

We are *not on track* to meet the Paris Agreement's objectives. What should we do?

World Energy Markets
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How to make
money from
renewables?





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1. Wind, solar, and nuclear energy are all struggling to attract investment. Because of this, government intervention is often necessary. For example, the UK's RAB model for nuclear and CfD for offshore wind are examples of such interventions. Major oil and gas companies see renewables as costs rather than value-generating assets.
2. Renewable energy is less profitable than oil and gas. However, fossil fuels are still subsidized in many parts of the world.
3. Companies need to change how this business is viewed, managing it as an asset.
4. Diversification of client base – need a risk portfolio, some assets traded on market, some in PPAs, some for storage

Introduction

The last decade has seen a surge of renewable capacity as the industry has experienced remarkable growth spurred by increasing environmental concerns and technological advancements. Global renewable capacity increased 12% in 2023, driven by solar PV and wind.

A recent International Renewable Energy Agency (IRENA) report showed that almost two-thirds of renewable power added in 2022 had lower costs than the cheapest coal-fired options in G20 countries, despite cost inflation.

However, despite the growth in capacity and generation, the sector continues to suffer from relatively low profits compared to traditional power generation, like coal or gas-fired plants.

Cost reductions, particularly in solar PV, and efficient engineering and supply chains are crucial for improving margins. Government policies, such as the U.S. Inflation Reduction Act, provide vital support, but regulatory challenges persist, especially in Europe.

Diversification, including renewable hydrogen and energy storage, offers new revenue streams. Additionally, addressing challenges like negative power prices through energy storage and grid modernization is essential.

Ultimately, most successful renewables players activate various strategies to enhance profitability, emphasizing the importance of operational excellence, policy support, well-executed financial discipline and innovation, particularly in the context of increasing negative power price periods due to over capacity.



Renewable energy: Growth and profitability trends

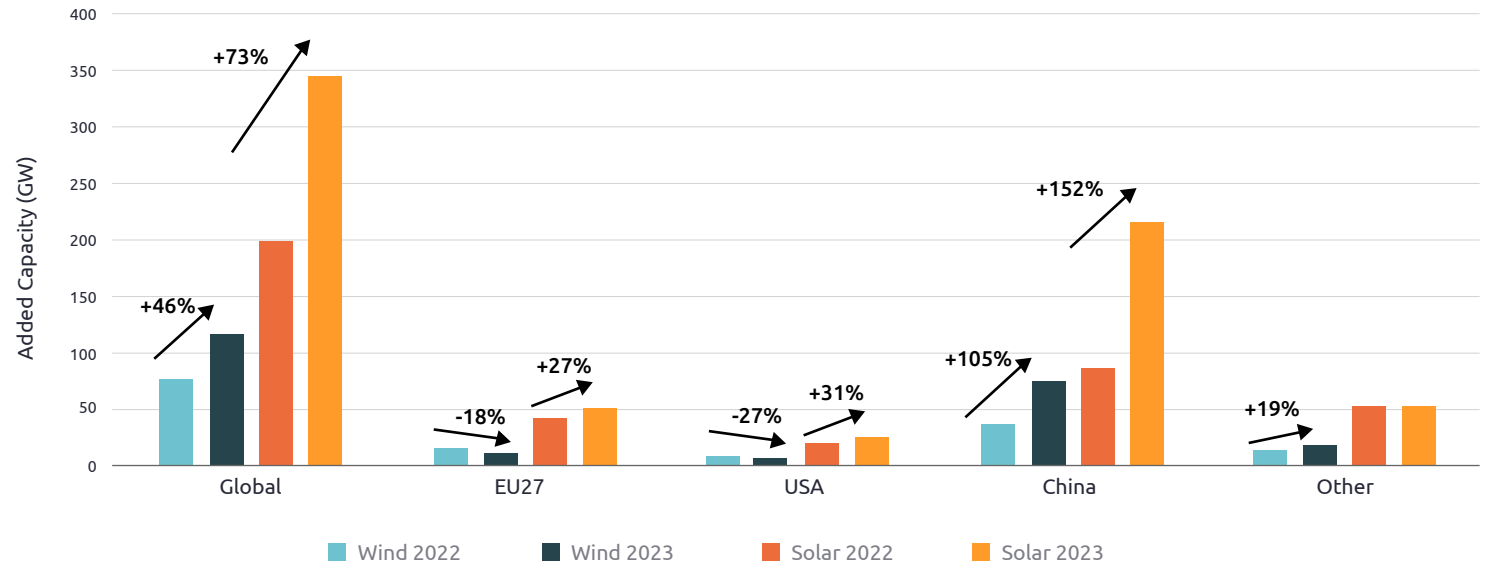
The renewables industry has seen remarkable growth in recent years. According to IRENA, in 2023, global renewable energy capacity increased by as much as 12%, hitting 3,372 gigawatts (GW). Solar PV and wind power were the two leading sources of growth, with 20% and 10% growth rates, respectively. In the first half of 2024, EU's wind and solar power even surpassed fossil fuels, reaching a share of 30% of electricity generation.

Global spending on renewables also hit a new record of \$735 billion in 2023, driven by solar PV and wind.

- North America: The USA saw a significant increase in utility-scale solar capacity, adding nearly 24 GW in 2023, driven by federal incentives and state-level mandates. However, wind capacity additions lagged, with only 8 GW added due to permitting delays and supply chain issues.
- Europe: The EU's REPowerEU plan aims to reduce dependence on Russian fossil fuels and accelerate the green transition. In 2023, Europe added 40 GW of renewable capacity, with a strong focus on offshore wind and solar PV. However, profitability remains a challenge due to high land and labor costs.
- Asia: As show in figure 1. China continues to lead in renewable energy capacity additions, with close to 300 GW added in 2023. The country benefits from lower production costs and economies of scale but faces challenges in grid integration and curtailment.

Despite this growth, renewables still have the lowest profit margins compared to other energy sector capacities. Coal, or oil and gas are more established industries than renewables and possess a level of profitability that renewables struggle to achieve.

FIGURE 1
Global added wind and solar capacity in 2022 and 2023



Source: Renewable Energy Capacity Statistics 2024 (IRENA)



However, while renewable companies in advanced economies saw improved profitability in 2023, lower prices for natural gas and deeper market penetration by low-cost renewables are starting to put pressure on wholesale electricity prices, creating uncertainties for their revenue streams.

In 2023, the weighted average net margins of renewable energy companies were significantly lower compared to large utilities and oil majors. For instance, according to the International Energy Agency (IEA), while oil majors reported net margins of around 10-15%, renewable energy companies averaged around 5-10%, as show on figure 2. This is why strategic steps must be taken to ensure the profitability of renewables.

Considering this gap between the internal rate of return (IRR) on oil and gas and on wind and solar, it's unsurprising that most of the oil & gas companies stick to their core business. While it's easier to invest in wind and solar, these companies have less of a competitive advantage in electricity markets, which are more volatile than oil markets.

Renewables also rely on subsidies and tax credits. Even if these incentives are quickly decreasing in many parts of the world, they can make renewables look more attractive in the near term without creating a more volatile spot market for electricity. Corporate power-purchase agreements can offer more reliable revenue streams. But often very large-scale renewables projects will need to compete in more volatile power markets.

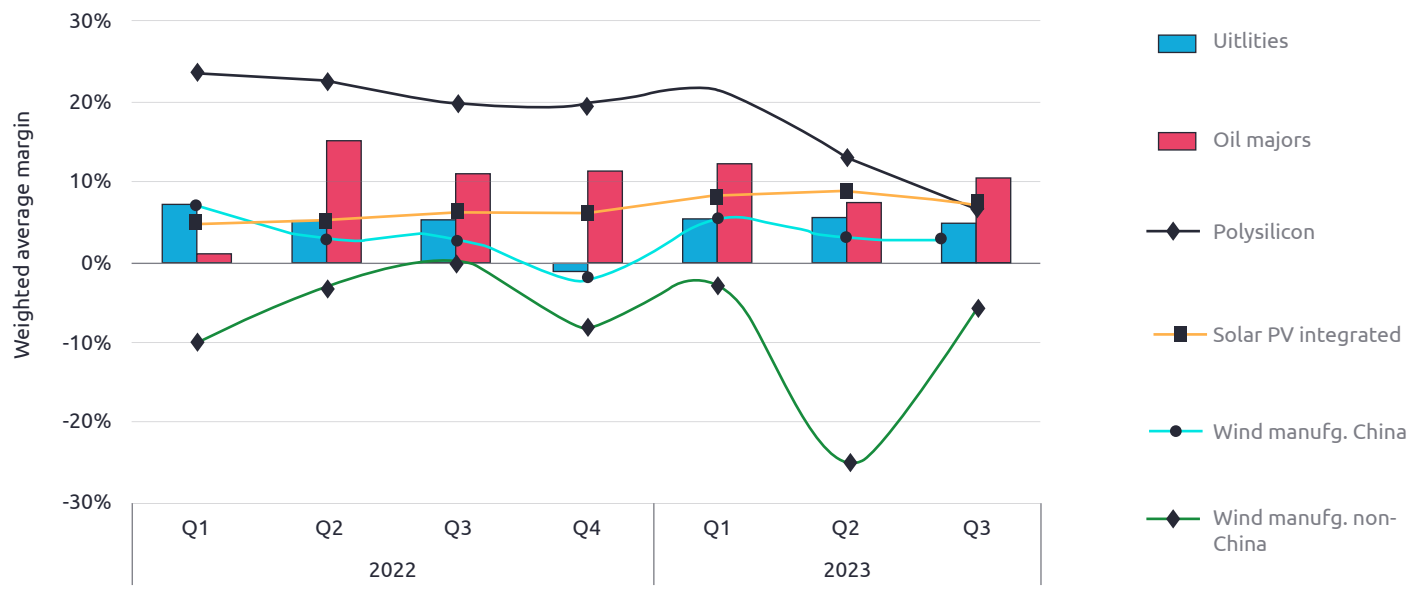
Support mechanisms is not a new phenomenon in energy systems: Fossil-fuel subsidies surged to a record \$7 trillion in 2022 according to the International Monetary Fund (IMF), the equivalent of 7.1% of the global gross domestic product.

Expecting renewables to achieve self-sufficiency without significant reforms in electricity markets is unrealistic. It's time to acknowledge that renewables won't reach a level of self-sufficiency that has never been demanded of coal, oil, and gas.

Nevertheless, the more mature renewable energy players are now looking to optimize their capital and operational expenditures and differentiate themselves through innovation, their goal being to increase profitability and reach levels of IRR way above 10%. They intend to do this while quickly growing their assets base.

FIGURE 2

Weighted average net margins of renewable energy companies, large utilities and oil & gas majors



Source: IEA, Renewables 2023



Boosting profitability across the renewable value chain

Increased market competition, coupled with reduced government support, rising capital costs, and inflation, is putting pressure on renewable returns. The days of 'invest and forget' in the renewable energy industry are over. Renewable executives are now looking for ways to operate more efficiently and find new revenue sources.

Historically, industry management has focused primarily on growth and investment, often overlooking cost control. The Levelized Cost of Energy (LCOE) has declined significantly in the last decade. Utility-scale solar fell from \$79 to as low as \$29 per MWh by June 2024, and onshore wind from \$74 to \$50 per MWh on average, according to Lazard's latest report. The main factors behind this decline are cheaper solar modules and wind turbines, larger turbine blades capturing more power, and improved operational practices (e.g., better planning and execution of maintenance).

In parallel, as renewable companies have expanded, their level of corporate complexity has grown exponentially. The increased number of assets, geographic spread, and diverse technology partnerships has made it more difficult to manage and track asset performance, as well as to make informed decisions and operate efficiently.

Additionally, companies are more exposed to merchant risk as the share of feed-in tariffs declines, and as cost pressures increase from reverse auctions.

Cost reduction strategies

To cope with the challenges of the new environment and drive their profitability, companies will need to focus on optimizing their activities to reduce costs at each phase of a renewable asset lifetime. This is especially true in early phases of a project, which represent 80-90% of the CAPEX and OPEX.

Improving efficiency during the origination and development phase

Project origination and development typically accounts for 40-45% of the total financial value creation, including costs for site selection, permitting, interconnection and securing financing. Developers constantly scramble to identify new sites with increasing speed. Standardizing their approach with the right toolbox for the team in charge of origination, improving the monitoring of their pipeline through commercial excellence programs, and increasing the efficiency of the development processes are some of the levers that can be activated.

Industrializing engineering and leveraging technology and digitization in renewable energy system design

Engineering and construction (E&C) represents about 40-45% of the value creation. It involves the design of the renewable energy system and its actual building and installation.

In engineering, for instance, operators will need to optimize plant design to maximize wind yield and minimize costs. Advanced analytics solutions can, for instance, help them optimize wind farm design to increase the energy yield.

Optimizing equipment choices is also important, as equipment typically accounts for over half of the CAPEX in new renewable projects, with costs rising as projects scale. Technological advancements, especially in major machinery like larger turbines, cheaper solar modules, and better software, have contributed to lowering LCOE. Taking advantage of the most advanced technology with optimized set up can also be a source of improved CAPEX efficiency.

More experienced companies are leveraging industrialized engineering to expand and standardize their wind and solar engineering capabilities globally. By establishing their own engineering centers, or outsourcing to engineering partners in low-cost regions, they can benefit from cost optimization, predictability, and access to a specialized pool of engineers who can work according to their standards and processes.

Efficient management of construction costs and timelines

Construction delays and cost overruns can negatively impact returns, with a negative cost deviation of 5-10%, potentially erasing a developer fee. Efficiency during the execution phase is, therefore, critical. Better contracting strategies (e.g., massifying procurement, optimizing EPC prices), combined with improved work planning and construction readiness (e.g., harmonizing KPIs for EPC performance, standardizing construction organization, enforcing use of standard project control tools, improving claims management) can reduce cost uncertainty.



Excellence in industrialization, operations and digitalization

The Operation & Maintenance (O&M) stage typically accounts for 15-20% of the value creation. This includes maintenance and operational management. Effective O&M practices can reduce downtime and maintenance costs, thereby improving IRR. Predictive maintenance and advanced monitoring systems can also enhance operational efficiency.

Ramping up from several to hundreds of GW portfolios requires both intense M&A and integration activities, and fast-paced operation scaling. Consequently, renewable players generally end up with unoptimized organizations and colorful landscapes of business processes and IT/OT urbanizations. To restore profitability and operational cost-efficiency, the renewable industry must undergo a deep transformation. This includes adopting industrialization strategies, excelling in operations, rationalizing the IT portfolio, and implementing data-driven architecture and business processes.

Unlocking operational agility and scalability

Determining the most scalable target operating model begins with a thorough core/context analysis, pinpointing key differentiating activities and margin generators, along with the best candidates for outsourcing. Effective industrialization relies on a clear strategic intent, trust in the partner ecosystem handling outsourced tasks and the seamless efficiency of continuous processes, ultimately creating an extended enterprise.

Achieving operational excellence

Developing a best-in-class and granular asset operations program and ensuring the deployment of the improvement levers at scale supports profitability. Clear and standardized business processes reduce operational hurdles, improve collaboration and reduce contingency costs in execution, and increase asset profitability in operation. This will also enable a focus on assets that generate the most value and/or have the greatest potential for improvement.

Additionally, building an asset performance monitoring solution can facilitate continuous improvement by sharing common tools and key performance indicators. This can help set target operating expenses for different types of plants.

Optimizing O&M contracts

Establishing appropriate KPIs and optimal service-level agreements (SLAs), benchmarked against similar sites and leading O&M providers, is essential to ensure performance and asset availability. Asset availability KPIs are considered more accurate than production level KPIs to evaluate O&M services.

Implementing a bonus/penalty mechanism in contracts incentivizes partners to meet or exceed performance goals, particularly in downtime avoidance. Penalties are typically capped at the contract's annual value, while bonuses can reach up to 50% of the contract value for surpassing SLA targets.

Performing regular audits and benchmarks of assets and O&M providers are crucial. This includes evaluations of service catalogs, SLAs, innovation, technology and competencies. Extending these audits to equipment and spare parts providers is essential due to the impact of their quality on operations.

Securing long-term maintenance contracts could lead to cost savings through economies of scale and by maintaining high-quality standards. This is because service providers typically offer discounted rates for guaranteed long-term commitments.

Innovation & digitization

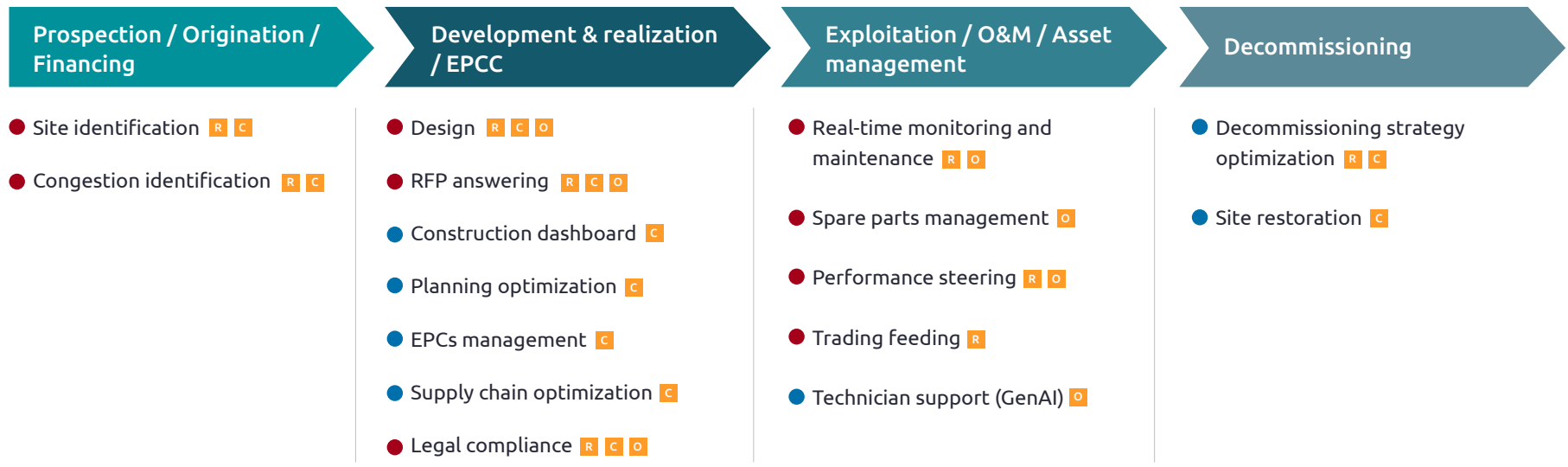
Streamlining IT/OT landscape via post-merger integration and strict tooling guidelines while expanding portfolios, is key to enhancing and sustaining profitability. Adopting new technologies and data-driven asset management processes (e.g. performance forecasting, maintenance optimization and weather management) boost performance and reduces asset TCO. These advancements ensure business processes evolve, maximizing the value of technology integration.

Figure 3 illustrates how the widespread availability of internal and external data and use friendliness, drive innovation across the renewable energy value chain. Organizations now focus on unified architecture, database and advanced analytics to enhance asset intelligence. Top asset managers use comprehensive datasets to create smart dashboards for CxOs, utilizing GenAI for real-time resource and investments decisions.



FIGURE 3

List of data-driven Use-cases along the renewable value chain



- Transversal**
- Portfolio vision **R C O**
 - Financial vision **R C O**
 - Digital twin **R C O**
 - Stakeholders mgt **L**
 - Sustainability **L B**
 - Workforce safety **L B**

Legend

Priority **P1 P2**

Impact

- R** Revenue
- C** CAPEX
- O** OPEX
- B** Brand image
- L** License to operate



Better financing

Since renewable projects are capital-intensive, access to low-cost financing and favorable terms can enhance IRR.

To improve financing renewable power assets, it's essential to define a financing strategy tailored to the project's context – location, technology, regulatory environment, and risk profile. Early access to non-recourse financing, which relies on project assets rather than the developer's balance sheet, can significantly enhance financial stability and attract investors without over-leveraging the company.

Exploring new financing schemes, such as green bonds, public-private partnerships, or crowdfunding, can create innovative funding opportunities. Diversifying funding sources reduces reliance on traditional lenders and boosts financial flexibility.

Additionally, industrializing the financing process and optimizing modeling streamlines operations and can improve accuracy. Developing robust templates, checklists, and replicable procedures, can significantly reduce time, costs, and complexity from project conception to financial close, which is particularly beneficial when scaling portfolios of projects.

A best-in-class organization is required to support the financing process effectively. Invest in top-tier tools and skilled personnel to ensure models are robust, transparent, and adaptable.

Adjusted ownership strategies

Using farm-down as sources of funding

In the dynamic renewable energy sector, companies must adopt adjusted ownership strategies to remain competitive and maximize long-term portfolio value. This involves capital recycling, structured products, and active asset management throughout their lifecycles.

Using non-conventional funding sources, such as farm-downs, divestment of non-core assets, and hybrid capital, can provide additional financial flexibility. The farm-down or "Build-Sell-Operate" (BSO) model allows developers to sell stakes in their renewable assets at various development stages to institutional investors seeking long-term, stable yields.

By selling a portion of their mature assets, companies can de-risk their investments, secure immediate capital, and still benefit from future returns. BSO is less capital intensive due to debt deconsolidation, sell-down margin, and limited equity injection. An example is TotalEnergies Renewables' \$689 million deal in 2023 for a 25.5% equity stake in the Seagreen offshore wind farm. Several players like Orsted, Engie, EDPR or Nextera also have implemented farm-down strategies.

Regularly evaluating the portfolio to identify assets suitable for divestment helps optimize the asset mix and maintain a high-performing portfolio.

This approach can be industrialized by implementing standardized procedures for executing farm-down deals, including thorough due diligence, accurate asset valuation, and strategic partner selection to ensure favorable terms and successful transactions.

Diversification and innovation

Two key ways to boost profitability are diversifying revenue streams and innovating to maximize the value of renewable electrons

Renewable hydrogen, biofuels, and energy storage are providing new markets and revenue streams. For example, as demand for clean hydrogen increases, this could become a significant source of revenue.

Renewable energy can be made more profitable by combining its output with other sectors, using synergies to stimulate growth and create partnerships with other industries. For example, partnerships with electric vehicle charging operators can lead to increased demand for renewable energy, boosting revenues for renewable players.

Diversification and new revenue stacking will mainly be enabled by the accelerated deployment of large-scale battery energy storage systems (BESS), as battery prices reduce. BESS will play a crucial role in building a new paradigm: while current electricity markets assume electricity cannot be stored, the introduction of a flexible generation asset will offer developers opportunities to generate new revenue from renewable generation, such as arbitrage trading on the wholesale market, capacity payments, and monetized ancillary services.

Therefore, the development and integration of BESS is crucial for diversifying renewable revenue streams. Rapid advancements in battery management technology are essential to ensuring the long-term reliability of storage assets and their seamless integration into grid infrastructure and trading ecosystem.



Leveraging government policies and regulatory support

Renewable players can leverage government support and regulatory frameworks to enhance their financial performance

In the USA, the Inflation Reduction Act has been instrumental in supporting renewable energy projects through substantial subsidies, tax credits, and grants. For instance, the act provides a 30% tax credit for solar and wind projects, significantly improving their economics. Streamlining permitting processes can also cut project timelines up to 50%, enabling quicker deployment and faster returns on investment.

In Europe, the European Union’s Green Deal and REPowerEU plan offer robust policy support for renewable energy. However, regulatory complexity and permitting delays remain significant challenges that can hinder project timelines and profitability.

In the UK, recent energy policies have introduced new incentives and support mechanisms to boost renewable energy investments, although specific details are pending.

In Asia, China has implemented aggressive policies to support renewable energy, including subsidies and favorable tariffs. Despite these efforts, regulatory uncertainty and grid integration issues continue to pose challenges.

These geographical contrasts highlight the varying levels of policy support and regulatory environments that impact the profitability and development of renewable energy projects worldwide.

Addressing negative power prices

The growing phenomenon of negative power prices from renewable energy overproduction poses a serious profitability challenge. In regions like southern Australia and southern California, wholesale electricity prices have been negative for about 20% of the time since last year. Similarly, Europe’s key economies saw record hours of zero or negative prices in early 2024 at times of low demand.

Producers must more frequently pay to offload power or stop their plants when supply of electricity exceeds demand, leading to price drops. Prolonged negative prices could threaten new and existing renewable energy projects due to curtailment risks.

To address this issue, several strategies can be implemented:

1. **Curtailment:** Intentional reduction of generation when prices are too low or negative can safeguard profitability. In 2023, Britain’s wind farms curtailed 5% of output, losing 4.3 TWh, costing £300 million in constraint payments.
2. **Energy storage solutions:** Investing in batteries to store excess energy stabilizes prices and improves profitability. According to the IEA, without storage or other flexibility sources, developers “may see a drop in potential revenues during peak generation – hampering profits and discouraging investment.”
3. **Demand response programs:** Incentivizing consumers to shift energy usage to off-peak times balances supply and demand, reducing negative prices. European countries are particularly focused on these programs.

4. **Grid modernization:** Upgrading grid infrastructure to better integrate renewable energy sources and manage fluctuations enhances grid stability and reduces negative pricing events. The USA and European countries are investing heavily in grid modernization efforts.





Our Convictions

- Get granular by drilling down in the OPEX and CAPEX structure to identify optimization levers. A detailed analysis in origination and development activities, engineering and construction costs and asset operations can reveal cost and efficiency opportunities.
- Standardize business processes and deploy top-tier asset management practices to streamline onboarding of new team members and partners, while also enabling continuous benchmarking of assets, especially as it relates to those generating the most value.
- Adopt scalable and flexible operating models to excel across the value chain, whether in-house or outsourced. Companies need clear make-or-buy decisions, a defined role for OEMs (especially for O&M activities) and lean site operations.
- Embrace digital solutions to boost efficiency and enable data-driven decisions. These tools are crucial for staying competitive throughout the asset life cycle—from site identification to project execution, predictive maintenance, and revenue analysis.
- Improve project financing by streamlining the process with skilled personnel and tools; adjust ownership strategies to generate additional revenues and maximize the asset portfolio value.
- Continuously innovate and diversify. This will be essential to optimizing profitability.



About Capgemini

Capgemini is a global business and technology transformation partner, helping organizations to accelerate their dual transition to a digital and sustainable world, while creating tangible impact for enterprises and society. It is a responsible and diverse group of 340,000 team members in more than 50 countries. With its strong over 55-year heritage, Capgemini is trusted by its clients to unlock the value of technology to address the entire breadth of their business needs. It delivers end-to-end services and solutions leveraging strengths from strategy and design to engineering, all fueled by its market leading capabilities in AI, cloud and data, combined with its deep industry expertise and partner ecosystem. The Group reported 2023 global revenues of €22.5 billion.

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