28 February 2023

Oil Change International is submitting the following comments on Rystad Energy's study on the greenhouse gas emissions effects of new oil and gas production on the Norwegian continental shelf. For more information, contact: Silje Ask Lundberg, Oil Change International, silje@priceofoil.org.

Effective, equitable, and 1.5°C-aligned Norwegian oil and gas policy must focus on phasing out fossil fuels, not increasing their supply

Summary

Rystad Energy's study on net greenhouse gas emissions effects from increased Norwegian oil and gas production should not be used by the Norwegian government as a basis for making policy decisions about future oil and gas development.[1] As we outline in the comments below, the study relies on a number of questionable and precarious assumptions to reach its conclusions whilst disregarding the long-term climate effects of carbon lock-in from new Norwegian production and considerations of global equity.

The relevance and rigor of the study's results are limited by the following factors:

- It focuses on the relative emissions intensity of different sources of fossil fuel supply in a single year, 2030, when **it is absolute, cumulative emissions over time that will determine the severity of the climate crisis and Norway's contribution to it.** As we show in Figure 3, **the majority of the production, and therefore climate impact,** of new Norwegian supply sanctioned in the 2020s **is likely to occur after 2030** – beyond the time horizon of the study.
- Relatedly, the study does not consider the economic consequences of new Norwegian supply forcing the early shut down of other supply and/or becoming stranded assets – which is a given in a world limiting warming to 1.5 degrees Celsius (°C).[2]
- The results hinge significantly on price effects that are highly speculative, particularly in an era of rapidly changing energy markets, whilst **ignoring the role of carbon lock-in from existing infrastructure** in mediating price effects.[3]

[1] "Netto klimagassutslipp fra økt olje- og gassproduksjon på norsk sokkel," Rystad Energy, February 2023, https://www.regjeringen.no/contentassets/f5fc522f50674c1f9e0b5db47c264dbe/netto-klimagassutslipp-fra-okt-olje-og-gassproduksjon-pa-norsk-sokkel_hovedrapport.pdf.

[2] Kelly Trout and Greg Muttitt et al., "Existing Fossil Fuel Extraction Would Warm the World Beyond 1.5 °C," *Environmental Research Letters*, May 17, 2022, https://iopscience.iop.org/article/10.1088/1748-9326/ac6228.

[3] Peter Erickson, Sivan Kartha, Michael Lazarus and Kevin Tempest, "Assessing carbon lock-in," *Environmental Research Letters* 10, 084023, 2015, https://iopscience.iop.org/article/10.1088/1748-9326/10/8/084023/meta#erl518579s4.

- The central "Gradual Transition" scenario assumes that almost all new Norwegian gas supply, or new demand induced by that supply, would result in liquefied natural gas (LNG) displacing coal in the power sector rather than competing directly with renewable alternatives. Yet, **solar and onshore wind are already the cheapest sources of electricity in markets covering 96% of global electricity generation**[4] and the International Energy Agency (IEA) projects that any role for gas as a "transition" fuel will be limited to the 2020s.[5] In fact, building new wind and solar is already cheaper than running *existing* gas or coal-fired power plants in countries worth three-fifths of global electricity generation.[6]

- The results of the "Faster Transition" scenario depend entirely on Norwegian production replacing other barrels of production that are higher cost and somewhat more emissions intensive to produce. This relies on the assumptions that new supply would have zero effect on demand and that equivalent volumes from other producers would be displaced based on relative price alone – neither of which match how oil and gas markets have historically functioned. On top of this, replacing one marginally less dirty fossil fuel with another is not a solution that meets the urgency or scale of the climate crisis.

- The study does not consider the political and normative consequences of Norway's decisions about its oil and gas production, which could either accelerate or impede global momentum to phase out fossil fuels. **An equitable global phase-out of oil and gas, which the Norwegian government publicly supported at COP27, depends on wealthy oil and gas producing countries like Norway moving first and fastest.**

Rystad is transparent that its findings hinge on many assumptions about how global markets will respond to additional Norwegian oil and gas production, and that these factors are largely outside of Norway's control.

Conversely, what Norway can directly control is whether or not it allows new oil and gas development in its waters, and whether its policies slow or speed the phase-out of its own oil and gas production. It is a given that new fields, once developed, will lead to additional barrels of Norwegian oil and gas being extracted and burned, adding more heat-trapping pollution to the atmosphere. It is also known that the emissions caused by exported oil and gas constitute by far Norway's largest contribution to the climate crisis, making Norway the world's seventh-largest exporter of carbon pollution.[7] Exporting more oil and gas will only add to this responsibility.

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[4] BloombergNEF, "2H 2022 LCOE Update," December 8, 2022, p. 3, available by subscription.
[5] IEA, World Energy Outlook 2022, October 2022, p. 382, https://www.iea.org/reports/world-energy-outlook-2022.
[6] BloombergNEF, "LCOE Update," p. 11, op. cit.
[7] Hannah McKinnon, Greg Muttitt, and Kelly Trout, *The Sky's Limit Norway: Why Norway Should Lead the Way in a Managed Decline of Oil and Gas Extraction*, Oil Change International, August 2017, https://priceofoil.org/2017/08/09/the-skys-limit-norway-why-norway-should-lead-the-way-in-a-managed-decline-of-oil-and-gas-extraction/.

It is also evident that Norway is one of the oil and gas-producing countries with the greatest capacity to rapidly phase out its oil and gas production while investing in a just transition for affected communities and oil and gas workers.[8] Despite the importance of the oil and gas sector for its economy, Norway's GDP per capita without the contribution of this sector is amongst the highest in the world.[9] Thanks to its sound management of its oil and gas revenues, Norway owns over US$1tn in sovereign wealth for a population of 5.5 million. **Analysis of an equitable global pathway for phasing out oil and gas production puts Norway among those countries that should phase out production by 2034 to hold global warming to 1.5°C – just four years after the 2030 timeframe applied in Rystad's study.[10]**

Ultimately, staying within the Paris Agreement limit of 1.5°C requires phasing out fossil fuels and replacing them with clean energy alternatives as quickly as possible. All Norwegian policies must be weighed against whether they advance this imperative or threaten to distract from or delay it. Incrementally exchanging one fossil fuel with another marginally less polluting fossil fuel, as the Rystad study considers, will not produce the rapid cuts in global pollution that are required, even if the study's speculative assumptions play out.

The Intergovernmental Panel on Climate Change (IPCC) warns that the fossil fuel phase-out must begin immediately, so that the world slashes global carbon emissions in half by 2030.[11] The IEA, whose demand scenarios Rystad uses as inputs to its study, has found that developing new oil and gas fields is inconsistent with the 1.5°C limit,[12] as already developed fields hold enough supply to meet 1.5°C-aligned demand. In this context, new Norwegian supply would either cause higher levels of global warming or create more stranded assets.

Electrification of oil and gas production in Norway will only make a marginal contribution to reducing emissions related to the sector. As it seeks to align its policies with the globally agreed goal of limiting warming to 1.5°C, Norway should immediately start implementing a just transition away from oil and gas production and design a phase-out pathway for its oil and gas production that is aligned with science and equity. Norway can begin this process by starting to phase out the oldest fields first, stopping the renewal of licences when they expire, and ceasing to grant new exploration and production licenses on the Norwegian continental shelf.

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[8] Greg Muttitt and Sivan Kartha, "Equity, climate justice and fossil fuel extraction: Principles for a managed phaseout," *Climate Policy*, 20(8), 1024–1042, 2020, https://doi.org/10.1080/14693062.2020.1763900.

[9] Dan Calverley and Kevin Anderson, *Phaseout Pathways for Fossil Fuel Production Within Paris-compliant Carbon Budgets*, Tyndall Centre, March 2022, p. 40-41, https://research.manchester.ac.uk/en/publications/phaseout-pathways-for-fossil-fuel-production-within-paris-complia.

[10] Calverley and Anderson, *Phaseout Pathways for Fossil Fuel Production*, p. 6, 40-41, 49, op cit.

[11] Keywan Riahi et al., "Mitigation pathways compatible with long-term goals," In IPCC: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2022, Table 3.6, https://www.ipcc.ch/report/ar6/wg3/.

[12] IEA, *Net Zero by 2050: A Roadmap for the Energy Sector*, May 2021, p. 21, https://www.iea.org/reports/net-zero-by-2050.

Detailed critique of selected assumptions and limitations

In this section, we provide a detailed critique of the following aspects of the study:

1. No consideration of carbon lock-in and the evidence that new oil and gas fields are incompatible with the 1.5°C limit
2. 2030 is an inappropriate time horizon for evaluating the climate consequences of new Norwegian fields and licences
3. Assumptions of increased LNG demand displacing coal power are incompatible with 1.5°C and highly uncertain

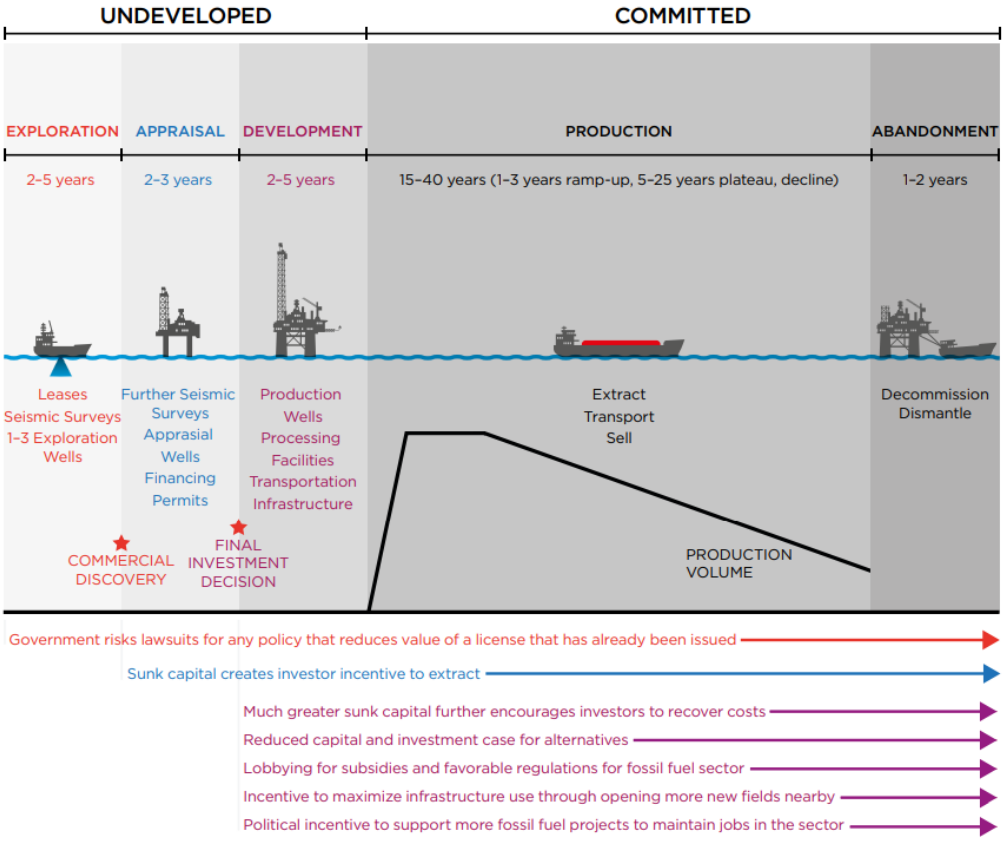
1. No consideration of carbon lock-in and the evidence that new oil and gas fields are incompatible with the 1.5°C limit

Oil and gas fields require large amounts of upfront capital and, once constructed, are typically expected to operate for decades to both recoup sunk capital and maximize profits (Figure 1). The carbon lock-in effect[13] created by sunk capital, as well as existing regulatory and political commitments, reduces the price sensitivity of developed fields.[14] Rystad's analysis disregards this dynamic, assuming that new Norwegian production will automatically shut-in higher-cost production from already operating fields in a perfectly "efficient" market.[15] In reality, once a field is developed, companies are incentivised to keep producing as long as the prevailing market price exceeds marginal operating costs. Governments also frequently prop up uneconomic production with subsidies.

Ignoring carbon lock-in effects is particularly dangerous given the scientific evidence that already developed oil and gas fields hold enough reserves to push the world beyond the 1.5°C limit. Analysis by the International Institute for Sustainable Development (IISD) of both the IEA's Net Zero Emissions (NZE) scenario and 1.5°C-compatible pathways assessed by the IPCC (Figure 2) finds a "large consensus" across models that no new fields should be opened: "they would either generate stranded assets, or push the world beyond the 1.5°C target, unless currently producing fields' operations are significantly curtailed."[16]

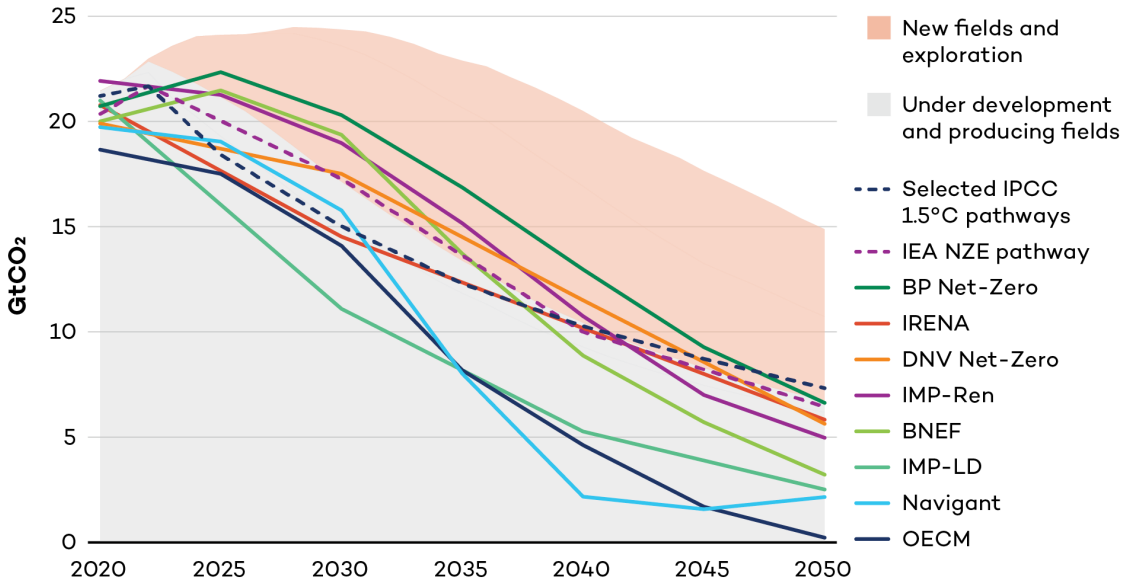
[13] Karen Seto et al., "Carbon Lock-In: Types, Causes, and Policy Implications," *Annual Review of Environment and Resources,* 41:1, 425-452, 2016, https://www.annualreviews.org/doi/abs/10.1146/annurev-environ-110615-085934.
[14] Trout and Muttitt et al., "Existing Fossil Fuel Extraction," op cit.
[15] The Rystad study states that, "In an efficient market, production increases will displace producers with high balance prices, i.e. the barrels with higher average upstream emissions" [translated from Norwegian], see Appendix, p. 11.
[16] Olivier Bois von Kursk et al. *Navigating Energy Transitions: Mapping the road to 1.5°C*, International Institute for Sustainable Development, October 2022, p. 14-18, https://www.iisd.org/publications/report/navigating-energy-transitions.

Figure 1: Lifecycle of a typical oil and gas field and types of carbon lock-in that occur at each stage



Source: Oil Change International

Figure 2: Developing new oil and gas fields is incompatible with limiting global warming to 1.5°C



Source: IISD (2022)[17]

[17] Bois von Kursk et al. *Navigating Energy Transitions,* p. 17, op cit.

Peer-reviewed research published by Oil Change International with a team of climate scientists and energy experts found that, as of 2018, operating and under-construction oil and gas fields worldwide held enough reserves to cause 488 billion tonnes of carbon-dioxide pollution (CO_2) (using reserves data sourced from Rystad Energy).[18] By contrast, as of 2023, the world's remaining 1.5°C carbon budget is estimated to be less than 400 Gt CO_2.[19] **Thus, even if coal production stopped overnight and no new oil and gas fields come online, some existing oil and gas fields will need to be decommissioned prematurely.**

When accounting for the impacts of carbon lock-in, new Norwegian supply sanctioned in the near term can have two effects: 1) lock in further degrees of global warming beyond 1.5°C and therefore devastating climate impacts, and/or 2) require the early closure of other extraction projects, thus increasing stranded assets.

Unless the Norwegian government were to compensate by forcing the premature closure of other Norwegian fields (which is not proposed in the Rystad study), it would be pushing responsibility for managing the phase-out of oil and gas production within climate limits onto other governments, expecting them to lead where Norway is not. The IEA underlined in its most recent World Energy Outlook that new projects "do not come for free in climate terms," adding, "the countries of companies choosing to undertake them [...] need to plan and justify for how global production levels will be further reduced in the future in a successful transition to net zero emissions by mid-century."[20]

Ultimately, climate policies that reduce both supply of and demand for fossil fuels simultaneously will be most effective at accelerating the energy transition and rapid decarbonization.[21] Carbon 'leakage' from price effects will be minimized most effectively, and carbon lock-in overcome, by tackling both sides of the equation together. It is not a question of choosing one lever or the other, particularly given how rapidly emissions must be slashed.

2. 2030 is an inappropriate time horizon for evaluating the climate consequences of new Norwegian fields and licences

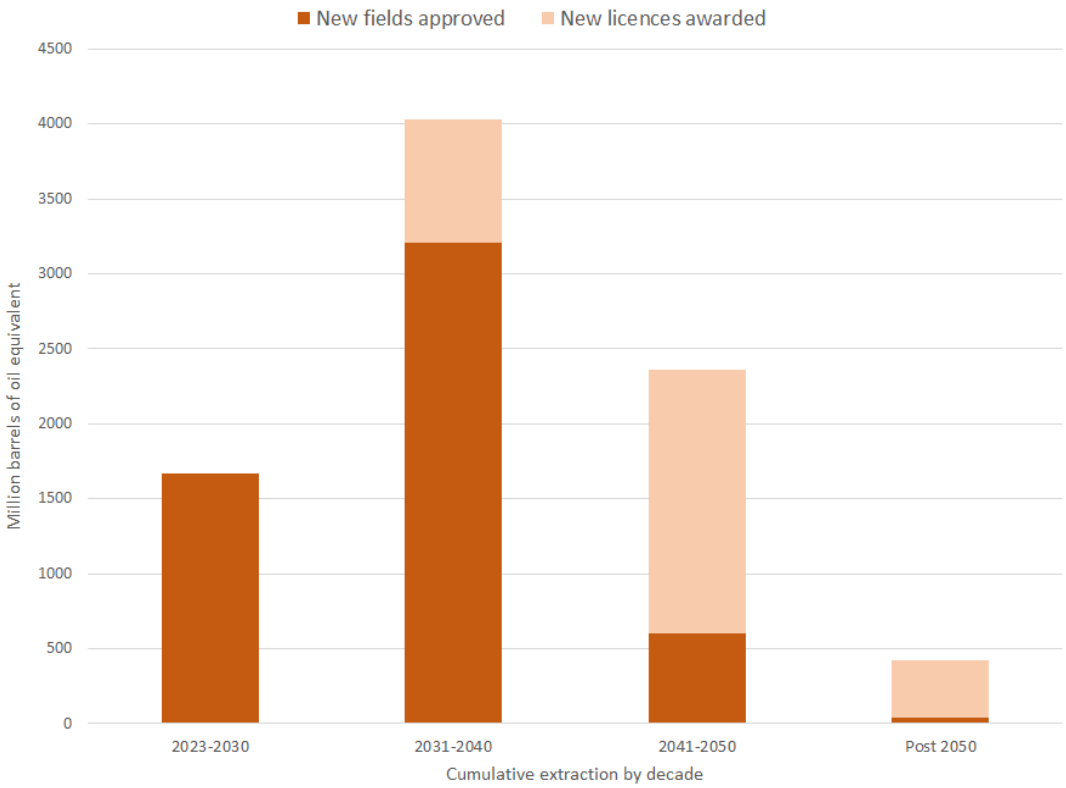
The Rystad study's findings are based on a series of assumptions about price and market conditions as of 2030. This is an inappropriately short time frame for meaningful assessment of the impact of new Norwegian fields or exploration approved in the 2020s, as these decisions will have an impact horizon of

[18] Trout and Muttitt et al., "Existing Fossil Fuel Extraction," op cit.
[19] Pierre Friedlingstein et al., "Global Carbon Budget 2022," *Earth System Science Data*, 14, 4811–4900, 2022, https://doi.org/10.5194/essd-14-4811-2022.
[20] IEA, *World Energy Outlook 2022*, p. 80-81, op cit.
[21] Brian Prest, *Partners, Not Rivals: The Power of Parallel Supply-Side and Demand-Side Climate Policy*, Resources for the Future, April 2022, https://www.rff.org/publications/reports/partners-not-rivals-the-power-of-parallel-supply-side-and-demand-side-climate-policy/; Fergus Green and Richard Denniss, "Cutting with both arms of the scissors: the economic and political case for restrictive supply-side climate policies," *Climatic Change* 150, 73–87, 2018, https://doi.org/10.1007/s10584-018-2162-x.

decades, not one or several years. Importantly, what matters for holding global warming to 1.5°C is not relative changes in emissions in a single year, but the absolute, cumulative quantity of carbon pollution emitted to the atmosphere over time. Rystad's study does not address the cumulative, long-term emissions impact that new Norwegian production and exploration would have in a world that must zero out fossil fuel pollution within three decades.

Figure 3 illustrates this limitation using data from Rystad Energy's UCube database. We show the cumulative quantities of oil and gas that Rystad's model projects will be produced from new Norwegian fields and exploration licences over time if they are approved or awarded in the 2020s (2023-2029). In the study, Rystad notes that, for new fields awarded in the near term, peak production would be expected around 2030, which our analysis corroborates. However, **most of the oil and gas in new fields and new licences would be extracted *after* 2030, including 70% of the reserves in new fields and 100% of potential exploration resources.** Our analysis of Rystad's data indicates one-third of the oil and gas from new fields and licences would be extracted after 2040. As a result, **the largest portion of climate pollution caused by new Norwegian fields and licences approved in this decade would come post-2030, beyond the horizon of the Rystad study.**

Figure 3: Cumulative oil and gas production by decade from new Norwegian fields or licenses approved from 2023-2029



Source: Oil Change International analysis of data from the Rystad Energy UCube (February 2023)

The majority of new Norwegian supply sanctioned or licensed in the near term would be impacting global energy markets in the 2030s – which is the decade in which the phase-out of oil and gas must accelerate significantly. For example, the IEA's NZE scenario, used as a source for oil demand and power mix projections in Rystad's "Faster Transition" scenario, finds that oil and gas production and use fall by 6% and 7% per year on average, respectively, in the 2030s.[22] This accelerated decline in oil and gas in the 2030s increases the stranded asset risks created by new supply sanctioned in the 2020s, again beyond the time horizon Rystad's study considers.

3. Assumptions of increased LNG demand displacing coal power are incompatible with 1.5°C and highly uncertain – solar and wind are already, or soon will be, cheaper almost everywhere

In the study's central scenario, which assumes the world exceeds 1.5°C of warming, Rystad concludes that, "Norwegian gas reduces global emissions as long as there is coal available for substitution" [translated from Norwegian].[23] The study's central findings hinge on an assumption that new supplies of piped Norwegian gas to Europe largely displace LNG imported from North America, and that 70% of this LNG diverted to other regions, as well as of new gas demand induced by increased Norwegian production, substitutes for coal, particularly in Asia.[24] Rystad assumes only 30% displaces renewable energy. Rystad cautions that its analysis of the price and demand effects of increased Norwegian gas supply on regional markets "involves a significant simplification" [translated from Norwegian].[25]

However, **renewable energy can now displace both coal and gas in Asia.** The latest Levelized Cost of Electricity (LCOE) analysis from BloombergNEF shows that renewable energy is now cost-competitive with gas and coal in the vast majority of markets around the world, including key LNG importing countries in Asia. BloombergNEF finds that "solar or onshore wind are the cheapest sources of electricity in countries representing 96% of global electricity generation."[26] Their analysis shows that solar is now the cheapest source of electricity generation in Japan; onshore wind is the cheapest in China and India; and in Malaysia, Thailand, and Vietnam it is solar.[27] BloombergNEF expects high gas and coal prices to linger for the short to medium term, supporting continued competitiveness of renewables for the foreseeable future. Meanwhile, wind and solar are expected to continue falling in price to 2030 and beyond.

This exposes the weakness in Rystad's assumption that additional Norwegian gas would lead to emissions reductions in Asia due to greater availability of LNG for Asian markets. The Institute for Energy Economics and Financial Analysis (IEEFA) finds that the economic case for additional LNG import capacity

[22] IEA, *World Energy Outlook 2022*, p. 134, op cit.
[23] See Rystad study, p. 28.
[24] See Rystad study, p. 20 and Appendix: Analysis of gas and coal substitution.
[25] See Rystad study, p. 22.
[26] BloombergNEF, "LCOE Update," p. 3, op cit.
[27] BloombergNEF, "LCOE Update," p. 10, op cit.

in Asia is "crumbling."[28] IEEFA's August 2022 report found that, "(e)fforts to reduce LNG dependence and shift toward alternative energy sources in the medium-term could negatively impact longer-term LNG demand growth forecasts." The report goes on to find that, "as long as unaffordable LNG prices and procurement challenges persist, US$96.7 billion dollars of proposed LNG-related infrastructure projects in Pakistan, Bangladesh, Vietnam, and the Philippines will face a heightened risk of underutilization or cancellation."[29]

In the face of increasingly competitive renewable energy and persistently volatile fossil fuel prices, the assumption that an increase in Norwegian gas supply will lead to emissions reductions via displaced coal ignores the facts on the ground. **Any increase in gas supply risks displacing renewables from markets at the margin. The key to emissions reductions in Asia is lowering the cost of capital for renewable energy projects, not increasing gas supply.**

Finally, Rystad's forecasts for rising global LNG demand[30] and gas expansion in the power sector are incompatible with limiting global warming to 1.5°C. For example:

- The IEA finds that, even in its Announced Pledges Scenario (APS), an input for Rystad's main scenario, "the role of gas as a transition fuel is largely limited to this decade."[31] In both the APS and NZE scenarios, "global LNG demand peaks before 2030," and it falls rapidly after 2030 in the NZE scenario.[32] The Rystad study uses the IEA's APS and NZE scenarios as the basis for petroleum demand and power mix projections in its central and "Faster Transition" scenarios, respectively. However, in the case of LNG markets, Rystad appears to also apply some of its own LNG modelling, which shows **hugely inflated demand for LNG even compared to the IEA's Stated Energy Policies Scenario,[33]** which is aligned with 2.5°C of global warming.

- **If Europe is to align with a 1.5°C energy pathway, it will phase both coal and gas out of the power sector in rapid succession.** Studies by Climate Analytics of 1.5°C pathways published by the IPCC find that it is both cost-effective and necessary for Europe to phase out coal by 2030[34] and gas by 2035.[35] Any assumption that Norwegian gas will displace coal in Europe's power sector is betting against a 1.5°C-aligned transition. In the context of Europe's recent gas supply crunch, analysis by IISD also finds that, "Not only can Europe meet its energy needs by reducing

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[28] Sam Reynolds, "The Economic Case for LNG in Asia is Crumbling: Unaffordable Prices Expected to Slow LNG Demand Growth in Key Markets," IEEFA, August 2022, https://ieefa.org/resources/economic-case-lng-asia-crumbling.
[29] Reynolds, "The Economic Case for LNG in Asia is Crumbling," p. 2, op cit.
[30] See Rystad study, Appendix: Gas demand scenarios.
[31] IEA, *World Energy Outlook 2022,* p. 382, op cit.
[32] IEA, *World Energy Outlook 2022*, p. 393, op cit.
[33] See Rystad study, Appendix: Gas demand scenarios.
[34] Paola A. Yanguas Parra et al, *Global and regional coal phase-out requirements of the Paris Agreement: Insights from the IPCC Special Report on 1.5°C*, Climate Analytics, September 2019, https://climateanalytics.org/publications/2019/coal-phase-out-insights-from-the-ipcc-special-report-on-15c-and-global-trends-since-2015/.
[35] Claire Fyson, Gaurav Ganti, Neil Grant and Bill Hare, *Fossil gas: a bridge to nowhere. Phase-out requirements for gas power to limit global warming to 1.5°C*, Climate Analytics, June 2022, https://climateanalytics.org/publications/2022/fossil-gas-a-bridge-to-nowhere/.

dependence on Russian gas supply through accelerating renewable energy, energy efficiency and electrification, it must do so to align with 1.5°C pathways."[36]

- While Rystad assumes LNG importing countries will have spare gas generating capacity to fill with displaced LNG in 2030, IISD's analysis also shows that global gas power generation capacity should *decrease* by more than 55% by 2035, compared to 2020 levels. **In a 1.5°C-aligned transition, not only should no new gas plants be built, but those already operating must remain underutilized.[37]**

[36] IISD, *Navigating Energy Transitions*, p. ix, op cit.
[37] IISD, *Navigating Energy Transitions*, p. 20-21, op cit.