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COMMISSION STAFF WORKING DOCUMENT

NER300 - Moving towards a low carbon economy and boosting innovation, growth and employment across the EU

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INTRODUCTION

(1) This Commission staff working document takes stock of the state of play of the first call for proposals under the EU´s NER300 funding programme, one of the world´s largest funding programmes for innovative low carbon energy commercial demonstration projects and a key component of the EU´s strategy to tackle climate change. The document also highlights the importance of the NER300 funding programme as one of the EU´s major policy initiatives to stimulate low-carbon growth and employment across the EU[1].

NER300 – TOWARDS BOOSTING INNOVATION, GROWTH AND JOBS ACROSS THE EU

(2) Under the ongoing first call for proposals of the NER300 funding programme, some 3 carbon capture and storage (CCS) demonstration projects and up to 16 innovative renewable energy (RES) demonstration projects could be co-funded. The amount of funding is still subject to uncertainty and will be known in October 2012. It is estimated that some €1.3 to 1.5 billion could be available. Projects in more than half of the Member States are likely to be supported, including a number of them in Member States in economic and fiscal difficulty at present. NER300 funding will leverage a considerable amount of private investment and/or national co-funding across the EU, it will boost the deployment of innovative low-carbon technologies, and it will stimulate the creation of jobs in those technologies in the EU. With this, the NER300 also addresses the country-specific recommendations for budgetary measures and economic reforms to enhance financial stability, boost growth and create employment across the EU adopted by the Commission on 30 May 2012, which point *inter alia* to the need for further investments in the energy sector[2].

NER300 – TOWARDS CONCLUDING THE FIRST TRANCHE BY END 2012

Background and main principles

(3) Established by Article 10a(8) of the EU Emissions Trading Directive[3], and further developed through Commission Decision 2010/670/EU (NER300 Decision)[4], the NER300 funding programme covers 300 million allowances from the new entrants reserve of the third phase of the EU Emissions Trading System for the co-financing

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1 This technical document has been prepared by the Commission services and is of a preliminary nature. It is published in the interest of transparency and is not intended to grant any assurance or to have any legal effect. It does not prejudge the award decisions to be adopted by the Commission at the end of the selection process.

2 For further information see Europe 2020 website: http://ec.europa.eu/europe2020/index_en.htm

3 Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC, OJ L 275, 25.10.2003, p.32.

4 Commission Decision 2010/670/EU laying down criteria and measures for the financing of commercial demonstration projects that aim at the environmentally safe capture and geological storage of CO2 as well as demonstration projects of innovative renewable energy technologies under the scheme for greenhouse gas emission allowance trading within the Community established by Directive 2003/87/EC of the European Parliament and of the Council of 3 November 2010, OJ L 290, 6.11.2010, p.39.

of commercial demonstration projects of environmentally safe carbon capture and geological storage (CCS), as well as innovative renewable energy technologies, in the territory of the EU.

(4) The funds generated from 300 million allowances are distributed through two rounds of calls for proposals, covering 200 and 100 million allowances, respectively. The first call for proposals was launched in November 2010. The Commission aims to adopt award decisions to Member States for successful projects by end 2012.

(5) The programme intends to support a wide range of CCS and RES technologies, the latter including bioenergy, concentrated solar power, photovoltaics, geothermal, wind, ocean, hydropower, distributed renewable management categories. The NER300 rules foresee that no Member State can be host to more than three projects over the two rounds.

(6) NER300 will provide 50% of relevant costs[5]. No project will receive funds corresponding to more than 15% of the available allowances over the two rounds of calls for proposals. In case the funds should amount to €1.3 billion the 15 % cap would amount to €292 million, with €1.5 billion the corresponding cap would be €337 million. Funding will be disbursed based on performance, i.e., the amount of CO_2 stored for CCS projects, and the amount of renewable energy produced for RES projects, and provided certain knowledge sharing requirements are met[6]. Upfront funding may be made available depending on available revenues to accelerate final investment decisions and entry into operation of projects to the extent possible. In case a project e.g. fails to enter into operation or ceases operation, Member States will have to recover and return any excess funding.

(7) The Commission is responsible for the overall implementation of the NER300 programme. Acting as an agent of the Commission, the European Investment Bank (EIB) has scrutinised the submitted bids and is also responsible for monetising the allowances as well as for providing funding to the Member States for disbursement to the project sponsors.

State of play and road ahead

(8) Both the selection and the monetisation process are on track towards issuing award decisions by the end of 2012. The first call for proposals received a strong response from project sponsors and Member States. In May 2011, a total of 79 project proposals, including 13 CCS and 66 RES proposals, from 21 Member States, were submitted to the EIB for further assessment. The total amount of funding requested was €11.8 billion.

(9) The EIB completed its technical and financial due diligence assessment of the project proposals in early February 2012, and submitted a list of projects, ranked by their cost-per-unit performance (which is the costs divided by the performance, i.e., the amount of CO_2 stored for CCS projects, and the amount of energy produced for RES

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5 Relevant costs are defined as those investment costs due to the application of CCS or RES technologies net of the net present value of the best estimate of operating benefits and costs arising due to the application of CCS or RES technologies during the first 10 (CCS) or 5 (RES) years of operation.

6 Pursuant to Article 8 of the NER300 Decision, projects shall be ranked in order of increasing cost-per-unit performance (cpup). The cpup is calculated by dividing the sum of the total request for public funding (i.e., the relevant costs minus any operator contribution) and the best estimate of the net present value of additional benefits by the performance of the project (i.e., the amount of CO_2 stored for CCS projects, and the amount of renewable energy produced for RES projects).

projects) to the European Commission. The due diligence assessment was completed for 76 of the 79 proposals submitted to the EIB. Three projects (2 CCS, 1 RES) had been withdrawn in the course of the process. Of the 76 projects for which the due diligence assessment was completed, 10 RES projects failed the due diligence assessment. The due diligence assessment was hence concluded positively for the remaining 66 projects, including 11 CCS and 55 RES projects, with a total funding request of €10.2 billion. On the basis of the funding requests of the two groups, the funding proportion between the two groups was established as around 60%/40% for CCS/RES projects. One further CCS project was withdrawn after completion of the due diligence assessment.

(10) The Commission services have provided first information on the outcome of the EIB due diligence assessment to concerned Member States and have also performed competitiveness checks for those RES sub-categories where only one or two project proposals had been submitted. All project sub-categories assessed were found to be competitive. In addition, the Commission services have verified the eligibility checks performed by the Member States.

(11) The EIB's selling of the first 200 million allowances is progressing well. By end June 2012, the EIB had sold some 140 million allowances for delivery in December 2013. This raises some € 1.14 billion upon delivery in December 2013. The average price per allowance sold so far has been € 8.05. Given the extra-budgetary character of the NER300, the expenses and fees incurred by the EIB[7], are covered from the generated funds. Therefore, not all of them will be available for award decisions. The monetisation of the first 200 million allowances will be completed in early October 2012.

(12) Whilst the variety and financial and technical quality of the project proposals in the competition has been found to be very positive and promising, available funds impose limits on the number of projects that may be awarded.

(13) The Annex indicates the current lists of candidates for award decisions, where appropriate, together with reserve candidates, which may be awarded funding in case some of the current candidates drop out. It should be noted that not all of the candidates on the lists may receive funding, depending on the total amount of funds available, and that the lists may still change in case project proposals are withdrawn by project sponsors or deselected by Member States. The candidate list of RES projects is longer as the prospective NER300 co-financing for a CCS project is substantially larger than the average funding required per RES project.

(14) Upon completion of the monetisation of the first 200 million allowances, the Commission will draw up the final list of candidates for award decisions, de-select projects as required to match the total available funds, and ask Member States to formally confirm support for at most three projects on the final list, as well as any national co-funding where applicable. The confirmed list of projects for award decisions will be presented for an opinion of the Climate Change Committee, and after that, award decisions will be made.

[7] Set out in Article 16 of the Co-operation Agreement between the Commission and the EIB on theimplementation of the NER300 Decision, OJ C 358 of 31.12.2010, p.3.

(15) Member States that have not yet done so are called upon to urgently finalise the transposition of the CCS-Directive[8] into national legislation.

CONCLUSIONS

(16) The NER300 funding programme is one of the world´s largest funding programmes for innovative low carbon energy commercial demonstration projects and a key component of the EU´s strategy to tackle climate change. It also is one of the EU´s major policy initiatives to stimulate growth and employment across the EU. Implementation of the first call for proposals is on track. The turnout and quality of the candidates for award decisions is very promising, while available funds are limited.

(17) In order for the Commission to adopt award decisions by end 2012, all Member States with candidate or reserve projects on the list in the Annex are requested to proceed swiftly to confirm for all candidates support as well as the national funding contributions, which will be granted subject to State aid approval in accordance with the notification requirement pursuant to Article 108(3) TFEU. Such confirmations should reach the Commission as soon as possible and no later than 1 October 2012.

[8] Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide of 23 April 2009, OJ L 140, 5.6.2009, p. 114.

Annex 1

Candidates for award decision, displayed in the current order of selection, and reserve lists for funding under the first call for proposals of the NER300 funding programme

Carbon Capture and Storage group

Candidates for award decisions and reserve list

N.B.: Within the estimated €1.3 to 1.5 billion of available funds, the first 2 to 3 CCS projects could be funded in the candidate list below. In case a project drops out from the candidate list, i.e., if it is de-selected due to insufficient funds or not confirmed by the Member State, the next-highest ranked project from the reserve list would succeed into the candidate list, provided the portfolio requirements set out in Article 8(2) of the NER300 Decision (minimum requirements in terms of technology categories and storage options represented) are met.

Candidates for award decisions

Project category	Member State	Project
Pre-combustion	UK	Don Valley Power Project
Post-combustion	PL	Belchatow CCS Project
Industrial application	NL	Green Hydrogen
Pre-combustion	UK	The Teeside CCS Project
Oxyfuel	UK	UK Oxy CCS Demo
Pre-combustion	UK	C.GEN North Killingholme Power Station
Post-combustion	IT	Zero Emission Porto Tolle
Industrial application	FR	ULCOS-BF

Reserve list

Project category	Member State	Project
Post-combustion	RO	Getica CCS Demo Project
Post-combustion	UK	Peterhead Gas CCS Project

Renewable Energy group

Candidates for award decisions and reserve list

N.B.: Within the estimated €1.3 to 1.5 billion of available funds, not all top-ranked projects could be funded. In case a project drops out from the candidate list, i.e., if it is de-selected due to insufficient funds or not confirmed by the Member State, it will be replaced by the second-ranked project in the relevant sub-category.

Candidates for award decision (top-ranked projects)			**Reserve list (second-ranked projects)**	
Member State	**Project category**	**Project**	**Member State**	**Project**
SE[9]	Bioenergy	Pyrogrot		n/a*
SE	Bioenergy	GoBiGas Phase 2	SE	E.ON Bio2G
IT	Bioenergy	BEST	PL	CEG Plant Goswinowice
SE	Wind	Vindpark Blaiken		n/a
FI	Bioenergy	Ajos BTL	NL	Woodspirit
AT	Wind	Windpark Handalm	SE	Multi-megawatt turbines
EL	CSP	MINOS	ES	PTC50-Alvarado
PT	Ocean	SWELL	IE	WestWave
SE	Distributed renewable management	Smart Grid Gotland		n/a
FR	Bioenergy	UPM Stracel BTL	FI	UPM Rauma BTL
DE	Wind	Innogy	DE	Veja Mate I
CZ	Geothermal	Litomerice		n/a
PT	PV	CPV Portugal		n/a
EL	CSP	MAXIMUS	CY	Helios Power
UK	Ocean	Sound of Islay	UK	Kyle Rhea
BE	Distributed renewable management	SLim		n/a
DE	Bioenergy	VERBIO Straw	DK	IKA2
HU	Geothermal	South Hungarian		n/a
PT	Wind	Windfloat	FR	VertiMED
EL	PV	PV Megalopolis		n/a
IT	CSP	Archetype 30+	IT	n/a
FR	Ocean	ETM Martinique		n/a

*No second-ranked projects available

[9] Pursuant to Article 8(4) of the NER300 Decision, no more than three projects shall be funded within a Member State over the two calls for proposals. Based on the above list, Sweden would hence have to deselect at least one project.

Annex II

Project descriptions

1. Carbon Capture and Storage Projects

1.1. Candidates for award decisions

UK Pre-combustion Don Valley Power Project

The Don Valley Power Project proposes to build a new Integrated Gasification Combined Cycle Power (IGCC) plant based on coal from local and imported sources, and capture the CO2 in a pre-combustion configuration from the synthesis gas (syngas) gasification process. The de-carbonized syngas will be combusted in two new, built-for-purpose gas turbines with waste heat recovered to drive a steam turbine (combined cycle). Nominal capacity of the IGCC power island is estimated as 900 MWe (net after CCS: 626 MWe). The proposed power plant site is at the Hatfield Colliery, in Stainforth near Doncaster (UK). The captured CO2 will be transported via an onshore pipeline to an offshore export facility at Auburn on the Yorkshire coast. It will then be transported via a 90 km long offshore pipeline to an aquifer storage site, and from there it will be further transported via another 265 km long pipeline to the Fulmar and Clyde oil fields for storage. The portion between the export facility and aquifer storage site is part of an infrastructure shared with two other projects of the Humberside CCS Cluster. The Project was awarded funding under the European Energy Programme for Recovery (EEPR)[10], for a maximum foreseen EU contribution of 180 M€.

PL Post-combustion Belchatow CCS Project

The Project concerns the design, construction and operation of a CCS demonstration facility including a post combustion capture installation located at the Belchatow lignite power plant in the Lodz voivodeship in Central Poland. One third of the flue gas from an 858 MW gross (806 MW net before capture) power unit will be captured, transported and stored. The unit is currently being commissioned. The CO2 capture installation consists of a single train which will capture approximately 1.74 Mt CO2/y. The captured gas will be transported in supercritical form to an (onshore) saline aquifer storage site located some 60 km away, also in Poland. The Project was awarded funding under the EEPR, for a maximum foreseen EU contribution of 180 M€.

NL Industrial application Green Hydrogen

This Project concerns the design, construction, and operation of CO2 capture plant from a stream of a hydrogen plant located at Rozenburg in the municipality of Rotterdam, the Netherlands, followed by the transport and storage of the CO2 captured to a Dutch depleted gas field. Hydrogen product will be produced via steam methane reforming of natural gas. CO2 from the tail gas stream of the hydrogen plant will be extracted in a cryogenic separation

[10] Established by Regulation (EC) No 663/2009, the European Energy Programme for Recovery (EEPR) co-finances a selected portfolio of energy projects.

unit and compressed for onward pipeline transportation in gaseous phase. A continuous CO2 stream of approximately 66 t/h will be transported through a short 500 m pipeline leading to 24 km trunk pipeline routed through the Rotterdam industrial port area to the CO2 hub storage area at the shoreline. At the Rotterdam hub, the CO2 will be liquefied and stored, with three 10000 m3 onshore storage vessels.

UK Pre-combustion The Teeside CCS Project

The project consists of the design, implementation and operation of four different components and is based at the existing Natural Gas Combined Cycle (NGCC) power plant at Teesside, UK. First, a new de-carbonized synthetic gas (syngas) plant will be constructed and will operate mainly on bituminous coal. Second, two out of the eight turbines will be modified at the existing power island to combust hydrogen-rich syngas. The gross capacity of this pre-combustion plant is 432 MWe, 300 MWe net to the grid after CCS. The capture rate is 89% of the total carbon input to the syngas plant, generating a CO2 stream of 2.45 Mt/y. Last, a transport system and two injection facilities will be built. The CO2 will be transported via a 250 km-long offshore pipeline to an offshore saline aquifer geologic storage site and also 160 km further for storage in the depleted Maureen oil field in the central North Sea.

UK Oxyfuel UK Oxy CCS Demo

The Project proposes to construct a new, integrated supercritical coal-fired power plant with an oxy-fuel CO2 capture solution and CO2 geological storage. The Project will be built adjacent to the currently operating Drax Power Station site at Selby located in North Yorkshire, UK. The net nameplate capacity after CCS is 304 MWe, and the proposed solution will capture about 90% of the produced CO2 emissions, or about 2 Mt CO2/year after dehydration from the flue gas. The CO2 stream is then transported via a 75 km-long onshore pipeline and a 90 km-long offshore pipeline for storage in a saline aquifer in the southern North Sea. The offshore transport and storage is part of an infrastructure shared with two other projects of the Humberside CCS Cluster.

UK Pre-combustion C.GEN North Killingholme Power Station

The North Killingholme Power Station Project proposes to build and operate a new Integrated Gasification Combined Cycle (IGCC) plant with full-implementation of pre-combustion CO2 capture and geological storage. The IGCC plant will be located about 1 km from the southern bank of the river Humber, in Killingholme, North Lincolnshire. The IGCC plant will have a 430 MWe net electricity output capacity, (and will capture about 88% of the produced CO2 emissions, or about 2.5 Mt CO2 /y in full capacity steady-state operation. The plan is to use coal as its main feedstock, with the possibility of co-gasifying up to 30% (heating value) of petcoke and biomass. The proposed site of the IGCC is adjacent to two operating NGCC power plants and a ship terminal on the river Humber, UK. The CO2 stream is then transported via a 130 km long onshore pipeline and a 90 km long offshore pipeline for storage in a saline aquifer in the Southern North Sea. The offshore transport and storage is part of an infrastructure shared with two other projects of the Humber CCS Cluster.

IT Post-combustion Zero Emission Porto Tolle

The Zero Emission Porto Tolle Project (ZEPT) proposes to convert an existing power plant about 60 km south of Venice (Italy) that burns heavy fuel oil to use coal in a modern Ultra Super Critical configuration comprising 3 units, each of 660 MWe (gross), with a post combustion amine-scrubbing CO2 capture plant processing about 40% of the emissions from one 660 MWe unit (equivalent to 264 MWe). The power plant is planned to be able to co-fire coal and up to 5% biomass (by heating value). The NER300 Project scope includes the carbon capture, the transport and storage of 1 Mt/y CO2. The captured CO2 will be transported by offshore pipeline (ca. 100 km long) to a storage site for injection in saline aquifer. The Project was awarded funding under the EEPR, for a maximum foreseen EU contribution of 100 M€.

FR Industrial application ULCOS-BF

This Project consists of the demonstration of a novel Ultra Low Carbon Dioxide Steelmaking (ULCOS) process via implementation of the technology at a steel blast furnace located in Florange, France, followed by transport and storage of the captured CO2 stream. The ULCOS process is an oxy-fired method of operating the blast furnace. The capture technology is an 'in process' capture whereby the CO2 is removed from the blast furnace top gas, with the remaining gas then being treated and reinjected into the blast furnace to increase the overall process yield. Approximately 730 kt/y of CO2 will be captured from the blast furnace and transported via an 80 km long pipeline to a storage site, West of Verdun, France. The CO2 will be injected with two wells in a saline aquifer over 1500m deep. A second site in the vicinity is also being considered for contingency.

1.2. Reserve list

RO Post-combustion Getica CCS Demo Project

The Getica Demo CCS Project comprises the retrofitting of the currently operating unit 6 at the Turceni lignite-fired power plant with a post-combustion chilled ammonia CO2 capture plant.. The Project involves one single line post combustion carbon capture plant, designed to capture 85% of the CO2 from the flue gas from Unit 6 (approximately 5700 t/d), as well as integrated gas treatment, compression and export facilities. A pipeline will be constructed to transport the CO2 to an onshore saline aquifer storage site located 40 km northwest of the power plant. The Project will capture, transport and store approximately 1.4 Mt /y CO2 at full capacity.

UK Post-combustion Peterhead Gas CCS Project

The Project concerns the design, construction and operation of a post combustion capture plant located at the Peterhead Combined Cycle Gas Turbine (CCGT) power plant south of Peterhead, Aberdeenshire in the United Kingdom (UK). The Power Plant comprises three gas turbines (with three Heat Recovery Steam Generators, HRSG) and one steam turbine. The Project involves diverting all of the flue gas from one gas turbine and HRSG to a post combustion CO2 capture plant, using an amine capture process. Approximately 940 kt/year of CO2 will be captured, compressed and transported 18 km south to the St Fergus gas Terminal

via an existing onshore pipeline. It will be compressed to dense phase and pumped into an existing 102 km offshore pipeline for long term offshore storage in the depleted Goldeneye hydrocarbon field located in the UK area of the North Sea.

2. Renewable Energy Projects

2.1. Candidates for award decision

SE Bioenergy Pyrogrot

The Project concerns the construction and operation of a plant for the production of pyrolysis oil using forest residues as feedstock. The design capacity is 160000 t/year of pyrolysis oil with the energy content estimated at about 750 GWh. The technical solution for the proposed facility comprises the following main components: biomass pre-treatment (both before and after drying), biomass drying, flash pyrolysis process including condenser, and storage of pyrolysis oil. The input processing capacity of the Project plant will be designed at 720 ton/day of dry biomass. The Project foresees the use of various biomass fractions while maintaining a uniform feed to the pyrolysis plant throughout the year. The Project is located at the site of a pulp and paper mill of the Project Sponsor near the town of Skärblacka in central Sweden.

SE Bioenergy GoBiGas Phase 2

The Project will demonstrate the large-scale conversion of low-quality wood into high quality synthetic natural gas (SNG) by indirect gasification at atmospheric pressure, gas cleaning, methane production (via nickel catalyst), pressurization and injecting the product into the regional gas network. The Project will make use of forestry feedstock, which consists of pulpwood and forest residues harvested from the surrounding areas of Gothenburg, the Lake Vänern and Baltic region. The volume of ~0.5 Mt/year of wet biomass will be used in the Project, which has an installed capacity of ~100 MWth to produce 800 GWh/year of gas (SNG).

IT Bioenergy BEST

The Project concerns the design, construction and operation of an integrated biofuels demonstration plant in Crescentino (province of Vercelli, Piemonte region, Italy), at a distance of about 40 km from Turin. The Project envisages second generation technology conversion of lignocellulosic biomass from selected energy crops into ethanol. The Project proposes the cultivation and use of a new, autochthonous energy crop, Arundo donax (giant cane).The utilisation of wheat straw as an additional main lignocellulose biomass feedstock is also foreseen. The annual production capacity amounts to 51 Ml/year. Additionally, lignin will be produced as a by-product at some 165 t/year on wet basis.

SE Wind Vindpark Blaiken

The Project is a 225 MW wind farm in arctic climate situated in Northern Sweden. It is located in the Blaiken area on a site approximately 10 km long and 3 km wide and consists of 90 wind turbines each of a nominal capacity of 2.5 MW, equipped with an innovative de-icing system comprised of heating elements in the leading blade edges, an intelligent measuring and control system, and cold climate adaptations built-in. The Project will be situated close to Juktan hydropower plant and connected to national grid with a 400 kV power line. The Project will be constructed in 3 lots of 30 turbines over 3 years.

FI Bioenergy Ajos BTL

The Project concerns the design, construction and operation of a biofuel-to-liquid (BtL) plant in northern Finland, with a gasification capacity of 320 MW and an annual output of 115000 t/y of biofuel using close to 950000 t/y of woody feedstock and 31000 t/y of tall oil. The technical solution is based on the following main components: biomass pre-treatment, gasification island (comprising two gasification lines of 160 MW each and an air separation unit), gas cleaning and compression, gas-to-liquid conversion (Fischer-Tropsch) including refining, processing and storage of products. The Project will produce and sell biodiesel and bionaphta in the Baltic Sea area, with a focus on Finland and Sweden. Principal off-takers are expected to be diesel and petrol retailers.

AT Wind Winpark Handalm

The Project comprises the design, construction and operation of a wind power project in the mountainous region of Styria in Austria with an average altitude of 1800 m above sea level. Given the location and the site characteristics, the proposed Project is intended to demonstrate applicability on a larger scale of a wind turbine generator (WTG) optimised for the special wind and site conditions in mountainous locations. The Project consists of 11 wind turbines and has a total nominal capacity of 33 MW. It will provide 72600 MWh of electricity annually. The WTGs will be equipped with a SCADA system, which offers remote control and reporting facilities. The control system in question will be especially developed for areas with unusual wind flow distortions and average height of more than 1600 meters above sea level, and will include an integrated optimisation system for rough weather conditions.

EL CSP MINOS

The Project concerns the implementation and operation of a concentrated solar power (CSP) plant based on central tower technology with a nominal electrical capacity of 50 MWe that will be built in the southeast of Crete. The Project intends to use heliostat mirrors to concentrate the sun irradiation on a solar receiver placed on the top of a tower. The tower system will be based on innovative superheated steam technology in order to increase the efficiency of the present plants with tower technology and saturated steam. The Project will be located adjacent to the existing power plant of Atherinolakos. The planned site has a size of approx. 143 ha, only 500 m from the sea, at an elevation between 50 and 100 m above sea

level. No storage system is envisaged and the back-up energy is supplied by a conventional diesel boiler.

PT Ocean SWELL

The Project concerns the implementation of an array of 10 wave energy conversion devices with a total nominal electrical capacity of 5 MWe. The 10 independent wave power/energy converters will have a nominal capacity of 500 kW each. The projected output of the Project is 13.8 GWh/year from 2016 to 2020. The devices will be submerged below sea level. The wave power is harvested with an upright, rectangular wing structure that performs an oscillatory pivotal motion upon impact. It will be built in the Portuguese territorial waters offshore the north side of the Peniche Peninsula, near the town of Peniche about 100 km north of Lisbon, Portugal.

SE Distributed renewable management Smart Grid Gotland

The Project includes a range of smart grid technologies that could enable the distribution network on the island of Gotland in Sweden to accommodate increased wind generation. These measures are focused on extending the reach of Supervisory Control and Data Acquisition (SCADA) to give greater visibility of generation and demand behaviour, the use of battery backed Static VAr Compensation technology and the development of metering, energy management and load control techniques. The network comprises a range of voltages from 70 kV downwards. There is currently some 112 MW of installed wind capacity in the system. It is predicted that this will grow to 195 MW by 2015.

FR Bioenergy UPM Stracel BTL

The Project concerns the construction and operation of a second generation Biomass-to-Liquid (BtL) plant on the Strasbourg site of the UPM Group, which already owns and operates a paper mill on the same site (Stracel). The Project is based on a prototype developed in cooperation with the technology provider using a gasification process. The Project is based on the application of novel pressurized oxygen blown biomass gasification technology. The BtL plant will be integrated into the paper & pulp production line, enabling exchanges of energy and products. The plant will use about 1 million tonnes of woody biomass and will have an annual output of 105 000 tons of biofuel. Using mainly wood feedstock, the Project aims to produce and sell biodiesel (80%) and bionaphtha (20%). The proposed technical solution is based on the following main components: feedstock handling, gasification, raw gas cleaning, gas-to-liquid conversion, liquid treatment and storage, and power generation.

DE Wind Innogy

The Project comprises the design, construction and operation of an offshore wind power project. It will consist of 54 wind turbine generators (WTG) of 6.15 MW each and have a total nominal capacity of 332 MW. The location is in the German Bight approx. 40 km north of the Juist Island in the North Sea. The water depth on the site varies between 25 and 35m. Main technical components are the WTG control system, the WTG foundations, on-site electrical network, on-site offshore substation, transmission cable to the offshore connector substation,

and export cable from the connector offshore substation to the grid feed-in point onshore. Further, a meteorological measurement mast (met mast) at the Project site is included for monitoring wind resources and conditions.

CZ Geothermal Litomerice

The scope of the Project is the design, construction and operation of a geothermal heat and power plant in the City of Litoměřice in the northern Czech Republic. Two production 5 km-deep wells and one re-injection well will be drilled in the geothermal field, which is a demonstration project of an enhanced geothermal system (EGS) in hydro fractured, hot dry, deep compact sedimentary and granite rock. Peak heat capacity from the heat plant is 42.6 MWth. The gross output capacity of the organic Rankine cycle (ORC) binary power plant is 5 MWe, with net output, sold to the electrical grid, of 4 MWe. The planned annual electrical output is 29.2 GWh.

PT PV NER300 CPV Portugal

The Project concerns the implementation and operation of a 20 MW concentrator photovoltaic (CPV) power plant. CPV modules will use a Fresnel lens to focus the sunlight onto high efficiency triple junction cells, which have a production efficiency of 38%. The Project will be built near the city of Beja, in southern Portugal. The area is flat, well-populated and has a developed infrastructure. A new power line will be built to connect the 20 MW power plant high voltages (HV) substations to an existing 60 kV power line.

EL CSP MAXIMUS

The Project is a large-scale Stirling dish power plant with a total installed capacity of 75.3 MWe, located in the north west of Greece in the region of Florina. The plant consists of 25160 Stirling dish units, each of the 3 kW rated power output. The plant is composed of 37 small power plants of modular design, built on different land plots, which will be connected to the grid via a single connection point. The Stirling dish unit consists of a cavity receiver that captures the concentrated solar irradiation from the parabolic-shaped reflector, a free-piston Stirling engine (FPSE) that converts the solar energy to electricity and a closed loop air driven cooling system. The concentrator is mounted on a structure with a two-axis tracking system to follow the sun.

UK Ocean Sound of Islay

The Project concerns the installation of an array of ten 1 MWe grid-connected tidal current turbines in the Sound of Islay, which is in UK territorial waters between the islands of Islay and Jura off the west coast of Scotland. The planned installation will be in deep water (50 to 58m). The Project will use a tidal turbine technology, with a 3-bladed, seabed mounted design. The overall net capacity of the array will be 10 MWe.

BE Distributed renewable management Slim

The Project proposes a smart grid solution for the distribution grid in the city of Lommel, Belgium, which is characterised by a high penetration of renewable generation capacity. The Project consists of five smart grid building blocks: CVPP (Commercial Virtual Power Plant), TVPP (Technical Virtual Power Plant), Smart Grid communication, New Power Market and TSO observability. The Project will develop the concepts and design of these building blocks over an initial two-year period, and then implement them and operate the distribution network in the Lommel area in conjunction with the planned level of renewable generation over a 5-year period. The Project proposes to address the associated network issues through a combination of electricity market changes, and smart grid control technologies to give improved visibility of the distributed energy resources to the Transmission System Operator (TSO) and increased controllability over the RES generation resources.

DE Bioenergy VERBIO Straw

The Project will be built as an extension to an existing ethanol-biogas plant in Schwedt, Germany, to produce biogas. The Project will have a design capacity of 25.6 Mm3(S) of bio-gas containing 12.8 Mm3(S) of methane and make use of 70000 t/year of straw. The process comprises raw material handling, biomass pre-treatment of biomass by steam and enzyme successively, production of biogas by anaerobic fermentation, and biogas post-treatment. The produced gas will be cleaned to natural gas quality and fed into the grid.. The Project is planned to be located in a refinery site of PCK Raffinerie GmbH (Refinery Site) and it benefits from the existing site infrastructure.

HU Geothermal South Hungarian Enhanced Geothermal System (EGS) Demonstration Project

The scope of the Project is the design, construction and operation of a geothermal power plant, near the village of Ferencszállás, located between the towns of Szeged and Makó, in South Eastern Hungary. The surface part of the Project comprises the design, construction and operation of a power plant using geothermal energy from hot dry rock in a compressional stress field. The geothermal resource is produced with an Enhanced Geothermal System (EGS). Its implementation includes the drilling of four 4 km deep production wells and two re-injection wells, and the hydraulic fracturation of the reservoir under the compressional stress fields. The gross capacity of the organic Rankine cycle (ORC) binary power plant is 11.8 MWe with net capacity of 8.9 MWe sold to the electrical grid.

PT Wind Windfloat

The planned wind farm consists of five floating wind turbine systems, with an overall capacity of 27 MW. The Project will be built and installed in two stages. The first stage will consist of two WindFloat support structures and two 3 MW offshore wind turbines. The second stage will consist of three WindFloat support structures and three 7 MW offshore wind turbines. The Project is located about 14 km offshore from the coastline of Portugal. The sea depth at the site is 60 to 100 m. Each offshore turbine will be connected in an array through

dynamic cables, to inter-array cabling and to a substation onshore through a medium voltage main cable of 30 km in length.

EL PV PV Megalopolis

The Project comprises the design, construction and operation of a new solar photovoltaic (PV) plant that will deploy multi-junction silicon thin-film (Si-TF) technology with a rated nominal capacity of 40 MW. Total amount of energy is expected to be around 53 GWh per year. The project is expected to implement approximately 280000 multi-junction Si-TF panels of 145 Wp rated capacity (resulting in a total capacity of 40.7MWp) with 40 inverter stations of 1000 kW each, each comprising 2 x 500 kVA inverters. The Project site is approximately 1km2 at depleted lignite mines deposits, in the Megalopolis Lignite Mine Area in the central Peloponnese in Greece. The Project will be a component of the Megalopolis power plant system.

IT CSP Archetype 30+

The Project concerns the design, construction, commissioning and operation of a CSP plant with 30 MWe capacity. The Project Sponsor intends to scale-up the existing demonstration plant (of 5 MW capacity) to an industry size plant, to improve the state-of-the-art of the CSP plants using molten salts as heat transfer fluid (HTF) and thermal energy storage (TES) system, as well as to prove the concept of hybridization with a biomass plant, with the aim to improve the dispatchability of electrical energy production and overall efficiency of the plant. The Project aims to convert solar irradiation into electrical energy by means of a field of parabolic trough panels, which reflect the solar irradiation to an environmentally friendly heat transfer fluid. The Project will be located in Passo Martino Contrada Robavecchia, close to the town of Catania in Sicily, Italy.

FR Ocean ETM Martinique

The Project is an ocean thermal energy project off the west coast of Martinique in the Caribbean Sea. A moored barge will be installed housing four turbo-generators. Each will be driven by an Ammonia closed Rankine cycle utilising the circa 20°C temperature difference between the cold seawater at 1.1 km depth and the warm surface waters. The cold water is pumped via a single 6 m diameter riser. Each turbine will produce 3.45 MW resulting in a total nominal installed capacity of ~14 MW with a maximum available capacity of 9.5 MW The ramp-up in production is 50% and 80% over the first two years. The net generated power (at annual average capacity of 8.4 MW; corresponding to ~67 GWh/year) is exported to the grid via a subsea cable and a substation at an existing conventional fossil fuel power plant.

2.2. Reserve list

SE Bioenergy E.ON Bio2G

The Project concerns the implementation and operation of a plant for the production of synthetic natural gas (SNG) using woody biomass as feedstock. Output capacity is 160 M Nm3/year of SNG corresponding to about 1.5 TWh/year. The SNG will be used as transport

fuel and for heat and power production. The Project site is expected to be located in Landskrona in southwestern Sweden on the Oeresund coast. The technical solution for the Project plant will comprise the following main parts: biomass handling and pre-treatment including drying, gasification, tar reformer, gas cleaning and desulfurisation, methanation, and a Power Island.

PL Bioenergy CEG Plant Goswinowice

The Project will demonstrate the production of second generation bioethanol from agricultural residues on a large commercial scale. The Project will make use of ~250000 t/year of wheat straw (75%) and corn stover (25%) sourced from the local agricultural area to produce 60 Ml/year of ethanol. The Project is located in Goswinowice in Poland close to an existing first generation ethanol plant. The Project plant and existing plant will be partially integrated. The co-products, lignin (70000 t dry matter lignin, moisture content 50-60%) and biogas (22.3 MNm3 biogas, 75% methane), will be sold as a fuel to the existing plant which in turn will provide steam for both plants.

NL Bioenergy Woodspirit

The Project will demonstrate the production of bio-methanol in large commercial scale using biomass torrefaction and entrained flow gasification as the new core technologies. The output of the Project is 516 Ml/y bio-methanol, which is equivalent to 413000 t/y. The plant will be located in the Netherlands next to the existing plant of the Project sponsor in Oosterholm, Farmsum. The Project will make use of 1.5 Mt/y of imported wood chips. The bio- methanol will be used as a petrol additive for partial replacement of mineral fuel. The main components of the new complex include a fuel receiving and processing facility, gasification island to produce raw syngas, the syngas cleaning area and the methanol plant including bio-methanol synthesis and purification plants.

SE Wind Multi-megawatt turbines

The Project is located in northern Sweden in the county of Norrbotten in the Pitea municipality, in a forested, hilly, and also sparsely populated area, characterised by demanding climate conditions, and typical seasonal temperature differences of 50 to 60 °C. The Project is embedded in a planned very large wind farm with up to 1101 turbines, 12 of which have been installed by the Project Sponsor and are in operation already. In the proposed Project, four large demonstration turbines are to be installed in two separate locations with the objective to demonstrate the suitability of the 7.5 MW turbines including the 135 m high tower built from pre-cast elements, and of the new load control system that will make the use of large turbines possible in turbulent wind regimes typical for complex terrain sites and for cold climate conditions.

ES CSP PTC50-Alvarado

The Project concerns the implementation and operation of a 50 MW central tower concentrating solar power (CSP) plant using superheated steam. The plan will be located 15 km southeast of the city of Badajoz in Spain. The main technical solution of the Project is

based on the conversion of primary solar energy into electrical energy, by means of a field of large tracking plain mirrors (heliostats), which reflect the solar radiation to a common focal point onto a solar thermal receiver mounted at the top of a central tower. It also implies the use of a conventional water steam power cycle (Power Island). The plant includes high capacity molten nitrate salt thermal energy storage system, as well as it integrates the hybridization with biomass and natural gas, in order to improve the manageability and overall efficiency of the plant.

IE Ocean West Wave

The Project aims to deploy a 5.4 MWe-rated, shallow-water, near-shore array of 6 wave energy capture devices, with associated power plant. The Project will be located off the west coast of the Republic of Ireland. The selected wave energy capture device is a large flap placed in 15m of water depth. A prototype has been tested at the European Marine Energy Centre (EMEC) in Orkney and a variety of design changes have been made to the device. The improved 800 kW rated design will be tested at EMEC in 2011 as a 3–device-array, and the lessons learnt will feed the final design, installation and operation of the Project.

FI Bioenergy UPM Rauma BTL

The Project concerns the construction and operation of a second generation biomass to-liquid (BtL) plant. The plant will be located within the premises of a paper mill site that the Project Sponsor owns in Rauma near the Bothnian Sea. The Project will use mainly forest energy wood and by-products as feedstock, and is planned to have an annual output of 107.7 Ml biodiesel (i.e. 84000 t) and 30.6 Ml (i.e. 21000 t) naphtha produced with an estimated plant availability of 8000 h/year. Additionally high pressure steam (net 428 GWh) and medium pressure steam (net 78 GWh) will be produced for the generation of renewable power in the existing steam network of the paper mill. The fly ash (net 74 GWh) from gasification will be used as fuel in a boiler. The proposed technical solution is based on the following main components: feedstock handling, gasification, raw gas cleaning, gas-to-liquid conversion, liquid treatment and storage.

DE Wind Veja Mate I

The Project comprises the design, construction and operation of an offshore wind power project in Germany. It will consist of 32 turbines of 6.5 MW and has a total nominal capacity of 208 MW. The main technical components are the turbine control system, the foundations, the on-site electrical network, the on-site offshore substation, the transmission cable to the offshore collector substation, and the export cable from the collector offshore substation to the onshore grid feed-in point. It is located in the North Sea, North West of Borkum in the German "Exclusive Economic Zone" (EEZ). The location is approximately 90 km off the shore.

CY CSP Helios Power

The Project is a large-scale Stirling dish power plant with a total installed capacity of 50.76 MWe, located on the eastern side of Cyprus, near the city of Larnaca. The Stirling dish unit

consists of a cavity receiver that captures the concentrated solar irradiation from the parabolic-shaped reflector, a free-piston Stirling engine (FPSE) that converts the solar energy to electricity and a closed loop air-driven cooling system. The plant is expected to have 16920 Stirling dish units. The total field area required for the Project is around 200 ha. High voltage 132 kV power lines, which run along the southern boundary of the site, will be used to connect the plant to the national grid.

UK Ocean Kyle Rhea

The Project concerns the implementation and operation of a tidal turbine array with a nominal capacity of 8 MWe that will be built in the narrow strait between the Isle of Skye and the Scottish mainland in a channel known as Kyle Rhea. The Project is based on a significant scaling up of the operational test turbine, which has a three-year track record in Northern Ireland, from 1.2 MWe to 2 MWe. The Project consists of four tidal energy twin rotor turbines each rated at nominal 2 MW_e resulting in a total generation capacity of 8 MW_e.

DK Bioenergy IKA2

The Project concerns the upgrading and expansion of an existing facility for the production of 2nd generation bioethanol. These measures will lead to the doubling of the production capacity from 5.4 Ml of bioethanol to 11.6 Ml per year and to increased feedstock flexibility. The general set-up of the plant comprises a number of process blocks, namely the feedstock handling and storage, mechanical handling and size reduction of feedstock, pre-treatment, C5 compounds separation from the cellulose-lignin mix after pre-treatment, hydrolysis/saccharification, fermentation, distillation/dehydration and product storage. The facility is located near the city of Kalundborg in eastern Denmark about 100 km from Copenhagen.

FR Wind VertiMED

The Project is a 26 MW power plant consisting of a floating offshore wind farm with 13 vertical axis wind turbines each of 2 MW capacity. The wind turbines will be installed on 13 floating structures. The floating structures will each be moored with 3 mooring lines in a classical anchoring system. The floating foundation is a steel tripod construction with concrete ballast tanks at each leg. The inter-array cable system will at 36 kV level connect the 13 wind turbines in an array and an export cable at the same voltage level will transfer the power to an onshore grid connected substation. The substation is located onshore, and 36 kV cables are used between the wind turbines and the shore. The Project is located 17 km off the French coast, 50 km off Marseille, at a location with 80-90 m sea depth.