan (TYNDP) produced by the European Network of Transmission System Operators for Electricity (ENTSO-E), published on October 2, 2017 (*i.e.*, shortly before Brattle's chosen date of valuation) forecasted materially higher renewable capacity deployment than the EU Reference Scenario (Brattle's source).[79] Figure III below shows that the EU Reference Scenario does not envisage any additions to renewable capacity (mainly wind and solar), keeping the capacity constant at 16GW. In contrast, the ENTSO-E's TYNDP 2018 forecasted increasing deployment of wind and solar capacity under different scenarios. These different scenarios forecasted between double and quadruple the wind and solar capacity envisaged under the EU Reference Scenario.

[79] The ENTSO-E is tasked by the EC to develop a new TYNDP every two years, which forms the basis for future cross-border grid developments at the EU level. Inputs are provided by industry experts, NGOs, national regulatory authorities, and EU member states, intended to set the scene for EU energy and climate goals. *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report, p. 3 **(S&R-039)**.

Figure III. TYNDP 2018 Forecasts of Renewable Capacity (Wind and Solar) in the Netherlands, GW, 2020–2040



Sources: European Commission. 2016. EU Reference Scenario. p. 180 ***(BR-37)****, Brattle Report, Figure 28 and Harris-Hesmondhalgh Workpapers, Tables D – Capacity Mix, ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Annex II, Table 1* ***(S&R-040)****.*

Note: The TYNDP 2018 only projects a single "Best Estimate" scenario for 2020 and 2025. 2030 data "or "Global Climate Action" scenario is linearly interpolated as the TYNDP only provide projections for 2040.

95. The share of renewable capacity is an important determinant of coal-plants profit margins, as Brattle explain, "*since many types of renewable generation have essentially zero marginal generation costs […] a high level of renewable generation capacity may limit the ability of Eemshaven to generate electricity and will reduce electricity prices, to Eemshaven's detriment.*"[80] By underestimating the deployment of renewable capacity in the future, Brattle's results therefore underestimate the challenging future market conditions in which Eemshaven would operate.

[80] *See* Brattle Report, ¶225.

96. Finally, Brattle's approach to mix one source of information for the commodity price forecasts (*i.e.*, the 2016 WEO) with another source of information for the installed capacity and demand (*i.e.*, the EU Reference Scenario) may lead to unexplored internal inconsistencies arising from the fact that the EU Reference Scenario was developed with certain assumptions on commodity prices that differ from those in the 2016 WEO.[81] Different commodity prices would result in different electricity prices, which in turn could result in differences in the expected evolution of installed capacity and demand. For example, higher CO_2 prices incentivize the deployment of low carbon technologies and the earlier retirement of the more carbon-intensive technologies, therefore changing the installed capacity mix. Thus, using capacity from one source and CO_2 prices from another may lead to inconsistent price-capacity combinations. Instead, using contemporaneous sources that provide forecasts for both capacity and prices ought to be preferred to those that do not. The abovementioned TYNDP 2018 provides, in a single source, projections for both i) commodity prices, and ii) electricity demand and installed capacity, and therefore should be free of the potential internal inconsistencies present in Brattle's selection.[82]

IV.1.3. Brattle's Loss Estimate Decreases When Using Inputs Contemporaneous to Brattle's Chosen Date of Valuation and Reflective of Efforts Closer to Compliance with the Paris Agreement

97. As explained in Sections IV.1.1 and IV.1.2, Brattle use a mix of sources for i) commodity prices (*i.e.*, fuel and CO_2), and ii) electricity demand and installed capacity inputs. Brattle's chosen inputs incorrectly assume that the EU will not attempt to comply with its climate commitments (notably with the Paris Agreement). Furthermore, Brattle's chosen source for electricity demand and installed capacity is significantly outdated as of their October 9, 2017 date of valuation.

98. An alternative source of information that would overcome the limitations of Brattle's choice of inputs is the abovementioned draft TYNDP 2018 produced by the ENTSO-E. The key benefits of the TYNDP 2018 are that:

[81] EU Reference Scenario uses fossil fuel prices as projected by PROMETHEUS. *See* European Commission. 2016. *EU Reference Scenario 2016*, Figure 8 **(BR-37)**.

[82] *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report, p. 32 **(S&R-039)**.

a. It was published on October 2, 2017, *i.e.*, shortly before Brattle's chosen date of valuation and thus reflecting the information available and expectations close to the Brattle's chosen date of valuation.[83]

b. It provides, in a single source, projections for both i) commodity prices, and ii) electricity demand and installed capacity. Thus, contrary to Brattle's approach of mixing sources for each of these groups, using a single source of information provides consistency between assumptions (*e.g.*, as explained in paragraph 96, different levels of commodity prices have an impact on expected deployment of installed capacity).

c. It provides long-term scenarios that assume additional efforts to meet decarbonization goals, in addition to a "business as usual" scenario. These long-term scenarios, also referred to by the TYNDP as "storylines", are:[84]

   i. "Global Climate Action" ("**GCA**"): considers global climate efforts and large-scale renewables projects across the EU. The EU, in this storyline as of 2018 is on track to meet its 2030 and 2050 decarbonization targets.

   ii. "Distributed Generation" ("**DG**"): places producers and consumers at the center and represents a more decentralized development with more reliance on small-scale generation and power storage technologies. Similarly, in this storyline, as of 2018, the EU is on track to meet its 2030 and 2050 decarbonization targets, but results in higher installed renewables capacity and lower CO_2 prices compared to GCA.[85]

99. If the inputs from the draft TYNDP 2018 on commodity prices, and installed capacity and demand are used in Brattle's calculations, their estimate of losses would decrease as of October 2017, on a

[83] The ENTSO-E publishing the draft version of the TYNDP report is one of the steps of their development process preceding public consultations of projection scenarios ("storylines") after which adjustments could be made. *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report, pp. 26–27 **(S&R-039)**.

[84] The TYNDP also presents a third long-term storyline called "Sustainable Transition." This storyline, however, aligns to a "business as usual" scenario, and is behind on the path to the long-term decarbonization goals. *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report, p. 11 **(S&R-039)**.

[85] *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report, Table 2 and Figure 9 **(S&R-039)**. We understand that Brattle also find the ENTSO-E's TYNDPs to be a reputable source, since Brattle relied on the TYNDP (albeit a more recent TYNDP) when assessing damages to Claimants as of December 2019 in local proceedings. *See* Brattle Reply Report (Dutch proceedings), ¶174 (**S&R-035**).

stand-alone basis (*i.e.*, not resolving the other flaws discussed in this report), by €[redacted], from €[redacted] to €[redacted], under the TYNDP's "Distributed Generation" scenario, and by €[redacted], from €[redacted] to €[redacted], under the TYNDP's "Global Climate Action" scenario.[86]

100. The range of results between the two scenarios above mentioned reflect the uncertainty regarding how centralized the European energy sector may evolve, with two extremes: i) the "Distributed Generation" scenario representing a more decentralized development of the energy sector, and ii) the "Global Climate Action" scenario focusing on the development of more centralized technologies (*e.g.*, large scale renewables, nuclear).[87]

IV.2. BRATTLE OMIT THE POSSIBILITY OF OPERATING EEMSHAVEN BEYOND 2030 WITH ALTERNATIVE FUELS

101. Brattle assume that with the Coal Ban (*i.e.*, in the Actual Scenario), the Eemshaven plant would unequivocally shut down no later than 2030.[88] This assumption, however, ignores the possibility of using alternative fuels that could extend the operations of the plant beyond 2030, resulting in additional value in the Actual Scenario, and hence lower damages, if any.

102. Brattle are instructed to assume that Eemshaven will only burn coal after 2027, and that operating Eemshaven with unsubsidized biomass would not be economically viable.[89] Brattle "agree" that this

[86] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H1" **(S&R-041)**, with Brattle's assumptions applied adjusted for market modelling inputs based on "TYNDP 2018 - Distributed Generation" and on "TYNDP 2018 - Global Climate Action", respectively, in cell I27. The difference between the total and the sum of components is due to rounding. *See* Appendix C for additional details of the TYNDP scenarios and our approach to transforming the data for alternative simulations. As explained in greater detail in Appendix C.2, Brattle do not disclose several of the assumptions made by Baringa on the market modeling inputs, and thus it was not possible to closely replicate Baringa's and Brattle's results. As a result, the impacts expressed here may be affected not only by differences in the assumptions on commodity prices, installed capacity and electricity demand, but also by differences between the CL Market Model and Baringa's model.
[87] *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*. Main Report, p. 7 (**S&R-039**).
[88] *See* Brattle Report, ¶31.
[89] *See* Brattle Report, ¶2c. Claimants also asked NERA to assess whether it would be economically viable to invest in converting a coal-fired plant like Eemshaven to using biomass by 2030 in the absence of biomass support schemes. *See* NERA Report, ¶6. NERA's analysis, however, focuses on the economics of converting a coal plant to biomass in 2017, or in 2021, but does not perform an economic analysis of such a conversion in 2030. We address NERA's report in greater detail in Appendix B.

is a reasonable assumption, without performing an independent analysis.[90] We note, however, that the instruction to Brattle is at odds with RWE's statements regarding its willingness to fully convert the Eemshaven plant, and that it recently increased the use of biomass. We discuss this in greater detail in Appendix B.

103. Brattle also refer to NERA's analysis, concluding that "*it would not be feasible to convert Eemshaven to 100% biomass, absent subsidies.*"[91] As such, Brattle implicitly assume that, out of the 100 different simulations ran by Brattle, there would be no single possible one where operations with unsubsidized biomass would be profitable.[92] This assumption is inconsistent with Brattle's methodology. Had Brattle performed an analysis of the viability of biomass operation in a fashion consistent with their valuation of Eemshaven (with 100 simulations of possible paths for electricity and commodity prices), and obtained the simulations in which operation with unsubsidized biomass would be profitable after the conversion, RWE Eemshaven's Actual value would have been higher, resulting in reduced losses.

104. Figure IV below illustrates Eemshaven's operating profits in two years as examples, 2032 and 2037, using Brattle's forecasted electricity prices, and Brattle's approach to forecasting biomass prices (*i.e.*, using a 2018 biomass price of €[redacted] increasing at the rate of inflation).[93]

[90] *See* Brattle Report, ¶136, 250. Brattle have not included in their modelling the possibility of using any other alternative fuel beyond 2030, such as natural gas or hydrogen. They discard the option to convert to natural gas on the sole basis that natural gas prices in the EU are relatively higher than in the US. Such argument, however, does not prove that conversion to natural gas, or hydrogen, is not a possibility for Eemshaven.

[91] *See* Brattle Report, ¶249.

[92] Brattle are also inconsistent with their line of reasoning for coal and biomass. If they were to value Eemshaven under the same premise of "likely" scenario assumed with certainty, as they do when relying on NERA's conversion analysis, Brattle should have valued the losses to RWE Eemshaven at [redacted] This is because the results of their own analysis show that it was indeed [redacted] that the plant would operate past 2030 even in the absence of the Coal Ban. *See* Section III; *see also* Brattle Report, ¶210.

[93] 2032 would be the first year of operations with biomass, as we assume that the conversion works would require the plant to be shut down for two years, in 2030 and 2031. *See* footnote 94 for additional assumptions on operations using biomass.

Figure IV. Eemshaven Operating Profit Using Biomass Fuel Across 100 Simulations, 2032 and 2037, € million

2032 Operating Profit, € million

[redacted]

Sorted Simulations by Operating Profit

2037 Operating Profit, € million

[redacted]

Sorted Simulations by Operating Profit

Source: Compass Lexecon Analysis ***(S&R-001)****.*

105. The figures above show that there are several simulations in Brattle's analysis where electricity prices exceed the cost of generating electricity with unsubsidized biomass, hence generating a positive operational profit. For [redacted] of these simulations, the profits from generating with biomass would be sufficient to make it profitable for Eemshaven to convert to biomass in 2030.[94] These simulations are shown in Figure V below, where the net present value of cash flows from converting and firing biomass is positive (red bars).

[94] The cash flows are computed using the electricity prices estimated by Brattle and their assumptions on biomass prices (*i.e.*, a 2018 level of €[redacted] increasing at the rate of inflation). *See* Brattle report, ¶104. We assume the conversion works would require the plant to be shut down for two years, in 2030 and 2031. The NPV accounts for an initial capital expenditure to convert, based on the average of NERA's estimates, and the cost of capital or the discount rate of 4.8% as per the study of Frontier Economics. *See* Frontier Economics. 2019. *Profitability and dispatch of MPP3 Power Plant with alternative fuels*. p. 10 **(S&R-042)**. *See* NERA report, ¶23. Such discount rate corresponds to a rate applicable specifically to the conversion and operations using biomass as a fuel, as opposed to operations with coal (which is further discussed in Section IV.3. Additional details on assumptions of conversion to biomass are provided in Appendix C.4.

Figure V. Net Present Value of Eemshaven's Post-2030 Cash Flows with Brattle's Market Modeling Assumptions, Alternatives Using Coal or Biomass, € million

2030–2054 cash flows, discounted to 2030, € million

[redacted]

Simulation #

Sources: Compass Lexecon Analysis ***(S&R-001)****.*

106. As observed in Figure V above, the simulations where the conversion to biomass is most profitable largely coincide with the simulations where Brattle finds that Eemshaven is most profitable with coal operations. This is unsurprising, since these simulations correspond mainly to simulations with very high electricity prices (for instance due to high gas prices), which make Eemshaven's operations more profitable, be it with coal or biomass.

107. Including the abovementioned possibility of conversion to biomass decreases Brattle's estimation of damages by €[redacted], from €[redacted] to €[redacted] as of October 9, 2017, on a stand-alone basis (*i.e.*, not considering other flaws in Brattle's analysis discussed in this report).[95]

108. As discussed in Section III, Brattle's own analysis concludes that the plant would continue operating beyond 2030 in only [redacted] out of 100 simulations in the But-for scenario. Given Brattle's instruction that "*co-firing biomass is not economically viable without the SDE+ support scheme*," Brattle conclude that (in the Actual scenario) the Eemshaven plant would need to shut down in all [redacted] of these simulations as a consequence of the Coal Ban. Taking Brattle's simulations as a given, and using Brattle's assumption on biomass prices,[96] we find that in [redacted] of these [redacted] simulations (that is in [redacted] of them) it would be profitable to convert Eemshaven to operate 100% with biomass, avoiding Eemshaven to shut down. Therefore, under Brattle's own assumptions, including the possibility to convert to biomass, the number of simulations where Eemshaven would shut down as a consequence of the Coal Ban reduces to [redacted] of the modeled states of the world, to [redacted] out of 100 (*i.e.*, [redacted] less [redacted]). In other words, the probability of Eemshaven shutting down because of the Coal Ban, as per Brattle's assumptions, but including the option of converting to biomass, is [redacted].

IV.3. Brattle Underestimate the Risks Faced by Coal Plants Given the Energy Transition

109. Brattle allocate most of the value of Eemshaven to the period between 2030–2054, which is more than 10 years away from their date of valuation (*i.e.*, October 2017). As explained in Section II, as of October 2017 the European energy market was at the early stages of decarbonization, expected to accelerate in the subsequent years, for instance with the shift away from fossil fuels to low-carbon technologies. This transformational process is usually referred to as the "energy transition."[97]

[95] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H1" **(S&R-041)**, with Brattle's assumptions applied adjusted for the possibility to convert to biomass in cell I27. Given that the possibility to convert Eemshaven to burn biomass would mean that the plant could run until 2054, for this sensitivity we assume in the Actual scenario the same closure decision criteria than Brattle do in the But-for scenario, and the corresponding impact of the closure decision on additional modelling assumptions. *See* Brattle Report, footnote 148, ¶¶191, 209, 197–198.

[96] Brattle use a 2018 biomass price of €[redacted] and adjust for inflation for years thereafter. *See* Brattle Report, ¶104.

[97] *See* IRENA. *Energy Transition - Definition* **(S&R-043)**.

110. Given the high carbon intensity of coal plants, such as Eemshaven, the energy transition poses significant risks in these types of plants in the future—risks that had not been faced in the past.

111. The expectations of increasing future risk for coal plants in the EU was evidenced well before Brattle's chosen date of valuation. For instance, in June 2016, Spring Associates, a Dutch consulting company, estimated the value of coal plants in the Netherlands and assessed the potential impact of assuming those would be closed in 2020.[98] The assessment did not attempt to model the cash flows beyond 2030, stating that "*it is difficult to see how all the coal-fired power stations can still be part of a more sustainable energy system after 2030.*"[99] Spring Associates further indicated that "*[i]n the long-term, the political commitments made in the Paris Agreement require additional measures that would increase the risks of future cash flows, and therefore results in a lower valuation.*"[100]

112. The negative impact that risk has on the value of assets can be incorporated through the cash flows or via the discount rate. However, Brattle's analysis i) does not introduce an adjustment to cash flows to account for such risk, and ii) their discount rate estimation is significantly lower than contemporaneous benchmarks. As a result, Brattle's analysis fails to account for the expected increased risk due to the energy transition.

113. In the next section we provide additional evidence showing Brattle's underestimation of Eemshaven's risk.

IV.3.1. Brattle's Backward-Looking Discount Rate Ignores Forward-Looking Risks Faced by Coal Plants Such as Eemshaven

114. Brattle account for risks of operating Eemshaven by discounting the forecasted cash flows using a discount rate that is higher than the risk-free rate. This is a common approach to account for risk. The discount rate chosen by Brattle is the weighted average cost of capital ("**WACC**").

115. Brattle rely on the Capital Asset Pricing Model ("**CAPM**") to compute the cost of equity, one of the building blocks of the WACC. Within the CAPM, the beta is the parameter used to account for the

[98] *See* Spring Associates. 2016. *Impact from the Closure of Dutch coal-fired power stations* **(S&R-044)**.
[99] *Ibid*, p. 12 (*own translation*).
[100] *Ibid*, p. 2 (*own translation*).

systematic risk of a project or asset.[101] Brattle calculate the beta from a sample of six companies operating coal power plants.[102] Brattle then calculate the historical betas of these companies between September 2012 and September 2017.[103]

116. While Brattle's approach to the computation of the beta parameter is standard for stable environments, it is not appropriate for coal power plants as of 2017: given the expected deterioration in their market conditions, this approach underestimates the risk faced by coal plants, including Eemshaven, going forward. The WACC is meant to reflect the minimum required returns for an investment that generates cash flows in the future, as it is applied to discount for the risk of <u>future</u> cash flows.

117. The risks faced by the companies in Brattle's sample were significantly different than those expected to be faced by coal-fired power plants, including Eemshaven, going forward, and in particular beyond 2030. Before 2017 the EU ETS had a surplus of emission allowances, which was reflected in very low prices for CO_2.[104] Therefore, prior to 2017 the companies in Brattle's sample were exposed to very little pressure on their profit margins due to CO_2 costs.

118. Berk and DeMarzo, the authors cited by Brattle as support for their discount rate calculations, note that "*many practitioners analyze other information in addition to past returns, such as industry characteristics.*"[105] De Maere d'Aertrycke, Ehrenmann, and Smeers also highlight that "*[f]uture risk exposures in a restructured power sector undergoing the energy transition will be quite different from those of the past.*"[106]

119. Brattle's analysis, however, does not "*analyze other information in addition to past returns, such as industry characteristics,*" as suggested by the economic literature. For instance, Brattle's analysis fails to analyze the industry characteristic that the European energy market would undergo an energy transition in the coming years, as explained in Section II. By omitting such analysis of the industry characteristics and thus ignoring the risks of the energy transition, Brattle's assessment

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[101] *See* Brattle Report, Appendix G.1. Returns in this case are measured as excess returns over the risk-free return.
[102] *See* Brattle Report, ¶436.
[103] *See* Brattle Report, ¶439.
[104] *See* European Commission. 2021. *Market Stability Reserve,* p. 1 **(S&R-018)**.
[105] *See* Berk, J.B., DeMarzo, P.M. 2014. *Corporate Finance*, pp. 435–436 (**BR-4**).
[106] *See* De Maere d'Aertrycke, G., Ehrenmann, A., Smeers. Y. 2017. *Investment with incomplete markets for risk: The need for long-term contracts, p. 2,* Section 2.2 (**S&R-045**).

underestimates the discount rate, and thus overestimate the value of Eemshaven, particularly in the medium to long term (*e.g.*, after 2030).

IV.3.2. Brattle's WACC Is Underestimated Compared to Contemporaneous Benchmarks

120. As mentioned in Section IV.3.1, Brattle's approach to account for the impact of risk on the value of Eemshaven is to discount future cash flows using the WACC as a discount rate. Brattle estimate the applicable WACC to be 3.85% as of October 2017.[107] Analyst reports covering RWE's business, however, have used significantly higher WACCs, both contemporaneously to October 2017 and in more recent analyses. For instance:

   a. Morgan Stanley in October 2017 indicated: "*We apply a divisional WACC of 6.9% for Generation and 7.9% for Trading & Supply*."[108]

   b. Société Générale in June 2018 indicated: "*We value Lignite & Nuclear and European Power with a DCF and a WACC of 8%*."[109]

   c. Morgan Stanley in December 2019 and January 2020 indicated: "*We apply a 6.6% WACC to Lignite & Nuclear, 4.3% to European Power*."[110]

   d. Bank of America (BofA) in January 2020 indicated: "*Generation DCF model based on a 6.8% WACC (increased by 0.1%)*."[111]

121. While the WACCs mentioned above are not specific to Eemshaven, they are applied to RWE's European power segment. Eemshaven is part of this segment, and the large majority of RWE's business in this segment is focused in Germany, the Netherlands, and the UK, all jurisdictions with country risk similar to that faced by Eemshaven.[112] Therefore, the abovementioned evidence from these analyst reports provide relevant benchmarks for Eemshaven's WACC.

[107] *See* Brattle Report, Table 5.
[108] *See* Morgan Stanley. 2017. *RWE AG: US Roadshow Feedback*, p. 3 **(S&R-046)**.
[109] *See* Société Générale. 2018. *Focus on 2020 and clean dark spreads*, p. 14 **(S&R-047)**.
[110] *See* Morgan Stanley. 2019. *Risk Reward Update*, p. 2 **(S&R-048)**. *See also* Morgan Stanley. 2020. *Further confirmation on German Coal Closure*, p. 2 **(S&R-049)**.
[111] *See* BofA. 2020. *Compensation secured and a cleaner future*, p. 2 **(S&R-050)**.
[112] *See* RWE. *Annual Report 2017*, p. 20 **(S&R-051)**.

122. While there is some variation in the benchmark WACCs outlined in these analyst reports—which are estimated at different points in time—it is notable that Brattle's estimated WACC is outside the lower bound of the range of these benchmarks and is well below the benchmark provided by analysts at Morgan Stanley as of October 2017 (3.85% vs 6.9%).[113]

123. The difference between Brattle's WACC and those of the cited third-party analysts cannot be explained by the analysts' inclusion in the WACC of risks related to uncertainties of development of commodity prices in the long term, in particular beyond 2030. This is because these analysts assume no value post-2030 (therefore, no growing variation in commodity and carbon prices that may result in profitability of coal plants). In other words, analysts covering RWE appear to have accounted for future risks at the cash flow level, as well as having higher discount rates than Brattle's 3.85%. For example:

a. Morgan Stanley's projection as of October 2017 uses a DCF only to 2030 with no terminal value "*given uncertainty on German energy market structure in the long-term*."[114] Morgan Stanley applies a WACC of 6.9%. That is, Morgan Stanley has accounted for risks at the cash flow level (which would imply a lower rate for discounting), but still applies a higher WACC than do Brattle.

b. Similarly, SocGen's analysis in June 2018 assumes no terminal value for coal generation post-2030.[115]

c. SocGen, similarly, applies a higher WACC of 8% while simultaneously making cash flow level adjustments for post-2030 (setting clean dark spreads to zero "*on the view that politics, CO_2 and technology (renewables & storage) will force coal out of the merit order*").[116] Effectively, this implies that they assume no terminal value for coal generation after 2030.

[113] Unless otherwise stated, it is common practice in valuation to express the WACC on a post-tax basis, and thus benchmarks would be comparable to Brattle's (updated) estimate of 3.85%. Even if the benchmark rates were presented by analysts on a pre-tax basis, Brattle's pre-tax WACC of 4.31% is still (up to 3.6%) lower than the comparable benchmarks. *See* Harris-Hesmondhalgh Workpapers, Tables F – Cost of Capital, Table F1. Setting cell G15 to 0% yields the pre-tax WACC in cell G18.
[114] *See* Morgan Stanley. 2017. *RWE AG: US Roadshow Feedback*, p. 3 **(S&R-046)**.
[115] *See* Société Générale. 2018. *Focus on 2020 and clean dark spreads*, p. 14 **(S&R-047)**.
[116] *See* Société Générale. 2018. *Focus on 2020 and clean dark spreads*, p. 14 **(S&R-047)**.

124. The difference in WACCs also cannot be attributed to the differences in types of businesses, as Brattle's own sample of companies to estimate beta parameter consists exclusively of vertically integrated companies with "*riskier businesses such as trading*" that have also been reforming their generating portfolios to increase exposure to renewable technologies.[117]

125. In sum, Brattle's estimation of Eemshaven's WACC is 3–4 percentage points below the WACCs used by market analysts and practitioners, suggesting that Brattle's valuation of losses is significantly overestimated.

126. Further evidence of the future risks faced by coal-fired power plants, and its reflection on discount rates, can be found in Germany's compensation scheme for coal phase out. In its calculations for the phase-out of coal, Germany used a WACC of 7.5% to discount foregone profits, indicating that such rate "*is justified by the uncertainties surrounding the future market developments*."[118] Notably, the European Commission still seemed to find this discount rate to be too low, stating that "*[i]t is questionable whether this discount rate is adequate or whether additional correction mechanisms would have to be foreseen to account for the high risks and uncertainties linked to the forecasts*."[119]

127. The WACC applied by Germany exceeds Brattle's estimation of WACC, reflecting the increasing risks to coal plants due to the expected energy transition. In other words, the WACC applied by Germany includes a "transition spread" that is not priced in Brattle's backward-looking WACC estimation.

128. According to Brattle, WACC rates were 0.51 percentage points higher in October 2017 than in December 2019 (a date contemporaneous to Germany's use of the 7.5% WACC).[120] Based on this,

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[117] *See* Brattle Reply Report (Dutch proceedings), ¶96 **(S&R-035)**. *See* also Brattle First Report (Dutch proceedings), ¶¶401–402 **(S&R-052)**.

[118] Germany used such assumption to set maximum prices for bids, yet Germany indicated that it "*expects the award values to be significantly lower than the maximum prices*" which could be the result of Germany underestimating the WACC and/or overestimating future cash flows. *See* European Commission. 2020. *SA.58181 (2020/N) Germany – Tender mechanism for the phase-out of hard coal in Germany*, C (2020) 8065 final, ¶¶34, 39 **(S&R-053)**. *See* also European Commission. 2021. *SA.53625 (2020/N) Germany – Lignite phase-out*, C (2021) 1342 final, ¶38 **(S&R-054)**.

[119] *See* European Commission. 2021. *SA.53625 (2020/N) Germany – Lignite phase-out*, C (2021) 1342 final ¶129 **(S&R-054)**.

[120] Brattle estimate Eemshaven's WACC as of December 2019 at 3.34%, while as of October 2017 at 3.85%. *See* Brattle Reply Report (Dutch proceedings), ¶166 **(S&R-035)**. The difference between the two WACC estimates is 0.51%.

an equivalent rate to the WACC applied by Germany, but expressed as of October 2017 would amount to 8.01% (*i.e.*, 7.5% + 0.51%). Using a discount rate of 8.01% decreases Brattle's estimate of damages by €[redacted], from €[redacted] to €[redacted] as of October 2017, on a stand-alone basis (*i.e.*, not considering other adjustments discussed in this report).[121]

IV.4. Other Errors in Brattle's Modeling

IV.4.1. Brattle Incorrectly Assume That a Willing Buyer Is Risk-Neutral

129. To arrive to a damages figure, Brattle take a simple average across different results obtained with their different simulations. With this, Brattle's calculations indicate that RWE Eemshaven's But-for FMV amounts to €[redacted] (after excluding the simulations resulting in the lowest and highest 5% of damages).[122] This is equivalent to stating that a willing buyer would be willing to pay €[redacted] to acquire RWE Eemshaven absent the Coal Ban.

130. Brattle's average calculation described above implicitly assumes that the willing buyer is risk-neutral to the underlying distribution of the estimated FMV (*i.e.*, that the willing is indifferent to whether the distribution of FMV is widely dispersed or equal to a specific value with a 100% probability). From an economic perspective this does not seem reasonable.

131. Figure VI below shows that the distribution of potential values of Eemshaven in Brattle's assessment is significantly dispersed and skewed. In particular, Figure VI shows that for [redacted] of the 100 simulations, Eemshaven's FMV is less than €[redacted], the price that Brattle assume a willing buyer would pay for the plant. That is, if a buyer were to pay €[redacted] to purchase Eemshaven, it would face losses on its investment in [redacted] of cases and see positive returns in [redacted] of the cases. In other words, the buyer of Eemshaven faces an almost [redacted] probability of not recovering its investment.

[121] *See* Harris-Hesmondhalgh Workpapers, Tables H, change cell H19 in sheet "H19" to 8.01% and press "Run Damages" button in sheet "H1" with results reported in cell H15.
[122] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model, sheet "H2." Taking the average of cells I22:I121 excluding the top and bottom 5% of the simulations from the range E22:E121 – those with zeros in column N.

132. Furthermore, out those [redacted] abovementioned simulations where Eemshaven's FMV is less than €[redacted] (and hence a putative buyer would not recover its investment), there are [redacted] simulations where Eemshaven's FMV is less than [redacted]. This means that with a [redacted] probability the potential buyer (which according to Brattle would likely be a European utility company)[123] will not only lose their entire investment of [redacted] but would also have to inject additional funds to operate the plant before deciding to close it.

Figure VI. Distribution of Brattle's Estimation of But-for FMV of Eemshaven

Fair Market Value (€ bln)

[redacted]

Price Paths

Source: Own analysis based on Harris-Hesmondhalgh Workpapers, Table H – Financial Model.

133. There is wide consensus in economic literature that rational investors are not risk-neutral, but that they are risk-averse. As Berk and DeMarzo explain, risk aversion is "*[w]hen investors prefer to have*

[123] *See* Brattle Report, footnote 360.

a safe future payment rather than an uncertain one of the same expected amount."[124] Therefore, for a gamble akin to the one resulting from Brattle's analysis and depicted in Figure VI above, a reasonable risk averse investor would not be willing to pay €1,447 million with certainty.[125] Literature analyzing risk and investments in the power generation acknowledge this. For instance, de Maere et al. state that "[*n]either investors nor consumers are risk neutral*."[126] Therefore, a risk averse willing buyer would pay less than the simple average of widely dispersed potential values shown in Figure VI above.

134. Brattle admit that some of the simulations lead to particularly high damages, but still do not account properly for the risk aversion of investors within their Monte Carlo framework.[127] Brattle, allegedly to be conservative and correct for outliers, discard the highest and lowest 5% of values, but this approach cannot be deemed a correction for investors' risk aversion, as the latter's aversion is to losses.[128]

135. There exists a range of methodologies to account for risk aversion of a potential investor when considering the distribution of investment returns. One of these measures is called Conditional Variance at Risk (CVaR). CVaR allows one to quantify the amount of risk in the extreme losses among the distribution of possible outcomes. By discarding the profitable simulations that would occur with a low probability (normally, lower than 5%), it is possible to express investors' risk aversion or prudence. According to Ehrenmann and Smeers, CVaR is becoming a standard risk function and accounts for risk aversion by ignoring the highest 5% realizations.[129]

[124] *See* Berk, J.B., DeMarzo, P.M. 2014. *Corporate Finance*, p. 1064 (**BR-4**). In fact, risk aversion is the basis of the Capital Asset Pricing Model, which Brattle explicitly endorse in their WACC estimation. *See* Brattle Report, ¶274.
[125] It is unreasonable to assume that a large utility company that may want to invest in the coal-fired power plant would be willing to put at risk almost [redacted] with chances of [redacted] that the money will be lost. Note that Brattle experts themselves assume that a willing buyer "*in the case of Eemshaven would be a large sophisticated corporation, which also operates a number of other power plants.*" *See* Brattle Report, ¶30.
[126] *See* de Maere d'Aertrycke, G., Ehrenmann, A., Smeers. Y. 2017. *Investment with incomplete markets for risk: The need for long-term contracts*, Energy Policy, 2.2.2 (**S&R-045)**.
[127] *See* Brattle Report, ¶227.
[128] Brattle provide no specific support for their discarding the top and bottom 5% of outcomes. *See* Brattle Report, ¶231.
[129] *See* Ehrenmann, A., Smeers, Y. 2010. *Stochastic Equilibrium Models for Generation Capacity Expansion*, p. 35 **(S&R-055)**.

136. Using the CVaR approach to exclude 5% of the simulations that yield the highest damages (but not additionally the 5% that yield the lowest, as Brattle do), decreases Brattle's estimate of damages by €[redacted], from €[redacted] to €[redacted] as of October 2017, on a stand-alone basis (*i.e.*, not considering other flaws in Brattle's analysis discussed in this report).[130]

IV.4.2. Brattle Show No Evidence That Monte Carlo Simulations Are Used to Determine FMV of Companies

137. As explained, Brattle's valuation approach generates 100 possible simulations of the future evolution of prices for coal, gas, and CO_2 from their chosen scenario using a so-called Monte Carlo technique. To do so, Brattle start from the 'central' tendencies of a chosen scenario (such as WEO's "New Policies" scenario) and build a distribution of 100 simulations around such central tendency.[131] Brattle claim that one could try and develop a "central" cash flow forecast or could come up with a subjective "scenario-based" approach, but the Monte Carlo simulation is an advanced and a more precise technique, whose average outcome is "more reliable."[132]

138. While Monte Carlo experiments are a theoretically valid method to incorporate uncertainty and randomness in price and cash flow projections, Brattle fail to provide any evidence that from a practical point of view Monte Carlo simulations are commonly used in real-life acquisitions of companies, where investors would rely on a valuation averaged from random simulations, and that such an approach is actually preferred by investors to using a "central" or "scenario-based" cash flow forecast.[133]

139. In contrast, the application of a "central" or "scenario-based" cash flow forecast for RWE, *i.e.* a scenario that will reflect the central tendency within a given scenario, can be observed, for example in:

[130] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H1" **(S&R-041)**, with Brattle's assumptions applied adjusted for CVaR to exclude the top 5% of damages only in cell I29.
[131] An illustration of this is in Brattle's Figure 4, where the central tendency is referred to as the "Mean."
[132] *See* Brattle Report, ¶227.
[133] Brattle have made just one reference to the practical use of the Monte Carlo technique, which was allegedly chosen to determine a compensation to Vattenfall. The underlying exhibit relied on by Brattle, however, does not state whether the Monte Carlo technique was used to determine the value of a company. We have been informed by the Netherlands that the Monte Carlo technique was not used to determine compensation in the way Brattle apply it, *i.e.*, to run different simulations of commodity price forecasts. *See* Brattle Report, ¶¶70–71.

a. [redacted].[134]

b. The equity analyst reports covering RWE and cited in Section IV.3.2, none of which apply a Monte Carlo technique. The authors of the October 2017 Morgan Stanley report,[135] the June 2018 Société Générale report,[136] and the January 2020 Bank of America report,[137] used a single scenario in the valuation of RWE, rather than a Monte Carlo analysis that contemplates multiple (let alone 100) simulations.

c. RWE's forecasts of Eemshaven's likely revenues and costs in the course of its normal business, referred as Station Contribution Outlook or "SCOut" reports, which forecast a central scenario of Eemshaven's cash flows for the subsequent [redacted].[138]

140. Brattle not only fail to provide evidence of the Monte Carlo technique being used to determine FMV, but also acknowledge that a "scenario-based" approach is commonly used, stating that "*[o]ne possible way to deal with the range of future commodity prices is to employ scenarios… <u>Such an approach is commonly used when assessing the benefits of a particular course of action – for example, the purchase of a power plant</u> – where it is important to understand what might happen in a worst case, what a very good outcome would look like, and what it is most reasonable to expect would happen*."[139]

IV.4.3. Brattle's Damages Estimation Rests on Extreme Unreasonable Simulations

141. Brattle highlight that by relying on a range of possible price paths they account for additional value associated with the possibility that coal-fired plants could be very profitable in some simulations.[140] Brattle further state that "*[t]he longer time horizon in our valuation creates the possibility for a wider range of outcomes, including higher value cases that are less likely to occur in the period* [redacted]

[134] *See* [redacted].
[135] *See* Morgan Stanley. 2017. *RWE AG: US Roadshow Feedback*, p. 3 **(S&R-046)**.
[136] *See* Société Générale. 2018. *Focus on 2020 and clean dark spreads*, p. 14 **(S&R-047)**.
[137] *See* BofA. 2020. *Compensation secured and a cleaner future*, p. 2 **(S&R-050)**.
[138] *See* Brattle Report, ¶¶141–142. *See also* RWE, SCOut Q3 2017, *Station Contribution Outlook*, dated October 10, 2017, pp. 47–48 **(BR-40)**.
[139] Emphasis added. *See* Brattle Report, ¶81.
[140] *See* Brattle Report, ¶¶52, 227, 234.

[redacted]."[141] Brattle, however, fail to test the reasonability of this "wide range of outcomes," in particular, with respect to their most extreme simulations.

142. Brattle explain that the Monte Carlo method that they use is simply an advanced technique to estimate the expected cash flows by generating 100 outcomes which, by construction, are equally likely.[142] According to Brattle, a few of the price paths lead to particularly high damages, and there is "*nothing inherently surprising*" that some of the outcomes are "*extremely favourable to Eemshaven*."[143] Brattle do not explain what constitutes an "extremely favorable" outcome.[144] Their "extremely favorable" simulations, however, stem from a purely mathematical application of accumulating volatilities on commodities prices over a very long period of time, without any assessment of whether the resulting simulations are reasonable.

143. For instance, the simulations with the top 20 higher valuation results (*i.e.*, the "extremely favorable" simulations) are mainly characterized by: i) high modelled electricity prices; and ii) high number of running hours for Eemshaven.

144. Brattle implicitly assume that all simulations are not only equally likely, but also bear the same risks. This is wrong, as such an assumption ignores the increasing regulatory risks in the simulations with the highest damages. High electricity prices increase regulatory risks as regulators may seek to address concerns of affordability to customers. High number of operating hours of coal plants mean high amounts of CO_2 emissions, which would be inconsistent with decarbonization expectations, and would increase the regulatory risk to limit such rising emissions (*e.g.*, by imposing stricter emission limits, requiring the deployment of carbon capture technologies).

145. These types of risks, associated with affordability concerns or environmental concerns, were mentioned by the IEA already in 2017, which stated that "*one major uncertainty concerns policy*," as additional policy shifts could be "*in response to concerns about energy security […] or affordability (e.g. to mitigate the effect of upward pressure on prices) or to temper rising emissions (e.g., via the*

[141] *See* Brattle Report, ¶52.
[142] *See* Brattle Report, ¶¶227–228.
[143] *See* Brattle Report, ¶230.
[144] *See* Brattle Report, ¶231.

commitment in the Paris Agreement to update pledges every five years with the intention to increase climate ambition)."[145]

146. Simulations with higher electricity prices carry higher regulatory risk as they imply a higher probability of state intervention to modify market situations that regulators deem undesirable. For instance, the recent increase in energy prices across European countries has provided several examples of how such risks could materialize:

a. As detailed in a quarterly statement covering Q1 2022 by RWE to its investors "*[t]he REPowerEU plan [the EU's 2022 energy security strategy] also outlines how burdens on consumers and companies which are impacted by high energy prices are to be reduced. EU states are to have the option of imposing windfall taxes on the extraordinary gains from the price increases.*"[146]

b. Spain passed legislation introducing a temporary reduction in the remuneration of electricity production activity to reduce windfall profits that have arisen from high energy and commodity prices.[147]

c. Italy is legislating for the introduction of an energy windfall tax whereby energy companies will have to pay a one-off 25% levy to help consumers and businesses cope with rising costs.[148]

d. The UK is legislating for an additional 25% windfall tax on oil and gas companies;[149] with discussions ongoing about the possibility to extend this tax to electricity companies.[150]

e. The EU is preparing for interventions in the energy market, potentially de-coupling electricity prices from natural gas prices, with the goal of lowering electricity prices.[151]

[145] *See* International Energy Agency. 2017. *World Energy Outlook 2017*, p. 40 **(S&R-056)**.
[146] *See* RWE. 2022. *Interim statement on the first quarter of 2022*, p. 3 **(S&R-057)**. *See also* The European Conservative. 2022. *EU Discusses Block-Wide Energy Windfall Taxes*. June 11, 2022 **(S&R-058)**.
[147] *See* Freshfields Bruckhaus Deringer. 2022. *Windfall Profit Taxes – do they work?* June 23, 2022 **(S&R-059)**.
[148] *See* Reuters. 2022. *Energy companies to pay Italian windfall tax in two parts by November – draft.* May 12, 2022 **(S&R-060)**.
[149] *See* BBC News. *Energy prices: How will the £5bn windfall tax work?* May 26, 2022 **(S&R-061)**.
[150] *See* Freshfields Bruckhaus Deringer. 2022. *Windfall Profit Taxes – do they work?* June 23, 2022 **(S&R-059)**.
[151] *See* Bloomberg. 2022. *EU Plans to Intervene in Energy Market as Winter Crisis Looms*. August 30 **(S&R-062)**.

147. In addition to regulatory risks, Brattle's approach of not assessing the reasonability of the resulting simulations is evidenced in their modeling of installed capacity. With the high electricity prices in the "extremely favorable" simulations, electricity generation becomes more profitable not only to Eemshaven but also for potential new entrants with various technologies (*e.g.*, coal with carbon capture technologies, biomass, renewables). Such a higher profitability would incentivize investors to deploy additional generation capacity or to delay the closure of existing capacity, thus leading to lower electricity prices. Brattle ignore this general equilibrium effect, and in doing so they further overestimate damages.[152]

148. In sum, the lack of reasonability assessment of the resulting simulations as modelled by Brattle lead to an overestimation of damages. To correct this overestimation, one would need to assess the reasonability of each of the individual simulations modelled by Brattle and to introduce adjustments to reflect expected consequences of high electricity prices or high CO_2 emissions (*e.g.*, increased regulatory risk, increased costs of emission reduction such as carbon capture)—such an approach introduces the need for additional assumptions that limit the potential desirability of the Monte Carlo approach to assess FMV.

149. Brattle use the Monte Carlo technique to simulate potential price paths from a chosen scenario, and apply the technique mechanically over a very long period of time (until 2054) without consideration for the reasonability of the resulting simulations. Alternatively, and as explained in Section IV.4.2, the FMV of Eemshaven could be assessed using a central (*i.e.*, most likely) scenario or a handful of reasoned scenarios, as investors more commonly undertake in their investment decisions in practice.

IV.4.4. Brattle's Assumption of CAO Revenues Overestimate Eemshaven's Value

150. Brattle include asset-backed trading revenue from trading coal, gas, CO_2, and electricity in their cash flow modeling, which altogether is branded as revenues from Commercial Asset Optimization

[152] Brattle argue that they "flex" the share of renewable capacity from the EU Reference Scenario capacity mix to account for the wide range of commodity prices included in the electricity modeling. They, however, do not flex technologies other than renewables. In addition, in the case of renewables, Brattle only "flex" the capacity between 2020 and 2050, converging to a to a single (*i.e.*, not "flexed") value in 2050 irrespective of the commodity price simulation, in other words, they "flex" only the interpolated years. This can be observed in Brattle's Figure 32, where the "flexing" peaks in 2034, and then converges to the 2050 value irrespective of the commodity price paths. It can also be observed in Brattle's Figure 33, where the minimum and maximum renewable capacity in 2050 (last two bars) are the same. *See* Brattle Report, ¶323 and Figures 32 and 33.

(CAO).[153] An example of such revenues originate from activities known as "hedging," whereby energy producers enter into contracts at fixed fuel and electricity prices to be delivered in the future, and thus lock in a positive margin (also referred to as the "clean dark spread," or "**CDS**") well ahead of the delivery date of the electricity. While mainly intended as a tool for risk management, in certain situations it is possible to make profits from hedging, which would result in a profit margin that exceeds the locked-in CDS.

151. Brattle assume CAO revenues to be equal to a fixed percentage (around [redacted]) of commodity margins,[154] claiming that the forecasted ratio between CAO revenues and commodity margins between [redacted] and "*it seems reasonable to suppose that this relationship would endure, and that future CAO revenues* [redacted]*, and the plant revenues,* [redacted]."[155] This approach is problematic for several reasons.

152. First, trading activities, if any, may generate not only gains but also losses. Therefore, it is possible that trading-related profits wash out over an extended time horizon.

153. Second, Brattle provide little evidence to justify why the ratio between CAO revenues and commodity margins should be fixed. Brattle use the average of forecasted CAO revenues over commodity margins for [redacted] and apply it in their cash flow model for all years and all simulations.[156] It may be the case, however, that the [redacted] ratio of CAO revenues over this period is due to the fact that the forecasted values of commodity margins are also relatively [redacted] in these years. Such a short period would therefore be insufficient to test whether the CAO revenues would indeed [redacted] as a share of commodity margins.

154. Third, Brattle outline an example of how a power plant can earn additional (CAO) profits if it enters into a hedging activity where: i) it enters into forward contracts locking in electricity prices and costs in three months' time, locking in a positive CDS; and ii) three months later when the time to deliver the power arrives, the spot CDS is negative.[157] In other words, Brattle's example shows the possibility

[153] *See* Brattle Report, ¶143.
[154] *See* Harris-Hesmondhalgh Workpapers, sheet "H17".
[155] *See* Brattle Report, ¶148.
[156] *See* Harris-Hesmondhalgh Workpapers, sheet "H14", row 14.
[157] *See* Brattle Report, ¶¶405–409.

of earning an additional revenue only when the forward CDS is positive but turns negative in a short period of time. Such a proposition is internally inconsistent given that negative CDSs—*i.e.*, under condition ii)—do not occur as often in simulations where the plant is highly profitable (also referred by Brattle as the "extremely favorable" simulations). In other words, it is less likely for a highly positive CDS to turn negative in a short period of time than it is for a low positive CDS. Thus, CAO revenues, if any, would be lower in high-profit simulations, and not [redacted] as Brattle assume. Therefore, Brattle are wrong to assume a [redacted] share of CAO revenues to commodity margins across all simulations, as it overestimates CAO revenues in the most favorable simulations.

155. Finally, Brattle's example of CAO revenues is based on the assumption that the plant enters into hedging activities. The flip side of entering into a (full) hedge position is that when the CDS increases after the time of hedging, the plant cannot fully benefit from such an increase in the spot CDS.[158] Brattle's modeling approach, however, does not assume that the plant enters into such hedging, and thus does not cap margins to reflect this. On the contrary, Brattle's modeling approach assume that Eemshaven benefits for the full extent of such CDS increases. Therefore, Brattle overestimate Eemshaven's profits, by allowing the plant to fully benefit from increases in CDS (as if it did not enter into hedging) and by including the CAO revenues (as if it entered into hedging).[159]

156. Eliminating the CAO revenues assumption reduces Brattle's estimate of damages by €[redacted], from €[redacted] to €[redacted] (rounded) as of October 2017, on a stand-alone basis (*i.e.*, not considering other adjustments discussed in this report).[160]

IV.5. BRATTLE'S ESTIMATION OF VALUE FAILS REASONABILITY CHECKS

157. In the Actual scenario in which Eemshaven is permitted to generate electricity with coal only until 2029, Brattle assess Eemshaven's value at €[redacted].[161] In the But-for scenario Brattle's assessment

[158] *See* Brattle Report, Table 14 column A.
[159] Had Brattle wanted to include CAO revenues, they would need to reduce their estimated commodity margins, to reflect the de-risking implicit in hedging.
[160] *See* Harris-Hesmondhalgh Workpapers, Tables H, change cell I11 in sheet "H17" to zero and press "Run Damages" button in sheet "H1" with results reported in cell H15.
[161] Brattle's calculated fair market value of RWE Eemshaven as of October 9, 2017 accounts only for the forecast cash flows from 2020 onwards—in other words, omitting the cash flows between October 9, 2017 and December 31, 2019.

of Eemshaven's FMV amounts to €[redacted], representing the value of operations up to 2054. This means that Brattle assign only [redacted] of Eemshaven's value to the operations up to [redacted], with the remaining [redacted] of their assessment of Eemshaven's value arising from 25 years of potential operations between 2030 and 2054.[162] This relatively large allocation of value towards the later part of Eemshaven's useful life contrasts with the market commentaries of further deterioration in the economics of coal power plants, as described in Section II.3.[163]

158. Whenever feasible, it is best practice to conduct a reasonableness check when performing a valuation, especially when using the income approach.[164] Brattle consider alternative methods to value the alleged losses to Claimants, but ultimately discard all of them.[165]

IV.5.1. Brattle's Damages Estimate Is Inconsistent with Contemporaneous Evidence as of Their Chosen Date of Valuation

159. The choice of an appropriate date of valuation is a legal matter, to which we provide no opinion. We comment, however, on Brattle's selection of the date of valuation, which is a result of their own analysis of the alleged impact of the Coal Ban on RWE Eemshaven's value.

See Brattle Report, ¶213. We understand from the SCOut report, that the "corporate cash contributions" for 2018 and 2019 (the closest approximation we can infer given the lack of data) amounted to €[redacted] and €[redacted] respectively. *See* RWE, *SCOut Q3 2017, Station Contribution Outlook*, dated 10 October 2017, pp. 47–48 (**BR-40**). Brattle's estimates of FMV therefore do not truly reflect the transaction price that a willing buyer and a willing seller would have agreed for RWE Eemshaven as of October 9, 2017.

[162] [redacted] = €[redacted] / €[redacted].

[163] Resolving the key flaws in Brattle's estimation of losses, as described in more detail in Section V, the operations with coal (*i.e.*, not accounting for the possibility of conversion to biomass) during the 25 years since 2030 until 2054 would represent between [redacted] of Eemshaven's value (instead of the [redacted] estimated by Brattle), for the "Global Climate Action" and "Distributed Generation" scenarios respectively, based on the Monte Carlo simulation approach. *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H2", cell Q14 **(S&R-041)**.

[164] As mentioned by *The Guide to Damages in International Arbitration* (one of Brattle's exhibits): "*Having considered the different approaches to valuation, most valuers will reach a conclusion on FMV from a combination of approaches. Provided sufficient information is available on the subject entity, most valuers will begin with the income approach, using DCF, to reach a valuation of the entire entity, and will regard this as their primary valuation. They will then use the market approach as a secondary valuation, to check that the income-based valuation falls within the range that the market approach would expect. […] When dealing with trading or operating businesses, most valuers will make little reference to the cost approach, other than to use it as a sense check on the results obtained from the income and market approaches.*" *See* Global Arbitration Review. 2018. *The Guide to Damages in International Arbitration*, Third Edition, p. 201 (**BR-21**).

[165] *See* Brattle Report, Section III.D.

160. Brattle indicate that they were not instructed to use a specific date of valuation, but instead were instructed to "*use a valuation date immediately before the impending Coal Ban became known in such a way as to affect the value of Eemshaven*;"[166] they clarify that this instruction means to use a date of valuation "*immediately before the Coal Ban had* <u>*any*</u> *effect on the value of Eemshaven and also to consider the full effect of the Coal Ban*."[167] Brattle choose as a date of valuation October 9, 2017, the day before the Dutch government published the 2017 Coalition Agreement, which contained an announcement that Brattle define as a formulation of the Coal Ban. Brattle state that this announcement "*was sufficiently defined and foreseeable to affect the valuation of coal-fired plants*."[168] Moreover, Brattle contend that it would only make sense to consider a date of valuation later than October 9, 2017 if "*a prospective buyer for Eemshaven would have paid the same price before the October 2017 announcement as after the announcement*," with which they disagree.[169]

161. If, as Brattle claim, the October 2017 announcement "*was sufficiently defined and foreseeable to affect the valuation of coal-fired plants*," and, in particular if the impact was Brattle's estimated amount (*i.e.*, €[redacted]), we would expect to find contemporaneous market indications reflecting such impact on the value of the Eemshaven plant or RWE's stock, either as an additional impairment recorded in the financial accounts, or in contemporaneous commentary of analysts covering RWE's stock. Brattle, however, provide no such factual evidence of any—let alone a "sufficiently clear"—effect from the 2017 Coalition Agreement announcement on Eemshaven's value. Nor do they provide any economic or financial analysis to support their conclusion that such an effect was commensurate with the damages estimated at €[redacted].

IV.5.1.a. Brattle Show No Evidence of Impact on the Value of RWE Due to the Coal Ban

162. We have reviewed contemporaneous analyst reports covering RWE's stock and found no mentions of the October 2017 announcement and any effect it had on Eemshaven's value. For example, Morgan Stanley on October 16, 2017, six days after the publication of the 2017 Coalition Agreement, issued a valuation of RWE and made no mention of the Netherlands, let alone of the October 2017

[166] *See* Brattle Report, ¶2.a.
[167] *See* Brattle Report, ¶43.
[168] *See* Brattle Report, ¶2.a.
[169] *See* Brattle Report, ¶2.a.

announcement.[170] Similarly, in November 2017, Barclays and BNP Paribas published reports assessing RWE which contained no mention of the Netherlands or the October 2017 announcement.[171]

163. Moreover, had RWE Eemshaven been negatively affected in October 2017 in the amount of €[redacted], as estimated by Brattle, we would expect this to be reflected in RWE's stock price, given that at the time, such an alleged loss would represent [redacted] of RWE's total market capitalization.[172] As we explain further in Section IV.5.2 below, we do not find evidence of such a negative impact on October 10, 2017, or even shortly after.

IV.5.1.b. Evidence Indicates That the Effect of the Coal Ban Was Uncertain as of October 2017

164. The 2017 financial accounts of RWE Eemshaven Holding II, B.V. do not mention any impairments related to the October 2017 announcement.[173] In fact, the RWE A.G.'s 2017 financial accounts indicate that "*[a]t present, it is impossible to predict the ramifications of the coalition agreement for the energy sector.*"[174]

165. In addition, Brattle implicitly acknowledge that as of October 2017 the impact of the Coal Ban on the value of coal-fired plants was still uncertain. For example, Brattle state that "*the probability that the Coal Ban would become law, and, particularly, that there would be only very limited compensation for the early closure of Eemshaven, increased between October 2017 and the end of 2019*."[175] Brattle also state that analysts covering RWE's business did not comment on the possibility of a €1.4 billion loss because at that point in time "*the extent of the effect was still uncertain.*"[176]

166. The October 2017 announcement, however, merely indicated the year of the coal phase-out and provided no specific indication of any potential compensation. Indeed, it only became certain that there would be no compensation from the Dutch State on December 20, 2019, with the enactment of

[170] *See* Morgan Stanley. 2017. *RWE AG: US Roadshow Feedback* **(S&R-046)**. The report mentions political uncertainty, but makes references exclusively to Germany.
[171] *See* Barclays. 2017. *RWE: 9m 2017 results preview: Operations back on track but policy risk growing*, p. 1 **(S&R-063)**. *See* BNP. 2017. *RWE: Coal exit and Innogy's strategic ambitions limit options*, p. 1 **(S&R-064)**.
[172] *See* paragraph 170.
[173] *See* RWE. *Eemshaven Holding II B.V. Annual Report, 2017* **(BR-76.J)**.
[174] Emphasis added. *See* RWE. *Annual Report 2017*, p. 36 **(S&R-051)**.
[175] *See* Brattle Report, ¶43.
[176] *See* Brattle Reply Report (Dutch proceedings), ¶140 **(S&R-035)**.

the Coal Ban Act. This is more than two years after Brattle's chosen date of valuation. Despite this, Brattle's damage estimation as of October 9, 2017 assumes with certainty no such upfront compensation, despite this being unknown as of Brattle's chosen date of valuation. As such, not only is Brattle's damages estimate overestimated, but it also incorrectly uses hindsight.

167. Overall, Brattle's estimation of a loss in value of €[redacted] is inconsistent with the contemporaneous evidence which, as of their chosen date of valuation of October 9, 2017, shows no such impact from the Coal Ban.

IV.5.2. Comparison to RWE's Market Capitalization

168. Brattle consider looking at RWE's share price movements to measure the alleged loss in value resulting from the Coal Ban.[177] They discard this approach altogether, however, arguing that: i) "*the effect of the Coal Ban on RWE's share price increased gradually over the period between October 2017 and the end of 2019, when the Coal Ban entered into law,*"[178] and because of a multitude of events that have happened during the alleged gradual increase of the Coal Ban effect, "*it is not possible to discern the effect of the Coal Ban on the share price over such an extended period [October 2017 and the end of 2019]*";[179] and ii) the change in RWE's market value may underestimate the losses if the market expected to receive some compensation.[180]

169. As explained in Section IV.5.1, Brattle's reasoning that the effect of the Coal Ban increased gradually over time highlights that the Coal Ban did not have full impact on October 2017 (as Brattle's €[redacted] damages valuation assumes).[181] As such, Brattle overestimate the damages as of October 2017. In addition, Brattle's estimation assuming a full impact of the Coal Ban on October 2017 relies

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[177] *See* Brattle Report, ¶42.
[178] *See* Brattle Report, ¶43.
[179] *See* Brattle Report, ¶43.
[180] *See* Brattle Report, ¶45.
[181] Brattle's explanations are arguments to determine a "last clean price" (LCP). As of the date of the LCP the full extent of the impact of the Coal Ban Act was unknown. The date of LCP is not necessarily equivalent to a date of valuation. In *Quasar v Russia* the last clean price (referred as "last reliable stock price") was April 14, 2004, while the date of valuation was November 23, 2007. *See Quasar de Valores SICAV S.A. et al v. The Russian Federation*, SCC Case No. 24/2007, Award, July 20, 2012, ¶¶188–192 (**S&R-065**). In Crystallex v Venezuela the "last available clean price" was June 14, 2007 while the date of valuation was April 13, 2008. *See Crystallex v Venezuela*, ICSID Case No. ARB(AF)/11/2, Award, April 4, 2016, ¶¶858, 891 (**S&R-066**).

on the use of hindsight, as Brattle recognize that the effect of the Coal Ban had not fully materialized but instead gradually increased after October 2017.

170. Such an overestimation is clear when considering how much Brattle's estimated loss of €[redacted] represents as a proportion of RWE's market value. As of October 9, 2017, RWE's market capitalization (*i.e.*, the market value of RWE's equity) stood at €12.2 billion.[182] Brattle's estimated loss to Eemshaven therefore represents [redacted] of RWE's market value[183]—a significant portion, which would not have been unnoticed by the market.

171. We would thus expect that analysts covering RWE's stock price would have commented on the implications of the announcements in the 2017 Coalition Agreement, had they believed that it would mean a €1.4 billion or [redacted] decrease in RWE's market value. Nevertheless, we have found no analyst making such commentaries in October 2017 or shortly thereafter, as discussed in Section IV.5.1. This further confirms that the market did not expect a material impact on the value of RWE's coal-fired assets as a result of the October 2017 announcements.[184] Equally, we have found no commentaries in relation to the impact of the Coal Ban Act in analyst reports covering RWE's stock in December 2019 or shortly thereafter.

IV.5.3. Comparison to Compensation for Early Closure in Germany

172. Germany's coal phase-out law set deadlines for closing coal power plants. For RWE's Westfalen and Ibbenbüren power plants this was [redacted].[185] In addition, Germany established an auction scheme to incentivize operators to voluntarily close coal power plants ahead of their deadlines in exchange for a compensation. RWE participated in the first of these auctions in 2020 and accepted compensation to bring forward the closure date of the Westfalen and Ibbenbüren power plants to the end of 2020.[186]

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[182] With 614,745,000 shares outstanding, RWE's closing share price on October 9, 2017 was €19.92. *See* Compass Lexecon Analysis **(S&R-001)**.

[183] [redacted] = €[redacted]/ €12.2 billion.

[184] In comparison, in the two years prior to the publication of the 2017 Coalition Agreement, RWE's stock price showed a daily volatility of just 2.6%. *See* Section IV.5.1 for the summary of the contemporaneous market coverage.

[185] *See* Brattle Reply Report (Dutch proceedings), ¶176 **(S&R-035)**.

[186] *See* Brattle Report, ¶49. *See also* RWE *Compensation allocated at hard coal phase-out auction: RWE closes power stations in Hamm and Ibbenbüren*, press release December 1, 2020 (**S&R-067**).

As Brattle indicate, the compensation accepted by RWE was to reimburse for the loss of electricity production solely for the [redacted]-year period between [redacted] and not for any value thereafter.[187]

173. Brattle discard the German compensation as a potential benchmark to estimate losses to Eemshaven.[188] In particular, Brattle indicate that such compensation only covered the period [redacted], *i.e.*, RWE's German plants are compensated for [redacted] years of lost operations between [redacted], while there are 25 years of alleged lost operations between 2030–2054 in the case of Eemshaven.[189] This however does not mean that there were any expectations of the plants having positive value [redacted].[190]

174. In fact, contrary to Brattle's statement, the evidence in relation to the German coal ban can provide useful indications of the reasonability of Brattle's calculations and Claimants' claim in the present case where [redacted] the alleged damages arise [redacted]. In particular, we are unaware of RWE having claimed compensation to the German State for the period [redacted].[191] One possible reason for a lack of claim for compensation for the period [redacted] could be a view

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[187] *See* Brattle Report, ¶52.
[188] *See* Brattle Report, ¶¶51–54.
[189] *See* Brattle Report, ¶52. The closing year of [redacted] is estimated by Brattle from the schedule of coal plant closures in Germany. *See* Brattle Reply Report (Dutch proceedings), ¶¶177–178 **(S&R-035)**.
[190] Brattle provide two additional reasons: (1) Brattle argue that Eemshaven plant operates in a market different to that of Westfalen and Ibbenbüren plants, and that Dutch wholesale prices have consistently differed from those in Germany. *See* Brattle Report, ¶51. This argument is however not a valid reason to discard the evidence from the German coal phase-out as a potential benchmark. If Brattle are referring to wholesale prices in the past, this evidence is of no consequence as the relevant timeframe to assess is [redacted], which, according to Brattle, explains [redacted] of Eemshaven's value. *See* Brattle Report, ¶29. It was already expected as of Brattle's chosen date of that convergence of the Dutch and German markets would intensify with little price difference [redacted] *See* PBL. 2016. *National Energy Outlook 2016*. p. 51 **(S&R-070)**. In particular, the German electricity market, where Westfalen operates, and the Dutch electricity market, where Eemshaven operates, have been coupled since 2010. *See* Epexspot. 2021. *European Market Coupling* **(S&R-068)**. In fact, the wholesale electricity prices in the CWE show a high level of convergence. *See* European Commission. 2019. *Quarterly Report on European Electricity Markets*. Volume 12 (issue 4, 4Q 2019), p. 21 **(S&R-069)**. Moreover, in 2016 the Dutch National Energy Outlook (NEV) stated that "*[a]ccording to model outputs, the price difference between Germany and the Netherlands will become increasingly small by 2020, and wholesale prices will be around the same level thereafter.*" *See* PBL. 2016. *National Energy Outlook 2016*. English summary, p. 8 **(S&R-015)**. In addition, by 2025 interconnection capacity between the Netherlands and Germany is set to increase by 50%, allowing further integration between the two markets. *See* Tennet. 2020. *Investeringsplan Net op Land 2021-2029,* Figure 4.8 **(S&R-071)**. (2) Brattle argue that such compensation takes into account developments until [redacted], while their date of valuation is October 2017. *See* Brattle Report, ¶53. This argument, however, does not hold for Brattle's [redacted] date of valuation.
[191] RWE agreed with the German government on a €2.6 billion compensation, but RWE indicates that such amount corresponds to the early exit from lignite, not hard coal. *See* RWE *Annual Report 2020,* p. 26 **(S&R-072)**.

that operations for this period are expected to have little to no value. If this is the case, it would contradict Brattle's estimation of significant value for Eemshaven [redacted]. As explained in Section IV.3.2, several analysts covering RWE in 2017 indeed projected [redacted] for RWE's coal-generation operations [redacted].

IV.5.4. Brattle's Computation of Avoided Carbon Costs Is Not a Reasonability Check of Their Calculations of Eemshaven's FMV

175. According to Brattle's modeling, closing Eemshaven in 2030 would result—on average—in nearly 210 million tons of avoided CO_2 emissions during the post-2030 years.[192] This makes the claim "equivalent" to the Netherlands paying around €16 for each ton of avoided carbon (*i.e.*, below current market prices of CO_2).[193] With this, Brattle conclude that this represents a "*reasonable cost for reducing carbon emissions*."[194]

176. As Brattle indicate, their analysis assesses the alleged reasonability of the "*cost for reducing carbon emission*" and not the reasonability of their valuation of FMV of Eemshaven. Therefore, no conclusion can be drawn from such analysis to assess the reasonability of Brattle's calculation.[195]

[192] *See* Brattle Report, ¶243.
[193] *See* Harris-Hesmondhalgh Workpapers, sheet "H7", cell J331.
[194] *See* Brattle Report, ¶15.
[195] Brattle's assessment is also fundamentally flawed. Brattle's calculation is circular, as it is the ratio of a) the value of the plant (derived from Brattle's modeling) divided by b) the expect amount of CO_2 emissions (also derived from Brattle's modeling). Since Brattle's modeling assumes a high utilization of the plant, it results in a) a high value of the plant (increasing the ratio), but at the same time results in b) a high amount of carbon emissions (decreasing the ratio).

V. RESOLVING BRATTLE'S KEY FLAWS SIGNIFICANTLY LOWERS THEIR LOSSES ESTIMATE

177. As explained in Section IV.5.1, Brattle's finding of significant damages (*i.e.*, €1.4 billion) is inconsistent with the evidence available as of Brattle's chosen date of valuation of October 9, 2017. As we also explained in the same section, Brattle's assessment as of that date implicitly assumes that in the Actual scenario expectations were, with certainty, that there would be no financial compensation to Claimants for loss of value due to the Coal Ban after 2030, when such information was not known as of October 10, 2017. Even if we were to accept this assumption for illustrative purposes (which is contradicted by contemporaneous evidence and Brattle's own statements), Brattle's assessment of damages at [redacted] is overestimated.

178. In Section IV we discussed the individual impacts of adjusting Brattle's estimate of damages. Since they are interrelated, however, the cumulative impact of implementing two or more adjustments simultaneously is not necessarily equivalent to the sum of the individual impacts. For instance, using commodity price inputs that result in expected deterioration of economic conditions for coal plants, including Eemshaven, would mean that a higher discount rate would have a smaller impact on value, since cash flows in the long term are already relatively low.

179. In the following sections we assess the cumulative impact on Brattle's calculations of jointly implementing the abovementioned adjustments.

V.1. RESULTS USING MONTE CARLO SIMULATION APPROACH

180. In this section we present modifications to Brattle's analysis by simultaneously resolving the following fundamental flaws, discussed in Section IV: a) changing the source for commodity and capacity forecasts to one dated closer to Brattle's chosen date of valuation; b) using forecast scenarios that comply with the EU climate change commitments (*i.e.*, the Paris Agreement goals); c) incorporating the possibility of converting Eemshaven to biomass after the Coal Ban; d) accounting for the contemporaneous assessment of risk in the cost of capital; e) taking into account investors' risk aversion; and f) eliminating CAO revenues.

181. To implement these modifications, we forecast commodity price scenarios using Brattle's approach and assumptions regarding volatilities and correlations. We deviate from Brattle's approach (in respect of electricity modeling) on the source of forecasts for commodity prices. We rely, instead on the draft TYNDP 2018's forecasts as presented in its scenarios "Global Climate Action" and "Distributed Generation", as discussed in the Section IV.1.3.[196]

182. Therefore, for the purposes of the present exercise of adjusting Brattle's estimate, we adopt the methodology used by Brattle, by changing only the long-term commodity prices.[197] We also change the source of forecasts for electricity demand and installed capacity, by relying on the draft TYNDP 2018.[198]

183. Since we use two scenarios of inputs (*i.e.*, the "Distributed Generation" and the "Global Climate Action" scenarios), as opposed to Brattle that use only one, but still rely on Monte Carlo simulations, we perform 200 simulations of electricity price projections and Eemshaven's commodity margins (100 simulations for each scenario).[199]

[196] We do not change Brattle's price projections between 2017 and 2022, which are based on market forward prices. The TYNDP provides data until 2040. Therefore, after 2040, we assume Eemshaven's commodity margins to remain constant in real terms (*i.e.*, grow with inflation) and running hours to remain constant at the 2040 levels. This assumption would overestimate damages, since profitability of coal plants would be expected to further erode due to decarbonization efforts beyond 2040. Despite this, we apply this simplifying assumption to reduce the computational burden of the market modelling.

[197] Brattle use the IEA forecasts provided for 2025, 2030, and 2040 as the spot prices for their model. Brattle explain in Appendix B to their report a process of converting spot prices to forward prices, because "*theory underlying [their] stochastic model requires that the price inputs to the model are forward prices*." Brattle do not explain the theory they are referring to and the reasons why it was chosen. Their analysis relies on a plethora of assumptions to execute the conversion, such as estimating the CAPM discount rate applicable to commodities and performing a discounting / roll back procedure. To minimize the areas of disagreement, we proceed on the basis of keeping these assumptions unchanged. This should not be interpreted, however, as our agreement with Brattle's methodologies and assumptions.

[198] As a pragmatic step to reduce to reasonable levels the running time required to complete the Monte Carlo simulations of electricity prices and commodity margins, we do not run a different set of assumptions for the Actual scenario as opposed to a But-for scenario. This means that in the Actual scenario the Amer plant remains available through 2032, instead of closing in 2024. The impact of this approach on Eemshaven's value is marginal and would result in overestimating alleged damages. As noted by Brattle, in the outcomes of their modelling up to 2030"*[t]here is very little difference between the monthly baseload electricity prices in the actual and but-for cases.*" *See* Brattle report, ¶341.

[199] *See* Appendix C.

184. Using Brattle's financial model, we generate 200 "pairs" of free cash flow paths (100 for each TYNDP scenario) for both the Actual and But-for cases under our market scenarios. We then introduce the adjustments discussed in Section IV, namely:

a. Incorporate the possibility of converting Eemshaven to fire 100% of its capacity using biomass, for those simulations with sufficiently high electricity prices that make such conversion profitable.[200]

b. Use a WACC of 8.01%, based on Germany's estimate of WACC, and which accounts for increasing risks to coal plants due to the energy transition.[201]

c. Remove CAO revenues.[202]

d. Allowing for investors' risk aversion in the computation of the fair market value of the plant.[203]

185. This provides us with 200 "pairs" of adjusted present values of Eemshaven's cash flows (100 pairs for the "Distributed Generation" scenario and 100 pairs for the "Global Climate Action" scenario), for 200 particular evolutions of the underlying commodity prices, either with or without the Coal Ban. The difference between the values within each pair represents the loss in value of Eemshaven resulting from the Coal Ban.

186. Figure VII and Figure VIII show the resulting loss in value of Eemshaven (*i.e.*, the difference in FMV between the But-For and Actual scenarios).

[200] In the But-for scenario, if the value of converting to biomass in 2030 exceeds the value of continuing operations with coal after 2030, we assume Eemshaven converts to biomass. In the Actual scenario, we assume such conversion in 2030 if the value of converting to biomass is positive, since there is no alternative to continuing operations with coal after 2030. We do not assume an impact on biomass prices as a result of such conversions. As explained in Appendix B.3, even if such conversions were to increase the biomass prices, they would do so up to the point where an investor would be indifferent between converting to biomass or continuing to use coal. While this would lower the value of a biomass conversion to Eemshaven, it would do so in both the Actual and But-for scenarios, thus not impacting the computation of damages.
[201] *See* paragraphs 127–128.
[202] *See* Section IV.4.4.
[203] *See* Section IV.4.1.

Figure VII. Sorted Distribution of the Loss in Value of Eemshaven Including All Adjustments to Brattle's Analysis – "Distributed Generation" Scenario

Lost Fair Market Value (€ million)

[redacted]

Sorted price paths by Lost FMV

Source: Compass Lexecon Analysis ***(S&R-001)****.*
Note: in red the 5% highest estimations of losses, to be excluded from the computation of average damages.

Figure VIII. Sorted Distribution of the Loss in Value of Eemshaven Including All Adjustments to Brattle's Analysis – "Global Climate Action" Scenario

[redacted]

*Source: Compass Lexecon Analysis **(S&R-001)**.*
Note: in red the 5% highest estimations of losses, to be excluded from the computation of average damages.

187. As observed in Figure VII and Figure VIII above, [redacted] of the simulations result in no loss in value to Eemshaven due to the Coal Ban.[204] This is because most of these simulations reflect unfavorable market conditions that would make Eemshaven close on or before 2030, while in most simulations with favorable market conditions it would be profitable to convert to use biomass, thus the Coal Ban not affecting Eemshaven. Only in the remaining [redacted] of the simulations there is a

[204] Figure VII and Figure VIII show, respectively, two and four simulations where the loss in value of Eemshaven is [redacted] (*i.e.*, Eemshaven's value [redacted] with the Coal Ban, represented by the [redacted] bars). Such simulations reflect situations where, by continuing operations in 2030 and thereafter, Eemshaven incurs in losses in the But-for scenario, which are avoided in the Actual scenario by closing the plant in 2030.

loss in value of Eemshaven (positive bars to the right in Figure VII and Figure VIII above). Yet, as explained in Section IV.4.1, we account for the risk-aversion of a willing buyer by removing the highest 5% of values.

188. Taking the average of the loss in value for the remaining 95% of price paths results in adjusted amounts that incorporate the cumulative impact of adjustments on Brattle's estimate of damages. With the cumulative impact of adjustments, Brattle's estimate of damages as of October 2017 would be [redacted] in both the "Distributed Generation" scenario and the "Global Climate Action" scenario.[205]

189. Finally, we note that the abovementioned results do not account for the inclusion of extreme unreasonable simulations in the computation of FMV, as explained in Section IV.4.3. A way to account for the inclusion of such unreasonable simulations is to assess the FMV of Eemshaven using a central (*i.e.*, most likely) scenario or a handful of reasoned scenarios, which would exclude such extreme and unreasonable scenarios. We implement this approach in the next section.

V.2. Results Using Scenario-Based Approach

190. As explained in Section IV.4.2, the common approach investors use to implement the DCF method to determine FMV of a company is to rely on a central scenario of cash flows, or at most a handful of reasoned scenarios (*i.e.*, the scenario-based approach).

191. Implementing such a scenario-based approach, and the additional adjustments already mentioned (*e.g.*, using the TYNDP 2018's scenarios, using a discount rate that accounts for risks of the energy transition, etc.), Brattle's estimate of damages would [redacted] in both the "Distributed Generation" scenario and in the "Global Climate Action" scenario.[206]

[205] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H1" **(S&R-041),** with all adjustments applied but keeping the Monte Carlo modeling approach in cell I30. In the case of the "Global Climate Action" scenario, the resulting loss in value is in fact [redacted], for the reasons explained in footnote 207. As a result, Brattle's estimate would be reduced to the point where there are no damages to Eemshaven (*i.e.*, damages would be nil).

[206] *See* Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments, sheet "H1" **(S&R-041),** with all adjustments applied but keeping the Monte Carlo modeling approach in cell I30. In the case of the "Global Climate Action" scenario, the resulting loss in value is in fact [redacted], for the reasons explained in footnote 207. As a result, Brattle's estimate would be reduced to the point where there are no damages to Eemshaven (*i.e.*, damages would be nil).

VI. A MORE RECENT DATE OF VALUATION WOULD RESULT IN LOWER DAMAGES THAN AS OF OCTOBER 2017

192. The value of Eemshaven and the estimate of alleged damages are affected by the expected market conditions that European coal plants will face, in particular after 2030 in the case at hand. Such expectations vary over time.

193. Counsel has instructed us to assess whether using a recent date of valuation, reflecting more recent market expectations than in Brattle's chosen date of valuation of October 2017, would affect the estimate of alleged damages.

194. Brattle's valuation of losses as of December 19, 2019 (prepared in the context of the Dutch legal proceedings) already provides an indication of how a more recent date of valuation affects the alleged damages to Claimants. With a date of valuation of December 2019, only two years after their October 2017 assessment, Brattle conclude that alleged damages to Eemshaven would [redacted][207]

195. More recent market developments, taking place after December 2019, are expected to further deteriorate Eemshaven's financial performance in the medium to long term. For instance, as mentioned in Section II, CO_2 prices significantly [redacted] since December 2019, more than [redacted] from [redacted] €/ton to average [redacted] €/ton since end of 2021.[208] In addition, since 2020 the EU further increased its targets to reduce emissions, with different regulations (*e.g.*, "European Green Deal," "European Climate Law") and proposals (*e.g.*, "Fit for 55," "REPowerEU") including additional limitations to the supply of CO_2 allowances and increases in renewable energy targets.[209] As such, an expected further deterioration of Eemshaven's profitability using coal after 2030 would result in even lower damages than those estimated for December 2019.

[207] *See* CL Reply Report (Dutch proceedings), ¶53 **(S&R-004).**
[208] *See* Figure I.
[209] *See* paragraphs 57–58.

VII. DECLARATION

196. We declare that:

a. We understand that our duty in giving evidence in this legal proceeding is to assist the Tribunal decide the issues in respect of which expert evidence is adduced. We have complied with, and will continue to comply with, that duty.

b. We confirm that this is our own, impartial, objective, independent, unbiased opinion which has not been influenced by the pressures of the dispute resolution process or by any party to the proceedings.

c. We confirm that all matters upon which we have expressed an opinion are within our area of expertise.

d. We confirm that we have referred to all matters which we regard as relevant to the opinions we have expressed and have drawn to the attention of the Tribunal all matters, of which we are aware, which might adversely affect our opinion.

e. We confirm that, at the time of providing this written opinion, we consider it to be complete and accurate, and to constitute our true, professional opinion.

[redacted]

Pablo T. Spiller September 5, 2022	Alan G. Rozenberg September 5, 2022
156 W 56th Street – Floor 19 New York, NY – 10019, USA	5 Aldermanbury Square London EC2V 7HR, UK

APPENDIX A LIST OF DOCUMENTS CITED

Tab #	Description
S&R-001	Compass Lexecon Analysis
S&R-002	Pablo T. Spiller CV
S&R-003	Alan G. Rozenberg CV
S&R-004	CL Reply Report (Dutch proceedings)
S&R-005	UN General Assembly. 1992. *United Nations Framework Convention on Climate Change*, FCCC/INFORMAL/84
S&R-006	UN Chronicle. 2007. *From Stockholm to Kyoto: A Brief History of Climate Change*
S&R-007	European Council. 2002. *Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment of commitments thereunder*, 2002/358/CE
S&R-008	European Union. 2003. *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC*
S&R-009	European Commission. 2016. *The EU Emissions Trading System*
S&R-010	European Commission. *Development of EU ETS (2005-2020*
S&R-011	European Commission. 2011. *Communication from the Commission: Energy Roadmap 2050*, COM(2011) 885 final
S&R-012	European Council. 2014. *Conclusions on 2030 Climate and Energy Policy Framework*
S&R-013	UNFCCC. Paris Agreement (December 12, 2015)
S&R-014	European Council and Council of the European Union. 2020. *Paris Agreement on climate change*
S&R-015	PBL. 2016. *National Energy Outlook 2016*. English summary
S&R-016	RWE. 2017. Interim Report on the First Half of 2017
S&R-017	Council of the EU. 2017. *Reform of the EU emissions trading system – Council endorses deal with European Parliament*, press release 632/17 (November 22, 2017)
S&R-018	European Commission. *Market Stability Reserve*
S&R-019	European Commission. 2021. *Proposal for a Directive of the European Parliament and of the Council*, COM(2021) 551 final, Impact Assessment Report
S&R-020	European Union. 2018. *Directive (EU) 2018/410 of the European Parliament and of the Council of March 14, 2018 amending Directive 2003/87/EC to enhance cost-effective emission reductions and low-carbon investments, and Decision (EU) 2015/1814*
S&R-021	European Commission. 2019. *Communication from the Commission: the European Green Deal*, COM(2019) 640 final
S&R-022	European Union. 2018. *Regulation (EU) 2018/842 of the European Parliament and of the Council of May 30, 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013*

Tab #	Description
S&R-023	European Parliament. *EU Climate Law: MEPs confirm deal on climate neutrality by 2050*, press release, June 24, 2021
S&R-024	European Commission. 2021. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality*. COM(2021) 550 final
S&R-025	European Commission. 2022. *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: REPower EU Plan*, COM(2022) 230 final
S&R-026	The World Bank. 2020. *Pricing Carbon*
S&R-027	Climate Analytics. 2016. *Implications of the Paris Agreement for Coal Use in the Power Sector*
S&R-028	Reuters. 2017. *Nearly all European coal-fired power plants will be loss-making by 2030 – research.* December 8, 2017
S&R-029	Carbon Tracker. 2017. *Lignite of the living dead*
S&R-030	Ember. 2019. *Solving the coal puzzle. Lessons from four years of coal phase-out policy in Europe. Europe is on a journey to phase out coal*
S&R-031	Europe Beyond Coal. 2022. Coal Exit Timeline
S&R-032	RWE *Annual Report 2012*
S&R-033	RWE *Annual Report 2013*
S&R-034	GDF Suez *Annual Report 2013*
S&R-035	Brattle Reply Report (Dutch proceedings)
S&R-036	International Energy Agency. 2019. *World Energy Outlook 2019*
S&R-037	United Nations. *All About the NDCs*
S&R-038	United Nations Environment Programme (UNEP). 2017. *The Emissions Gap Report 2017*
S&R-039	ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*, Main Report
S&R-040	ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Annex II
S&R-041	Harris-Hesmondhalgh Workpapers, Tables H – Financial Model - With Adjustments
S&R-042	Frontier Economics. 2019. *Profitability and dispatch of MPP3 Power Plant with alternative fuels*
S&R-043	IRENA. Energy Transition - Definition
S&R-044	Spring Associates. 2016. Impact from the Closure of Dutch coal-fired power stations
S&R-045	de Maere d'Aertrycke, G., Ehrenmann, A., Smeers. Y. 2017. Investment with incomplete markets for risk: The need for long-term contracts
S&R-046	Morgan Stanley. 2017. *RWE AG: US Roadshow Feedback*
S&R-047	Société Générale. 2018. *Focus on 2020 and clean dark spreads*
S&R-048	Morgan Stanley. 2019. *Risk Reward Update*
S&R-049	Morgan Stanley. 2020. *Further confirmation on German Coal Closure*

Tab #	Description
S&R-050	BofA. 2020. *Compensation secured and a cleaner future*
S&R-051	RWE. *Annual Report 2017*
S&R-052	Brattle First Report (Dutch proceedings)
S&R-053	European Commission. 2020. *SA.58181 (2020/N) Germany – Tender mechanism for the phase-out of hard coal in Germany*, C (2020) 8065 final
S&R-054	European Commission. 2021. *SA.53625 (2020/N) Germany – Lignite phase-out*, C (2021) 1342 final
S&R-055	Ehrenmann, A., Smeers, Y. 2010. *Stochastic Equilibrium Models for Generation Capacity Expansion*
S&R-056	International Energy Agency. 2017. *World Energy Outlook 2017*
S&R-057	RWE. 2022. *Interim statement on the first quarter of 2022*
S&R-058	The European Conservative. 2022. *EU Discusses Block-Wide Energy Windfall Taxes*
S&R-059	Freshfields Bruckhaus Deringer. 2022. *Windfall Profit Taxes – do they work?* June 23, 2022
S&R-060	Reuters. 2022. *Energy companies to pay Italian windfall tax in two parts by November – draft.* May 12, 2022
S&R-061	BBC News. *Energy prices: How will the £5bn windfall tax work?* May 26, 2022
S&R-062	Bloomberg. 2022. *EU Plans to Intervene in Energy Market as Winter Crisis Looms*. August 30, 2022
S&R-063	Barclays. 2017. *RWE: 9m 2017 results preview: Operations back on track but policy risk growing*
S&R-064	BNP. 2017. *RWE: Coal exit and Innogy's strategic ambitions limit options*
S&R-065	*Quasar de Valores SICAV S.A. et al v. The Russian Federation,* SCC Case No. 24/2007, Award, July 20, 2012
S&R-066	*Crystallex v Venezuela*, ICSID Case No. ARB(AF)/11/2, Award, April 4, 2016
S&R-067	RWE. *Compensation allocated at hard coal phase-out auction: RWE closes power stations in Hamm and Ibbenbüren*, press release December 1, 2020
S&R-068	Epexspot. 2021. *European Market Coupling.*
S&R-069	European Commission. 2019. *Quarterly Report on European Electricity Markets*. Volume 12
S&R-070	PBL. 2016. National Energy Outlook 2016.
S&R-071	Tennet. 2020. *Investeringsplan Net op Land 2021-2029*
S&R-072	RWE *Annual Report 2020*
S&R-073	Eemskrant.NL. 2017. RWE wants to run the power station in the Eemshaven entirely on biomass. July 1, 2017
S&R-074	DNV-GL. 2019. *Environmental Impact Report. Increasing the share of biomass in the RWE-Eemshaven power plant*
S&R-075	Province of Groningen. 2021. *Decision on environmental permit for RWE Eemshaven*
S&R-076	RWE. 2019. *The new RWE: carbon neutral by 2040 and one of the world´s leading renewable energy companies*. September 30, 2019

Tab #	Description
S&R-077	RWE. *Biomass and the energy transition*
S&R-078	DNV.GL. 2017. *EIA Project: Notification of intention to the competent authority within the framework of the EIA procedure for increasing the share of biomass in the RWE Eemshaven*
S&R-079	FTI Consulting Compass Lexecon Energy. European Power Market Modelling and Intelligence
S&R-080	ENTSO-E. 2019. *TYNDP 2018 – Data and expertise as key ingredients*
S&R-081	ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition).* Input Data
S&R-082	European Commission. 2014. *Communication from the Commission to the European Parliament and the Council: European Energy Security Strategy*. COM(2014) 330 final
S&R-083	Compass Lexecon Model Inputs

APPENDIX B NERA'S ANALYSIS IS UNFOUNDED AND CONTRADICTED BY RWE

197. NERA allege that "*[c]onverting a coal-fired plant like Eemshaven to biomass would run a high risk of losses, which is why a reasonable and prudent investor would not make the necessary conversion investment.*"[210] NERA's conclusions, however, are contradicted by Claimants' own statements.

198. As early as in July 2017, RWE acknowledged that "*[w]ith the use of biomass as fuel in our power plant, we can continue to work on CO_2 reduction. As far as we are concerned, the decision taken now is a prelude to a further conversion of the power station in the future. It is our ambition to eventually make the Eemshaven power station 100% CO_2 neutral.*"[211]

199. In an April 2019 report commissioned by RWE Eemshaven Holding II B.V. in support of its application to increase the share of biomass from 15% to 30%, RWE noted, when discussing an environmental impact assessment, that the assessment "*describes the next step to further increase biomass (to 30% on an output basis biomass; about 1600 kton) <u>towards the ultimate goal of 100% biomass production</u>.*"[212] In the same report, RWE submits that its "*ultimate goal*" in Eemshaven is "*to be able to produce CO_2 neutrally (=100% biomass) in 2030.*"[213]

200. Additionally, in 2019, RWE's CEO announced that "*Carbon neutral by 2040, one of the world´s leading renewable energy companies, a responsible producer of power from all energy sources – this is the formula behind the new RWE […]. RWE is in the process of converting the plants in Eemshaven and Amer to fire biomass. The objective is to transform electricity generation from fossil fuel in order to achieve carbon neutral production. In addition to a large international portfolio including wind turbines and photovoltaic units which the company intends to expand continuously, RWE will then*

[210] *See* NERA Report, ¶8.

[211] Own translation. *See* Eemskrant.NL. 2017. *RWE wants to run the power station in the Eemshaven entirely on biomass*. July 1, 2017 (**S&R-073**).

[212] Emphasis added. DNV-GL. 2019. *Environmental Impact Report. Increasing the share of biomass in the RWE-Eemshaven power plant*, p. 22 (**S&R-074**). We note that a decision from local authorities concerning RWE's permit was issued on September 15, 2021, allowing RWE to increase the share from 15% to 30%. *See* also Province of Groningen. 2021. *Decision on environmental permit for RWE Eemshaven* **(S&R-075)**.

[213] *See* DNV-GL. 2019. *Environmental Impact Report. Increasing the share of biomass in the RWE-Eemshaven power plant*, p. 6 (**S&R-074**).

place its chips on storage, biomass and gas-fired power stations primarily fired by 'green' gas, which will be indispensable to achieving security of supply."[214]

201. As of today, RWE states on their website that they "*aim to be CO_2-neutral by 2040 […] there is a need for what is referred to as flexible capacity. In the years ahead, this will also increasingly need to be free of CO_2. Biomass provides that security […] can also be used to produce heat in a highly efficient and sustainable way*."[215]

202. Knowing that subsidies to biomass will not be extended in the Netherlands, and assuming RWE is a reasonable and prudent investor, RWE's statements directly contradict NERA's conclusions that "*a reasonable and prudent investor would not make the necessary conversion investment.*"

203. While we find RWE's statements above to be sufficient to dispel NERA's conclusions, in the remainder of this Appendix we provide detailed comments to NERA's analysis. The conclusions of the NERA Report can be broadly divided in three main categories:

   a. Biomass economic viability: NERA claim a reasonable and prudent investor would not anticipate investing in unsubsidized biomass plants, given the competition from technologies with lower marginal costs of generation.[216]

   b. Biomass outlook from 2017 to 2021: NERA allege that biomass costs were expected to increase even further due to the risk of tightened environmental regulations,[217] and that the political support for large-scale electricity generation from biomass has faded in recent years.[218]

   c. Sustainability of biomass procurement: NERA explain that biomass use is also subject to a potential scarcity of wood pellets in upside scenarios where biomass conversion would in principle become profitable, *e.g.*, in a scenario of very high gas or CO_2 prices.[219] They also

[214] *See* RWE. 2019. *The new RWE: carbon neutral by 2040 and one of the world´s leading renewable energy companies*. September 30 **(S&R-0076)**.
[215] *See* RWE. *Biomass and the energy transition* **(S&R-077)**.
[216] *See* NERA Report, ¶24.
[217] *See* NERA Report, Section 2.1.
[218] *See* NERA Report, Section 3.2.
[219] *See* NERA Report, Section 2.2.

claim that such a scenario seems to have materialized recently but should be considered transitory.[220]

204. In the following three sections we address each of these contentions.

B.1 NERA's Conclusion That Biomass Is Economically Unviable is Unsubstantiated and at Odds with Brattle's Analysis

205. NERA rule out coal-to-biomass conversions because of high risk of losses due to biomass not being competitive without subsidies and because of increasing risk of sustainable fuel procurement.

206. A key limitation in NERA's analysis is that it only assesses the viability of converting to biomass as of 2017 or as of December 18, 2021, *i.e.*, the date of NERA's report, noting *that* "*the investor would not pursue the conversion at either one of the two dates.*"[221] However, NERA do not assess the viability of a conversion to biomass expected in 2030, the first year when burning coal would not be permitted in the Netherlands, or at any date thereafter. They therefore ignore expectations of capital costs and operating costs in the future, as well as of evolution of electricity prices after 2030. For the very same reason, NERA's analysis of existing European biomass conversion projects (alleging that without subsidies a conversion to biomass is not economically viable) is moot.[222]

207. NERA's analysis involves comparing the marginal costs of generating electricity from industrial wood pellets against the marginal costs of other technologies, such as nuclear, coal, and natural gas, to conclude that marginal costs of biomass-fueled generation absent subsidies are the highest in 2017.[223] NERA's analysis contains several shortcomings.

208. First, NERA relies on a 2015 IEA study to derive marginal costs of generation because *"2017 spot prices for natural gas were low"*[224], but fails to mention the IEA's comment in the study that "*[b]iomass electricity can already be competitive with fossil fuels under favourable circumstances*

[220] *See* NERA Report, Section 3.1.
[221] *See* NERA Report, ¶22.
[222] *See* NERA Report, section 1.3.
[223] *See* NERA Report, ¶37.
[224] *See* NERA Report, ¶35.

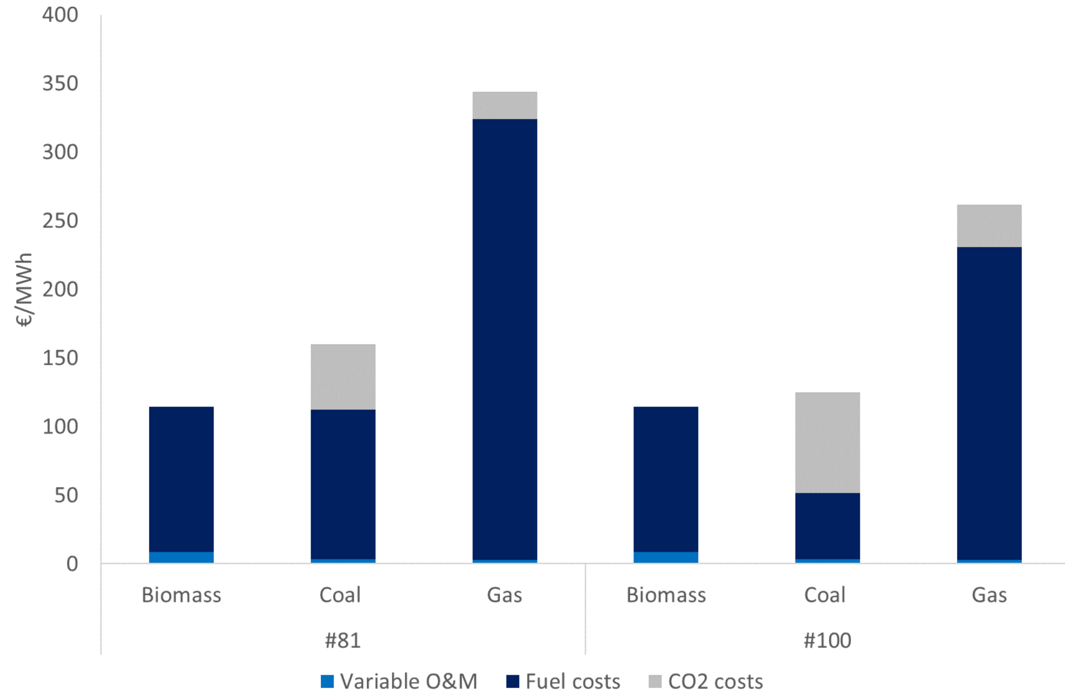
today. Through standardising optimised plant designs and improving efficiencies, biomass electricity generation could become competitive with fossil fuels under a CO_2 price regime."[225]

209. Second, NERA focus on a single static marginal cost in 2017, ignoring the possible future evolution of commodity prices that will impact these marginal costs. This approach is at odds with Brattle's analysis that simulates 100 potential price paths for each of the commodities, across which there are vast differences in future prices relative to each other. Figure IX below shows as an example two of Brattle's simulations of commodity prices where in the future (*e.g.*, 2035) the marginal cost of biomass would be lower than that of gas and coal.[226]

[225] *See* International Energy Agency, Nuclear Energy Agency (September 2015), *Projected Costs of Generating Electricity 2015 Edition*, p. 156 **(NERA-0002)**. NERA also refer to the IEA's study on "Projected Costs of Generating Electricity 2015 Edition" to derive the estimates of marginal generation costs, rather than the actual parameters of the plants in the Dutch market as of Brattle's chosen date of valuation of October 9, 2017. Indeed, as the IEA explains, its "*database cannot be considered a statistical sample*" and represents "*a set of hypothetical power plants*," rather than the actual parameters of the plants in the Dutch market as of October 9, 2017. NERA recognize the limitations of the assumptions used in this analysis, yet they fail to adjust it. *See* NERA Report, footnote 16.

[226] Overall, we find that the short-run marginal costs for coal exceed those for biomass in [redacted] of Brattle's simulations of [redacted] and in [redacted] simulations of [redacted]. The short-run marginal costs for gas exceed those for biomass in [redacted] of Brattle's simulations of [redacted] and in [redacted] simulations of [redacted]. *See* Compass Lexecon Analysis **(S&R-001)**.

Figure IX. 2035 Marginal Costs of Electricity Generation for Biomass, Coal, and Gas, Based on Brattle's Simulations #81 and #100



Source: Compass Lexecon Analysis ***(S&R-001)***

210. Third, NERA do not conduct any analysis of different types of biomass other than wood pellets (such as biowaste) and of the marginal costs of electricity generation from such different biomass types, which may be lower than the estimated marginal costs of using wood pellets.[227] As such, it cannot be concluded that as of 2017 an investor would have attached zero value to the possibility of burning unsubsidized biomass (or any other alternative fuel) in Eemshaven at least since 2030.

211. Evidence from analyst reports also shows expectations in the market that the end of subsidies for biomass will not automatically result in the termination of biomass generation. For instance, a [redacted]

[227] We understand that in July 2017 RWE Eemshaven Holding II B.V. filed the first notice for an environmental permit to expand biomass co-firing from 15 to 30% (it was eventually granted on September 15, 2021). In addition to wood and wood pellets, the permit envisages sugar cane waste, bentonite (residual products from the food and beverage industry) and lignin (bio-refining by-product). *See* DNV.GL. 2017. *EIA Project: Notification of intention to the competent authority within the framework of the EIA procedure for increasing the share of biomass in the RWE Eemshaven*, p. 5 **(S&R-078)**. *See* also Province of Groningen. 2021. Decision on environmental permit for RWE Eemshaven **(S&R-075)**.

[redacted][228]

B.2 NERA's Conclusion That Biomass Bears Risks of an Unsustainable Fuel Is Inconsistent with Evidence

212. NERA explain that while the GHG released during the firing of biomass may eventually be recovered from the atmosphere, the long delay needed to grow plants and trees casts doubt on whether biomass can be considered a carbon neutral fuel without increasingly tightening regulation over the sustainability of its use.[229] NERA therefore flags certain risks related to the use of biomass, namely: heightened sustainability requirements and biomass plants potentially being subjected to the ETS.[230]

213. NERA's argumentation is speculative. NERA reference "*undersigned scientists and economists*" and "*growing public opposition*,"[231] which seems at odds with a long list of existing biomass conversion projects mentioned by NERA itself.[232] NERA also fail to mention potential solutions to the use of biomass in the event that it is no longer considered carbon neutral, such as carbon capture storage technologies. It is also noteworthy that Frontier Economics, which performed an assessment of a potential conversion of a Dutch power plant from coal to biomass, did not raise any concerns regarding the alleged risks of tightening regulation.[233]

214. Moreover, there does not seem to be such a concern for RWE as evidenced by RWE's statements highlighted at the beginning of this Appendix, indicating that RWE intends to continue to use Eemshaven as a biomass-fueled power plant.

[228] *See* [redacted].
[229] *See* NERA Report, ¶¶61–63.
[230] *See* NERA Report, Section 2.1.
[231] *See* NERA Report, ¶95–96.
[232] *See* NERA Report, Table 1.1 and Appendix D.
[233] *See* Frontier Economics. 2019. *Profitability and dispatch of MPP3 Power Plant with alternative fuels* **(S&R-042)**.

B.3 NERA's Concerns on Issues with Procurement of Wood Pellets and the Alleged Impact on Biomass Prices Are Misplaced

215. NERA raise a concern that increasing demand for renewable power from biomass may adversely affect biomass prices. In particular, NERA argue that in a scenario where marginal costs of biomass were competitive relative to other technologies, "*not only Eemshaven and the other Dutch coal power plants, but also many other former coal-fired power plants all over Europe might have an incentive to take up biomass-based power generation.*"[234] As a result, additional demand will lead to higher biomass prices in a magnitude that cannot be foreseen.[235] This logic is flawed.

216. Even if marginal costs of biomass are lower than those of coal, once capital costs of conversion are taken into account in the analysis for profitability of conversion, operators of coal plants will not necessarily convert to biomass if continuing operations with coal is preferable. As a result, coal power plant operators, not subject to operational limitations, would be better off continuing operations with coal and there would not be a widespread conversion to biomass 'all over Europe.'[236] As a consequence, there would not be such risk of increased biomass prices.

217. Even if a conversion to biomass were to be more profitable than continuing operations with coal, and if large-scale conversions were to take place with a resulting increase in biomass prices, such an increase in biomass prices would be limited. Once the biomass prices increase to a point where the value of conversion to biomass no longer exceeds the value of continuing operations with coal, coal power plants' operators would be indifferent between converting or continuing to operate with coal

[234] *See* NERA Report, ¶77.
[235] *See* NERA Report, ¶83.
[236] In fact, for plants that are not banned from burning coal, for a large-scale conversion to take place two conditions are required: i) profits from running with biomass should exceed the capital costs of conversion; and ii) the value added of converting to biomass should exceed the value of continuing to run with coal. An example of this can be seen in Figure V of Section IV.2, where for several of Brattle's simulations, while the value of converting to biomass is positive (positive bars for biomass in the chart), such a value is lower than the value of continuing operations with coal (the biomass bars that are lower than the coal bars in the chart). If a plant is not allowed to burn coal, however, its best next alternative is to convert to biomass, but if it is allowed to use coal it would continue to do so since the value it obtains is higher than with a conversion to biomass.

(*i.e.*, the value of both alternatives is the same). Yet, the few Dutch plants that are banned from using coal would convert to biomass and obtain an equivalent value as that of continuing coal operations.[237]

[237] This assumes that the Dutch plants alone are not sufficiently large for their biomass demand to cause a material effect on biomass prices. Even if other European plants are banned from using coal from 2030, and not banned from using alternative fuels, Eemshaven would be better placed for a conversion to biomass relative to older plants in Europe, which would have lower efficiency and shorter remaining useful life. Thus, while it may be profitable for Eemshaven to convert to biomass, it may not necessarily be the case for older plants.

APPENDIX C ELECTRICITY MARKET MODELING AND EEMSHAVEN'S DISPATCH

218. To carry out the market modeling we provided Compass Lexecon's electricity modeling team ("**CL Electricity Modeling Team**" or **CLEMT**) with the assumptions on commodity prices, plant capacities and demand from the alternative sources described in Section IV.1.3.[238] The CL Electricity Modeling Team used this information to model detailed electricity price projections ("**Energy Model**") and model Eemshaven's dispatch and commodity margins resulting from said electricity price projections ("**Asset Model**").

219. To perform this analysis, the CL Electricity Modeling Team used the in-house Compass Lexecon European Power Market Dispatch Model ("**CL European Model**") that simulates the day-ahead power markets across Europe and the associated hourly merit order.[239] The model is implemented on the commercial modeling platform Plexos®, the same platform used by Baringa according to Brattle.[240]

220. This Appendix provides a summary of the approach and assumptions taken by the CL Electricity Modeling Team, analogous to Brattle's description of Baringa's modeling in Appendices C and D of the Brattle Report.

C.1 OPTIMIZATION PRINCIPLES

221. The CL European Model covers the EU-27 countries as well as the United Kingdom, Switzerland, Norway, and the Balkans. The model uses the zonal transmission network representation that matches with the market bidding zones currently implemented in Europe. The geographic scope of the model is shown on Figure X below.

[238] The CL Electricity Modeling Team in the present case was led by Dr. Dmitri Perekhodtsev.
[239] The CL Electricity Modeling Team has used its power market dispatch model for a range of assignments and clients across Europe to provide a robust and reliable source of market intelligence. Recognizing that the best source of market insights stems from stakeholders, the CL European Model has been developed collaboratively using Compass Lexecon experts' insights and stakeholders' contributions, in particular from national TSOs and ENTSO-E. *See* FTI Consulting | Compass Lexecon Energy. European Power Market Modelling and Intelligence **(S&R-079)**.
[240] *See* Brattle Report, ¶¶107, 317–318.

Figure X. Geographic Scope of CL European Model

Source: Compass Lexecon.

222. The CL European Model seeks to determine the least cost unit commitment and dispatch solution to meet power demand, while respecting multiple constraints, such as, for example:

a. Energy balance constraints.

b. Generator technical constraints: ramping rate (minimum up-, down-), minimum stable level.

c. Generator energy limits (*e.g.*, hourly, daily, weekly).

d. Transmission limits.

223. To minimize costs and determine the unit commitment and economic dispatch of each generation unit in the CL European Model, the model simulates a merit order for each price zone at an hourly level, while allowing for the possibility of transferring power generation between interconnected price zones up to the available Net Transfer Capacity ("**NTC**"). The model calculates the price in each price zone as the marginal value of energy delivered in that zone (also known as the shadow price of the energy balance constraint).

224. The CL European Model normally operates on an hourly basis, aligned with the current timeframe of the day-ahead power prices in Europe. Given the long-time horizon of Eemshaven's cash flows under the But-for scenario (until 2054) and Brattle's methodology relying on the Monte Carlo technique simulating 100 paths of electricity modeling, the CL Electricity Modeling Team adopted Brattle's approach to run the power market dispatch model on a 4-hour basis, so as to reduce the computation time.[241]

225. In addition, to reduce the computational burden, simulations of the Energy Model were run in batches by decade: 2020–2030 and 2030–2040. After running simulations for 2020–2030 we tested whether the resulting margins would be sufficient for Eemshaven to keep operating or whether it would shut down, following Brattle's shut-down conditions.[242] For 2030–2040, simulations were only run for those paths where Eemshaven remained open as of 2030.

C.2 Inputs and Assumptions of the Energy Model

226. The following inputs are needed to run the Energy Model:

a. Commodity prices (gas, coal, biomass and CO_2).

b. Installed capacity per technology and associated technical parameters (*e.g.*, efficiency).

c. Electricity demand and its hourly profile.

d. Climate year.

e. Cross-border (interconnector) capacity.

227. Brattle provide assumptions for commodity prices, and installed capacity and electricity demand as well as Baringa's assumptions on efficiency by plant for the Netherlands and Germany. Brattle, however, do not disclose the assumptions on: i) the climate year; ii) hourly demand profile; and iii)

[241] *See* Brattle Report, ¶¶118, 318.
[242] Brattle assumes Eemshaven to close after two years of cash losses in the But-for scenario. *See* footnote 47. *See* also Brattle Report, ¶¶197, 198.

interconnector capacity.[243] Therefore, in addition to adjusting Brattle's inputs on commodity prices, capacity and demand, we rely on further assumptions from the CL Electricity Modeling Team on the missing data, as explained in Sections C.2.3 to C.2.6 below.

C.2.1 Commodity Prices and Installed Capacity

228. In Section IV.1.3 we explained that the draft TYNDP 2018 produced by ENTSO-E is a more appropriate source of data as of Brattle's chosen date of valuation, October 9, 2017. The TYNDP 2018 provides projections for 2030 and 2040 under three so-called "storylines": i) the "Sustainable Transition" storyline, ii) the "Distributed Generation" storyline, and iii) the "Global Climate Action" storyline.[244]

229. We select the "Global Climate Action" and "Distributed Generation" scenarios, which, in turn, rely on scenario "Best Estimate – Gas Before Coal" for 2025.[245] The reason that we select these scenarios is that they envisage staying on track with the EU contemporaneous long-term decarbonization targets, while the remaining "Sustainable Transition" scenario is expected to be behind those goals. We note, however, that none of the scenarios from the TYNDP 2018 would be sufficient to achieve the goals of the Paris Agreement.

230. Instead, all of the scenarios in TYNDP 2018 refer to the targets of the EU related to long-term decarbonization. As mentioned in Section II.1, these targets included 80%–95% reduction of GHG emissions by 2050 under the Energy Roadmap 2050. Investors as of Brattle's chosen date of valuation, however, would have reasonably factored in the requirements of the Paris Agreement, even if the announced EU decarbonization targets prevailing at that time were falling short of these.[246] Using the TYNDP 2018 'Distributed Generation' and 'Global Climate Action' scenarios would

[243] *See* Brattle report, Table 11. Brattle summarize the sources of key assumptions for their modelling. Several inputs are sourced from "Baringa Reference Q2 2017 scenario" and "Baringa Reference Q4 2019 scenario" but such inputs have not been disclosed.
[244] *Ibid*.
[245] "Best Estimate – Gas Before Coal" scenario reflects all national and European regulations in place, uses prices from 2016 WEO "450" scenario and assumes gas marginal cost lower than coal. *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition)*. Main Report, Figure 3 **(S&R-039)**.
[246] The Paris Agreement set the goals of "*holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels*." *See* UNFCCC. Paris Agreement, Article 2 (December 12, 2015) **(S&R-013)**.

therefore be conservative, as the required efforts expected by investors to tackle climate change would be beyond the level contemplated in them. To the best of our knowledge, however, there is no alternative source of data that would reflect in full the expectations of the Paris Agreement as of the date of valuation chosen by Brattle.[247]

C.2.1.a Capacity assumptions

231. The draft TYNDP 2018 provides the data on installed capacity per type of technology (*e.g.*, coal, gas, offshore wind), per country, for 2020, 2025, 2030 and 2040 target years and for different scenarios. In Table II below we summarize the TYNDP scenarios that we rely on for all European countries, as explained in Section V.2.

Table II. TYNDP 2018 Data Points Used in CL Modeling for 2017 Date of Valuation

Storyline	2020	2025	2030	2040
"Distributed Generation"	BE 2020	BE 2025	DG 2030	DG 2040
"Global Climate Action"	BE 2020	BE 2025	GCA 2030 (see note)	GCA 2040

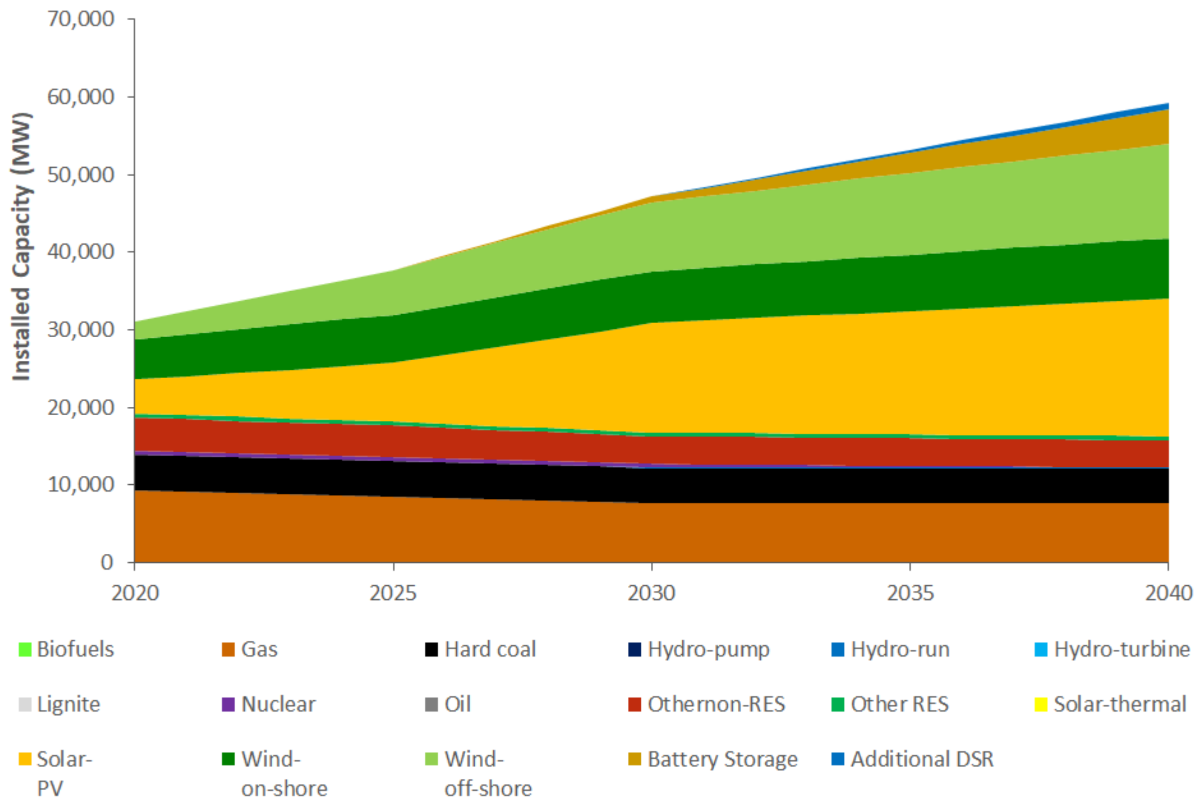
Source: Own elaboration.
Note: The draft TYNDP does not provide data for 2030 for the GCA scenario. Instead, we interpolated between BE 2025 and GCA 2040.

232. As observed in the table above, the TYNDP only provides capacity assumptions in five-year or 10-year steps. Therefore, we linearly interpolate capacity to obtain yearly data. The TYNDP does not provide data beyond 2040. For the case at hand, we have thus only performed a detailed market modelling, as explained in this Appendix, until 2040. After 2040, we assume Eemshaven's commodity margins to remain constant in real terms (*i.e.*, grow with inflation) and running hours to remain constant at the 2040 levels.[248]

[247] The IEA noted that although developed economies such as those of the EU look on track to meet their climate pledges, these are insufficient to deliver the Paris Agreement's goals. Therefore, a critical element of the Paris Agreement is "*the expectation that commitments to more intensive action will be made over time*." *See* International Energy Agency. 2016. *World Energy Outlook.* p. 314 **(BR-32)**.
[248] Such an assumption is optimistic for Eemshaven's operations, since it would be reasonable to expect that 2040 would not yet reflect a steady state of the world. Instead, after 2040 there would be further decarbonization efforts, at

233. Figure XI and Figure XII below show the resulting capacity mix in the Netherlands for an October 9, 2017 date of valuation and for the two selected TYNDP scenarios (*i.e.*, "Distributed Generation" and "Global Climate Action").

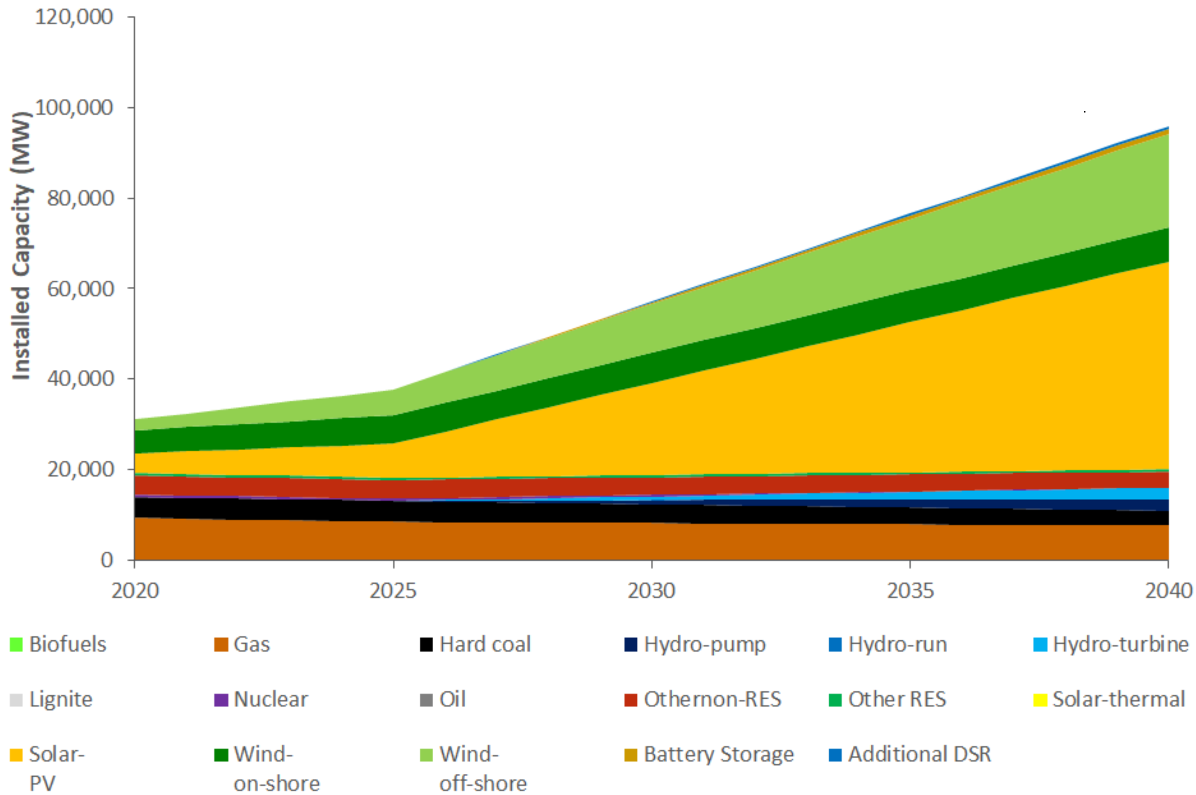
Figure XI. Dutch Central Capacity Mix, 2017 Date of Valuation, "Distributed Generation" Scenario



Source: ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Main Report ***(S&R-039)****.*

least for the subsequent decade. Such efforts would erode Eemshaven's profitability. Despite this, such assumption does not have an impact on the results of adjusting Brattle's calculations, since in any event we find that with such an optimistic assumptions Brattle's estimate of damages would be nil. See Section V. Such an assumption, in addition, allows to reduce the computational burden of the market modelling.

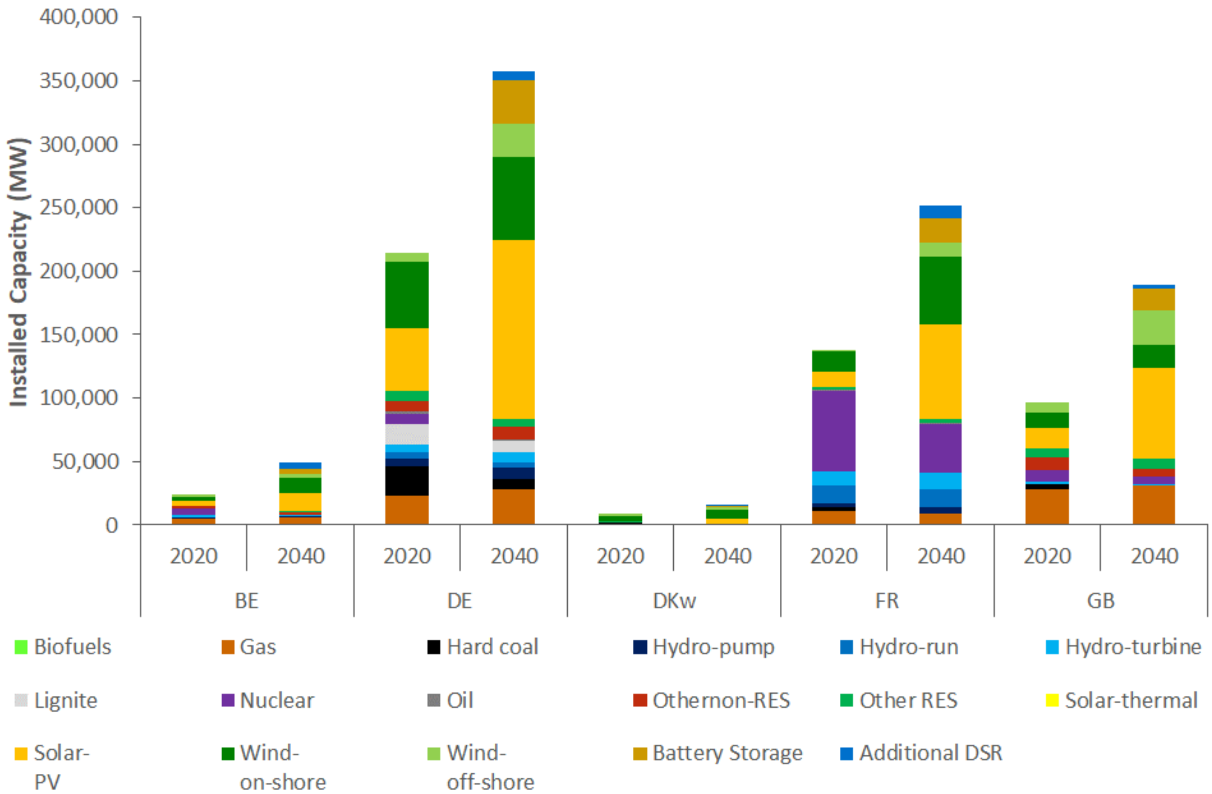
Figure XII. Dutch Central Capacity Mix, 2017 Date of Valuation, "Global Climate Action" Scenario



Source: ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Main Report ***(S&R-039)****.*

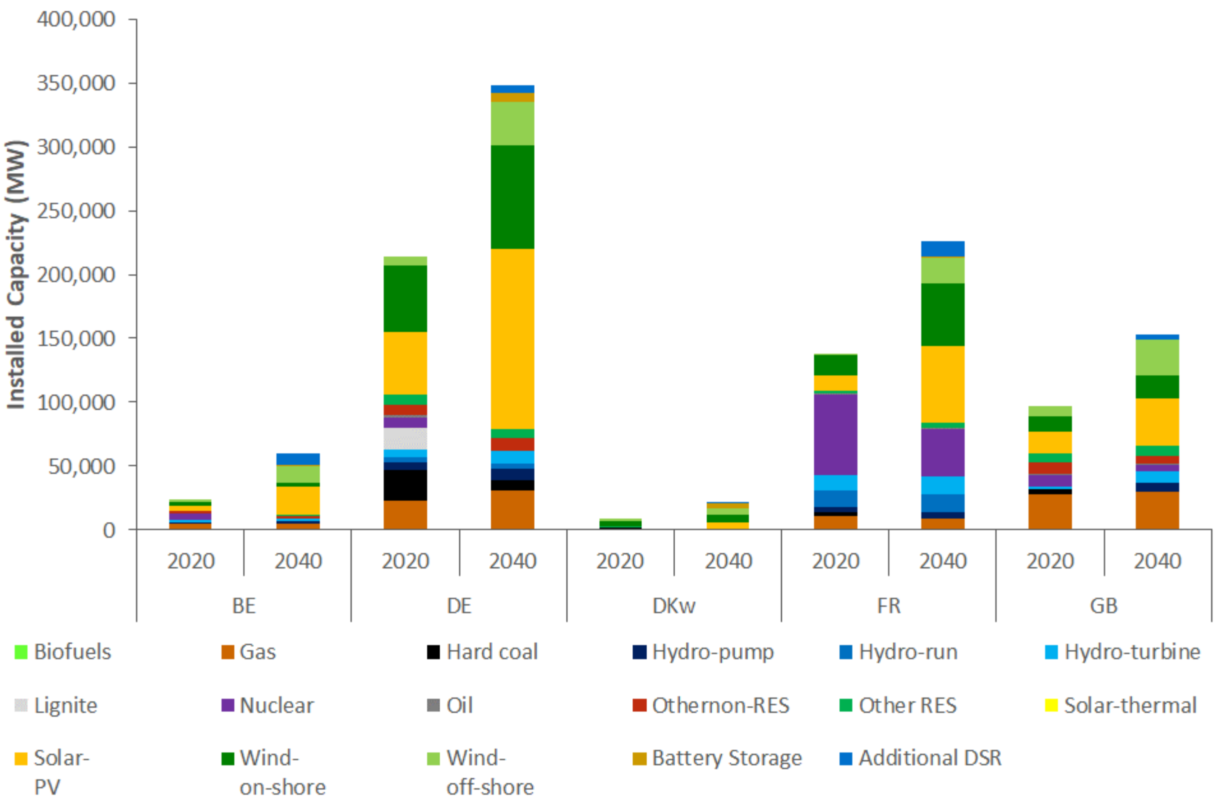
234. Figure XIII and Figure XIV below show the resulting capacity mix in a selection of neighboring countries for an October 9, 2017 date of valuation and for the two selected TYNDP scenarios (*i.e.*, "Distributed Generation" and "Global Climate Action").

Figure XIII. Interconnected Markets Central Capacity Mix, 2017 Date of Valuation, "Distributed Generation" Scenario



Source: ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Main Report ***(S&R-039)****.*

Figure XIV. Interconnected Markets Central Capacity Mix, 2017 Date of Valuation, "Global Climate Action" Scenario



Source: ENTSO-E. 2017. TYNDP 2018 Scenario Report (October 2017 draft edition), Main Report ***(S&R-039)****.*

C.2.1.b Flexing Generation Capacity in Response to Commodity Prices

235. As mentioned in Section IV.4.3, Brattle's approach to the modeling of installed capacity is inconsistent with their methodology behind commodity price forecasts. To model 100 different simulation of electricity prices, Brattle's model contains 100 different simulations of fuel and CO_2 prices, which would affect investors' long-term decisions to deploy additional capacity or to close certain technologies, depending on their profitability. For example, a scenario of high electricity prices would make all technologies (not just renewable ones) relatively more profitable and signal investors to deploy additional generation capacity or to delay the closure of existing capacity, thus leading to lower electricity prices.

236. Brattle ignore this dynamic in their capacity assumptions. They argue that they "flex" the share of renewable capacity in the generation mix to account for the wide range of commodity prices included in the electricity modeling.[249] However, they only "flex" the capacity between the years 2020 and 2050, and they do not flex technologies other than renewables. In other words, Brattle's capacity mix is the same in 2050 irrespective of the commodity price simulation.[250]

237. Implementing "flexing" properly across all technologies, years and simulations would require re-running the entire model with annual assessments across 2020–2054 of which technologies turned loss-making (and should retire) and which ones are becoming profitable (and should enter the capacity mix). We decided not to re-run the model with the dynamic exits and entries for computational efficiency. Moreover, this assumption results in higher commodity margins for Eemshaven, as in the scenarios of high electricity prices there are no new entries that would enhance competition and make prices decrease.[251] As a result, keeping capacities constant leads to overestimation of Eemshaven's damages.

238. We decided also not to follow Brattle's approach to "flex" in the intervening years the share of renewable capacity in the capacity mix across the commodity price paths, as Brattle's approach is flawed. In particular:

   a. Brattle's choice of the maximum level allowed for the divergence to flex renewable capacity is unsubstantiated (16%);[252]

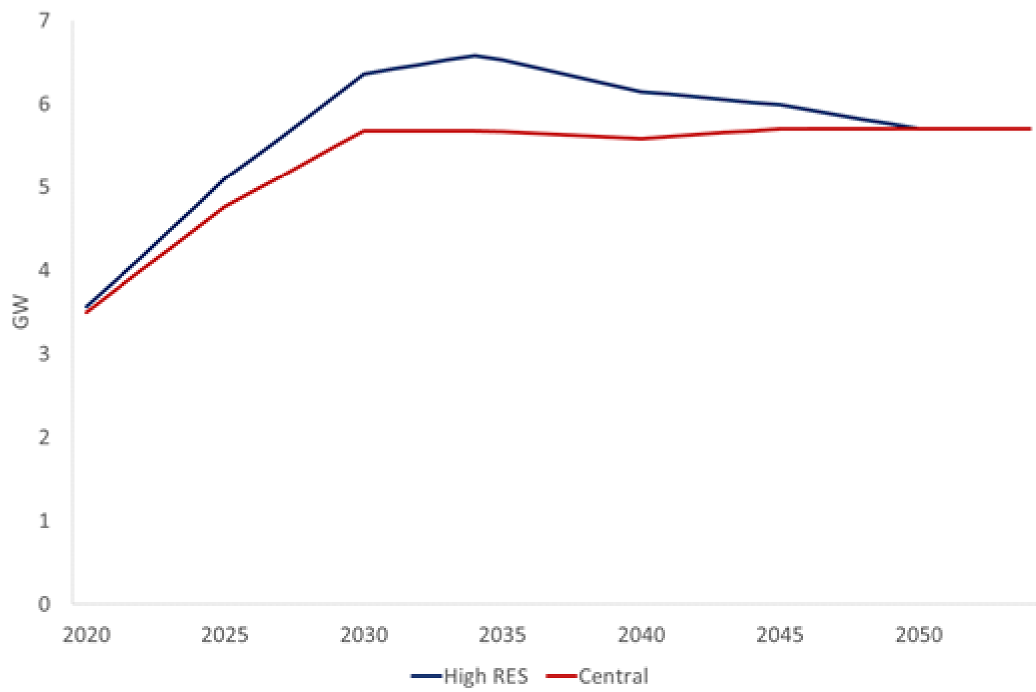
   b. This maximum divergence level is not linked to the absolute level of a commodity price within a path but instead to its relative level compared to a median commodity price path on a pro-rata basis.[253] In other words, when for a given year a simulated commodity price path diverges the most from the median prices, the renewable capacity of the same simulation will be set to diverge from the EU Reference Scenario by the maximum additional capacity. The renewable

[249] *See* Brattle Report, ¶323.
[250] *See* Brattle Report, Figure 32. *See* also Harris-Hesmondhalgh Workpapers, Tables I, sheet "Capacity mix."
[251] In the simulations of low electricity prices Eemshaven would likely shutdown and be unaffected by the changes in generation mix.
[252] *See* Harris-Hesmondhalgh Workpapers, Tables I, sheet "Capacity mix", cell F59. *See also* Brattle Report, Figure 32.
[253] *See* Brattle Report, ¶329.

capacity of this simulation will be "flexed" at its maximum no matter whether the said commodity prices diverge from the median by 10% or 50%, as the absolute level of the prices is not taken into account. In reality, however, the higher the commodity prices (in absolute terms, not relative terms), the higher the incentives to develop renewable generation technologies.

c. Brattle's approach may in fact result in decreasing RES capacity between 2035 and 2050, as happens, for example, with Dutch offshore wind capacity according to Baringa. Figure XV below shows illustrates this.[254]

Figure XV. Offshore Wind Capacity in NL (GW)



*Source: Compass Lexecon Analysis **(S&R-001)**.*

[254] As outlined in paragraph 238.b, this phenomenon occurs in Brattle's approach because RES capacity is increasing with higher commodity prices (and vice versa). However, this increase or decrease is only applied temporarily, whereas the capacity values are converged to the year 2050 to the same value for all samples, and left fixed thereafter. Figure XV shows the applied "flex" capacity reaches its maximum (16%) in 2034/35 when the RES capacity is highest and the keeps declining to reach the lower fixed point in 2050.

d. According to Baringa, only renewable capacity can be increased in cases of high commodity prices. In reality, nuclear capacity can also be impacted—for instance, in case of very high commodity prices, nuclear phase-out can be delayed (or even nuclear development anticipated) compared to a central scenario. Similarly, in cases of very high gas prices, coal phase-out may be slowed down compared to a central scenario. These options are not considered by Baringa.

e. To have the same derated margin (*i.e.*, the amount of excess supply above peak demand) as in the central scenario, Baringa would simultaneously decrease thermal capacity by the same percentage, across all technologies. That is, Baringa would decrease peak thermal units at the same rate as nuclear baseload generation. In reality, the least profitable technology should be decreased first in the capacity mix.

239. As discussed in Section IV.4.2, relying on a scenario-based approach (that is, using ready-made scenarios of TYNDP instead of generating simulations using the Monte Carlo approach) alleviates the issue of dynamic capacity modeling, as such an approach already uses capacity forecasts that should be consistent with the commodity price forecasts.

C.2.2 Annual Electricity Demand

240. The draft TYNDP 2018 provides data regarding expected annual demand in each country across different scenarios and target years.

241. As with the assumptions on installed capacity, the TYNDP provides the demand data in five-year and 10-year increments. Therefore, we followed the same approach as described in paragraph 232 to interpolate and obtain yearly data on electricity demand.

242. The CL Electricity Modeling Team then transformed the annual electricity demand data into hourly profiles, as described in Section C.2.6 of this Appendix.

C.2.3 Climatic Year

243. Several key parameters depend highly on climatic conditions—this is the case for renewable generation, hydro generation and demand. Climatic conditions are often determined based on

historical years. In the context of the TYNDP, ENTSO-E builds a Pan-European Climate Database ("**PECD**") that reflects different weather conditions determined based on past years.[255]

244. As of 2017, the PECD contained 14 historical years and the climate year 2011 was chosen as a reference year by ENTSO to prepare the TYNDP 2016. The CL Electricity Modeling Team therefore relied on this climate year when running simulations as of Brattle's chosen date of valuation of October 9, 2017.

C.2.4 Cross-Border Capacity

245. The draft TYNDP 2018 report does not provide data regarding cross-border capacity evolution. The CL Electricity Modeling Team therefore used other ENTSO-E publications available as of October 9, 2017.[256] These are:

   a. The Mid-Term Adequacy Forecast ("**MAF**") 2016, released in July 2016, which provides cross-border data for 2020 and 2025; and

   b. The previous TYNDP 2016, released in November 2016, which provides data for 2020 and 2030.

246. Based on this available data, the CL Electricity Modeling Team built the cross-border capacity evolution for October 9, 2017 simulations based on the following assumptions:

   a. For 2020 and 2025, they relied on the MAF 2016 data.

   b. For 2030, they relied on the TYNDP 2016 data.[257]

   c. For 2040, ENTSO-E publications do not provide any assumptions. Instead, the CL Electricity Modeling Team used the EU guidelines according to which cross-border capacity should be

[255] *See* ENTSO-E. 2019. *TYNDP 2018 – Data and expertise as key ingredients*, p. 8 **(S&R-080)**.
[256] The use of such other publications also authored by ENTSO-E allows to minimize potential inconsistencies that could arise from mixing information from alternative data providers.
[257] In cases where the TYNDP 2016 data showed lower interconnection capacity in 2030 than that in 2025 as per the MAF 2016 (*i.e.*, implying a decrease in capacity), the CL Electricity Modeling Team kept the capacity in 2030 equal to 2025.

equal to 15% of installed capacity by 2030.[258] They assumed the same target for 2040 and increased 2040 Net Transfer Capacity to reach the 15% target for the GCA or DG installed capacity respectively.[259]

C.2.5 Capacity Split by Technology

247. The TYNDP 2018 only provides installed capacity per type of fuel (*e.g.*, gas, coal). It does not, however, provide the split between technologies (*e.g.*, gas capacity split between combined cycle gas turbines or "**CCGT**", open cycle gas turbines or "**OCGT**", and steam gas). Furthermore, within each technology category, not all plants have the same technical characteristics and in particular the same efficiency. For instance, in the Netherlands, some coal plants were built recently and are relatively efficient (*e.g.*, Eemshaven, and Maasvlakte) whereas some other units are older and less efficient (*e.g.*, Amer 9, and Hemweg 8). The TYNDP data does not provide this level of detail which is essential to model correctly the electricity supply side and consequently power prices.

248. The CL Electricity Modeling Team relied on their internal expertise and knowledge of the European electricity market to split the thermal capacity (*e.g.*, coal, CCGT, OCGT, lignite) into different vintage classes, which differ according to their commissioning year (for instance CCGT old 1, CCGT old 2, CCGT recent). This split is aligned with the methodology employed by ENTSO-E in their modeling exercises.[260] Moreover, for each vintage class, the CL Electricity Modeling Team determined the associated technical parameters (*e.g.*, efficiency, minimum output, unavailability rate based on generic assumptions provided by ENTSO-E for the TYNDP. [261]

249. Table III below shows the CL Electricity Modeling Team's assumptions on the average full output efficiency of plants in the Netherlands and Germany in 2020, on a capacity weighted basis.

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[258] In 2014 the European Commission proposed to extend the interconnection target to 15% by 2030: "*In the medium term to long term Europe needs to achieve a better functioning and a more integrated energy market. Priority projects should be accelerated to join up existing energy islands and ensure delivery of the existing interconnection target of at least 10 % of the installed electricity production capacity by 2020. By 2030, Member States should be on track to meet a 15% interconnection target*." *See* European Commission. 2014. *Communication from the Commission to the European Parliament and the Council: European Energy Security Strategy*. COM(2014) 330 final, p. 20 **(S&R-082)**.

[259] In order to take into account industrial or acceptability constraint that may limit the cross-border development, we limited the 2030–2040 increase to the increase expected between 2020 and 2030.

[260] *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition).* Input Data **(S&R-081)**.

[261] *See* ENTSO-E. 2017. *TYNDP 2018 Scenario Report (October 2017 draft edition).* Input Data **(S&R-081)**.

Table III. CL European Model Assumptions on Average Efficiency of Plants in the Netherlands and Germany in 2020 (in HHV Terms)

Country	Technology	2020 Average Efficiency (Capacity Weighted)
Netherlands	CCGT	48%
Germany	CCGT	47%
Germany	OCGT	36%
Germany	Steam gas	34%
Netherlands	Coal	42%
Germany	Coal	38%
Germany	Lignite	38%

Note: Corresponds to full output efficiency.
*Source: Compass Lexecon Analysis **(S&R-001)**.*

C.2.6 Electricity Demand – Hourly Profiles

250. The CL Electricity Modeling Team derived the hourly demand profiles from the annual data described in Appendix C.2.2 by assuming that demand for all hours increases at the same rate, equal to the annual demand increase rate (*i.e.*, if annual demand increases by 2%, they assumed that hourly demand increases by 2% for all hours).

C.3 ASSET MODEL OF THE EEMSHAVEN PLANT

251. The modeling described in the preceding sections of this Appendix corresponds to the Energy Model, which aims at replicating the functioning of power markets and at computing the day-ahead power prices. This section, however, focuses on the so-called "Asset Model," which aims at optimizing the revenues that the Eemshaven plant (the "asset") can make while respecting its technical constraints. Thus, the Asset Model is different from the Energy Model (described in the Sections C.1and C.2 of this Appendix). The Energy Model produces as an output the power prices in the Netherlands, while the Asset Model uses those power prices as an input to determine the optimal dispatch decision for the Eemshaven power plant.

252. Using the Plexos® software, then, the CL Electricity Modeling Team used the power prices for the Netherlands (as described in the preceding sections of this Appendix), to determine the optimal dispatch decision of the Eemshaven plant in a manner similar to Brattle (as described in appendix D of the Brattle Report keeping all technical and economic parameters and constraints the same. The sole change introduced by the CL Electricity Modeling Team was to optimize the power plant dispatch on an hourly basis (*i.e.*, the plant can change its production each hour), compared to Brattle's optimizing it on a 4-hour basis.[262] The optimization on an hourly basis enables to better reflect ramping constrains.

253. The CL Electricity Modeling Team ensured that it properly replicated Brattle's modeling of Eemshaven's dispatch by comparing the commodity margins estimated by Brattle with the commodity margins computed by the Asset Model using the same input data as Brattle (*i.e.*, Baringa's power prices, and Brattle's coal and CO_2 price assumptions). Using one of Brattle's 100 simulations (their simulation #1, as an example), Table IV below shows for that the difference in the commodity margins between those used by Brattle and the CL Electricity Modeling Team is quite limited, with an average deviation in prices of less than 1%.

Table IV. Commodity Margins Results (including subsidy), Simulation #1, € million

[redacted]

Source: Compass Lexecon Analysis ***(S&R-001)****.*

C.4 Asset Model of the Eemshaven Plant Following Conversion to Biomass Firing

254. As described in Section IV.2, Brattle were instructed to assume that operating Eemshaven with unsubsidized biomass would not be economically viable. As a result, Brattle fail to perform an

[262] However, in both cases, power prices are defined on a 4-hour basis.

analysis of the viability of biomass operation in a fashion consistent with their valuation of Eemshaven—that is, with 100 simulations of possible paths for electricity and commodity prices. [redacted] profitable, thus allowing Eemshaven to continue operations after 2030 in the Actual scenario (*i.e.*, [redacted].

255. To assess the impact of Eemshaven's full conversion to operating with biomass in addition to assumptions on the length and capital cost of the conversion, it is necessary to make assumptions regarding the following inputs:

   a. Time required to perform the conversion works in the power plant that would require the plant to be shut down;

   b. Initial capital expenditure to convert to biomass;

   c. Changes to Eemshaven plant's technical parameters (*e.g.*, capacity, efficiency); and

   d. Fuel and any additional variable operating and maintenance costs.

256. Given the lack of plant-specific data provided by Brattle and NERA, we make the following assumptions:[263]

   a. Conversion works would require the plant to be shut down for two years, in 2030 and 2031;

   b. Initial capital expenditure to convert, based on the average of NERA's estimates, ranging between €[redacted] and €457 million;[264]

   c. Eemshaven plant's capacity will decrease by 10% following full conversion to biomass, i.e. from 1,560 MW to 1,404 MW;

   d. Eemshaven plant's efficiency will decrease to 44%;

[263] In their assessment of the economic viability of potential biomass conversion neither Brattle nor NERA included any project-specific technical details of the Eemshaven plant, that could have been obtained from Claimants. We may reconsider such assumptions should Claimants make plant-specific technical data available at a future stage.
[264] *See* NERA report, ¶23.

e. The variable and maintenance costs of running the plant will increase to €4.0/MWh; and

f. The fuel costs will equal the cost of firing wood pellets.

257. For the price of wood pellets, we follow Brattle's assumption to use a 2018 price of €[redacted], from RWE's "Eemshaven Cofiring Business Case." Again, following Brattle's approach, we assume this price to be non-stochastic and increasing with inflation.[265]

[265] *See* Brattle Report, ¶59.