

INNOWIND India & Denmark

# OFFSHORE WIND: BEST PRACTICES



Knowledge sharing on establishing and supporting an offshore industry





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# OFFSHORE WIND: BEST PRACTICES

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# Executive summary

This report summarizes the key insights from two workshops held as part of the INNOWIND India & Denmark project, which focuses on leveraging Danish expertise in offshore wind energy to support India's growing ambitions in the sector. Offshore wind has emerged as a crucial component of the global renewable energy transition. While Denmark is a recognized leader in this field, collaboration with India offers mutual opportunities for growth, shared learning, and innovation.

Denmark's pioneering role in offshore wind energy is supported by its history of innovation, public-private partnerships, and regulatory development, which offers valuable insights for India's growing market. The country has developed advanced technologies such as digital twin systems, condition monitoring, and data-driven optimization of wind farm operations. Denmark's ability to integrate academic research, government policy, and industry needs through a collaborative, cluster-based model has also been key to its success. However, despite its leadership, Denmark still faces challenges, including workforce shortages, port infrastructure upgrades, and ongoing grid integration – areas that are ripe for international collaboration with India.

India, while a newcomer to offshore wind, has set ambitious renewable energy targets, including 30 GW of offshore wind capacity by 2030 as part of its broader goal to achieve 500 GW of renewable energy by the same year. India's rapidly expanding energy market and significant wind potential position the country as a critical player in the global energy transition. However, India must navigate bureaucratic delays, infrastructure gaps, and the need for stronger financial incentives to attract investment. Moreover, engaging with local communities, particularly in coastal areas, is essential to minimizing resistance and ensuring the success of offshore wind projects.

The collaboration between Denmark and India presents a unique opportunity to address shared challenges. Denmark's expertise in streamlining regulatory frameworks, fostering public-private partnerships, and promoting socio-economic benefits for local communities can help India avoid some of the typical hurdles faced in large-scale projects. Meanwhile, India's young, skilled workforce and growing digital expertise can support Denmark in addressing its labor shortages and advancing technological innovation, particularly in areas such as grid integration and digitalization.

This partnership between Denmark and India goes beyond immediate knowledge sharing; it positions both countries as pioneers in the global offshore wind market. For Denmark, India's vast and untapped offshore wind potential offers significant growth opportunities for Danish companies to expand operations and drive down costs. For India, Denmark's proven strategies can help fast-track its renewable energy goals and avoid common pitfalls in the development of large-scale offshore wind projects.

In conclusion, the INNOWIND India & Denmark project underscores the power of international collaboration in addressing global renewable energy challenges. Denmark brings technological expertise, policy innovation, and a proven track record, while India offers scale, a vast talent pool, and market potential. Together, these two nations can overcome their respective challenges, foster innovation, and set an example for the global renewable energy sector. This partnership has the potential to drive sustainable development and position both Denmark and India as leaders in offshore wind energy.

# Introduction

According to the International Energy Agency, electricity consumption in India is expected to triple by 2040, which corresponds to more than the EU's total electricity consumption today (International Energy Agency, 2024). This means that India will become one of the largest markets for renewable energy in the coming decades. The Indian government has set a target for renewable energy for the coming years: 175 GW by 2022 (approx. 90 GW by the end of 2020) and 500 GW by 2030 and a long-term target of net zero emissions in 2070. India's ambitions will also force the country to investigate in implementing various types of renewables, and especially wind energy will play an increasing role in the Indian electricity matrix. Wind has been the fastest-growing renewable energy source in India (Ministry of New and Renewable Energy, n.d.). By the end of 2022, total renewable energy installed in India stood at 121 GW of total installations with wind contributing 35% of this (approx. 42GW), making India the fourth-largest wind market in the world, in terms of cumulative installed capacity. However, India needs accelerated deployment and commissioning of wind power projects if it is expected to achieve 140 GW of wind capacity by 2030 and advance towards the long-term goal of net zero by 2070. While onshore wind power has been the backbone of India's RE journey, a growing domestic and international appetite exists to tap into India's significant offshore wind resource. Harnessing the full potential of offshore wind energy will propel the country towards its net zero target by 2070 – but India is not expecting to do it alone. In 2020, Denmark and India entered a green strategic partnership, which places Denmark in a special position in relation to delivering green solutions to Indian demands. “Denmark has the skills – India has the scale,” said the Prime Minister of India, Shri Narendra Modi (Embassy of India in Copenhagen, 2022). This partnership laid the foundation for the project INNOWIND India & Denmark (Energy Cluster Denmark, n.d.), in which four partners came together to support the Indian offshore venture by sharing knowledge, expertise, and technology to accelerate the process. INNOWIND India is just one notable example of collaboration efforts between Denmark and India. This project aims to harness Danish expertise in offshore wind technology to support India's burgeoning offshore wind market, primarily focusing on the regions of Tamil Nadu and Gujarat. This collaboration will not only help India fast-track its offshore wind ambitions but also enable Denmark to benefit from India's growing expertise in digital solutions, workforce, and market opportunities.

## Key takeaways

This report highlights key insights from the INNOWIND India & Denmark project's first two events. Below, you will find some takeaways from the report, focusing on what is potentially needed to advance India's offshore wind energy sector, promoting sustainable development and positioning the country as a global leader in renewable energy:

### 1. Regulatory and policy framework improvements

The need for a streamlined and transparent regulatory environment is crucial for attracting foreign investments and expediting project approvals. This includes reducing bureaucratic delays, simplifying tax policies, and providing financial incentives such as Viability Gap Funding (VGF) to offset high initial costs (Invest India, 2024). Recent announcements of VGF are promising, as they provide financial support for initial offshore wind projects, helping to mitigate the high upfront costs. Denmark's experience in creating such regulatory frameworks may offer a proven model for India to adopt with adjustments.



## **2. Importance of collaboration and partnerships**

The INNOWIND India & Denmark project and its activities/events have highlighted the significance of collaboration needed between government bodies, industry stakeholders, academia, and clusters as well as how it can benefit. Strategic partnerships and the pooling of resources can facilitate innovation, reduce financial risks, and ensure the effective implementation of large-scale offshore wind projects. Denmark's model of collaboration, including public-private partnerships and cluster-based approaches, can offer valuable lessons and be an inspiration for India as it establishes and later scales up its offshore wind capacity.

## **3. Alignment of academic research with industry needs**

If academic institutions focus on research areas that align with industry needs, such as advanced turbine technology, grid integration solutions, and environmental impact assessments, they can play an important role in supporting the innovation and development of these industries. Collaboration with industry stakeholders and participation in clusters can enhance the relevance and commercialization potential of academic research. The Danish approach and alignment of academic research with market demands through cluster integration can serve as a guiding framework for India.

## **4. Role of clusters in fostering innovation**

Clusters has the potential to play a vital role in integrating academic research with market demands, providing administrative support for funding and project compliance, and ensuring the commercialization of innovations. Effective post-project follow-up mechanisms and international collaborations are essential for maintaining innovation momentum and achieving sustainable growth in the offshore wind sector. In Denmark, there exist a cluster-based model, exemplified by Energy Cluster Denmark, which provides a roadmap for fostering innovation and driving technological advancements (Cluster Excellence Denmark, n.d.).

## **5. Shared challenges and mutual learning**

Both Denmark and India face challenges in upgrading port infrastructure, addressing workforce shortages, and integrating offshore wind farms into the grid (Khosravi, Pillai, & Bak, 2021 / (Danish Energy Agency, 2022). This collaboration offers an opportunity for mutual learning, with Danish solutions in these areas providing valuable insights for India, while India's young, skilled workforce and digital expertise can support Denmark in overcoming its labor and innovation gaps. Together, both countries can address these challenges more effectively through shared best practices and innovation.

## **6. Financial mechanisms and de-risking offshore wind projects**

Introducing targeted financial incentives and risk mitigation strategies, such as the VGF, is critical to attracting foreign investment for offshore wind projects in India. Denmark and other countries have experience in implementing financial mechanisms to de-risk offshore wind projects and can serve as inspiration to a model for India (Green Power Denmark, 2021). By leveraging such funding models, India can reduce upfront costs, making its offshore wind sector more attractive to investors and expediting project timelines.

## **7. Workforce development and skills exchange**

Workforce development is crucial for the success of offshore wind in both countries. Denmark's need for skilled labor can be met by India's large, technically proficient workforce, creating an opportunity for skills exchange (The Copenhagen Post, 2024). Additionally, collaborations between educational institutions and industry stakeholders in both countries will help build a future-ready workforce capable of driving offshore wind innovation and implementation.

## **8. Local community engagement and socio-economic impact**

Successful offshore wind development depends on engaging with local communities and managing socio-economic impacts, particularly in areas like fishing. Addressing local concerns through transparent communication, fair compensation, and socio-economic benefits provides valuable lessons that should be taken into consideration, both in India and Denmark (Vattenfall, 2020). Ensuring local support and developing alternative livelihood options will be key to minimizing resistance and driving long-term project success. Additionally, it will ensure that industry and government take social responsibility.

# India's Green Ambitions vs Current Framework

India has set ambitious renewable energy targets, aiming to achieve 500 GW of renewable energy capacity by 2030, with 140 GW from wind energy, including 30 GW specifically from offshore wind. The Ministry of New and Renewable Energy (MNRE), supported by the National Institute of Wind Energy (NIWE), leads this initiative. In 2015, India introduced its offshore wind policy, outlining processes for project execution, leasing, and necessary clearances (Asia Pacific Energy, n.d.). However, to meet these goals, India must overcome regulatory, infrastructural, and financial challenges. Denmark, a global leader in offshore wind, holds experience that can offer valuable support by sharing how to navigate similar challenges, providing a path for collaboration that will accelerate India's progress.

In Denmark, there exists some well-established regulatory processes, developed over decades of offshore wind experience, which can be used as inspiration on how to streamline approvals and create a transparent, investment-friendly policy environment (Green Power Denmark, 2021). While India's regulatory environment is evolving to support renewable energy growth, it may benefit from Denmark's past experience and leapfrog, avoiding repeating mistakes, thus reduce bureaucratic



delays and foster inter-governmental cooperation. Denmark's approach to managing these processes – such as digitalizing permitting and fostering industry-government partnerships – can serve as a blueprint for India. Through this partnership, India may be able to fast-track regulatory improvements, enhancing its ability to meet its renewable energy targets while fostering an environment conducive to foreign and domestic investment.

The sections below will highlight some of India's challenges in relation to facilitating the establishment of an offshore wind industry in its current landscape.

## **Robust policy framework**

One of India's challenges is establishing a policy framework that attracts investment while streamlining project approvals. The complexity and diversity of stakeholders – including government bodies, private investors, and local communities – demand comprehensive and coherent policies that address all interests. India's regulatory landscape, while progressing, has sometimes been hindered by procedural delays, which can create uncertainty and elevate project costs.

Denmark's experience in crafting regulatory frameworks, particularly in the renewable energy sector, can potentially guide India in refining its approach. By incorporating Denmark's best practices – such as integrating public and private interests, simplifying tax policies, and promoting transparent procedures – India can reduce project approval times and create a stable, investment-friendly environment. This not only boosts investor confidence but also facilitates economic growth and job creation in the offshore wind sector.

Rather than viewing regulatory challenges as roadblocks, this collaboration provides an opportunity for India to adapt Denmark's streamlined practices, leading to long-term improvements. Experience in harmonizing the needs of various stakeholders while maintaining procedural transparency exist within Denmark and they can help foster a more efficient regulatory landscape in India – one that promotes sustainable energy development while supporting community interests.

## **Development of infrastructure**

Upgrading India's infrastructure – particularly ports and transmission networks – is another key challenge in scaling offshore wind projects. India's port infrastructure is primarily designed for traditional maritime activities and requires significant modifications to support the specialized needs of offshore wind, including the handling of large wind turbine components. Here, Danish knowledge and learnings are particularly relevant. Denmark has continuously modernized its port facilities to meet the growing demands of offshore wind, and its approach to constructing heavy-lift terminals, deepening berths, and optimizing logistics systems can provide some input to a roadmap for India's own infrastructure development. However, this does not mean that Danish port facilities are not facing their own or similar challenges.

Similarly, integrating offshore wind farms into the national grid requires extensive upgrades to India's transmission networks. Expertise in grid integration, particularly in managing the variable nature of wind energy, can help India develop more resilient systems. By collaborating on infrastructure development, India can deploy advanced technologies and avoid common pitfalls, accelerating the deployment of offshore wind projects.

Both countries face challenges in upgrading port facilities to support offshore wind. By recognizing these shared challenges, India and Denmark have the opportunity to exchange best practices and improve infrastructure, supporting faster development in both countries' offshore wind sectors.

## Costs and investments

The high capital expenditure required for offshore wind projects is another considerable hurdle. Offshore wind farms require substantial investments in specialized equipment, technology, and infrastructure. The costs associated with manufacturing and transporting large wind turbine components, constructing offshore platforms, and installing undersea cables are significantly higher than for onshore projects. Furthermore, the harsh marine environment and climate changes demands robust and durable materials, further driving up costs.

Denmark holds experience in implementing financial mechanisms to de-risk offshore wind projects, could be applied in India to lower initial project costs. By introducing targeted financial incentives and risk-sharing strategies, India can attract the necessary foreign investment to fund large-scale offshore projects. Additionally, Denmark's extensive experience in mapping and site selection, using advanced technologies such as LiDAR systems and geophysical surveys, can improve India's ability to identify suitable offshore wind locations. This will reduce uncertainties and minimize costly delays associated with inaccurate site assessments.

By leveraging Denmark's experience in establishing financial models and technology expertise, India can reduce upfront costs, making its offshore wind sector more attractive to investors and expediting project timelines.

## Local impact and engagement

The socio-economic impact of offshore wind farms on local communities, particularly fishing communities, is a critical issue that must be managed carefully. Offshore wind projects can disrupt traditional livelihoods, and it is vital to address these concerns through transparent communication, fair compensation, and the development of alternative livelihood options.

Denmark has in some cases successfully navigated similar challenges by ensuring that local communities were involved in project planning and benefit from socio-economic development. Through collaboration, India can consider adopting some of Denmark's previous inclusive approaches, where fostering trust and ensuring that offshore wind projects are seen as beneficial by local stakeholders. Engaging communities early in the project lifecycle and ensuring clear communication is part of the key to minimizing resistance and building long-term support.





## Moving Forward: Collaboration for Growth

Government support is crucial to overcoming the challenges facing India's offshore wind sector. Recent announcements (Press Information Bureau, 2024) by the MNRE on their Viability Gap Funding program are a positive step toward mitigating upfront costs for initial projects. Moreover, partnerships with academic institutions such as the Indian Institute of Technology, Madras, and NIWE will help develop the skilled workforce needed to sustain offshore wind growth. Denmark and several other countries have already had success in integrating academic research with industry needs can provide input to a model, adjusted to the Indian market, to align education and training programs with sectoral demands.

Through collaboration with Denmark and other countries, India can streamline its regulatory environment, reduce costs, and foster a culture of innovation in offshore wind. The partnership between India and Denmark represents not just the sharing of expertise, but a strategic alignment that will enable both countries to lead in the global offshore wind sector.

For further details on initiatives and the regulatory framework, we refer to the MNRE website and the Danish Energy Agency.



**MNRE website**



**Danish Energy Agency  
website**



# Best Practices from Denmark

Denmark is widely recognized as an innovator in the offshore wind sector, partly due to its status as an early mover in wind energy. During the workshop on best practices, several key insights from Denmark were highlighted, particularly in the areas of technological innovation, regulatory frameworks, and collaborative models. These insights can offer valuable lessons to India while also providing opportunities for both countries to adapt and complement their approaches.

## Collaboration

Denmark's collaborative approach has been a central element of its success in offshore wind energy, helping the country stay at the forefront of the sector. This approach is not only a strength for Denmark but also serves as a valuable example of how India can leverage similar models, pooling resources and sharing knowledge between public and private sectors.

### ***Sharing risks and pooling resources***

Collaboration allows for the pooling of resources, which is particularly beneficial in an industry as capital-intensive as offshore wind energy. Companies can share the financial burden of research and development, infrastructure investments, and project implementation. Public-private partnerships (PPPs) are a prime example, where the government provides financial support and regulatory frameworks while private companies bring in technological expertise and capital (Danish Energy Agency, 2021/ North Sea Energy Island, n.d.). This risk-sharing model makes it easier to undertake large-scale projects that might be too risky or expensive for a single entity.

### ***Integrated policy and regulatory support***

Denmark's collaborative approach extends to the regulatory and policy environment. Government agencies work closely with industry stakeholders to develop clear, supportive policies that facilitate project approvals and compliance (Danish Energy Agency, 2023). This framework has been crucial for attracting international investments and speeding up development timelines. By working closely with industry, Denmark has managed to streamline processes such as environmental impact assessments and permitting, creating a stable and predictable investment environment. India's regulatory framework could similarly benefit from such collaboration, helping to reduce bureaucratic delays and provide clearer guidelines to investors (Danish Energy Agency, n.d.).

### ***Workforce development and training***

Workforce success in Denmark is based on close collaboration between academia and industry, ensuring that the skills developed in universities directly meet industry needs. Universities such as Danish Technical University (DTU) and Aalborg University (AAU) are instrumental in training engineers and researchers who contribute to the offshore wind sector. By collaborating on research projects and offering industry-driven training programs, Denmark ensures that its workforce is continuously updated with the latest technologies and practices. India's growing educational sector could similarly consider fostering deeper connections between academia and industry to develop the skilled workforce needed for its offshore wind ambitions.

### ***Community engagement and support***

Engaging local communities is a critical aspect of Denmark's collaborative approach. By involving communities early in the process, one will be able to mitigate opposition and ensure public support. Transparent communication about the benefits and impacts of wind projects, along with fair compensation mechanisms, has proven effective (Green Economy Coalition, 2020). India can adopt similar models to ensure that coastal communities are part of the development process, fostering local support and minimizing resistance.



# Clusters – supporting and facilitating collaboration and innovation

Energy Cluster Denmark, a member-based organization including companies, research institutions, and governmental bodies, fosters a culture of continuous innovation and knowledge exchange. The cluster's focus is to facilitate collaboration to encourage and enable innovation and through its work it is shown time and time again that by collaborating closely, stakeholders can share best practices, technological advancements, and research findings that can lead to a better and more effective way to achieve green ambitions. For instance, the partnership facilitated by Energy Cluster Denmark between industry players and/or academia has multiple times led to the development of advanced technologies and improved operational efficiencies (Aalborg University, 2024). This constant flow of information and innovation has helped Denmark stay at the forefront of wind energy technology.

## ***Highlights from an industry perspective***

Clusters offer valuable networking opportunities, enabling companies to find and connect with relevant partners for innovation projects and benefit significantly from the administrative support provided by the cluster, allowing the company to focus on their core innovation activities.

- The clusters possess deep industry insights and knowledge about funding possibilities. They can guide companies towards the right funding sources and help them navigate the complexities of funding applications.
- Participation in matchmaking events and workshops organized by clusters is beneficial. These events help companies to connect with other industry players, fostering collaboration and sharing best practices.
- Clusters provide critical support for SMEs, helping them overcome challenges related to funding, networking, and project management. This support is crucial for smaller companies that may lack the resources of larger firms.

## ***Highlights from an academic perspective***

Clusters can provide academic institutions with access to a broader network of industry and public stakeholders, facilitating collaborations that might be challenging to establish independently. Clusters hold a unique position, especially when it comes to finding the right stakeholders at the right time. They can play a significant role in supporting the commercialization of academic research. This includes helping researchers understand market feasibility and business models. Participation in cluster-organized matchmaking events and workshops can help academic institutions find relevant industry partners and foster collaborative research projects, essentially clusters can act as a hub for connecting academia with industry needs.

Clusters provide administrative support for managing collaborative projects, including handling funding applications and compliance. This support is valuable for academic institutions, allowing researchers to focus more on their core research activities.

## ***Highlights from a cluster perspective***

In Denmark, clusters act as a central hub for networking, allowing companies, academic institutions, and public bodies to find relevant partners for innovation projects. This facilitates collaboration across various stakeholders, enhancing innovation and commercialization efforts. They provide crucial administrative support, easing the burden of project management, funding applications, and regulatory compliance for companies. They help navigate the complexities of funding opportunities, especially for smaller companies that may lack the resources to do so independently.

From a Danish perspective, clusters need to align strategically with industry needs and government policies to function effectively, e.g., Energy Cluster Denmark has a board that consists of private and public members that helps steer the direction of the organization and ensure its work is guided by the industry and grounded in demands.

Successful clusters often have a regional presence, allowing them to understand and address



local industry needs effectively, even in a smaller country like Denmark. They should also engage in international collaborations to bring diverse perspectives and access to global markets. This dual focus helps clusters remain relevant and responsive to both local and global industry trends. The collaboration between Energy Cluster Denmark and the Indian Energy Consortium highlights the importance of international partnerships. These collaborations not only bring diverse perspectives and can open up new markets, but they also facilitate new opportunities for innovation.

Clusters should emphasize sustainable and inclusive innovation, addressing the long-term needs of industry and society. This includes focusing on emerging technologies, environmental sustainability, and ensuring that small and medium-sized enterprises (SMEs) have access to the same opportunities as larger companies.

## Technological innovation and digital solutions

Denmark's leadership in offshore wind energy is strongly supported by its emphasis on technological innovations and the integration of digital solutions, immensely supported by its collaborative approach. These advancements are critical in ensuring the efficiency, reliability, and economic viability of wind energy projects and serve as a best practice model for other countries. The use of digital twin technology, condition monitoring systems, IoT devices, and big data analytics has enabled Denmark to achieve high levels of efficiency, reliability, and cost-effectiveness in its offshore wind projects (FORCE Technology, n.d.). The emphasis on technological innovations and the integration of digital solutions are also closely tied to the country's marine spatial planning (MSP) framework. These advancements are critical in ensuring the efficiency, reliability, and economic viability of wind energy projects while safeguarding marine ecosystems and balancing other maritime activities, such as fishing and environmental conservation. The use of MSP enables Denmark to spatially organize offshore wind infrastructure, allowing for optimal turbine placement and minimal disruption to existing marine industries. This holistic approach to offshore planning, integrated with digital solutions, serves as a best practice model for other countries, including India, as it develops its offshore wind sector. By continuously innovating and integrating advanced technologies Denmark works to maintain its position in the global wind energy market, setting a benchmark for technological excellence and operational efficiency (Port Esbjerg, 2023). India's growing digital sector can play a complementary role in bringing new innovations to offshore wind, particularly in areas such as smart grid integration and data-driven optimization.

The Horns Rev 3 offshore wind farm, one of Denmark's prominent wind projects, exemplifies the successful implementation of technological innovations and digital solutions. The project uses digital twin technology and advanced CMS to monitor and optimize turbine performance. Real-time data from sensors allows for predictive maintenance, reducing downtime and maintenance costs. Additionally, big data analytics helps in optimizing operational strategies, ensuring maximum efficiency and reliability of the wind farm (Vattenfall, n.d.).



# Challenges and Areas for Improvement in Denmark

Despite Denmark's global leadership in offshore wind energy, the country still faces several challenges that need to be addressed to maintain its competitive edge and continue facilitating innovation. Many of these challenges are similar to those faced by other countries, including India, highlighting opportunities for collaboration and mutual learning.

## Aligning academia and industry

One challenge for Denmark is continuing to ensure alignment between academic research and industry needs. While academic institutions sometimes tend to focus on long-term research and development, industry players often prioritize immediate commercialization and market-driven innovations. Misalignment can hinder effective collaboration, which is essential for driving breakthrough advancements in offshore wind technologies. By continuously fostering stronger ties between academia and industry, Denmark can ensure that research efforts are more closely aligned with practical industry needs, thereby accelerating the commercialization of new technologies.

## Follow-up mechanisms

Another area for improvement is post-project follow-up mechanisms. While Denmark is effective in developing innovative solutions, ensuring that project outcomes are fully integrated into industry practices sometimes proves as a continuing challenge. Strengthening these follow-up mechanisms may be crucial for maintaining innovation momentum and ensuring that advancements are effectively commercialized. Collaborative efforts between industry, government, and academia can play a key role in ensuring the practical application of project outcomes, leading to greater long-term benefits for the offshore wind sector.

## Infrastructure development

Infrastructure development also remains a critical issue for Denmark, particularly regarding the upgrading of port facilities to handle the growing scale of offshore wind projects. Many existing port facilities continue to require substantial investments and modifications to accommodate ever growing wind turbines, including components and equipment (Khosravi, Pillai, & Bak, 2021). This includes the construction of heavy-lift terminals, the deepening of berths, and the installation of advanced logistics systems. A challenge that is not unique to Denmark; India faces similar hurdles in upgrading its ports to support offshore wind. As mentioned before, both countries can benefit from sharing best practices and collaborating on port infrastructure solutions, potentially accelerating improvements in both regions.

## Grid integration

Finally, integrating offshore wind and other sources of RE into Denmark's national grid requires ongoing upgrades to the transmission network. This includes the construction of new substations, the laying of undersea and onshore transmission lines, and ensuring grid stability to manage the variable nature of energy production dependent on weather (Khosravi, Pillai, & Bak, 2021). These



By addressing these challenges, Denmark may continue to strengthen its leadership position in offshore wind energy while offering valuable lessons for emerging markets like India. This mutual exchange of knowledge and solutions highlights the global nature of the offshore wind industry, where countries can benefit from working together to overcome shared challenges.





# Business Strategies and Market Entry for Danish Companies

Doing business in India requires a strategic, long-term approach, a deep understanding of the local culture, and a commitment to compliance and safety. Leveraging local talent, forming strategic partnerships, and utilizing available support networks can significantly enhance the chances of success.

## ***Feet on the Ground Approach***

Establishing a local presence in India is crucial. This can start with a small setup, such as an employer of record (EOR) model, which allows Danish companies to hire local staff without immediately setting up a legal entity. This approach helps companies understand the market better and build relationships before fully committing. Experts from the Indian wind industry emphasized the importance of having a physical presence to effectively navigate the regulatory environment and build trust with local stakeholders. Many Danish companies opt for a phased approach when entering the Indian market as it allows them to test the waters.

## ***Strategic Timing***

Timing the market entry based on one's position in the value chain is critical. Companies need to align their entry with the development stages of the market and regulatory milestones. For instance, those at the beginning of the development process should enter earlier to capitalize on growth opportunities, while component suppliers might wait until the market is more mature.

## ***Leveraging Support from Multilateral Agencies***

Utilizing support from Danish multilateral agencies such as the Embassy, Trade Council, and EKF is a best practice. These organizations provide essential support, from feasibility studies and market visits to hosting initial employees and navigating regulatory hurdles. DI India emphasizes the importance of leveraging these resources to ease the market entry process and improve the chances of success.

## ***Cultural Sensitivity and Adaptation***

Understanding and respecting cultural differences is vital for success in India. It is important to be aware of and adapt to the local business culture. This includes understanding communication styles, negotiation tactics, and the overall approach to building business relationships. Danish companies are advised to approach these differences with an open mind and a willingness to learn and adapt.

## ***Long-Term Commitment***

The Indian market requires a long-term investment perspective. Companies should be prepared for a roller-coaster ride with ups and downs and not expect quick returns. Building a successful business in India involves staying invested, developing strong local partnerships, and being patient with the market dynamics. There will be a need for a long-term view as short-term expectations can lead to disappointment.

## ***Harnessing Local Talent***

India offers a vast pool of talented professionals. It is encouraged to tap into this resource and make connections between local, regional, and global operations. This bidirectional flow of talent and ideas can drive innovation and ensure that the best practices are shared and implemented across geographies.

### ***Regulatory Compliance and Safety***

Ensuring compliance with local regulations and maintaining high safety standards is crucial. There is a need for thorough preparation and alignment with local laws from the outset. Companies must also be proactive in auditing and enforcing these standards to maintain a strong and compliant business operation. It will be important to understand how to navigate the regulatory aspects that govern funding and investment in India.

By leveraging local support, understanding cultural nuances, and committing to long-term investment, Danish companies can navigate the complexities of the Indian market and achieve sustainable growth.



# Recommendations

Actionable steps derived from the insights of the INNOWIND events suggest:

## **Policy makers**

- The need for a more streamlined and transparent regulatory framework to attract foreign investment and expedite project approvals. Policies should focus on reducing bureaucratic delays and simplifying tax regimes, ensuring a stable environment for investors.
- Offering incentives such as Viability Gap Funding (VGF) can alleviate the high initial costs of offshore wind projects.
- Policy makers should also engage with local communities to address socio-economic impacts, ensuring fair compensation and alternative livelihood options for those affected by offshore wind developments.

## **Academia**

- Academic institutions should focus on collaborative research that aligns with industry needs. Areas such as advanced turbine technology, grid integration solutions, and environmental impact assessments are crucial.
- Partnerships with industry stakeholders and participation in clusters like Energy Cluster Denmark can enhance research relevance and commercialization potential. This involves addressing long-term industry needs and ensuring that research outcomes contribute to societal benefits.
- Academia should prioritize the development of a skilled workforce through specialized training programs and courses, ensuring a continuous supply of professionals equipped to drive innovation in the wind energy sector.

## **Industry**

- Businesses looking to enter or expand in the Indian wind energy market should adopt a long-term, phased approach. Establishing a local presence through partnerships or representative offices can help navigate regulatory landscapes and build trust with local stakeholders.
- Leveraging support from multilateral agencies, such as the Embassy Trade Council and EKF, can provide essential market insights and facilitate smoother market entry.
- Companies should also focus on strategic timing, aligning their entry with regulatory milestones and market development stages to maximize opportunities.

## **Clusters**

- Clusters should strive for better integration between academic research and industry demands, ensuring that collaborative efforts lead to market-ready innovations. The events highlighted the different goals of academia and industry. Clusters need to manage these differing objectives to ensure that collaborations are productive and beneficial for both parties.
- They should focus on providing robust administrative support for managing funding applications and project compliance, particularly benefiting SMEs. Clusters also need to emphasize post-project follow-up mechanisms to track the impact and commercialization of innovations. Strategic alignment with industry needs and government policies is vital, and engaging in international collaborations can bring diverse perspectives and open new markets, enhancing the overall effectiveness and sustainability of cluster activities.
- Having large companies involved in the cluster activities is crucial as it acts as a magnet for SMEs and provides significant value through their expertise and resources.
- Create a strong platform in Denmark for collaboration with India, involving multiple stakeholders and building a critical mass. This strategic alignment can help attract more funding and support collaborative efforts effectively.
- There is a need for more national and international funding opportunities for collaboration. Clusters should consider being involved in policy development and advocacy to attract more funding, including bilateral calls and seed funding.
- There is a need for clusters to support the commercialization of project outcomes. It is important to ensure innovations are not just developed but also brought to market effectively. Ensuring the continued relevance and commercialization of project outcomes is a key area for improvement. Clusters should consider implementing post-project follow-up mechanisms to track the impact and commercialization of innovations. This would help in maintaining the momentum of innovation and ensuring that the developed technologies and solutions are effectively integrated into the industry.



# Conclusion

Through the two workshops that form the foundation of this report, the INNOWIND India & Denmark project has provided crucial insights into the development of an offshore wind industry in India. Collaboration between Indian and Danish stakeholders have underscored the importance of streamlined regulatory frameworks, robust infrastructure development, and strategic partnerships. The discussions have shown that despite the differences in scale, both countries face similar challenges in areas such as infrastructure and grid integration, which can serve as a platform for shared learning and collaboration.

A key takeaway is that while India's ambitions are clear, addressing challenges such as bureaucratic delays, regulatory complexity, and infrastructure gaps is essential for realizing its offshore wind potential. Denmark's experience in overcoming these hurdles through streamlined processes, public-private partnerships, and innovation offers valuable lessons. Meanwhile, Denmark can benefit from India's workforce and market scale to further bolster its own offshore wind sector, making this collaboration mutually beneficial. By focusing on shared challenges, particularly in regulatory frameworks, infrastructure development, and the alignment of academic research with industry needs, the report illustrates how Denmark's expertise can help India accelerate its path toward achieving its renewable energy goals. This collaboration highlights the complementary strengths of both nations, demonstrating how working together can create a more sustainable and efficient offshore wind industry for both countries.

## Future Directions

Looking forward, India's wind energy policy and business practices are poised for significant evolution, driven by the insights gained through collaboration with Denmark and other countries. Policy makers are expected to refine regulatory frameworks to enhance investor confidence and expedite project approvals. This will likely involve more focused financial incentives, such as VGF, and the development of socio-economic impact assessments to ensure sustainable growth.

A critical area for development in India is marine spatial planning (MSP). MSP serves as a foundational tool for the sustainable growth of the offshore wind industry by ensuring that energy infrastructure is carefully integrated into marine ecosystems while minimizing conflicts with other uses, such as fishing and environmental protection. Denmark's robust MSP framework allows for spatially organized offshore energy projects while preserving fishing grounds and sensitive environmental areas. By adopting and tailoring MSP frameworks, India can strategically plan its offshore wind development, ensuring efficient use of its vast maritime space and long-term sustainability. Denmark's MSP expertise offers a roadmap for India as it builds the foundations for its offshore wind infrastructure, balancing development with ecological and socio-economic considerations.

The role of academic institutions will continue to be critical, with an increased emphasis on aligning research with industry needs, particularly in areas such as advanced turbine technology and grid integration. Fostering stronger collaborations between academia and industry, facilitated by clusters such as Energy Cluster Denmark, can be key to ensuring the commercialization of innovations and their effective integration into industry practices.

Industry stakeholders in both countries will need to adopt phased, localized approaches to market entry, supported by strategic partnerships and multilateral cooperation. Danish companies looking to expand into India will benefit from understanding the regulatory and cultural nuances of the Indian market, while Indian companies will gain from Denmark's technological expertise and experience in the offshore wind sector.

Clusters will play an increasingly important role in facilitating collaboration and driving innovation. By providing administrative support, offering funding guidance, and encouraging post-project follow-up mechanisms, clusters can ensure that innovations are not only developed but also brought to market effectively. Strengthening these collaborations between Denmark and India will not only foster innovation but also create more integrated global value chains in offshore wind.

These efforts will contribute to positioning India as a global leader in renewable energy, while simultaneously reinforcing Denmark's leadership in offshore wind. The INNOWIND India & Denmark project exemplifies how international partnerships can drive sustainable development and accelerate technological progress, benefiting both countries and the global offshore wind industry.

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# EVENT SUMMARIES

The following contains two short summaries of the online sessions which this report builds upon. It contains information about the sessions, summaries of the event contents, list of speakers, and lastly a link to the recordings.





# INNOWIND India Best Practices Workshop

- Date and Time: April 12, 2024
- Organizers: Energy Cluster Denmark, IIT Madras, and Innovation Centre Denmark
- Objective: To explore cluster collaboration in fostering the offshore wind sector in Tamil Nadu and Gujarat, drawing insights from Danish best practices.
- Funded by: The Danish Energy Agency

In April 2024, the partners organized a workshop focusing on best practices exchange within cluster development. The purpose of the workshop was to dive into the world of “Clusters” and how they can support industries, particularly how they can play a role in building the offshore wind industry in Tamil Nadu and Gujarat, India. The workshop particularly focused on collaboration between clusters and different actors and/or stakeholders involved in building and strengthening specific industries. We looked at how India can create a cluster landscape that creates value, by investigating Danish best practices. The primary goal was to explore how a cluster can help industries and stakeholders overcome challenges and seize opportunities, with a specific focus on building the offshore wind sector in India.

## Speakers

- Glenda Napier, CEO – Energy Cluster Denmark
- Lars Bruckner, International Director – Energy Cluster Denmark
- Dr. Nikhil Tambe, CEO – The Energy Consortium



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# Navigating the Indian Offshore Market: A Danish Perspective

- Date: May 30, 2024
- Organizers: Energy Cluster Denmark and Trade Council Denmark, India
- Objective: To gain in-depth market understanding of the emerging offshore market in India and lay the groundwork for understanding how to establish a presence while navigating nuances, regulatory framework, cultural considerations, and market dynamics.
- Funded by: The Danish Energy Agency

The online session aimed to provide Danish companies with insights into navigating the Indian offshore wind market. Hosted by Energy Cluster Denmark and Trade Council Denmark in India, the session included presentations from experts in the industry and focused on strategic, regulatory, and cultural aspects crucial for establishing a successful presence in India. The objective was to provide Danish companies with essential insights and practical advice on how to enter the Indian offshore wind market. Emphasizing the importance of strategic planning, cultural understanding, and regulatory compliance, the event set the stage for future collaborations and highlighted the potential for Danish expertise to contribute significantly to India's renewable energy goals.

## Speakers

- Nikoline Bak, Project Manager – Energy Cluster Denmark
- Suresh Mugalivakam Subramaniam, Head of Energy – Trade Council – Ministry of Foreign Affairs of Denmark
- Dr. Rahul Rawat, Scientist-D Ministry of New and Renewable Energy
- Hemkant Limaye, Expert on Wind Energy
- Jesper Bollerup Gade, MD – DI India
- Anand Choudhary, Senior Associate, Roedl Partners
- VV Sivakumar General Manager NTPC Green Energy Limited



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# Acknowledgements

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Thank you for your commitment and participation.

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To learn more about the project and its activities, scan here.



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