Zero-Subsidy Wind Investments Risks and Opportunities

Could onshore wind be economically viable and technically feasible without subsidies?

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Smart Investing is all about seeing the big trend and leaping on it before everyone else does. "Zero- subsidy" is a great concept in the wind power industry and it will likely become an even greater opportunity in the next

Introduction

With the new WIND ENERGY SCIENCE RESEARCH PAPER on the Onshore Wind Cost of Energy Mitigation due for publication in the spring, we analyze the market trends of subsidy free onshore wind power investments (SFOWPIs)*and report on some exclusive analysis of where developers, pension funds and investors should go hunting for opportunities.

Ambitious prospects

WESCi predicts that the amount of subsidy-free wind power investments will increase by around 20-35% until 2030. The manufacturers' competition and technological innovations can reduce the cost of construction on the wind farms by around 55%. Additionally, the possibility of new corporate schemes and innovative PPAs along with the fact that many coal and nuclear plants will go offline in the next years, should also contribute that free-subsidy will attract solid interest.

Focus on co-created projects

The results of our research show that there are significant opportunities on co-created wind power investments. Additionally our research shows that a growing number of investors have been interested in the subsidy-free concept but firstly they need to understand the polysemy of this transition, the importance of the engagement and knowledge sharing and the risksassociated.

Opportunities and risks

We analyzed numerous W.P projects and found clear evidence of a shift towards subsidy-free investments. However several critical parameters such us the support mechanisms and the regulatory framework diversity, community involvement, lessons learned implementation, knowledge sharing, novel Power Purchased Agreements, design improvements and a new standardized Intellectual Property Rights framework should be further evaluated to have a holistic picture between the opportunities and risks.

The detail behind the big picture

WIND ENERGY SCIENCE research paper makes it clear that it is significantly important to understand the meaning behind the term *"subsidy-free"*. **Support withdrawal, community engagement, co-created values, new regulatory framework-support mechanisms** for the energy plants and the **associated health, safety and environmental effects-externalities** from energy investments should be carefully evaluated before any definition of this new era in the wind power industry.

31%

The cost of onshore wind has already fallen from **€96/MWh, to around €86/MWh** and is expected to further decreased to around **€67/MWh (31% lower than nowadays) by 2020** or shortly thereafter.

122

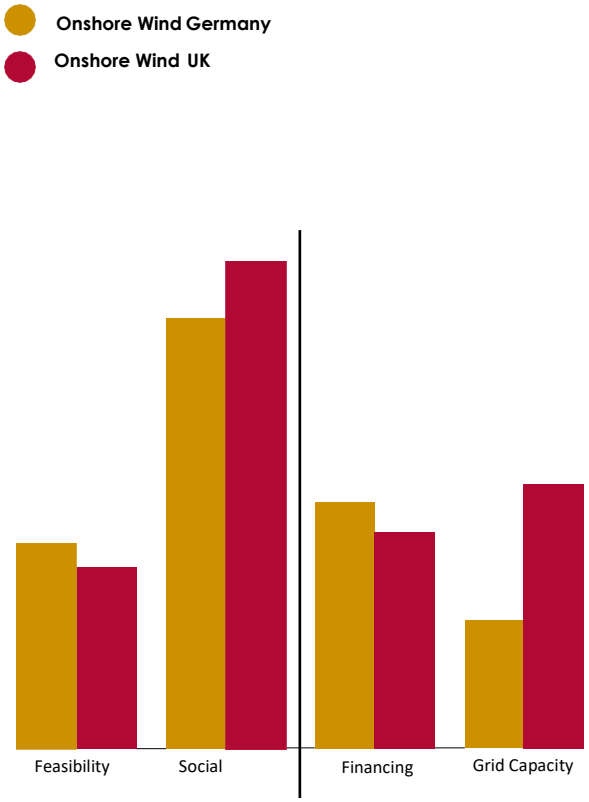
is the number of the subsidy-free and co-created values survey respondents.

62%

of the survey respondents **believe that wind power groups** cannot understand the importance of the co-creation values.

When you're looking a wind energy investment, air pollution, visual impact, biodiversity impacts, supply chain effects and society benefits or risks are also related to the project viability?

Given the growth in wind energy deployment and as the sector continues to mature, it is certain that the sector continues to face various challenges. These depend on the maturity stage and the market-specific regulatory framework. The diagram below illustrates these barriers in two European countries,



Where should wind power industry focus for a subsidy-free low carbon electricity?

Our analysis identifies areas which score highly on the foundation of a "subsidy-free" approach:

- Energy Support Mechanisms
- Co-created values
- Community engagement
- Capacity Factor improvements
- W.T G technology improvements
- Knowledge Sharing
- Mitigation of Secrecy
- Risks Understanding-Mitigation
- Environmental Impacts
- Power Purchased Agreements
- Supply Chain Improvements
- Lessons Learned Implementation
- Project Life Cycle Standardization

The objective of this research is to provide a holistic review of literatures and industry practices in relation to implementation and constraint analysis for subsidy-free wind power projects. Furthermore, this paper will present how the onshore wind industry can actively use constraints in co-creation processes as a mean to encourage creativity, knowledge sharing and innovation within developers, consultants, investors, manufacturers, policy makers, local authorities, and communities.

In summary, there is a need for a better understanding of constraints in co-creation-collaborative knowledge and an urgent need for a structured identification model to investigate their influence on subsidy-free and economically viable wind power projects. More specifically, the following research questions need to be addressed:

- What is co-creation without motive? Can there be engagement without any incentive?
- How can we establish the economic viability and technical feasibility of a project without governmental support?
- If expectations are different, how can we alleviate dysfunctional conflict that may also prevent perception and cost of energy mitigation prospects?
- Which externalities should be assessed and how they should be measured to reflect their impact in policy terms?
- Is it possible to achieve a significant mitigation of the Not in My Backyard syndrome through an intrinsic involvement (through the act of participation) or through an instrumental involvement (contribute to decision making)?
- In which way can we elucidate why and how onshore wind controversies might be ameliorated via community engagement strategies?
- Subsidies brought large amounts of renewable capacity online but did not let renewable energy producers to react to market signals. Why a subsidy zero approach can facilitate innovation?

In the case of a 'zero-subsidy' wind power project, which barrier is the most critical one?

Barrier	Number (%)
Market prices fluctuation	21%
Ever-changing regulatory framework	31%
Financial crisis	19%
Changes in governmental programs	23%
Geopolitical instabilities	6%

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September 2019

Does a zero-subsidy wind power investment make sense?

Subsidies were established to mitigate the cost of a new technology until this technology is cost-efficient and enough competitive. The subsidy scheme is considered reliable and effective if its general benefits outweigh project's costs. This has proven to be the case for the wind power industry, given that the learning curve depicts a significant decrease in the Levelised Cost of Energy as generators availability, capacities and production increase.

The most common governmental subsides nowadays are defined below:
1- Feed-in Tariff (FIT) is a fixed payment per MWh to renewable energy producers set by the state, providing a stable cash flow that facilitates project financing.
2- Contract for Difference (CfD) is a dynamic subsidy. It rewards the producer when the wholesale price falls below the strike price, and in return the producer must pay back the state when the wholesale price surpasses the strike price.
3- Feed-in Premium (FIP) is similar to CfD subsidy but the producer does not return the difference when the market price exceeds the strike price agreed.

Such supporting schemes developed to help investors reduce their expose to market price fluctuations, ensure high return of investment, mitigate uncertainties and risks. However, market signals and lessons learned cannot be identified with such schemes in place. Additionally, there is no motivation to reduce renewable energy costs or bottleneck phenomena on grids. This is not good for the industry as a whole because no matter how low is the wholesale electricity price, wind energy producers are agreed a premium to secure the strike price.

Subsidies will continue to exist and new schemes can be introduced in the future, as market conditions vary across countries. This is particularly true, because countries have different renewable energy targets, different energy plants, grid capacities, community support, energy needs etc. However, in light of the continuous increase in wind projects size and decrease in the associated cost, subsidies are lessening and in some European countries may come to an end.

In some countries, the cost of wind energy has drastically fallen to such an extent that zero-subsidy onshore wind projects are currently being developed. Surprising to many, zero-subsidy offshore wind projects in Germany and the Netherlands have been auctioned and awarded, indicating a new, yet uncertain and risky trend for the wind power industry.

The ability to invest or lend against a constant framework of cash flows, thanks to support schemes and subsidies, has provided a level of comfort and security both for investors and lenders. Given that a decrease or even halteration of subsidies is approaching, establishing a positive and stable revenue should be a key challenge as renewable energy producers are increasingly exposed to price volatilities. The higher exposure to the fluctuation of the electricity prices, with no subsidy support, may result in a higher project finanncing cost and uncertainty. However, this implicates some new challenges.

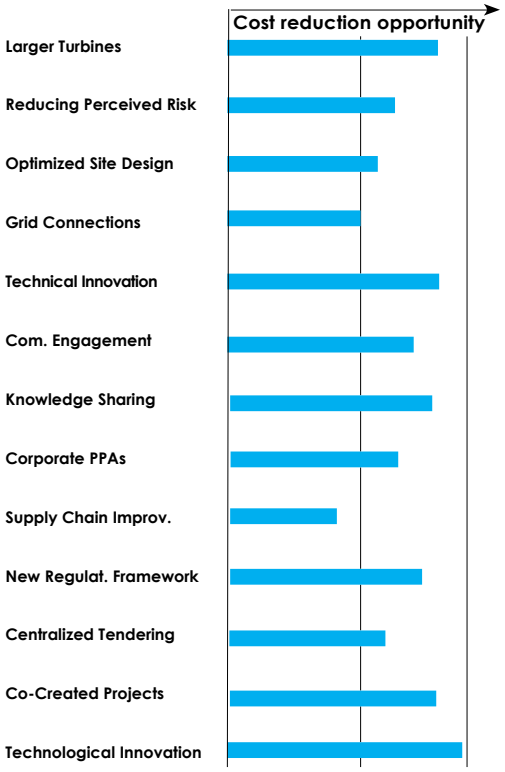
60GW

Around 60 gigawatts (GW) of new renewable capacity could be built by 2030, without subsidy, across six northwest European countries.

55%

It is estimated that surging demand, competition among manufacturers and technological innovations decreased the cost of construction on the wind farms by around 55%, meaning that zero-subsidy wind farms can be financially viable for bidders.

The most significant parameters to achieve a reliable and efficient cost reduction for onshore wind power projects.



Collaborative behaviours, such as knowledge sharing, open dialogue, community involvement, ethical synergy, decision making and joint improvements are high priorities to improve onshore wind social acceptability and foster innovation. Community engagement can be viewed as a vehicle through which to obtain a social license to operate (SLO); an indicator of community acceptance which can change over the course of a project and a significant parameter to a zero-subsidy transition.

What is missing from the past studies is a comprehensive and structured approach in managing co-creation constraints, community dissatisfaction and the relative conflicts resulting from a zero-subsidy approach. *How can those opportunities be generated for a meaningful engagement that can be seen as evidence of a willingness or openness to engage? What is possible to achieve with a co-created value and knowledge and what is the relationship between those two to facilitate innovation a zero-subsidy project?*

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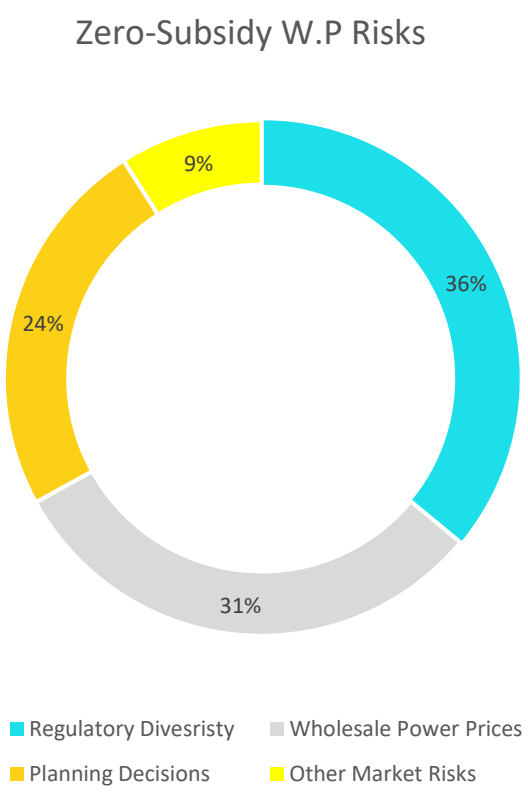
"Zero-Subsidy-free" has not the same meaning in every country because the renewable energy regulatory framework varies significantly. An indicative paradigm is the Netherlands where unlikeley the United Kngdom there is a govermental support for the grid connection of renewable energy installations. Additionally, technology innovations in the wind turbine generators with a capacity of 13-15MW compared with the current maximum generated power output of 9MW — are also a significant factor tor the economic viability of a wind power project.

A critical uncertainty for a zero-subsidy wind power project is the wholesale power prices volatility and unpredictability. During our survey a wind power professional from SIEMENS, said the firms bidding in these auctions "are taking a critical risk as they will almost certainly need higher wholesale power prices compared with today's power prices to make a reasonable profit and establish the highest return of ther investments".

Nevertheless, the wholesale power prices volatility can be managed effectively given the expected wind turbines improvements and as several coal plants come offline and Germany's nuclear power plants will stop their opeation in the next few years to come.

Risk Management of a zero-subsidy wind power project was a strong theme amongst survey participants . A third of responders (36 percent), particularly staff from smaller companies and those operating in onshore wind power development, identified the diversity of the regulatory framework as the most critical concern, while a further 31 percent indicated the wholesale power prices volatility as the second source of risk. Planning decisions are another source of uncertainty, particularly for the largest schemes particularly for those with complex supply chains and a diverse international reach. As a result, 24 percent either retained a decentralized approach to categorize the risks as "a calculated gamble" or with the same importance, depending on the business segment or market. Those that indicated "other market risks" also typically had a combined approach.

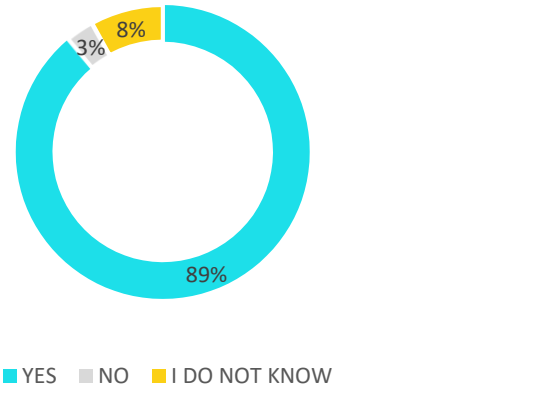
What are the risks to subsidy-free wind power deployment?



As any innovative regulation, procedure or policy can be a double-edged sword, it is imperative to understand the value added in W.P business from a subsidy free project and the associated benefits of the different structuring options.

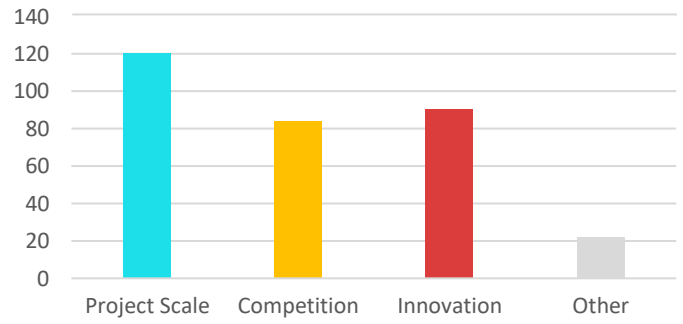
Price stability is one of the most critical factors to provide investors enough confidence and assurance that projects are viable and for banks that projects are bankable. There is a wide range of structuring options to establish price stability, such as: corporate power purchase agreements (PPAs) and Backing competitive auctioning schemes. Corporate PPAs are getting more attention across the industry during the last three years. This due to the fact that corporate PPAs can guarantee long-term fixed power prices and thuscan mitigate the associated risks. Corporates privet their power prices by paying a fixed price per MWh to the producer.

Do you think that a Corporate Power Purhace Aggreement can resolve the merchant risks for a subsidy-free wind power investment?



According to the respondents, competition, innovation, and scale all contribute to the rapid cost declines that have been achieved throughout the entire wind power project life-cycle. From the supply chain to turbine manufacturing and from the to installation to operation and maintenance. However the most dominant factor is "the decisive factor is scale."

What is the most important factor that should contribute to a significant cost of energy mitigation and facilitate subsidy-free schemes get off the ground?



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Survey Methodological Approach

The primary research method for this study is literature review, implementation of a subsidy-free wind energy project and modeling of the potential conflicts, risks and constrains towards project feasibility and high return of investment.

Barriers and risks identification through a structured approach is the very first step toward a "zero-constraint-conflict" environment for a subsidy-free project. This study will first review various types of constraints-conflicts in subsidy free onshore wind investments and their characteristics. Based on this understanding, a categorization method will be developed to classify constraint and conflict factors for the purpose of constraint-conflict identification, management and modeling.

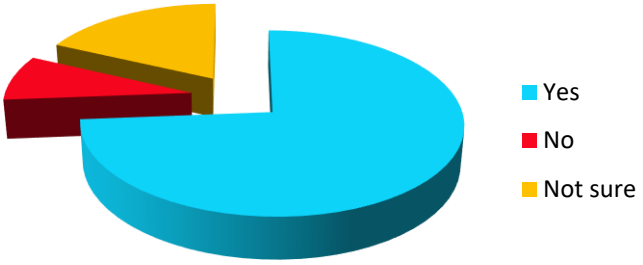
In the second stage of this study, other forms of energy plants (coal, gas and solar)will be technically, environmentally and economicaly analyzed. In the third stage the outcomes of the investigation will be incorporated to a multi-directional survey shared between the client, industry experts, the academia, developers, investors and local authorities.

Finally, once the risks, constraints and conflicts for a zero-subsidy wind energy project are classified, a conceptual framework to mitigate the technocratic arguments, merchant risk and price uncertainty will be provided to holistically evaluate the 'subsidy free' threshold.

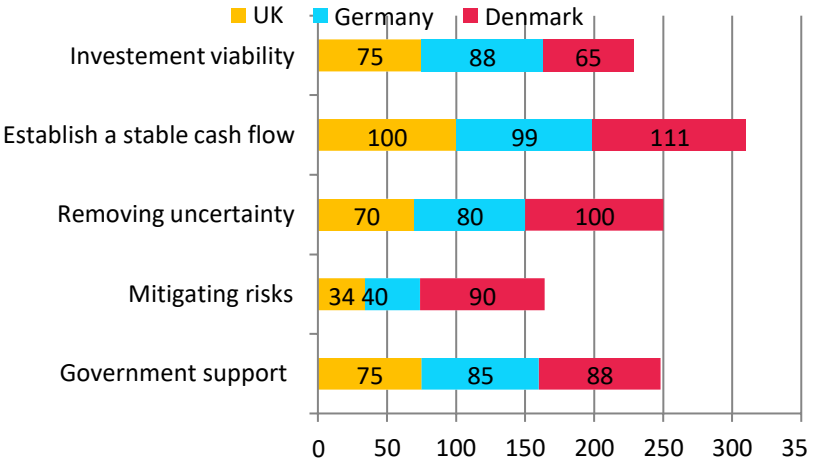
This is the public and not completed version of our research – survey paper.

To access the full version of the "**Zero-Subsidy Wind Investments - Risks and Opportunities**" contact Stavros Thomas, the author of this report, at stavros@windenergyscience.com

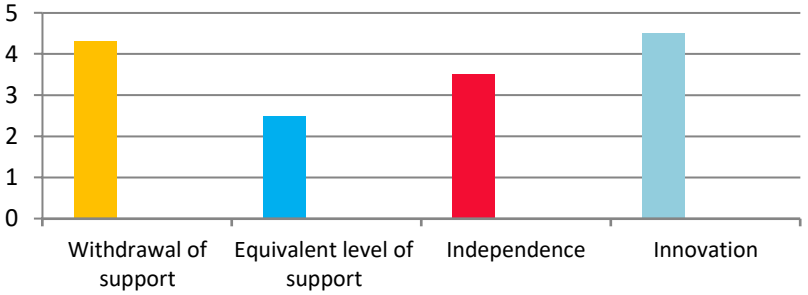
If a wind power project costing less than the market price for electricity across the lifetime of its 15-year CfD term could be considered subsidy-free?



What does the subsidy for a wind energy project really mean?



According to your experience what a zero-subsidy wind project really mean?



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