EUROPEAN COMMISSION
RTD - Energy
ENER - Renewables, R&I, Energy Efficiency
JRC – Institute for Energy and Transport
SET Plan Secretariat

SET-Plan – Declaration on Strategic Targets in the context of an Initiative for Global Leadership in Offshore Wind

Purpose of this document

This document[1] is intended to record the agreement reached between representatives of the European Commission services, representatives of the EU Member States, Iceland, Norway, Turkey and Switzerland, (i.e. the SET-Plan Steering Group) and representatives from the SET-Plan stakeholders most directly involved in off-shore wind[2], on the implementation of the actions contained in the SET-Plan Communication[3], and specifically the strategic targets for the priority "Number 1 in renewable energy" for what concerns off-shore wind.

This agreement follows consultations with industry represented by the Research and Innovation Working group of the European Wind Energy Association and the Smart Grids Technology Platform, with the research community represented by the EERA Joint Programme on Wind, and with academia via the European Platform of Universities in Energy Research & Education (EUA-EPUE), as well as a public consultation via the SETIS website[4] on an issues paper prepared by the Commission[5]. It takes into consideration the corresponding input papers and public comments available on SETIS (https://setis.ec.europa.eu/towards-an-integrated-SET-Plan) and discussions in the SET-Plan Steering Group on 9 December 2015 with the participation of the relevant SET-Plan stakeholders mentioned previously.

The stakeholders agree to highly ambitious targets in an endeavor to maintain global leadership in the sector, to put forward their best efforts in a coordinated way between public and private sectors, and to jointly address all relevant issues in order to attain the agreed targets.

Brussels, 20 January 2016

1 This document has no legally binding character, and does not prejudge the process or final form of any future decisions by the European Commission.
2 Research and Innovation Working group of the European Wind Energy Association, the EERA Joint Programme on Wind, the Smart Grids Technology Platform
3 Towards an Integrated Strategic Energy Technology (SET) Plan: Accelerating the European Energy System Transformation" (C(2015)6317).
4 Strategic Energy Technology Information System website https://setis.ec.europa.eu/
5 https://setis.ec.europa.eu/system/files/SET_Plan_Issues_Paper_Offshore_Wind.pdf

Introduction – Off-shore Wind

Wind energy is the renewable energy technology expected to provide the largest contribution to the RE targets for 2020 and beyond. Installed wind power capacity in the EU is currently around 140 GW; approximately 127 GW of the capacity is onshore and just over 13 GW is offshore. By 2020 total installed wind energy capacity could reach 210 GW, that equals a capacity to supply 14% of electricity demand, and by 2030 it could reach 350 GW (i.e. supplying between 21% and 24% of demand). The cost of onshore wind power is already competitive with other sources of electricity in a number of countries and the sector is now developing on the basis of its economic advantages.

Offshore wind represents a significant future opportunity: resources are stable and abundant and public acceptance is higher. Europe is the leader in offshore wind and the sector continues growing. While in other regions of the world the offshore wind industry has just started to develop, European industries can count on over 20 years of experience and on a continuous increase at gigawatt (GW) levels in additional annual capacity since 2012. As of July 2015 around 3100 offshore wind turbines in 82 wind farms across 11 countries in European waters are fully grid connected. Another 2.9 GW are awaiting connection and according to industry sources, there are 26.4 GW of consented offshore wind farms identified, and a further 98 GW of planned offshore wind farms in the pipeline. Industry cost reduction targets for 2020 vary between €100/MWh to €140/MWh.

In order to maintain European leadership, the competitiveness of the offshore wind energy sector must increase further. Therefore 2 key issues need to be tackled:

1 - Offshore wind costs must be reduced through, but not only, increased performance and reliability in order to meet its full potential contribution to the European energy mix.

2 - There is a need to develop (floating) substructures or integrated floating wind energy systems for deeper waters and wind energy systems for use in other marine climatic conditions, to increase the deployment possibilities and to improve the European position in the global market.

Strategic Targets

Agreed strategic targets for offshore wind energy

1. **Reduce the levelised cost of energy (LCoE)** at final investment decision (FID) for fixed offshore wind* by improvement of the performances of the entire value chain to
    - **less than 10 ct€/kWh by 2020** and to
    - **less than 7ct€/kWh by 2030**;
2. Develop cost competitive **integrated wind energy systems** including substructures which can be used in **deeper waters (>50m) at a maximum distance of 50 km from shore with a LCoE* of**
    - **less than 12 ct€/kWh by 2025** and to
    - **less than 9 ct€/kWh by 2030**

** the costs for delivering the electricity to onshore substations are taken into account within the LCoE*

These ambitious targets are associated with high reliability (going up to 98-99%), superior performance, and with much more cost-effective and innovative installation, maintenance, and logistics. To realize the cost targets a facilitating research and innovation framework needs to be accompanied by sufficiently large deployment volumes.

A projected relation between cost reductions and volumes deployed can be seen in the figure below. For example, LCoE of projects for a bottom fixed offshore wind farm with FID in 2030 deployed at 4-4.5 GW/year (EWEA central scenario[6]) will be around 8.5ct€/kWh, and with a higher deployment rate of 7-7.5GW/year achieving a cost of around 7.9 €ct/kWh. To realise a further reduction to 7 ct€/kWh more ground-breaking research and innovation actions will be needed.

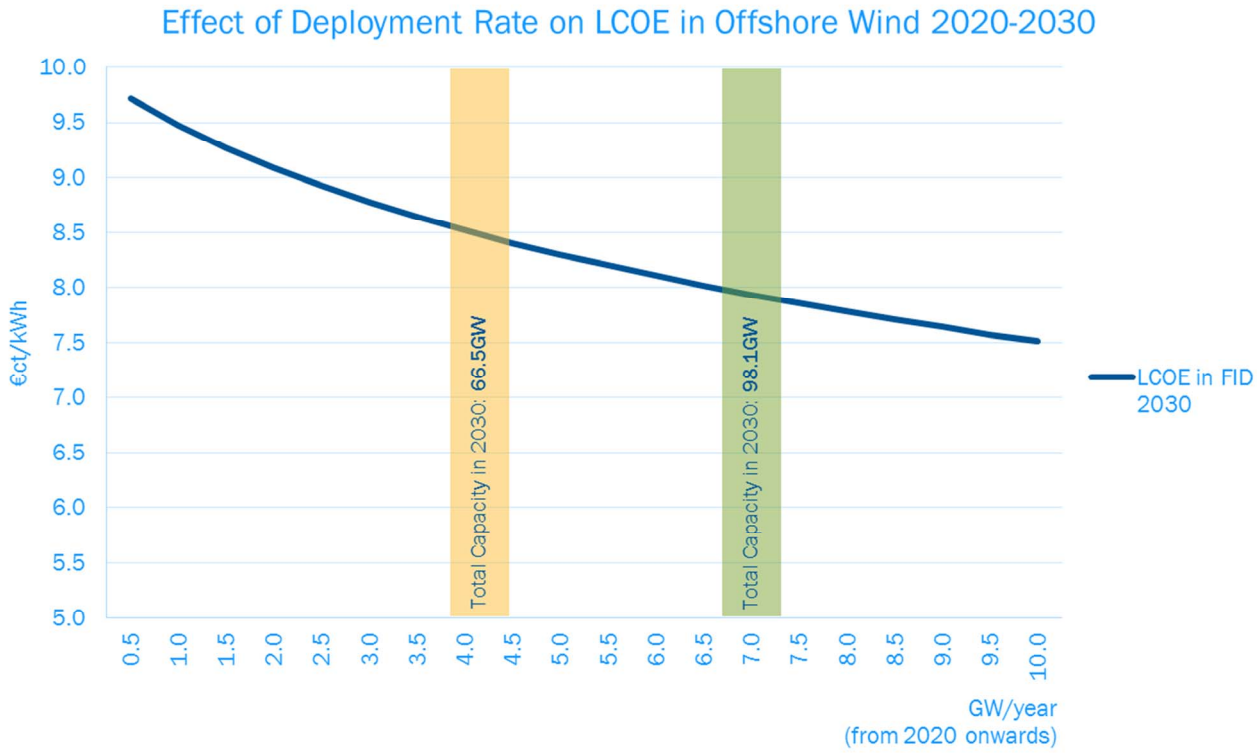

Figure 1 Offshore Wind Cost Reduction in Europe based on different deployment rates to 2030[7]. Analysis is based on Central and High Scenario projections in EWEA Wind Energy Scenarios 2030 for Europe with a 16% learning rate applied to derive the cost of energy. The starting LCOE is EUR100/MWh for projects reaching FID in 2020 and based on the current national offshore wind energy targets it is expected that around 24 GW will be installed in 2020.

These targets possibly involve the following elements[8]:

- *Production value chain performance/cost competitiveness:*
Larger and lighter turbines (>10 MW while maintaining top-head mass below 50t/MW); more reliable turbines (materials and components of better quality; condition monitoring and control strategies); lower-cost, fast deployment installations, including foundations, and improved cable laying and protection methods; development of lower cost interconnection systems. Substructures or integrated wind energy systems for water depths beyond 50m and possibly in other climates conditions for instance for offshore wind farms in the Baltic Sea and Mediterranean.

[6] http://www.ewea.org/publications/reports/wind-energy-scenarios-for-2030/
[7] EWEA Business Intelligence analysis
[8] SET-plan Towards and integrated roadmap (2014)
https://setis.ec.europa.eu/system/files/IR_Annex%20I_Part%20II_Competitive,%20Efficient,%20Secure,%20Sustainable&Flexible%20Energy%20System.pdf

- *Production value chain*
Standardisation; better infrastructure for large scale deployment including appropriate and sufficient test and validation centers, effective methods for repowering and recycling, lighter, stronger and cheaper materials; new control and power electronics.

- *Better system integration*
Grid development (enhancing system security, grid integration) and reliability of the grid at very high levels of wind power penetration, up to 70% of the electricity demand, and accuracy of wind power forecasting. .

- *Wind conditions*
Efficiency and accuracy of wind design conditions, siting, resource assessment and forecasting. An uncertainty of less than 3% in the forecasting is expected by 2030.

- *Non technological aspects*
A coordinated, continuous pipeline of offshore wind projects until 2030 enabling a continuous learning curve and cost reduction. New market designs and optimal business models for a power system with high shares of non-dispatchable renewables generation, improved financing conditions for wind energy projects especially reducing the cost of capital for offshore wind. Knowledge exchange (sharing best practice, seeking common solutions and standards, seeking common ground for economically viable investments)

- *Environmental and societal issues*
Knowledge on potential impacts of wind energy on the environment and cost-effective solutions to minimise it, increase social acceptance and support for wind energy.

Next steps

The stakeholders agree to develop within 6 months a detailed implementation plan for the delivery of these targets, determine joint and/or coordinated actions, identify the ways in which the EU and national research and innovation programs could most usefully contribute, identify the contributions of the private sector, research organizations, and universities, identify all issues of a technological, socio-economic, regulatory or other nature that may be of relevance in achieving the targets, and report regularly on the progress with the purpose to monitor the realisation of the targets and take rectifying action where and whenever necessary.

The stakeholders intend to use the new European Technology and Innovation Platform for Wind as the main vehicle for discussing and agreeing on the implementation plan.