



Budgeting megaprojects for success during uncertain times

Insights into how developers and operators across the energy value chain can adapt to the increased market and price volatility when budgeting megaprojects.



Content

Key insights

for the quick reader. How to budget megaprojects for success during times of high commodity price volatility.

Expected renewable energy capacity

Renewable energy capacity in Denmark is expected to grow ninefold by 2049.

Uncertainty and volatility challenge megaprojects

Rising interest rates and increased commodity price volatility challenge megaprojects.

KPMG's three-step model to budget for success

KPMG proposes a three-step model to budget megaprojects for success.

Key insights

Investments come at a time where there are surging interest rates and high commodity price volatility

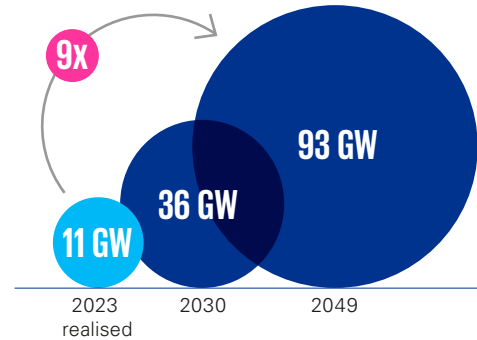
Denmark has high ambitions for a massive capacity expansion of renewable energy and low-carbon technologies.¹ To realise this, robust value chains must sustain the large-scale expansion. Yet, value chains are becoming increasingly disrupted. In addition, developers and operators who wish to budget megaprojects for success are facing surging interest rates and commodity price volatility, casting doubts on their ability to stay competitive. To seize profitable growth opportunities and meet the expected capacity, developers and operators must address these challenges correctly when budgeting megaprojects.

Navigating commodity price volatility and correlations between cost elements will be defining factors for successfully budgeting megaprojects

The growing demand for renewable energy and essential commodities, such as steel and copper, has led to increased competition and higher prices on a global scale. Meanwhile, uncertainty in the global economy, supply chain disruptions, and surging inflation have contributed to significant increases in the volatility of commodity prices during 2020–2024M3 compared to 2017–2019.² In addition, during volatile times, commodity prices tend to become more strongly correlated, leading to an amplified effect of volatility.² Therefore, it is imperative that developers and operators enhance their capabilities and find effective and transparent solutions to these challenges to remain competitive in a challenging and uncertain market.

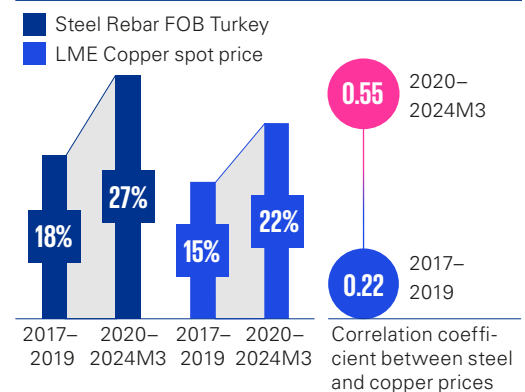
Renewable energy capacity* in Denmark is expected to grow ninefold by 2049

Forecasted capacity of renewable energy¹, GW



Volatility in commodity prices has risen significantly during 2020–2024M3

Annual standard deviation in respective period², %



To budget megaprojects for success in an uncertain market, KPMG proposes a three-step model:

01 Identify correlations between cost elements in the budget

Explore and identify the degree to which cost elements in the megaproject correlate with each other. A price increase in one cost element may have adverse effects on other budget elements.

02 Estimate a viable contingency for unforeseen risks

Use historical performance and data-driven benchmarks to estimate a competitive CAPEX contingency based on the complexity of the asset and type of megaproject.

03 Identify the potential losses for the megaproject

Estimate the exposure to price risk with respect to the duration of construction and installation, contractual conditions, and procured materials. The result will reflect potential losses until the asset is commissioned.

¹ Danish Energy Agency (2023).

² Bloomberg and own calculations.

* Renewable energy refers to solar PV, onshore and offshore wind. Due to rounding, some totals may not correspond with the sum of the separate figures.

The capacity of renewable energy will be nine times its current level by 2049

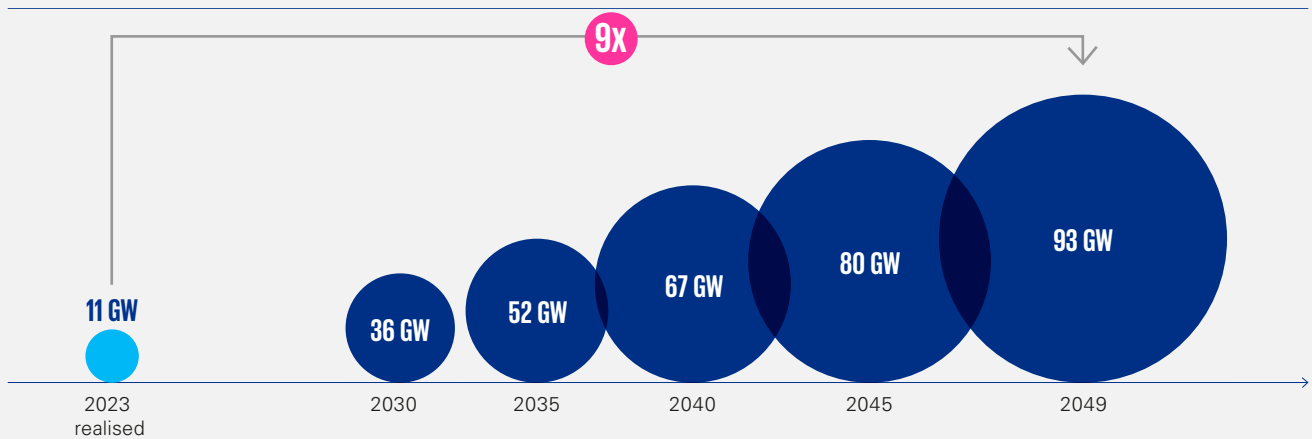
From 11 to 93 GW: Meeting Denmark's expected capacity for renewable energy

In 2023, Denmark realised a capacity of 11 GW solar PV, onshore and offshore wind energy, but the expectations for 2049 are staggering, with a projected capacity of 93 GW as presented in figure 1.³ Such a large-scale expansion will require significant investments across the value chain, including from the financing mechanisms of projects; the supply chains that provide the commodities needed; and the

installation and construction required to support this build-out. Yet, renewable energy represents only a fraction of the overall capacity expansion. Other sectors, such as hydrogen, (upgraded) biogas, CCS, and CCUS are expected to grow significantly by 2049.³ These developments all require similar basic materials and infrastructure, thus highlighting the challenge of delivering such a large-scale expansion.

Figure 1. The capacity of renewable energy in Denmark is expected to increase nine times its current level by 2049*

Forecasted Danish capacity of solar PV, onshore and offshore wind³, GW



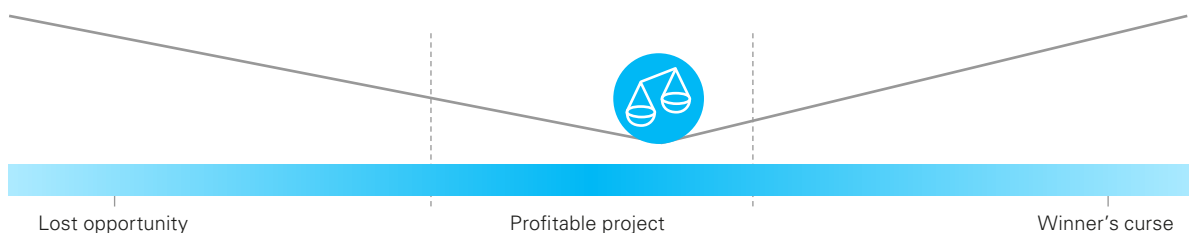
The value chains are currently imposing great challenges to budgeting a profitable megaproject

To realise the ambitious target for renewable energy and low-carbon technologies, significant investments into the value chains are required. However, the investments come at a time when interest rates are surging and prices are more volatile, amplifying the risks and uncertainty for developers and operators trying to budget for success. Capturing these chal-

lenges correctly is essential for players across the sectors to budget effectively and seize profitable growth opportunities. Players must find a balance between overly conservative budgets that could lead to lost opportunities and overly optimistic budgets that would result in the winner's curse.

Conservative budget

Optimistic budget



³ Danish Energy Agency (2023).

* Due to rounding, some totals may not correspond with the sum of the separate figures.

Steepening commodity price volatility and labour shortage challenge megaprojects

Higher prices, increasing volatility and higher levels of labour shortage pose as barriers to the green transition

The transition to renewable energy drives demand for an extensive workforce, particularly in the industry and construction sectors, and for essential commodities such as steel, copper, and aluminium. The green transition is happening on a global scale and calls for the same resources evidently leading to higher prices and increased competition. Meanwhile, uncertainty in the global economy, supply chain disruptions and surging inflation have contributed to a significant

increase in the volatility of commodity prices in recent years. As shown in figure 2, the annual steel price volatility has increased by almost 10 percentage points to 27% during the period of 2020–2024M3 compared to 2017–2019.⁴ Likewise in figure 3, the industry and construction sectors report significantly higher levels of labour shortage evidently limiting their ability to meet demand.⁵

Figure 2. The volatility in commodity prices during 2020–2024M3 is significantly higher than in 2017–2019

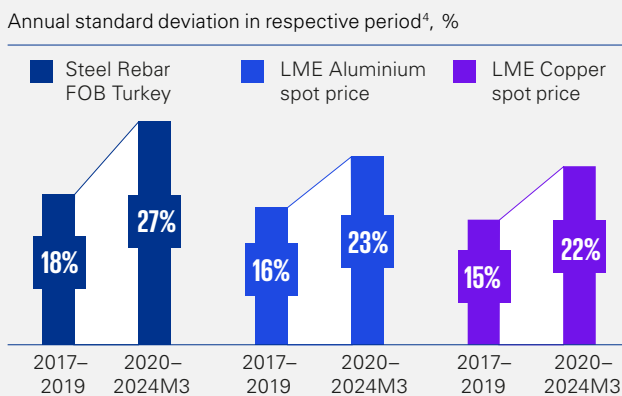
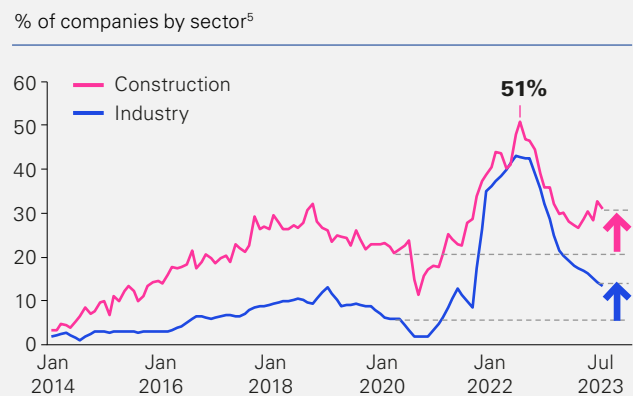


Figure 3. % of Danish companies within construction reporting labour shortage reached record high levels during 2022



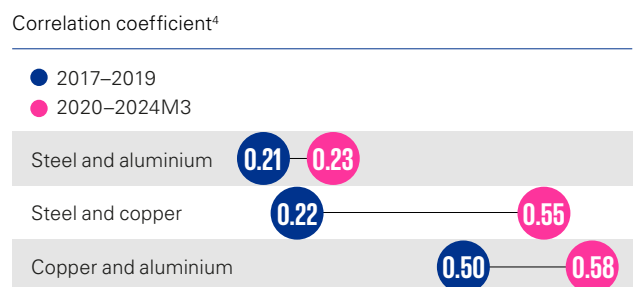
Risk management during uncertain times is even more important as prices tend to correlate more

The increased volatility in commodity prices and higher levels of labour shortage impose a great challenge for developers and operators, as they attempt to budget for success in an increasingly uncertain market. Price volatility and labour shortage affect projects across their maturity; from the pre-FID stage through construction and installation phases, exposing them to higher risk.

In addition to the general increase in volatility in commodity prices during uncertain times, prices tend to become more strongly correlated. In figure 4, the correlation coefficient between steel and copper is 0.22 during 2017–2019. During 2020–2024M3, however, the correlation coefficient is 0.55.⁴ Evidently, if the price of steel increased by 1 EUR it would yield an increase in the price of copper by 0.55 EUR. Since commodity prices correlate more during uncertain

times, it calls for a heightened sense of awareness and thus new ways of budgeting to account for the amplified effect of co-movement in commodity prices.

Figure 4. The correlation coefficient between commodity prices is significantly higher during more uncertain times



⁴ Bloomberg and own calculations.
⁵ Danish Ministry of Finance (2023).

Increased risk levels affect the value chain for financing megaprojects

Steepening long-term yields pose major funding challenges for megaprojects

Renewable energy and low-carbon technology companies tend to carry higher levels of gearing compared to oil and gas firms. Debt sourced through bonds and project financing, secured against long-term power purchasing agreements, has driven the rapid expansion of renewables.⁶ However, with long-term bond yields increasing, as seen in figure 5, the cost of borrowing has increased substantially and could limit the industry's ability to execute viable

megaprojects through debt financing.⁷ Coupled with heightened market volatility, firms may face challenges sourcing long-term financing at reasonable costs. Furthermore, the negative term spread, which often signifies an impending economic slowdown, reflects broader instability across money markets, increasing investors' perceived risks in the short-term and potentially exacerbating volatility.

Figure 5. The increasing yields translate to costly capital which compromises the success of megaprojects

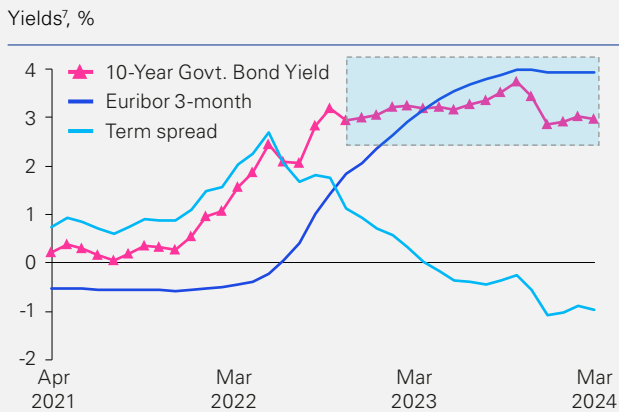
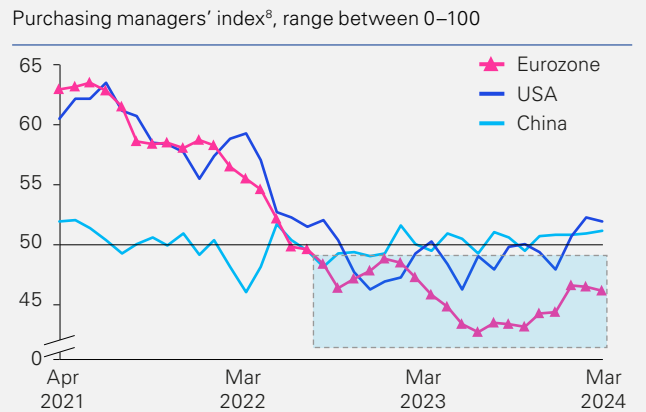


Figure 6. The Eurozone purchasing managers' index (PMI) for manufacturing suggests continuous supply chain issues



A consistent low Eurozone PMI suggests persistent challenges in the manufacturing sector

The purchasing managers' index (PMI) is a key economic indicator derived from surveys of purchasing managers across industries, reflecting factors such as production, new orders, employment, supplier deliveries, and inventories. PMI values above 50 indicate expansion, while values below 50 suggest contraction. The PMI holds significant importance as it offers timely and forward-looking information. The notable divergence between the Eurozone's PMI in figure 6, averaging between 42 and 46 over the period from July 2022 to March 2024, and those of the USA and China, signifies underlying differences in economic performance.⁸ The consistent lower Eurozone PMI suggests persistent challenges within its manufacturing sector, reflecting expectations of continuous supply chain issues.

Industry expert from the Danish transmission system operator, Energinet, confirms the challenges

Kristian Snog Folmann, Senior Director at Energinet Corporate Purchasing, confirms the notable increase in uncertainty, particularly in the Eurozone. Kristian argues that:

"Besides the increase in commodity price volatility, processed components derived from these commodities have witnessed a significant surge in pricing, creating additional market turbulence. This is further compounded by delivery delays stemming from limited production capacity".

Developers and operators will need to take action to address these challenges and manage risks effectively in the years ahead to successfully develop robust megaprojects.

⁶ Wood Mackenzie (2024).
⁷ ECB and own calculations.
⁸ Bloomberg and S&P Global.

KPMG proposes a three-step model to budget megaprojects for success

There is a need for creating transparency to properly identify the risks associated with prices

The world has changed, as reflected in the increased price volatility, labour shortage, and interest rates that have challenged existing practices of developing megaprojects. In today's environment, the renewable energy and low-carbon sectors can no longer rely on efficient project management and traditional budgeting approaches. These megaprojects have a long planning and construction phase that expose them to the increasing volatility in commodity prices, and other external risk factors. To meet the large demand for renewable energy and seize profitable growth, the industry must foster transparency in budgeting and risk management. By doing so, developers and operators can navigate market and price uncertainty, and to a large extent mitigate external price risk factors that may otherwise compromise the success of the megaproject and reduce its appeal as an attractive investment opportunity. KPMG has developed a three-step model that improves transparency and

refines the budget of a megaproject, which will help developers and operators gain competitiveness in a challenging and uncertain market. The three-step model is presented below.



Efficient project management can only take us so far. Improving transparency around prices and dependencies in the megaproject budget is crucial to effectively mitigate external risk and take informed decisions.

Kristian Snog Folmann

Senior Director at Energinet Corporate Purchasing



01 Identify correlations between cost elements in the budget

Megaprojects essentially consist of the same, few commodities and the prices of these are highly correlated. From the moment these are contracted and up until installation or end of contract, prices may have significantly changed. Given the correlation between these commodities, a price hike in one commodity can have adverse effects on the others. It is essential to identify to which degree the cost elements in the budget correlate. Understanding the correlations helps to take preventative measures proactively and establish a proper hedging strategy.



02 Estimate a viable contingency for unforeseen risks

Megaprojects are prone to go over budget and time due to their complex nature. Therefore, budget contingencies are set to reduce the risk of budget overruns. Yet, developers and operators have often adopted a one size fits all approach across all types of megaprojects. In highly competitive markets, a proper CAPEX contingency is vital given its impact on the business case. It is essential to overcome the one size fits all approach by considering specific project complexities using performance-based data and benchmarks to estimate a competitive contingency.



03 Identify the "Value at Risk" potential losses for the megaproject

Megaprojects take a long time to be built and commissioned, exposing developers to price changes during the construction and installation phases. A recommended best practice is to identify and estimate the "Value at Risk". This includes identifying potential losses that could occur due to price volatility. This approach should be adapted to include the duration of construction and installation, contractual conditions and materials, ensuring that the calculated potential loss and risk is a weighted average between all essential components that go into the budget.



Let's connect

If you wish to find out more about KPMG's work on megaprojects and our three-step model, please do not hesitate to reach out to our dedicated Energy & Green Transition team.

Energy & Green Transition addresses core parts of the green transition, and works with strategy, CAPEX projects and operations across the energy value chain.



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