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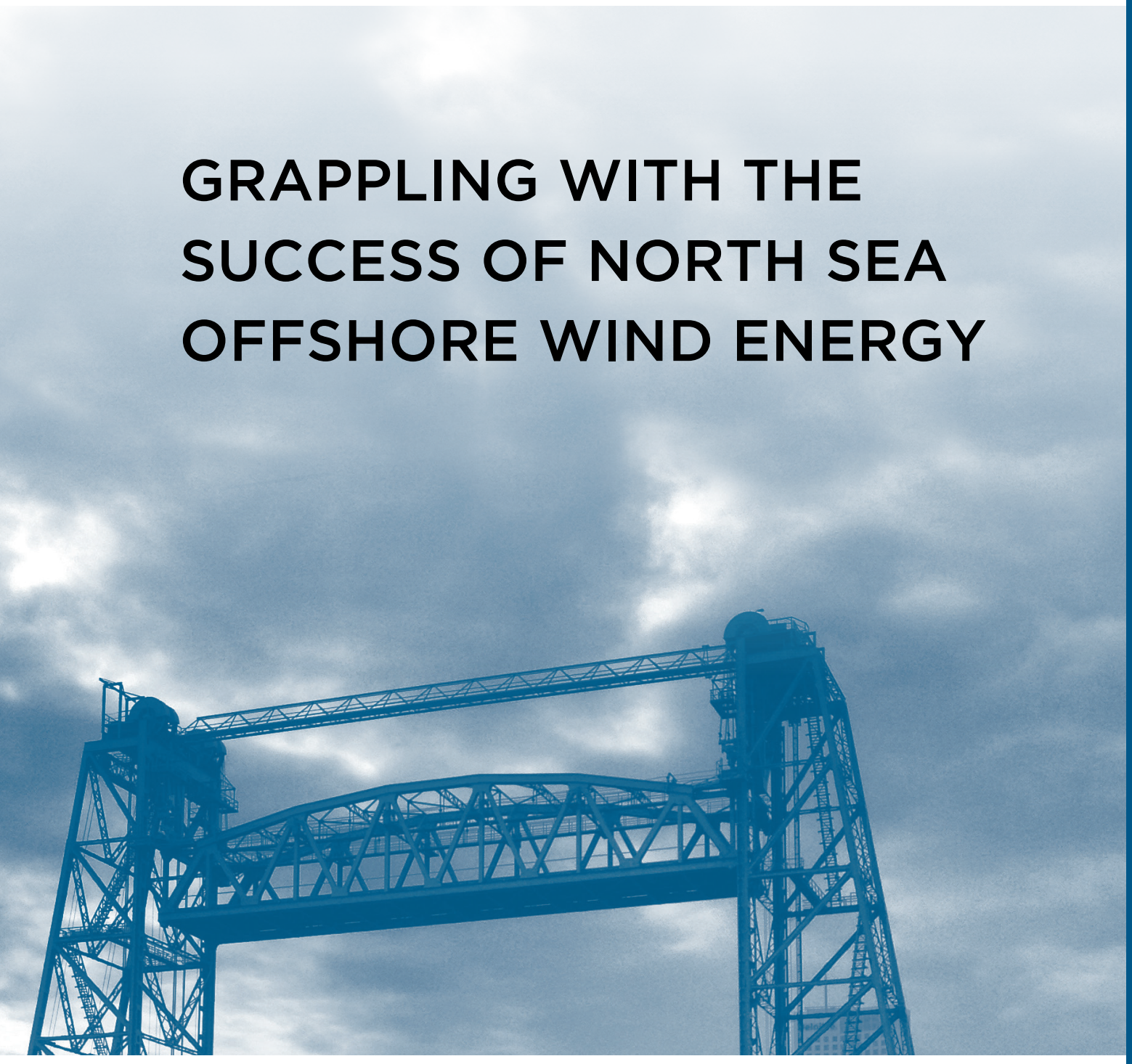
GRAPPLING WITH THE SUCCESS OF NORTH SEA OFFSHORE WIND ENERGY



GRAPPLING WITH THE SUCCESS OF NORTH SEA OFFSHORE WIND ENERGY

Energy featured prominently in the Draghi report of 2024 as one of the causes for the Europe's bleak level of competitiveness.[1] The structurally higher energy costs are for many businesses in the European Union (EU), compared to their peers in the US and China, a major contributor to the competitive disadvantage. The Draghi report also raised concerns about the innovative strength of the EU economies. In energy-related cleantech, the EU lost out to China when it comes to the manufacturing of primary components for electric vehicles (EVs), batteries, and solar PV. At the same time, the EU's wind industry has been a bright light, with a substantial part of the wind value chain located within the EU. This is a major positive in terms of the EU's economic security and strategic autonomy.[2]

Particularly in Northwest Europe, the success of the offshore wind sector in the past two decades is worth noting. Recently, however, concerns have grown over the business case or investment case for new offshore wind farms. The point articulated in this discussion note is that the current apprehension can fundamentally be understood as a consequence of the very success of the offshore wind sector, namely the impressive scale it has reached and the very substantial amount of energy it is set to deliver. However, there are concerns that the electricity sector, i.e. wholesale markets and grids, cannot absorb this amount of energy. This is worrying, because Europe needs this great new domestic energy asset, of which it has little.

This Discussion Note arrives at three insights:

1. The lack of confidence in future growth of electricity demand and the limited interest in electrification of industrial processes must be seen in the context of the overall competitiveness problem of EU industry, as described by Draghi.
2. While there is reason to be disappointed with the progress made in developing hydrogen value chains, they still represent a key piece of the puzzle for developing the North Sea wind resource to its full potential. The implication should be that the EU and its North Sea partners must continue to support the commercialisation of hydrogen technologies.
3. Given the limits to what producer mandates can achieve in some sectors of the European economy, last year's *Call for Demand Creation to Drive Industry Investments*, by a broad coalition of industry associations, network organisations, knowledge institutions, NGOs and companies, should be welcomed.[3] It recognises that European consumers are responsible for ensuring that investments in clean production pay off.

North Sea governments should acknowledge and promote these insights, because it is in their common interest to develop the North Sea asset to the fullest extent possible.

[1] Mario Draghi, The Future of European Competitiveness, part A and B, European Commission, 2025, PDF: ISBN 978-92-68-22715-2 doi:10.2872/9356120, https://commission.europa.eu/topics/eu-competitiveness/draghi-report_en.

[2] Mario Draghi, idem, p. 121.

[3] *Call for Demand Creation to drive Industry Investments*, 12 December 2024, https://www.demandcreation.eu

This Discussion Note describes the journey that led to these insights. First, it will highlight the success of the offshore wind sector by showing historical data for the offshore wind sector across six North Sea countries combined: Germany, Denmark, Norway, the United Kingdom (UK), Belgium and the Netherlands. Second, three quantitative pathways are presented for the future size of the offshore wind sector in terms of its annual capacity additions (GW/yr). Third, the associated wind energy volumes are put in perspective of current energy demand in the North Sea region and the size of the electricity sector, demonstrating why the concerns over whether these wind energy volumes can be accommodated are justified. Fourth, "the hydrogen solution" is revisited, as this was the anticipated way to deal with the large amounts of wind energy, while results have been mixed at best so far. Fifth, the sector's understandable calls for continued or renewed public financial support for projects are highlighted, while it is emphasised that such support is unlikely to be a structural solution to the fundamental problem that has arisen. Finally, in the conclusion, this Discussion Note arrives at the three insights mentioned.

OFFSHORE WIND ENERGY: ALREADY OVER TWO DECADES A SUCCESS IN THE MAKING

Figure 1 shows the annual offshore wind capacity additions in six North Sea countries, i.e. Germany, Denmark, Norway, the UK, Belgium, and the Netherlands, which is a good reflection of the region's offshore wind sector's size through time.[4] In many energy transition scenarios, the North Sea offshore wind resource plays an important role. This can be understood not just from a climate policy viewpoint, but also from a security of energy supply perspective, as it is a domestic energy resource that is scalable and has great potential, of which the region has little. For this reason, continued growth of the offshore wind sector should be applauded in European capitals.[5]

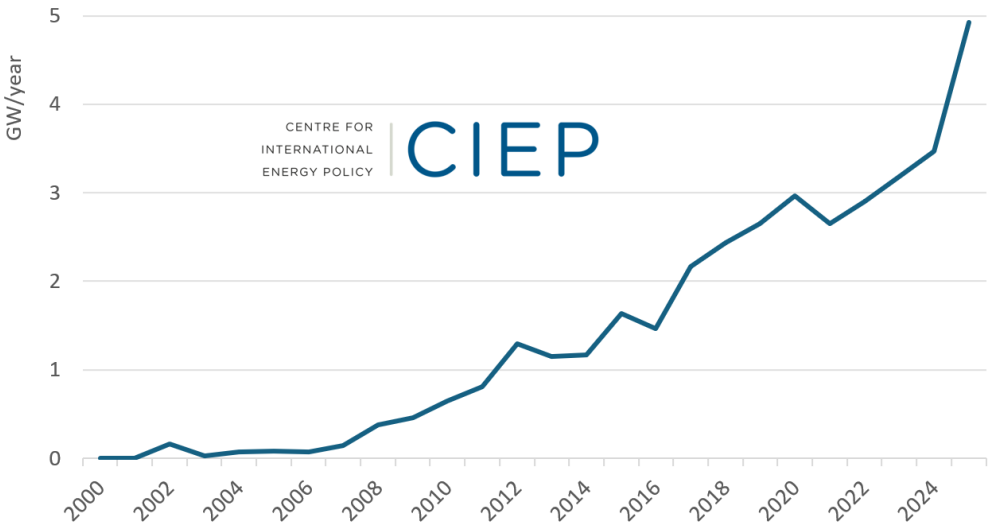


Figure 1. Annual offshore wind capacity additions in the six North Sea countries (GW/year)

[4] Figure 1 is based on publicly available data and is the result of a bottom-up analysis, providing an approximation of the installed offshore wind capacity in the North Sea for the relevant countries. In the dataset, the capacity of an offshore wind farm is linearly distributed from the year in which offshore construction began to the year in which the farm was (fully) commissioned.

[5] One recent study worth noting in this regard is: *Unlocking the North Sea as a Green Powerplant*, North Sea Wind Power Hub, 2022, https://northseawindpowerhub.eu/knowledge/unlocking-the-north-sea-as-a-green-powerplant

To keep an economic sector dynamic, innovative and healthy, market growth is very helpful. This also goes for the offshore wind sector in the North Sea region. Not only the total installed (cumulative) wind capacity must increase, but also the annual capacity expansions, in terms of gigawatts per year.

THREE PATHWAYS FOR THE NORTH SEA OFFSHORE WIND SECTOR

To accommodate the volumes of wind energy produced from the total installed capacity, additional applications of electricity are needed to absorb the power in the energy system. In this regard, the challenge ahead for North Sea governments is illustrated here through three pathways for the future market size of the offshore wind sector. The prime focus is on the years up to 2040, in terms of annual installations (GW/year) in the six North Sea countries. The three pathways are shown in Figure 2. The pathways were constructed with the aim to sketch the public policy dilemma: either accepting a scaled down offshore wind sector that will go through restructuring in the coming years and is unlikely to deliver the long term public policy targets, or enabling the sector to deliver low-carbon and renewable electricity and molecules in a growing range of value chains, while keeping the sector in good shape in the process.

Figure 2. Three pathways for future size of the offshore wind sector in the six North Sea countries (GW/year)

Most likely, the market sizes reflected in the high and mid pathway allow for continued dynamism and innovation until 2040. In these pathways, annual capacity additions continue to grow. This is in stark contrast with the low growth pathway, in which the market in 2030 is substantially smaller than today, and growth in the 2030s is very modest.

Let's explain the rationale behind the pathways. All three are based on a combination of variables, most notably on the existing policy ambitions, often all the way to 2050, but also on the more recent headlines in the media suggesting headwinds for the sector.[6] While 2050 ambitions guide developments, it should be noted that the focus in this Discussion Note is on the period until 2040.

[6] Three general assumptions apply to all pathways. First, the difference in installed capacity between 2030 and 2050 is assumed to be distributed as follows: one-third is installed between 2030 and 2040, and two-thirds between 2040 and 2050, due to scaling-up effects. Second, the pathways do not reflect ambitions, realities, or expected trajectories, but rather a possible path based on specific assumptions. Finally, the reported current installed capacity is an approximation of reality based on publicly available information.

The high pathway represents a future in which the offshore wind sector continues to grow substantially, due to near-perfect conditions for the sector to thrive. Grounded in such assumptions, in the high pathway, the offshore wind sector in the North Sea grows to a cumulative installed capacity of around 65 GW in 2030 and 165 GW in 2040. This pathway is largely consistent with achieving existing policy ambitions and targets of the six North Sea countries towards 2040 and 2050.[7] Belgium aims to increase its installed offshore wind capacity from its current 2.3 GW to 5.8 GW by 2030, and 8 GW by 2040.[8] In the high pathway it is assumed that space constraints limit the ability of Belgium for further scaling beyond the maximum level of 8 GW. Denmark strives to reach 7.7 GW by 2030 and 35 GW by 2050. Its current installed capacity is 2.6 GW.[9] In the high pathway, the assumption is made, that under ideal conditions and given its spatial potential, Denmark has a major potential for offshore wind of above 35 GW, reaching 70 GW by 2050. Germany targets 30 GW, 40 GW, and 70 GW by respectively 2030, 2035, and 2045 in their North Sea and Baltic waters.[10] It has currently approximately 9 GW installed in the North Sea. Spatial constraints are real for the country, limiting the 2045 capacity to an estimated 45 GW in the German North Sea. The Netherlands until very recently aspired to grow from its current installed offshore wind capacity of 4.7 GW to 21 GW, 50 GW, and 70 GW by respectively 2032, 2040, and 2050.[11] Under the assumed circumstances, realising these ambitions is possible, but still a challenge. Norway aims to increase its installed offshore wind capacity from its current 0.1 GW to 3 GW and 30 GW by respectively 2030 and 2040.[12] In the high pathway it is assumed that vast numbers (towards 70 GW by 2050) are possible, in view of the significant space available in Norwegian waters and the potential success of floating offshore wind turbines in deeper waters. The UK aims to increase its installed offshore

[7] The high pathway primarily aims to reach 2040 and 2050 targets of cumulative installed capacity, but not necessarily by achieving the 2030 targets in time. For all countries, the 2030 targets of installed capacity are higher than the assumed installed capacity at 2030 in the high pathway.

[8] *Supply*, Belgium Offshore Platform, https://www.belgianoffshoreplatform.be/en/services/supply/; *Belgian offshore wind energy,* FPS Economy, 17 April 2025, https://economie.fgov.be/en/themes/energy/sources-and-carriers-energy/belgian-offshore-wind-energy; *Global offshore wind: Belgium*, Norton Rose Fulbright, 12 February 2025, https://www.nortonrosefulbright.com/en/knowledge/publications/816b71d7/global-offshore-wind-belgium

[9] *Wind energy in Europe: 2024 Statistics and the outlook for 2025-2030*, WindEurope, February 2025; *No offshore bids in Denmark – disappointing but sadly not surprising*, WindEurope, 6 December 2024, https://windeurope.org/newsroom/press-releases/no-offshore-bids-in-denmark-disappointing-but-sadly-not-surprising/

[10] *Wind energy in Europe: 2024 Statistics and the outlook for 2025-2030*, WindEurope, February 2025; *Status of Offshore Wind Energy Development in Germany*, Deutsche Windguard, 15 July 2024, https://bwo-offshorewind.de/wp-content/uploads/2024/07/Status-of-Offshore-Wind-Energy-Development_First-Half-2024_final.pdf; *Germany largely on track for offshore wind expansion targets – industry*, Clean Energy Wire, 4 February 2025, https://www.cleanenergywire.org/news/germany-largely-track-offshore-wind-expansion-targets-industry

[11] *Routekaart NPVI: van grijs naar groen*, Nationaal Programma Verduurzaming Industrie, https://www.verduurzamingindustrie.nl/hulp-bij-verduurzaming/routekaart+npvi; *Wind op zee*, Rijksoverheid, 2025, tabblad Doelstellingen, https://windopzee.nl/onderwerpen/doelstellingen; *Netherlands Scales Down Offshore Wind Target for 2040*, Offshore Engineer, 17 July 2025, https://www.oedigital.com/news/528049-netherlands-scales-down-offshore-wind-target-for-2040

[12] *Ostend Declaration of Energy Ministers on The North Sea as Europe's Green Power Plant delivering Cross-Border Projects and Anchoring the Renewable Offshore Industry in Europe*, April 2023, https://northseasummit23.be/en/ostend-declaration/; *Offshore wind*, Norwegian Government. https://www.regjeringen.no/en/topics/energy/landingssider/havvind/id2830329; *Norway announces big new offshore wind targets*, WindEurope, 2 June 2022, https://windeurope.org/newsroom/news/norway-announces-big-new-offshore-wind-targets/

wind capacity from its current approximate 16 GW to 50 GW by 2030.[13] In the high pathway it is assumed that floating offshore wind and the spatial potential (in Scottish waters in particular) provide significant room for growth, to potentially 110 GW by 2050.

The low pathway, in contrast, is consistent with continued headwinds for the offshore wind sector, in line with recent headlines in European newspapers.[14] In Denmark, a shock was caused in December 2024 by the lack of interest in a tender for offshore wind capacity.[15] The Danish government had not offered a firm public support scheme. Tenders in the UK had already failed a year earlier, because the strike price in the *Contracts for Difference* scheme was set too low compared to the new cost realities in the offshore wind sector.[16] In the Netherlands, the Dutch government managed to generate just enough interest in developing wind energy at the *IJmuiden Ver* site in 2024, but interest was lower than in previous years.[17] In Germany, in August 2025 the German Bundesverband Windenergie Offshore released a press statement declaring that not one single company had participated in a major auction.[18] The Belgian government had already put the brakes on the development of a park in their waters one month earlier.[19] Broadly and generally speaking, in the low pathway, factors such as the larger cost base and higher financing cost could continue to play an influential role, and future tenders for new capacity might still not draw any bids or could be postponed.[20] Actors could continue to refuse to engage in tenders due to a deteriorated or poor risk-return ratio.[21,22]

[13] *Offshore wind net zero investment roadmap*, UK Department for Energy Security & Net Zero, 2023, https://www.gov.uk/government/publications/offshore-wind-net-zero-investment-roadmap/offshore-wind-net-zero-investment-roadmap; *UK Offshore Wind Report 2024*, The Crown Estate, 2024, https://www.datocms-assets.com/136653/1747814298-osw-report-2024.pdf

[14] Orlando Jenkinson, *Vattenfall shelves 1.3GW Norfolk Boreas offshore project amid spiralling costs*, Windpower Monthly, 20 July 2023, https://www.windpowermonthly.com/article/1830711/vattenfall-shelves-13gw-norfolk-boreas-offshore-project-amid-spiralling-costs; *UK subsidy auction fails to attract any offshore wind bids in blow to net zero plans*, Financial Times, 7 September 2023, https://www.ft.com/content/c5a2986a-6edf-46d1-bcbc-584fb9426802

[15] *Denmark disappointed after offshore wind tender draws no bids*, Reuters, 5 December 2024, https://www.reuters.com/sustainability/climate-energy/denmark-disappointed-after-offshore-wind-tender-draws-no-bids-2024-12-05/

[16] *UK subsidy auction fails to attract any offshore wind bids in blow to net zero plans*, Financial Times, 7 September 2023, https://www.ft.com/content/c5a2986a-6edf-46d1-bcbc-584fb9426802; *Offshore wind drops out of UK auction on costs, risking climate goals*, Reuters, 8 September 2023, https://www.reuters.com/sustainability/climate-energy/latest-uk-renewables-auction-fails-attract-offshore-wind-bids-2023-09-08/

[17] *Eneco drops out of tender for massive Dutch offshore wind farm*, Reuters, 28 March 2024, https://www.reuters.com/business/energy/eneco-drops-out-tender-massive-dutch-offshore-wind-farm-2024-03-28/

[18] *Press release: Offshore wind auction failed: Politicians must finally act!,* Bundesverband Windenergie Offshore e.V., 6 August 2025, https://bwo-offshorewind.de/en/pressemitteilung-offshore-wind-auktion-gescheitert-politik-muss-endlich-handeln/

[19] *Belgium Delays Tender for Offshore Wind Farm in Princess Elisabeth Zone Until 2026,* OffshoreWIND, 1 July 2025, https://www.offshorewind.biz/2025/07/01/belgium-delays-tender-for-offshore-wind-farm-in-princess-elisabeth-zone-until-2026/

[20] *Dutch postpone offshore wind farm tenders due to low interest*, Reuters, 16 May 2025, https://www.reuters.com/business/energy/dutch-postpone-offshore-wind-farm-tenders-due-low-interest-2025-05-16/

[21] *Changing Course - Proposal for a new contract for offshore wind power*, Eneco, 2025, https://www.eneco.nl/-/media/eneco-com/files/white-paper-windtenders-eng.pdf

[22] *Ørsted to discontinue the Hornsea 4 offshore wind project in its current form*, Ørsted, 7 May 2025, https://orsted.com/en/company-announcement-list/2025/05/orsted-to-discontinue-the-hornsea-4-offshore-wind--143901911

In the low pathway sketched here, the sector experiences a substantial decline in the very near future, with annual installations of capacity in the North Sea shrinking to almost half of current annual capacity additions by 2030, after which growth picks up, albeit at a slower pace compared to the last five years. This pathway leads to a cumulative installed capacity in the North Sea of around 45 GW in 2030 and 75 GW in 2040.

The mid pathway represents a future that is simply positioned between the high pathway (which assumes near-perfect conditions) and the low pathway (which assumes continued and intensifying headwinds). In 2030 the total installed capacity in the mid pathway sits at 55 GW, in between the high and low pathway, after which the sector continues to grow gradually, resulting in 120 GW by 2040.

ENERGY DEMAND IN THE NORTH SEA REGION

The mid and the high pathways are likely to keep the sector sufficiently healthy**.** Then why are there concerns that these pathways will not materialise? A large part of the answer to this question lies in the limited absorption capacity of the electricity sector for the sheer amount of energy that the North Sea offshore wind sector can deliver to Europe in the next five to fifteen years.[23]

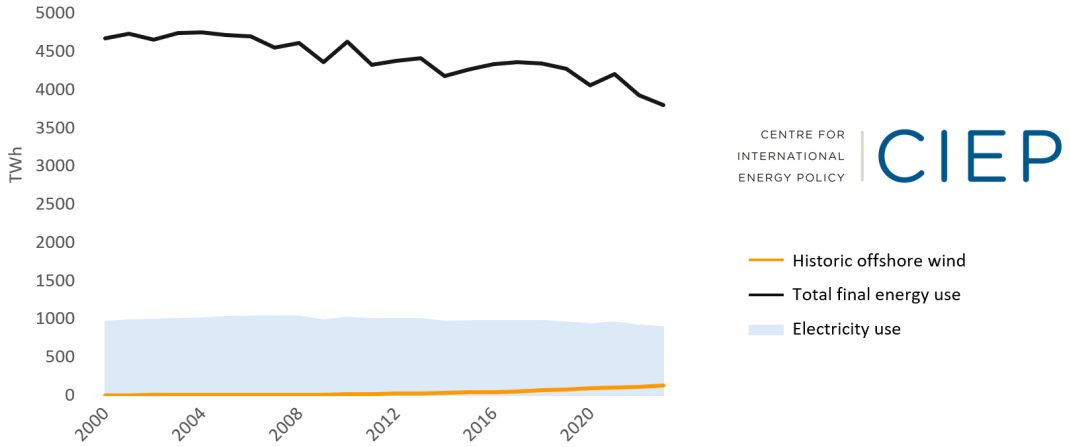


Figure 3. Total final energy use, electricity use, and offshore wind energy since the year 2000

Figure 3 shows the relative size of the electricity sector, compared to total final energy demand in the North Sea region since the year 2000. Denmark, Norway, the UK, Belgium, the Netherlands and half of Germany are included.[24] Germany is not entirely included, because its more inland regions are far from the North Sea and difficult to serve through electricity transmission infrastructure, which has to cross the entire length of the country. The pace at which such infrastructure is built has been debated for years.[25] Also shown is

[23] Limited absorption capacity can best be understood by distinguishing between electricity grids on the one hand, and (the combined regional Northwest European) electricity markets on the other hand. Regarding grids, notably *onshore* grid expansions have proven difficult to realise.

[24] Half of Germany means 50% of total final energy demand in Germany and 50% of electricity consumption.

[25] Keder Balasubramanian, *Germany's green power race: North vs. South in sustainable energy innovation*, illumine, 12 May 2025, https://illuminem.com/illuminemvoices/germanys-green-power-race-north-vs-south-in-sustainable-energy-innovation

the amount of offshore wind energy produced in the North Sea waters of these six countries.[26]

Total final energy demand in the North Sea region has declined over the past two decades. And perhaps more surprising, electricity demand in the region has not increased during this period. So far, the call for electrification of currently non-electrified parts of the economy has led to mixed results at best. Adoption of new types of electrical appliances such as heat pumps in the built environment or EVs, and the emergence of new economic activities, for example in the field of computing, are factors to consider, but energy efficiency improvements and deindustrialisation also play a role.

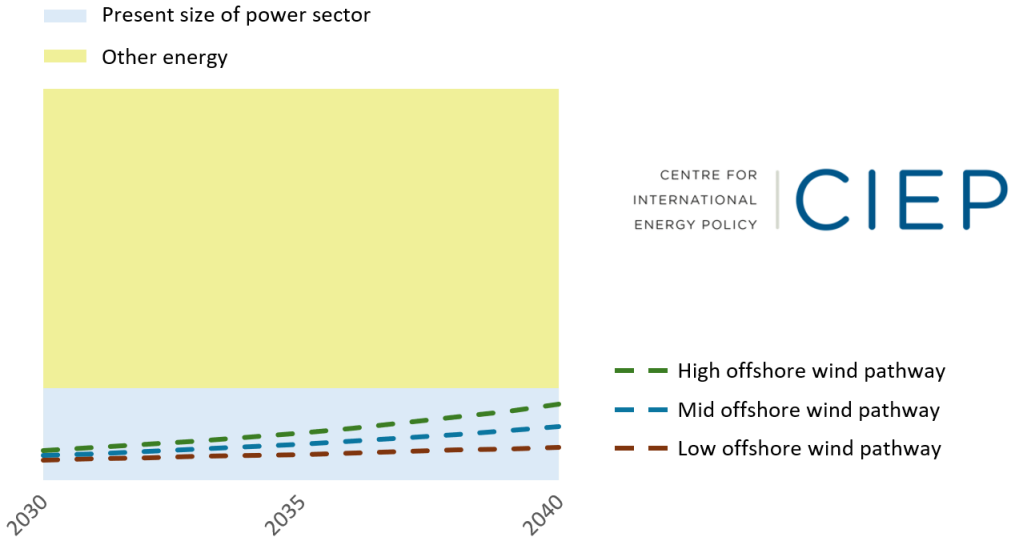


Figure 4. Offshore wind energy in the three pathways relative to current electricity and energy demand

The size of the regional electricity market and expectations for the future strongly affect the willingness to invest in further offshore wind development in the six countries. Figure 4 presents the order of magnitude of offshore wind energy production in the three pathways, relative to the present size of the electricity sector and current total final energy demand electricity and energy demand.[27,28] Offshore wind energy production is set to become quite substantial, relative to electricity demand as we know it, particularly in the mid and high pathways. It should be stressed that offshore wind energy adds to electricity supplied by other types of power generation capacity, including onshore wind, solar, and nuclear power capacity, which are not shown in Figure 4.

The picture shown in Figure 4 is not the entire story, because wind energy is variable in nature. Abundant wind supplies enter the electricity system at the same time or on the same days, having a larger impact on both electricity grids and electricity wholesale markets than suggested by annual numbers. Moreover, electricity generation from wind

[26] In this graph the amount of offshore wind energy is calculated based on the assessment of installed capacity in the six North Sea countries and applying a capacity factor of 50 percent. The real amount could be different, likely somewhat lower, since the earliest wind parks had lower capacity factors than the newer wind parks.

[27] The most recent numbers for total final energy consumption and electricity consumption in the North Sea countries are from 2023, based on publicly available IEA data at https://www.iea.org/data-and-statistics/data-tools/energy-sankey.

[28] A capacity factor of 50% was used for converting installed capacities into annual energy volumes.

in the North Sea countries is correlated.[29] To show what this implies, Figure 5 illustrates periods of strong winds.[30]

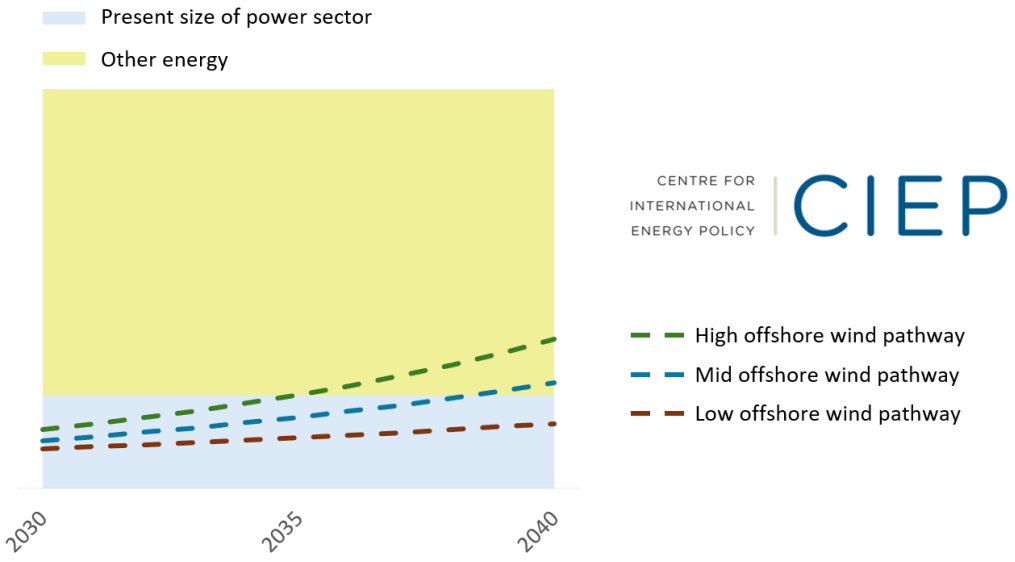


Figure 5. Offshore wind energy relative to current electricity and energy demand during periods of strong winds

Considering the growing reluctance to invest, offshore wind developers appear to expect the electricity system to become saturated with energy, especially during periods of high winds. Once again, it should be stressed that it is often not just offshore wind capacity that is supplying electricity, but also onshore wind, and solar PV and nuclear. This is a very bad prospect for those wishing to develop offshore wind projects now, that should pay for themselves in the 2030s.

THE HYDROGEN SOLUTION

Early calls for the development of hydrogen supply chains, to give offshore wind a role beyond the current electricity sector, should be seen in this light. Through water electrolysis, the abundance of electricity from offshore wind energy can be used to produce green hydrogen. In 2022, the European Commission radically embraced the hydrogen solution when it set indicative targets for a mind-blowing ten million tonnes of domestically produced hydrogen alongside ten million tonnes of imported renewable hydrogen for 2030, Europe-wide.[31] The IEA had already published the commentary 'Offshore wind and hydrogen for industry in Europe' in 2018, which underscored the important role for new hydrogen value chains for the industrial sector.[32] In 2019, German State Secretary for Energy Andreas Feicht said that offshore wind energy could cover a significant portion of Germany's energy demand in the future, particularly as a method for hydrogen production, and that European countries should strive to jointly develop entire value chains for hydrogen production, while the UK ambassador to Germany added that

[29] See section: 'Building a Business On Subsidies', page 23, of the 2014 CIEP Publication: *'Sunset or Sunrise? Electricity Business in Northwest Europe'*, https://ciep.energy/publications/publication/sunset-or-sunrise-electricity-business-in-northwest-europe

[30] In Figure 5 the capacity factor has been changed from 50% to 100%.

[31] REPowerEU, Europese Commissie, COM(2022)230, 2022, https://commission.europa.eu/topics/energy/repowereu_en

[32] Hydrogen is already used in refineries to make oil products cleaner, and in the chemical industry to produce methanol and ammonia, a key ingredient in nitrogen fertilizers. It could also be used in steel production to drastically reduce CO_2 emissions. See: *Offshore wind and hydrogen for industry in Europe*, IEA, 25 May 2018, https://www.iea.org/commentaries/offshore-wind-and-hydrogen-for-industry-in-europe/ for the commentary

the UK and Germany's leadership in offshore wind could be extended to also champion hydrogen production with wind power.[33] CIEP and the IEA had jointly identified Northwest Europe as well-positioned for building new hydrogen value chains, because of the pre-existing demand for hydrogen in the industrial sector and the vicinity of the North Sea offshore wind resource.[34]

In 2025, the actual progress being made, is reason for major concern. Reuters reported recently that only about a fifth of planned projects in the EU are expected to be operational by 2030, referring to companies stating that the "high costs and a lack of demand for green hydrogen have rendered many plans unprofitable".[35] The gap between ambition and reality demonstrates the extent of the green hydrogen sector's reset, Reuters wrote. In 2024, the European Court of Auditors had already called for a reality check on the 2030 hydrogen targets and argued that the EC should update the targets "so that they are ambitious but realistic".[36]

CALLS FOR RENEWED FINANCIAL SUPPORT

Already today offshore wind project developers are experiencing difficulties in their prospective business cases. This hasn't gone unnoticed. The Dutch minister for Climate Policy and Green Growth, who is responsible for deployment of wind farms in Dutch waters recently scaled back the Netherlands' 2040 ambitions.[37] However, the Dutch business community, including offshore wind players and pockets of industry, do not think this is the right answer to the challenging business environment.[38] From a European industrial-strategic perspective they could be right. A too-early decline for the offshore wind sector and limited growth prospects during the 2030s are likely to harm the sector's health, innovative drive, and future. The question is whether the positive findings from the Draghi report on the wind sector can hold true in the North Sea region, if the market starts to stagnate or shrink in the coming years. The European economy is an open economy. Other major countries in the world do not necessarily play the game of international trade and competition according to the rules that Europeans envisioned in previous decades, as emphasised in the CIEP publication 'A Game of Jenga with European Industry'.[39] Non-European companies active in the global wind energy sector, with a strong base in home markets which are not truly open to European companies, could be well-placed to target the North Sea, once demand for extra wind capacity picks up again. The EU has lost out to

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[33] *UK and Germany mull boosting cooperation on hydrogen production with offshore wind,* Clean Energy Wire, 21 November 2019, https://www.cleanenergywire.org/news/uk-and-germany-mull-boosting-cooperation-hydrogen-production-offshore-wind

[34] *Hydrogen in North-western Europe, a vision towards 2030*, IEA & CIEP, April 2021, https://ciep.energy/publications/publication/hydrogen-in-north-western-europe-a-vision-towards-2030

[35] *Green hydrogen treat poses treat to emissions targets*, Reuters, 23 July 2025, https://www.reuters.com/sustainability/climate-energy/green-hydrogen-retreat-poses-threat-emissions-targets-2025-07-23/

[36] *The EU's industrial policy on renewable hydrogen – Legal framework has been mostly adopted – time for a reality check*, special report 11/2024, 17 July 2024, https://www.eca.europa.eu/en/publications?ref=sr-2024-11

[37] *Dutch Gov't Lowers 2040 Offshore Wind Target | '50 GW Unrealistic and Unnecessary'*, OffshoreWIND, 17 July 2025, https://www.offshorewind.biz/2025/07/17/dutch-govt-lowers-2040-offshore-wind-target-50-gw-unrealistic-and-unnecessary/

[38] *Dutch Industry Sounds the Alarm after Dutch Government's plan to lower offshore wind targets*, Windpowernl, 21 July 2025, https://windpowernl.com/2025/07/21/dutch-industry-sounds-the-alarm-after-dutch-governments-plan-to-lower-offshore-wind-targets/

[39] Coby van der Linde, *A Game of Jenga with European Industry*, CIEP paper 2025-01, February 2025, https://ciep.energy/publications/publication/a-game-of-jenga-with-european-industry

China in the production of primary components for EVs, batteries, and solar panels. The EU and the countries around the North Sea cannot afford to lose out on the offshore wind sector as well.

Calls for renewed public financial support in the short term should be seen in this light.[40] Such support could surely contribute to keeping 'order books' filled in the next several years. Moreover, it seems unlikely that the offshore wind sector can continue to scale up without such support. At the same time, a departure from the earlier 'subsidy-free' approach in some countries, has an impact on earlier business cases for projects, ranging from existing offshore wind farms to conventional power plants and nuclear power plants. This should be acknowledged. It remains to be seen how robust the political support will be for renewed financial guarantees when it becomes increasingly clear that the electricity sector will be flooded with extra electricity in the 2030s, while there is insufficient demand for it.

CONCLUDING REMARKS

The offshore wind sector realistically needs a sufficiently large market for the enormous amount of energy it can supply in the 2030s. Yet it appears that offshore wind project developers are unconvinced by the policy scenarios that expect a substantial increase in demand for electricity in the region, while new hydrogen value chains need more time to develop. Their reluctance to invest in new projects under the current conditions and market circumstances automatically reduces the market dynamics in the coming years, while from a public policy viewpoint it is clearly too early for the North Sea offshore wind sector to enter a phase of stagnation or decline.

There are numerous ideas on how to improve the outlook for the offshore wind energy sector in the North Sea, but are they enough? A shared vision on the ideal development path for the sector's market size, in terms of annual installations and coordination between North Sea countries regarding the tendering calendar for offshore wind projects, will help the sector and its supply chains better to anticipate future conditions. Joint infrastructure development can help overcome challenges related to grid integration or market absorption that cannot be overcome at the national level. The North Seas Energy Cooperation aims to enable "international offshore wind projects, such as energy islands, hybrid interconnections, and cross-border grid infrastructure" while also "looking for ways to limit the spatial and environmental impact of offshore developments, and to reduce costs".[41] Countries involved are Germany, France, the UK, Norway, Belgium, the Netherlands, Luxembourg, Ireland, Denmark and Sweden, and waters covered include the North Sea, Kattegat, Skaggerak, Irish Sea, Celtic Sea and the English Channel. The Pentalateral Energy Forum is working to remove barriers to cross-border electricity trade. The participating countries are Germany, France, Belgium, the Netherlands, Luxembourg, Austria and Switzerland.

[40] *Europe's wind industry proposes New Offshore Wind Deal for Europe*, WindEurope, 10 April 2025, https://windeurope.org/newsroom/press-releases/europes-wind-industry-proposes-new-offshore-wind-deal-for-europe; *Call to Minister Hermans: ensure offshore wind rollout is safe*, NedZero, 2 Juni 2025, https://nedzero.nl/en/news/call-to-minister-hermans-ensure-offshore-wind-rollout-is-safe

[41] North Seas Energy Cooperation (NSEC), Benelux, https://www.benelux.int/en/information-for-citizens/benelux/north-seas-energy-cooperation-nsec/.

However, there are also important challenges and ideas that transcend these forums, but which are essential for the successful continuation of wind energy development in the North Sea.

1) The slow pace of electrification, the lack of growth in electricity demand in the North Sea region, and the credibility of policy scenarios that project future growth must be critically examined, while *recognising the EU's overall competitiveness problem,* as emphasised by Draghi. The energy-intense industrial sector in Northwest Europe, notably in Belgium, the Netherlands, and the German State of North Rhine-Westphalia was anticipated to absorb a substantial amount of North Sea wind electricity. Until recently, EU and national policy frameworks introduced carrots and sticks to encourage energy-intensive industrial companies to invest in energy transition projects. The implicit assumption seems to be that most companies are fundamentally competitive and can remain so in the long run. The sticks that come with the carrots then encourage these industrial companies to invest in energy transition projects for a prosperous future. Much of this policy framework stems from the pre-COVID period, before the Russian invasion of Ukraine and the energy crisis. Now, if companies lose confidence in their long-term competitiveness, the carrots will not be attractive enough and the application of the sticks will have greater negative effects than anticipated. Headquarters of international companies have a global portfolio of investment options, potentially pushing European locations down the list. If no final investment decisions are made on European energy transition projects, there will be no extra demand for electricity. Closure of industrial sites could negate any potential increase in electricity demand resulting from successes. The long-term prospects for energy-intensive companies in the region must be improved before the electrification agenda is sufficiently credible for developers of offshore wind projects. The industrial strategies and trade policies of other countries around the world must be recognised and anticipated in this regard, as noted in the CIEP publication 'A Game of Jenga with European Industry'.[42]

2) While many stakeholders are looking for ways to accelerate the electrification of currently non-electrified parts of the energy economy, hydrogen remains a key piece of the puzzle for developing the North Sea wind resource to its full potential in the long term. "Green hydrogen production at the scale we need is possible onshore as well as offshore", the North Sea Wind Power Hub initiative stressed in 2022.[43] *The EU and its North Sea partners must continuously monitor whether their R&D agendas and industrial strategies are fit for the successful commercialisation of hydrogen technologies*, that is, the transformation of an electrolyser from a laboratory concept to mass production. The cost of electrolysers, and therefore also the cost of hydrogen, is currently too high. Developing scalability and industrialisation is essential to increase efficiency, reduce costs, and enable large-scale implementation of hydrogen technologies. This was clearly not sufficiently recognised when setting the 2030 hydrogen targets. Moreover, hard lessons must be learned from the commercialisation of solar and wind technology, not least

[42] Coby van der Linde, *A Game of Jenga with European Industry*, CIEP paper 2025-01, February 2025, https://ciep.energy/publications/publication/a-game-of-jenga-with-european-industry

[43] *Unlocking the North Sea as a Green Powerplant*, North Sea Wind Power Hub Programme, September 2022, https://northseawindpowerhub.eu/knowledge/unlocking-the-north-sea-as-a-green-powerplant

regarding managing strategic dependencies in supply chains and ensuring a truly level playing field for European companies. Here too, the industrial strategies and trade policies of other countries must be recognised and anticipated.

3) There are limits to what producer mandates can achieve in various sectors of the European economy. For Europe, international competition is the norm, despite recent setbacks. Cheaper imports are often easy alternatives to European goods produced by Europe's energy-intensive industries. It remains to be seen whether instruments like the Carbon Border Tax Adjustment Mechanism (CBAM) are sufficient, given the complexity and dynamism in international value chains.[44] Moreover, strategic dependencies exist within international value chains, which are leveraged in the struggle for economic or political dominance. The 'Call for Demand Creation to Drive Industry Investments' by a broad coalition of industry associations, network organisations, knowledge institutions, NGOs and companies, should be seen as a bright light, *as it recognises the European consumer's responsibility to ensure that investments in clean production pay off*.[45] In an open letter, signatories stressed the need for a policy and regulatory framework that creates demand for clean products. The EC reaffirmed the idea in their communication of 28 February 2025, indicating that "The Clean Industrial Deal will put the conditions in place for this demand to emerge. Creating lead markets for European clean technologies and products will better position the EU as a global leader in the clean transition."[46] Such an approach is a very important supplement to Europe's existing sustainability framework, although some weeding in the rules and regulations would be welcome as well. It should be noted, however, that it probably offers insufficient relieve to European companies targeting export markets, which are also essential to Europe's prosperity. Moreover, stronger coordination by the EU, and probably with OECD[47] partners, remains indispensable to address the weaponisation of strategic dependencies in international trade.

The Esbjerg Declaration[48] and the Ostend Declaration[49] demonstrate political support for the offshore wind agenda at the highest level in Belgium, Denmark, the Netherlands and Germany, as well as in France, Norway, the UK, Ireland and Luxemburg. These groups should continue to work on the success of offshore wind energy in the North Sea and reach out to other European and OECD partners for topics such as the commercialisation of hydrogen technologies, while at the same time managing strategic dependencies.

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[44] See section: 'Grappling with new curve balls', page 30-31, of the 2025 CIEP Publication: *A Game of Jenga with European Industry*, CIEP paper 2025-01, February 2025, https://ciep.energy/publications/publication/a-game-of-jenga-with-european-industry

[45] *Call for Demand Creation to drive Industry Investments*, 12 December 2024, https://www.demandcreation.eu

[46] European Commission, The Clean Industrial Deal: A joint roadmap for competitiveness and decarbonisation, COM(2025) 85 final, [COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS], https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52025DC0085

[47] Organisation for Economic Co-operation and Development.

[48] *The Esbjerg Declaration on The North Sea as a Green Power Plant of Europe*, May 2022, https://regeringen.dk/aktuelt/tidligere-publikationer/the-esbjerg-declaration/

[49] *Ostend Declaration of Energy Ministers on The North Sea as Europe's Green Power Plant delivering Cross-Border Projects and Anchoring the Renewable Offshore Industry in Europe*, April 2023, https://northseasummit23.be/en/ostend-declaration/.

Meanwhile, researchers must continue to work on understanding the development of the new value chain in Europe's dynamic market economies, in a rapidly changing international context. Are the current institutional and policy arrangements in the EU and the North Sea countries fit for developing this great new energy resource? What kind of coordination is currently lacking and cannot be orchestrated by commercial market players in the current highly competitive market environment? Can risks and benefits currently be distributed fairly across the new value chains, or do fragmentation of value chains and the previous disintegration of companies lead to higher risk profiles for new ventures? Can capital markets be tapped more efficiently to keep financing costs for capital-intensive projects reasonably low? What is the precise role of competition in the market, for the government, for state-owned enterprises, and for public-private partnerships? Draghi's heirs, working on incorporating his advice, might want to take some of these questions on board.

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