




COST
REDUCTION
MONITORING
FRAMEWORK
2015



“OFFSHORE WIND
REMAINS ON TRACK TO
ACHIEVE THE LEVELISED
COST OF ENERGY TARGET
OF £100/MWH BY 2020”

FOREWORD

“Since publication of the first Cost Reduction Monitoring Framework, offshore wind in the UK has continued to make progress in cost reduction as evidenced by both this report and the results from the first Contract for Difference auction where projects cleared the auction 14% and 18% below the reserve price. This shows that cost reductions continue to be driven through developments in the areas detailed in this report and through competition. The findings of this second Cost Reduction Monitoring Framework report continue to be encouraging and show we can be confident that £100/MWh by 2020 will be achieved. Industry and Government will now start to look towards the future at a new, ambitious cost reduction target for the mid/late 2020s”



Andrea Leadsom

Andrea Leadsom MP
Minister of State
Department of Energy and Climate Change

ABOUT OWPB

The Offshore Wind Programme Board (OWPB) brings together industry and government to find and implement solutions to barriers which have the potential to impede the viability and deliverability of offshore wind in the UK.

The OWPB reports to the Offshore Wind Industry Council and is working to drive deployment, bring down costs and build a successful, competitive UK-based industry.

ABOUT ORE CATAPULT

ORE Catapult combines unique and world leading test, demonstration and research facilities with expertise to accelerate development of technology innovation from SMEs and provide advisory services to industry.

We are reducing risk and lowering costs by helping to develop and operate offshore renewable technology more effectively, unlocking the UK's potential for affordable, secure, low-carbon energy with huge economic benefit.

Front cover image shows the Levenmouth Demonstration Turbine, the world's largest, open access offshore wind turbine dedicated to research.

1 EXECUTIVE SUMMARY

In 2015, the total installed capacity of offshore wind generation exceeded 5GW and the sector is now established as an important part of the UK's low carbon energy mix. The UK Government has stated that there will be funding available for a further three Contract for Difference (CfD) auctions in the current parliament provided that the sector continues to reduce costs. Tracking cost reduction and taking action to safeguard the pathway to the current target of £100/MWh has never been more important.

The Cost Reduction Monitoring Framework (CRMF) provides a systematic method to assess the progress against key milestones. Now in its second year, it is possible to carry out year on year comparisons for each indicator and this combined with the strengthening of the outlook assessment provides the sector and policy makers with a firm basis for informed decisions. The CRMF 2015 qualitative assessment is based on questionnaires, interviews and workshops with senior staff from 46 organisations active in the offshore wind industry between August and October 2015. The evidence was complemented by contributions from sector specialists and has been reviewed with industry working groups.

Details of the findings and specific recommendations are included in the CRMF 2015 Qualitative Assessment Report¹. The key findings are:

- Industry remains on target to achieve the Levelised Cost of Energy (LCOE) target of £100/MWh for projects reaching Final Investment Decision (FID) in 2020².
- The areas that make the largest contribution to cost reduction (turbines, competition and cost of equity) have all made good progress and remain on target or ahead of target.
- There is low confidence in achieving the 2020 milestones in the areas of growth and scale and OFTO capex. Balance of plant, installation and cost of equity were areas with a medium level of confidence indicating that risks remain.
- Lack of visibility of market deployment is leading to reduced investment in R&D and manufacturing infrastructure and was highlighted by all parts of the supply chain as the largest risk to achieving £100/MWh and to further cost reductions beyond 2020.
- The introduction of the CfD auction process is broadly supported across the sector but the auction process has indirectly introduced some additional barriers to cost reduction that require action to ensure they are overcome.

The main recommendations for the OWPB are to:

1. Work with Government to enable further CfD auctions in 2016 and subsequent years and to provide clarity on the budget allocation for offshore wind.
2. Prioritise industry support for areas where 2020 innovation targets are at risk. Support Government agencies in taking a coordinated approach to technology innovation programmes, including demonstration of novel foundations and optimised electrical infrastructure.
3. Coordinate industry and government to overcome the barriers to cost reduction indirectly introduced by the CfD auction process.
4. Track the impact of slower than anticipated market deployment on investment in R&D and manufacturing infrastructure, to safeguard the UK's leading position in the offshore wind market.
5. Identify technology innovations that will deliver further cost reductions post-2020.

¹ CRMF 2015 Qualitative Assessment Report ore.catapult.org.uk/industry-report

² In 2011 real terms



“Tracking cost reduction and taking action to safeguard the pathway to £100/MWh has never been more important.”

CRMF 2015

2 INTRODUCTION

2.1 BACKGROUND

The Cost Reduction Monitoring Framework (CRMF) was initiated in 2014 by the Offshore Wind Programme Board and the members of the Offshore Wind Industry Council. The aim of CRMF is to track the industry's cost reduction progress towards a target LCOE of £100/MWh for projects that achieve FID in 2020. The framework was designed by ORE Catapult in conjunction with the Crown Estate and progress is tracked against milestones that assess the potential of innovations in technology, supply chain and finance to support cost reduction.

CRMF is focussed on the UK market but it incorporates evidence from activity worldwide, particularly in the EU. This is the second year that the CRMF has been implemented and the use of a consistent approach allows direct year-on-year comparisons to identify progress and risks.

2.2 FRAMEWORK

The CRMF comprises a qualitative and a quantitative assessment:

- The qualitative assessment uses questionnaires and interviews to assess industry progress against pre-agreed milestones and provides an outlook towards 2020 targets.
- The quantitative assessment uses standardised project data declared at FID and Works Completion to calculate an industry average LCOE.

To ensure anonymity of commercially sensitive data, the Quantitative Assessment can only be carried out when there are sufficient projects reaching FID or Works Completion in the given year. For CRMF 2015, there were insufficient suitable projects and consequently no Quantitative Assessment was carried out. There will be sufficient suitable projects in early 2016 to allow a Quantitative Assessment in 2016 for the period 2015/16.

2.3 DELIVERY

The consultation for CRMF 2015 was carried out between August and October 2015. Participation was positive and there was a broad mix of developers, supply chain and finance organisations. Note that the main consultation was carried out ahead of the government's energy reset speech³ which may have started to address concern around market visibility.

The full outputs of the Qualitative Assessment can be found in the two outputs:

- CRMF 2015 Qualitative Assessment Report⁴
- CRMF 2105 Qualitative Assessment Evidence Log⁵

³ www.gov.uk/government/speeches/amber-rudds-speech-on-a-new-direction-for-uk-energy-policy

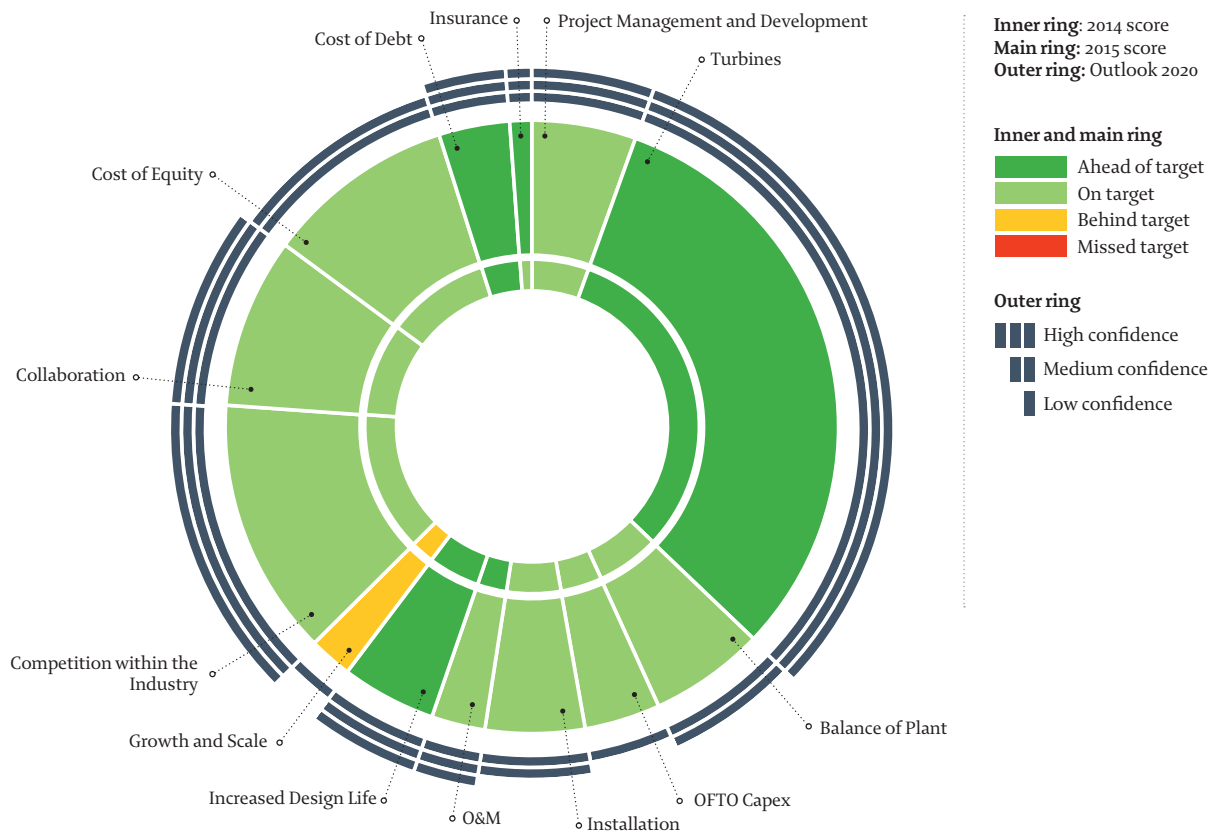
⁴ CRMF 2015 Qualitative Assessment Report ore.catapult.org.uk/industry-report

⁵ CRMF 2105 Qualitative Assessment Evidence Log ore.catapult.org.uk/industry-report

3 SUMMARY OF RESULTS

3.1 QUALITATIVE ASSESSMENT RESULTS

The following chart summarises the results of the CRMF 2015 Qualitative Assessment. The size of each segment shows the relative potential of each activity for cost reduction for projects reaching FID in 2020. The inner ring shows the 2014 assessment, the main ring shows the 2015 assessment and the outer bands show the outlook assessment in terms of confidence of achieving the 2020 target.



With the exception of growth and scale, all of the Level 1 indicators remain ahead or on target. The large potential for cost reduction from turbine development makes a significant contribution and includes increases in ratings, optimised rotor sizes and improved drivetrain concepts. Note that the full Qualitative Assessment covers 66 Level 3 indicators and the full report provides insights into these detailed changes year on year. The level 1 indicators are weighted averages of these Level 3 indicators.

Cost of debt and increased design life also remain ahead of their respective targets. O&M is on target in 2015 rather than ahead of target in 2014 but this is a minor change reflecting some slower than forecast uptake in areas such as offshore accommodation.

The outlook assessment highlighted low confidence in achieving the 2020 milestones in the areas of OFTO capex and growth and scale. Balance of plant, installation and cost of equity were areas with a medium level of confidence indicating that risks remain.



3.2 CURRENT STATUS

The CRMF 2015 Qualitative Assessment supports the view that the industry remains on target to achieve the cost reduction target of £100/MWh for projects reaching FID in 2020. The majority of indicators show that progress is being made at the required pace to achieve the target reductions by 2020.

The CRMF 2014 report provided evidence that, on an industry aggregated basis, projects taking FID in the UK by 2014 were based on business cases showing LCOE of £121/MWh.

Evidence of further progress in LCOE reduction was seen in the results of the UK's first CfD auction round, announced in February 2015, with strike prices of £119.89 and £114.39 indicating that the owners of these

projects (due to take FID in 2016) are confident of achieving LCOE lower than £121/MWh.

Whilst comparisons with tariffs or economic signals from other countries must be understood in the context of differences between the regulatory regimes, progress in other European countries in 2015 also provided supporting evidence of the cost reduction trajectory. Details of this can be found in the Qualitative Assessment Evidence Log.

The areas that make the largest contribution to cost reduction (turbines, competition and cost of equity) have all made good progress and remain ahead or on target.

Turbine development remains ahead of target and this was demonstrated by the significant increase in turbines contracted for projects reaching FID in 2015 being in the 5MW to 7MW range. There has also been progress in control technology but commercial deployment of nacelle mounted LIDAR is lower than expected. Longer term development required for the next generation of turbines with ratings of over 10MW is progressing at a slower pace due to uncertainty in future markets with some drivetrain concepts lagging behind targets.

There is a trend of consolidation within the sector but the level of competition remains on target. In terms of turbines, there are four OEMs with products that are categorised by CRMF as proven. The number of experienced suppliers of XL monopiles is considered to be as low as three. Any further reductions in either of these areas would jeopardise the cost reduction that comes from optimum levels of competition.

3.3 OUTLOOK

The outlook assessment highlighted low confidence in achieving the 2020 milestones in the areas of growth and scale and OFTO capex. Balance of plant, installation and cost of equity were areas with a medium level of confidence indicating that risks remain.

The outlook of HVDC technology reflects the perception that projects reaching FID in the UK before 2020 are unlikely to use this technology, although other markets, such as Germany, are likely to continue development.

The low confidence in the outlook for growth and scale reflects the smaller than anticipated CfD allocations and lack of firm market forecasts. It is worth noting that while supply chain consultees viewed the UK and European markets together, the UK is still currently seen as the leading market. This will only remain the case with clarity on future CfD budget allocations.

Balance of plant was given a medium confidence outlook reflecting that while there has been significant progress in the R&D of cost reduction technologies such as 66kV electrical infrastructure and gravity base structures the industry is still experiencing delay in commercial deployment. Risks of meeting the 2020 target were also identified around installation. For example, there is no evidence of investment decisions to commission new support structure installation vessels.

3.4 GROWTH AND SCALE

Growth and scale was assessed as behind target and this is despite a reassessment of the milestones for this indicator in 2014 when the UK target was reduced to reflect the cost reduction potential of a smaller (11GW by 2020) market. The delay of a second CfD auction has meant that the milestone has not been achieved. Implementation of a CfD auction in 2016 and a further two by 2020 could return this indicator to on target.

Lack of visibility of market deployment was highlighted by all parts of the supply chain as the largest risk to achieving £100/MWh and to further cost reductions beyond 2020. CRMF 2014 reported that this was a risk to investment decisions for developers and turbine OEMs. The consultations in 2015 found this was becoming an issue throughout the supply chain and this will be a barrier to entry to the market for SMEs with innovative solutions who cannot fund product or service development without sufficient confidence in the size of the market.

3.5 ADAPTING TO CFD

The introduction of the CfD auction process is broadly supported across the sector but the auction process has indirectly introduced some additional barriers to cost reduction that require action to ensure they are overcome.

The competitive auction system is leading to reduced intercompany knowledge sharing particularly in the period before auctions. Instead, there is an increased focus on internal knowledge sharing. This may be a natural adaptation as the sector matures but it was also seen as a risk to collaborative cost reduction initiatives.

There is a continued downward trend in number of contracting packages by most developers but it is not clear whether this is resulting in the anticipated reduction in contingencies throughout the whole supply chain. Developers who are seeking to consolidate contracting packages tend also to see involvement of supply chain earlier and in more detailed design work.





4 CONCLUSIONS

The CRMF 2014 Report concluded that £100/MWh was achievable but that risks remained particularly around volume and market uncertainty. CRMF 2015 concludes that the progress in cost reduction is continuing and that £100/MWh remains achievable by 2020. This is supported by the results of the CfD auctions in March 2015 and activity in other European countries.

The risks raised in 2014 were expressed most strongly from developers. In 2015, the concerns are also heard from the supply chain. The areas that have the lowest confidence outlook are balance of plant and OFTO Capex. It is noticeable that these are the areas that required long term investment in manufacturing facilities and vessels.

This is the first CRMF report since the introduction of CfDs. With a low budget allocation, the CfD process has increased competition and resulted in winning bids that have required commitment to significant cost reductions. The result is undoubtedly positive in terms of value for money and for the transition to low carbon electricity generation.

The CRMF consultation found broad support for the CfD process. However, the consultation received two consistent messages relating to CfD. Firstly, greater clarity on future CfD timing and allocation was required in order to support further investment in cost reduction. The UK Government has started to address this but further clarification is required on the cost reduction milestones required to become cost competitive with other low carbon technologies and the timing and allocation of CfD rounds.

The second message related to the indirect consequences of the CfD auction process from reduced collaboration, increased risk during the development phase and less opportunities for innovation. The recommendations in this report aim to address these consequences.

In summary, £100/MWh remains achievable but the following risks should be addressed:

- Missing cost reduction progress due to lower than expected volume
- Installation and balance of plant due to hesitation to invest in manufacturing and vessels
- Uncertainty in political support and volume post-2020
- Unintended impact of the CfD on industry collaboration

5 RECOMMENDATIONS

The main recommendations for the OWPB are to:

1. Work with Government to enable further CfD auctions in 2016 and subsequent years and build on the positive indications given in the Government's November 2015 energy policy announcements to ensure clarity on the budget allocation for offshore wind.
 2. Prioritise industry support for areas where 2020 innovation targets are at risk. Support Government agencies in taking a coordinated approach to technology innovation programmes. Recommendations identified by the assessment include:
 - Ensure continued progress in deployment of 66kV, ensure lessons learned about early deployment of the technology are disseminated to industry. Undertake a review of the gaps in cable standards to understand where future efforts should focus.
 - Ensure that demonstration sites are secured to de-risk gravity base structures. Prioritise research to enable optimisation of jacket designs.
 - Continue work in understanding the true cost reduction potential of optimisation of AC platform design, increased capacity AC cables, lightweight (or distributed) transmission systems and HVDC.
 3. Coordinate industry and government actions to grow collaborative initiatives in a maturing competitive market. These initiatives should aim to overcome the barriers to cost reduction indirectly introduced by the CfD auction process.
 4. Track the impact of slower than anticipated market deployment on investment in R&D and manufacturing infrastructure, to safeguard the UK's leading position in the offshore wind market.
 5. Identify technology innovations that will deliver further cost reductions post-2020.
- Engage regulators on lessons learned from other European countries on policies that reduce development risk such as changes to CfD application eligibility criteria or support for project development activity.
 - Continue to investigate comparisons/ collaborations with equivalent European organisations such as the Offshore Stiftung programme in Germany and TKI Wind Opp Zee in the Netherlands.
 - Consider whether increased barriers to collaboration have been introduced too quickly as an indirect consequence of the CfD auction process. Make recommendations to government on how to achieve the appropriate balance between competition and collaboration on cost reduction.
 - Develop a tool that tracks supply chain growth and investment to help OWPB highlight the benefits of that market volume has on economic growth. This could build on the capability of the online RenewableUK supply chain map.
 - Consultees highlighted the importance of market visibility beyond 2020. This should be informed by an industry-led forecast of cost reduction opportunities supported by OWPB and key stakeholders.

DISCLAIMER

Whilst the information contained in this report has been prepared and collated in good faith, ORE Catapult makes no representation or warranty (express or implied) as to the accuracy or completeness of the information contained herein nor shall be liable for any loss or damage resultant from reliance on same.

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