

# European Wind Integration Study (EWIS) Towards a Successful Integration of Wind Power into European Electricity Grids

**Contract number: TREN/07/FP6EN/S07.70123/038509**

**Grid reinforcement projects identified  
or confirmed within EWIS**

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
1	Rede Eléctrica Nacional, S.A.	Macedo de Cavaleiros (PT)	Vila Pouca de Aguiar (PT)	New 75km double circuit 400+220kV OHL (only 220kV circuit installed in the first step) Macedo de Cavaleiros (PT) -Valpaços (PT) - Vila Pouca de Aguiar (PT).	Integration of new renewable generation units and strengthen the Security of Supply to PT.	The project is expected to help RES integration (mainly wind) and improved the security of supply. In addition, an increase of ES-PT NTC is expected, due to reinforced exchange capacity on Douro border.	design& permitting	2010		
2	Rede Eléctrica Nacional, S.A.	V. P. Aguiar - Carrapatelo - Estarreja (PT)		New 400+220kV double circuit OHL (initially only used at 220kV) Vila Pouca Aguiar - (Rib. Pena) - Carrapatelo - Estarreja . Total length of line: 2x(90+49)km.	Integration of new renewable generation units and improving the Security of Supply.	RES integration (mainly wind) and improved security of supply.	design& permitting	2012-2013		
3	Rede Eléctrica Nacional, S.A.	Armamar - Bodiosa - Paraimo (PT)		This 120km double-circuit OHL has been constructed according to 400kV standards but is currently operated at 220kV as Valdigem (PT) - Bodiosa (PT) - Paraimo (PT). The project consists of operating one circuit at 400kV while creating a new 400/220kV substation in Armamar and upgrading the existing Bodiosa substation from 220/60kV to 400/60kV. Total length of line : 120km.	Insufficient capability of existing network to accommodate interior to littoral flows.	The project is expected to help RES integration, increase the NTC and improved the security of supply.	under construction	2010		
4	Rede Eléctrica Nacional, S.A.	V. Chã B - Arg./Góis - Penela - Paraimo / Batalha (PT)		New double circuit 400+220kV OHL (only 400kV circuit installed in a first step) Vila Chã B- Arganil/Góis-Penela (90km) plus new double circuit 400kV OHL (15km) to connect Penela substation to Paraimo - Batalha line. Two new 400/60kV substations at Vila Chã B and Arg./Góis are needed, as well as the expansion of the existing Penela substation to include 400kV facilities.	Insufficient capacity of the existing network to receive new renewable energy (wind and hydro).	The project is expected to help RES integration, improved the security of supply and reduce the annual grid losses.	planned	2015-2016		
5	Rede Eléctrica Nacional, S.A.	Guarda - Ferro B - (C. Branco) - Falagueira (PT)		New double circuit 400+220kV OHL Guarda (PT) - Ferro B (PT) -'Castelo Branco zone' (PT) (between Guarda and Ferro B only the 400kV circuit will be installed) plus new double circuit 400+150kV OHL 'Castelo Branco zone' (PT) -Falagueira (PT). New 400/60kV substations in Guarda and Ferro B. Total length of line: 135km.	Insufficient capacity of existing network to receive new renewable energy (mainly wind).	The project is expected to help RES integration, improved the security of supply and reduce the annual grid losses.	planned	2013-2014		

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6	Rede Eléctrica Nacional, S.A.	Falagueira (PT)	Pego (PT)	New 40km double circuit 400kV OHL (only one circuit installed) substituting for an existing 150kV line.	Insufficient capacity to receive new renewable (wind and hydro) energy and need for alleviating some congestions near Falagueira (PT) substation.	The project is expected to help RES integration, increase the NTC and reduce annual grid losses.	planned	2014		
7	Red Eléctrica de España: S.A. and Rede Eléctrica Nacional, S.A.	Aldeadávila (ES)	Lagoaça (PT) - Armamar (PT) - Recarei (PT)	<p>New Duero Interconnection 400kV New 400kV OHL interconnection line Aldeadávila (ES) - Lagoaça (PT), including new Lagoaça substation (PT). Also associated, the lines Lagoaça-Armamar-Recarei 400kV in PT and the Armamar (PT) 400/220kV substation.</p> <p>On a first phase (2009) a new 400/220kV substation (Lagoaça - PT) will be created with only 220kV level installed, and there will be some rearrangements and reinforcements on the local 220kV network structure.</p> <p>On river crossing a new 220kV double line with separated circuits, firstly Aldeadávila (ES) - Lagoaça (PT) 1 &amp; 2 and changing later to Aldeadávila (ES) - Pocinho (PT) 1 &amp; 2, will substitute the existing two 220kV lines Aldeadávila (ES) - Bemposta (PT) and Aldeadávila (ES)-Pocinho (PT). Total length: 1km (ES)+105km (PT).</p>	Limitations and congestions on the 220kV network in the Douro area where new hydro power stations (~800MW) are in construction or permitting in Portugal, in addition to export/import situations between Portugal and Spain.	Increase of NTC (From today 1100-1500MW up to 1500-2000MW), RES integration and conventional generation integration. Support in Iberian (ES+PT) market integration in MIBEL.	design& permitting for 400kV under construction for Lagoaça substation and 220kV restructuring in Portugal	2009/2010	X	
8	Red Eléctrica de España: S.A. and Rede Eléctrica Nacional, S.A.	Guillena (ES)-Puebla de Guzman (ES)	Tavira (PT)-Portimao (PT)	<p>New Southern Interconnection New 400kV OHL double-circuit line between Guillena (ES)-Puebla de Guzman (ES) - Tavira (PT) - Portimão (PT), including new Tavira (PT) and P.Guzman (ES) 400kV substations. On the interconnection section P.Guzmán (ES) -Tavira(PT), initially only one circuit will be placed. Total length: 153km (ES)+110km(PT).</p>	Congestion that occurs on the existing 400kV line Alqueva (PT) -Brovaes (ES) at high level of exportation from Portugal to Spain, limiting exchange capability from Portugal to Spain.	The project is expected to increase NTC (up to 3000MW from Portugal to Spain), help RES integration and improved the security of supply. Support in Iberian (ES+PT) market integration in MIBEL.	design& permitting	2011	X	
9	Red Eléctrica de España: S.A. and Rede Eléctrica Nacional, S.A.	O Covelo (ES)-Boboras (ES)	Vila Fria (PT)-Vila Conde (PT) - Recarei (PT)	<p>New double circuit 400kV OHL between O Boboras (ES) -O Covelo (ES) - Vila Fria (PT) - Vila do Conde (PT) - Recarei (PT), including new 400kV substations O Covelo (ES), Boboras (ES), Vila Fria (PT) and Vila do Conde (PT).</p> <p>On the section O Covelo (ES) - Vila do Conde (PT), only one circuit will be placed. Total length: 43km (ES)+112km (PT).</p>	Congestion on the existing 400kV line Cartelle (ES) -Lindoso (PT) at high level of exportation from Spain to Portugal. Special needs for High Speed Train projects.	The project is expected to increase NTC (up to 3000MW from Spain to Portugal), help RES integration and improved the security of supply.  General Benefit: Market integration in MIBEL.	design& permitting	2014	X	

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10	Red Eléctrica de España: S.A.	Arkale (ES)	Hernani (ES)	Upgrading the existing 12km single circuit Arkale-Hernani n°2 220kV OHL in order to increase its capacity up to 670 MVA.	Overloads in this line in high export situations to France.	Increase of NTC and RES integration.	design& permitting	2011		
11	Red Eléctrica de España: S.A.	Boimente (ES)	Ichaso (ES)	<p>North axis Project between Galicia and the Basque Country.</p> <p>Part of the project is considered as the Asturias Ring.</p> <p>New 162km double circuit Boimente-Pesoz- Grado 400kV OHL.</p> <p>Change of voltage level of the existing 50km Soto-Tabiella single circuit from 220kV to 400kV, and connection as input/output in Grado.</p> <p>New 178km single circuit Soto-Penagos 400kV OHL.</p> <p>New 96km double circuit Aguayo/Penagos-Abanto 400kV OHL</p> <p>New 34km double circuit Zierbena-Abanto-Gueñes 400kV OHL.</p> <p>New 120km double circuit Gueñes-Ichaso OHL.</p> <p>New 58km double circuit Gozón-Carrio-Lada -Sama 400kV OHL. It is expected to use the corridors of existing lower voltage lines for some sections.</p> <p>New 124km double circuit Sama-Velilla 400kV OHL.</p> <p>Upgrading (uprating) the 73km single circuit Lada-Robia 400kV OHL in order to increase its capacity by around 300 MVA.</p> <p>It includes new 400kV substations Pesoz, El Palo, Salas, Grado, Gozón, Sama, Carrio, Valle del Nalon, Costa Verde, Penagos, Solorzano, Abanto and Ichaso, with transformers to 220kV.</p>	<p>Congestions in the 400kV lines between the northWestern area and the East, because of the attraction of this area as a production site.</p> <p>Congestions in the 220kV network due to the increase of demand in Cantabria, that has today only one 400kV injection from the south.</p> <p>Constraints in the north-to-south direction due to the expected increase of generation in the north-West and north-East areas.</p> <p>Limitations of production of Santurce and Zierbena power plants (high concentration of generation), which sole evacuation line (Santurce-Gueñes) has a slight capacity.</p>	<p>The project is expected to help mainly RES and also conventional generation integration.</p> <p>It will allow to connect regional networks and enhance mutual support. In addition, security and quality of supply in some northSpain areas will be improved.</p>	design& permitting	2010-2015	X	TEN support for studies concerning: Lada-Velilla, Boimente-Narcea, Soto-Penagos, Penagos-Gueñes and Gueñes-Ichaso, Santurce evacuation

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12	Red Eléctrica de España: S.A.	Vitoria (ES)	Magallon (ES)	<p>Northern part of the new Cantabric-Mediterranean axis. New 144km double circuit Castejón-Muruarte-Dicastillo-Vitoria 400kV OHL, with new 400kV substations in Muruarte and Dicastillo with 400/220kV transformers</p> <p>New 32km double circuit La Serna-Magallón 400kV OHL.</p>	<p>The project is needed to accommodate geographical unbalances between production (in Northern Spain) and consumption (Mediterranean area) that otherwise would produce congestion in the 400kV corridors of Valladolid/Palencia-Madrid and Aragón/Cataluña-Levante. Need to alleviate congestion on the 220kV network supplying Pamplona.</p> <p>Also need to alleviate congestions on the 400kV and 220kV network between La Serna and Magallón in several production profiles (mainly with high wind power energy) and after contingencies.</p>	<p>The project is expected to improve RES integration, security of supply and reduce annual re-dispatching cost.</p>	design& permitting	2011-2012	X	TEN: La Serna-Magallon
13	Red Eléctrica de España: S.A.	Fuendetodos (ES)	Eliana Turis (ES)	<p>Southern part of the new Cantabric-Mediterranean axis.</p> <p>New 110km double circuit Fuendetodos-Muniesa-Mezquita-Morella 400kV OHL.</p> <p>New 77km double circuit Teruel-Mudejar-Morella 400kV-OHL.</p> <p>New 78km double circuit La Plana-Morella 400kV OHL substituting to the existing single circuit line.</p> <p>New 63km single circuit La Eliana-La Plana 400kV OHL and upgrading (uprating) the existing line.</p> <p>New 162km double circuit Mezquita-Platea-Turis 400kV OHL. As a first step, in 2012, the new Turis substation will be equipped with a 400/220kV transformer and connected to the existing 400kV lines Cofrentes-La Eliana, and Catadau-Requena 400kV lines.</p> <p>New 400kV substations Mezquita, Platea, Muniesa, and Mudejar with 400/220kV transformer units</p> <p>Upgrading (uprating) the existing 76km Aragón-Peñafor 400kV OHL</p>	<p>The project is needed to accommodate geographical unbalances between north of Spain and Mediterranean area, that otherwise would produce congestion in 400kV existing corridors.</p> <p>Necessity of integration of wind power energy in an area without enough transmission network.</p> <p>In addition, congestion is expected in Levante area because the low capacity of the existing La Eliana-La Plana 400kV OHL is not sufficient to cope with the high flows coming from the northWest to supply the high increase of demand in Levante.</p>	<p>RES integration, improved security of supply and conventional generation integration.</p>	design& permitting	2011-2014		

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14	Red Eléctrica de España: S.A.	Aragón (ES) - Isona (ES) & Escatron (ES) - La Secuita (ES)		New 167km double circuit Aragón/Peñalba-Monzón II Isona 400kV OHL with new 400kV substations Monzón II and Isona, and a 400/220kV transformer in Monzon II. New 60km single circuit Escatrón-Els Aubals-La Secuita 400kV OHL with a new 400kV substation in Els Aubals with 400/220kV transformer.	Congestion on existing grid due to unbalanced production and consumption between Aragón and Cataluña.	The project is expected to benefit in Annual re-dispatching cost reduction and higher RES & conventional generation integration.	design& permitting	2013-2014		
15	Red Eléctrica de España: S.A.	Cofrentes (ES)	Pinilla (ES)	New 82km single circuit Cofrentes-Ayora-Campanario-Pinilla 400kV OHL. This project also includes a new 400kV substation in Campanario.	Necessity of mutual support between two axis of 400kV Cofrentes-Benejama-Rocamora and Romica-Rocamora to avoid overloads in contingencies. Look for a possibility to allow more wind power production in the Peñarrubia area.	Expected benefits regard RES integration, anual re-dispatching cost reduction and CO2 emission mitigation.	design& permitting	2012		
16	Red Eléctrica de España: S.A.	Cartuja (ES)	Guadame (ES)	New 94km double circuit Cartuja-Arcos de la Frontera-La Roda-Cabra-Cordoba-Guadame 400kV OHL . It includes new 400kV substations Cartuja and Cordoba, with 400/220kV transformers.	The concentration of generation (combined cycle and wind power energy) in the Cadiz and Tajo de la Encantada area causes constraints, in contingency situations, in the 400kV and 220kV network in case of high production profiles.	The project will help RES & conventional generation integration and Improved the security of supply.	design& permitting	2010-2013	X	
17	Red Eléctrica de España: S.A.	Caparacena (ES)	La Ribina (ES)	New 177km double circuit Caparacena-Baza-La Ribina 400kV OHL, with two new 400kV substations in Baza and La Ribina (these substations will be also connected to existing El Palmar-Litoral 400kV line ). In addition, the existing 173km single circuit Litoral-Tabernas-Hueneja-Caparacena 400kV line will be upgraded (uprated) in order to increase its capacity from 1310 to 1590 MVA.	Necessity of integration of wind and solar power energy in addition to a new pump storage in the area of Baza. It takes the advantage to support the distribution. Need to alleviate the overloads in the 400kV Caparacena-Hueneja in some production profiles.	The project is expected to improve RES (especially wind & solar energy) integration, diversity & security of supply.	design& permitting	2012-2013		

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18	Red Eléctrica de España: S.A.	Romica (ES)	Brazatortas (ES)	Transmanchega project (total length 255km) New double circuit line Romica-Manzanares-Brazatortas 400kV OHL. New substation Manzanares with a 400/220kV transformer unit. The new 400kV substation Brazatortas will be commissioned in 2012 and connected to the existing line Guadame-Valdecaballeros.	The project is needed for integration of wind energy (insufficient capacity of existing network to transmit the power). In addition, the 220kV network supplying Ciudad Real is close to congestion and would need some support.	The project is expected to provide higher RES integration and improved security of supply.	design& permitting	2013-2015		
19	Red Eléctrica de España: S.A.	Trives (ES)	Moraleja (ES)	SUMA Project (using part of an existing 220kV corridor) New 201km single circuit Trives-Aparecida-Valparaiso-Tordesillas 400kV OHL. New 130km double circuit Tordesillas-Segovia/Herrerros- Galapagar/(El Cereal-SS Reyes) 400kV OHL New 33km double circuit Galapagar-Moraleja 400kV OHL (substituting for the existing line) and new PST in the 400kV line Galapagar-Moraleja. Upgrade of the 21km existing single circuit Loeches-SS Reyes 220kV OHL to 400kV in order to increase its capacity. New 33km double circuit 400kV Mudarra-Tordesillas OHL and upgrade of the existing 25km single-circuit Mudarra-Tordesillas 400kV line in order to increase its capacity. The project includes new 400kV substations in Aparecida and Herrerros .	Congestion from the northWest area to the centre of the country due to the attraction of Galicia as a production site (conventional and wind power power plants).  The new expected generation in north-Western Spain causes overloads on the lines transmitting the power to Madrid.  High flows on Madrid ring cause congestion on the existing Galapagar-Moraleja and SS.Reyes-Loeches 400kV lines.	The project is expected to reduce annual re-dispatching cost, improved the security of supply and help RES integration. It will also help conventional energy integration.	design& permitting	2011-2015		
20	Red Eléctrica de España: S.A.	to be determined (ES)	to be determined (ES)	Reinforcements in the 220kV network overall the country, in addition to upgrading of 300km of 220kV network , due to wind power evacuation.	Lack of network capacity to evacuate wind power energy, and congestion in some 220kV lines.	These projects will provide higher RES integration.	design& permitting	2009-2014		



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21	Red Eléctrica de España: S.A. and Réseau de Transport d'Electricité	Sta.Llogaia (ES)	Baixas (FR)	New HVDC (VSC) bipolar interconnection in the Eastern part of the border, via +/- 320kV DC underground cable using existing infrastructures corridors and converters in both ending points. The thermal capacity is expected in the range 2x825-2x1000MW. Total line length: 60km.	Limited NTC in both directions and limitations to the integration of wind power energy in the Iberian Peninsula.	The project will provide increased cross-border capacity, up to 2800MW from FR to SP (today 1400MW), higher RES integration and improved security of supply. The project increases the security of the system in case of major incidents. Close to the diversity of supply benefits, decrease in CO2 emissions is expected.	design& permitting	2014	X	European Coordinator Mr. Mario Monti appointed by DGTREN. There is a political agreement on the proposed solution.
22	Red Eléctrica de España: S.A	Santa Llogaia (ES)	Bescanó (ES)	New 119km double circuit Sta.Llogaia-Ramis-Bescano-Vic/ Senmenat 400kV OHL (single circuit in some sections) New 400kV substations in Bescano, Ramis and Sta.Llogaia,with 400/220kV transformers in Ramis and Bescano.	Necessity of adapting the existing network to the new Eastern interconnection.Congestions mainly in the 400kV Vic-Baixas line and in Catalonian area in contingencies. NoT enough transmission network for the connection of new generation in the Bescano area and support to the security of supply in the Girona area.	The project will provide an increase of NTC, improved the security of supply and support RES integration.	design& permitting	2010-2012	X	
23	Red Eléctrica de España: S.A. and Réseau de Transport d'Electricité	tbd (ES)	tbd (FR)	New cross-border line - not in the French department "Pyrenees Orientales" nor in the Spanish region of Cataluña.	Limited NTC of the ES- FR border in both directions.	Increase of interconnection capacity, up to 4000MW.	under consideration	long term	X	
24	Réseau de Transport d'Electricité	Avelin (FR)	Warande (FR)	Reconductoring (with ACSS) of both circuits of existing 400kV OHL between Avelin, Weppes & Warande. Total length : 85km	Need to alleviate congestion due to generation evacuation in Northern France.	The project will reduce annual re-dispatching costs and Improved the overall capability of the network to accomodate international power exchanges in the area.	under construction	2010		
25	Réseau de Transport d'Electricité	Baixas (FR)	Gaudière (FR)	Reconductoring of existing 70km double circuit 400kV OHL to increase its capacity.	Congestion is expected on existing asset due to increased exchanges with Iberian peninsula.	The project will result in increased ability to cope with higher exchanges with the Iberian peninsula.	under consideration	2014		

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26	Réseau de Transport d'Electricité and amprion GmbH	Ensdorf (DE)	St. Avold (FR)	Change of conductors on the German part of this single circuit 225kV line (9km) and installation of a phase-shifter in Ensdorf (DE) 225kV substation.	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Increase of NTC and Improved security of supply.	planned	mid term		
27	Elia System Operator S.A.	Lillo (BE)	Mercator (BE)	Doubling of the axis Zandvliet-Mercator via Lillo by erecting a new 35km 380kV double circuit OHL with 1500 MVA capacity.	Needed to avoid overloading of the line during certain contingencies as a result of new generation and increasing demand.	Conventional generation integration; improved security of supply; Increase of NTC.	design& permitting	2018		
28	Elektro Slovenija d.o.o.	Divaca (SI)		Installation of a new 400kV PST to assist control of power flows to Italy on secure level and secure the operation of Slovenian grid enabling full utilisation of regional market.	The project will provide improved security of supply, increased NTC and reduced re-dispatching costs & grid losses.	Improved security of supply, increase of NTC, annual re-dispatching costs reduction and annual losses reduction.	under construction	short term	X	
29	Terna - Rete Elettrica Nazionale SpA	Chiaramonte Gulfi (IT)	Sorgente (IT)	Realization of 380kV ring grid, through the construction of 3 new 380kV line: "Chiaramonte Gulfi - Ciminna", "Sorgente - Ciminna" and "Paternò - Priolo". It will be realized a new 380/150kV substation in Caltanissetta area and the voltage upgrade of the existing Ciminna substation up to 380kV. Total line length: 365km.	Congestion on the existing 220kV Sicily network. Future generation evacuation. Energy transfer from Western to Eastern part of Sicily.	RES integration, annual losses reduction and Improved security of supply.	planned	2015/long term		
30	Terna - Rete Elettrica Nazionale SpA	Sorgente (IT)	Rizziconi (IT)	New 90km double circuit 400kV line, partly via subsea cable and partly via OHL. This line is part of a larger project that foresees the creation of the future 400kV ring grid of Sicily.	Need of increasing transport capacity between Sicily and Mainland, improving the security of supply (securing the coverage of energy demand and decreasing the probability of loss of load).	The project will support RES integration (by transmitting wind power from Sicily to mainland), reduce grid losses and Improved the security of supply (by avoiding the risk of Sicily tripping to isolated operation).	under construction	2013		
31	Terna - Rete Elettrica Nazionale SpA	Foggia (IT)	Villanova (IT)	New 178km double circuit 400kV OHL between existing Foggia and Villanova 400kV substations, also connected in and out to the Larino and Gissi substations. A PST will be installed on the new 400kV line.	Increase of power exchange capability between south and central south of Italy in order to get over the splitting of the regional market caused by limited transfer capability in both directions.	The project is expected to support conventional generation integration, mitigate CO2 emission, reduce grid losses and help RES integration.	design& permitting	2015		

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32	Terna - Rete Elettrica Nazionale SpA	Feroletto (IT)	Maida (IT)	New 400kV OHL across Calabria between the existing substation of Ferroletto and the future substation of Maida, while restructuring the existing grid in North Calabria.	Overcoming the overloads and voltage stability problems limits due to the present production units and the future generation in the area.	Conventional generation integration, CO2 emission mitigation, annual losses reduction and RES Integration.	design& permitting	short term		
33	Terna - Rete Elettrica Nazionale SpA	Montecorvino (IT)	Benevento (IT)	New 70km double circuit 400kV OHL between the existing 400kV substations of Montecorvino and Benevento II, providing in and out connection to the future substation to be build in Avellino North area, which will be also connected to the existing "Matera-S. Sofia" 400kV line.	Overcoming the overloads and voltage stability problems limits due to the present production units and the future generation in the area.	Conventional generation integration, CO2 emission mitigation, annual losses reduction and RES Integration.	design& permitting	short term		
34	Terna - Rete Elettrica Nazionale SpA	Foggia (IT)	Benevento II (IT)	Upgrade of the existing 85km Foggia-Benevento II 400kV OHL and installation of a PST on this line.	Increase of power exchange capability due to the renewable generation development in Southern Italy.	The project is expected to support RES & conventional generation integration and improved the security of supply.	design& permitting	short term		
35	Terna - Rete Elettrica Nazionale SpA	Deliceto (IT)	Bisaccia (IT)	New 30km single circuit 400kV OHL between the future substations of Deliceto and Bisaccia, in the Candela area.	increase of power exchange capability due to the new renewable generation development in the Southern Italy.	The project is expected to support RES & conventional generation integration and reduce grid losses.	design& permitting	short term		
36	Terna - Rete Elettrica Nazionale SpA	Fiumesanto (IT)	Latina (IT)	Second pole of HVDC link between Sardinia and mainland Italy via 400kV DC subsea cable (420km). The first pole is in operation since 2009. Total capacity of the bipolar link: 1000MW.	Increase of security of Supply in Sardinia island and overcoming the splitting the regional market caused by limited transfer.	The project is expected to support RES integration, reduce re-dispatching costs and improved the security of supply.	under construction	2010		
37	amprion GmbH ,EnBW Transportnetze AG, VKW-Netz AG and Swissgrid AG	Area of Bodensee (DE, AT, CH)		Construction of new lines, extension of existing ones and erection of 400/220/110kV-substation.	This project will increase the current power exchange capacity between the DE, AT and CH.	The project is expected to increase NTC and improved the security of supply.	planned	long term		

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38	50Hertz Transmission GmbH and PSE Operator S.A.	Vierraden (DE)	Krajnik (PL)	This project is the conversion of existing 220kV double circuit line Krajnik (PSE Operator) - Vierraden (50Hertz Transmission) into a 400kV line together with installation of phase shifting transformers in Krajnik (PSE Operator) and Mikulowa (PSE Operator).	The project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the cross-border transmission capacity and flexibility of the grid.	It is expected that the project will decrease the loop flow from DE to PL and to CZ/SK. It will improve the security of supply, increase the power exchange capacity between PL and DE on PL/DE/CZ/SK synchronous profile (i.e. support CCE market development) and support the RES integration.	design& permitting	Before 2013	X	conversion of the existing 220 kV double circuit line Krajnik (PSE Operator) - Vierraden (50 Hertz Transmission) into a 400 kV line is a top priority project according to German act for acceleration of transmission grid extension (EnLAG)
39	50Hertz Transmission GmbH and PSE Operator S.A.	Eisenhüttenstadt (DE)	Plewiska (PL)	This project is the 3rd 400kV double circuit OHL interconnection between Poland (Plewiska) and Germany (Eisenhüttenstadt) with reinforcement of the Polish internal grid. Total length is 252km, 242km of which being in Poland.	The project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the cross-border transmission capacity of the grid.	It is expected that the project will support the CCE market development, RES integration and maintain or even Improved security of supply.	planned	long term	X	Top priority project according to German act for acceleration of transmission grid extension (EnLAG); German-Polish project development company is in preparation
40	50Hertz Transmission GmbH and Energinet.dk and Affärsverket Svenska Kraftnät	Ishøj/Bjæverskov (DK)	Bentwisch (DE)	The Kriegers Flak project is the new subsea cable multiterminal connection between Denmark, Sweden and Germany used for both grid connection of offshore wind farms Kriegers Flak and interconnection. Technical features still have to be determined.	The project will alleviate mainly the need of 1) grid connection for new off-shore wind farms in the Baltic Sea and 2) additional cross-border transmission capacity of the grid.	RES integration and increase of NTC.	under consideration	2014		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Kriegers+Flak/">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Kriegers+Flak/</a>
41	transpower stromübertragungs gmbh and Statnett SF	Tonstad (NO)	tbd (DE)	Nord.Link: A new HVDC connection between Southern Norway and Northern Germany. Estimated subsea cable length: 520 - 600km. Capacity: 700 - 1400MW.	Connecting isolated systems (currently no connection between Germany and Norway).	Increase of NTC (700 - 1400MW), diversity of supply and RES integration.	under consideration	long term		
42	transpower stromübertragungs gmbh and Energinet.dk	Kassø (DK) & Ensted (DE)		Installation of two PSTs. This project is in the framework of step 2 in the Danish-German agreement to upgrade the Jutland-DE transfer capacity; This step includes also planned strengthening of existing 380kV lines in the grid of TPS and Energinet.dk .	The project will increase the power exchange capacity between Germany and Denmark West. This will improve the market function and contribute to a better utilization of the increasing amount of wind power.	Increase of NTC (Approximately by 500MW when the whole step 2 will be finished), improved security of supply and annual losses reduction.	under construction	mid term		

## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
43	transpower stromübertragungs gmbh and Energinet.dk	Audorf (DK)	Kassø (DE)	Step 3 in the Danish-German agreement to upgrade the Jutland-DE transfer capacity. It consists of partially an upgrade of existing 400kV line and partially a new 400kV route in Denmark. In Germany new 400kV line mainly in the trace of an existing 220kV line. The total length of this OHL is 114km.	The project will increase the power exchange capacity between Germany and Denmark Wets. This will improve the market function and contribute to a better utilization of the increasing amount of wind power.	This project will enable an Increase of NTC between the two countries, improved security of supply, reduce annual losses.	under consideration	long term		
44	amprion GmbH and TenneT TSO B.V.	Niederrhein (DE)	Doetinchem (NL)	New 400kV line double circuit DE-NL interconnection linew. Length:60km.	Overloads due to high North-South power flows through the auctioned frontier between the Netherlands and Germany in peak hours of wind in-feed.	Increase of NTC (1000 - 2000MW), improved security of supply and RES integration.	design& permitting	2013		EnLAG (German Law for new lines)
45	amprion GmbH and Elia System Operator S.A.	Aachen/Düren region (DE)	Lixhe (BE)	Connection between Germany and Belgium including new 100km underground cable and extension of existing 380kV-substations.	Low cross border capacity.	NTC increase, conventional generation integration and RES integration. The project will facilitate IEM.since presently there is no direct exchange capability between DE and BE.	under consideration	long term	X	
46	transpower stromübertragungs gmbh	Dollern (DE)	Hamburg/Nord (DE)	New 400kV double circuit OHL Dollern - Hamburg/Nord including one new 400/230kV transformer in substation Hamburg/Nord and new 400kV switchgear Kummerfeld. Length:43km.	Increase of the transmission capacity from north to south-West Germany due to the increase of RES in Northern Germany.	RES integration, improved security of supply and annual re-dispatching costs reduction.	design& permitting	1. circuit midterm; 2. circuit longterm	X	EnLAG (German Law for new lines)
47	transpower stromübertragungs gmbh	Audorf (DE)	Hamburg/Nord (DE)	New 400kV double circuit OHL Audorf - Hamburg/Nord including two new 400/230kV transformers in substation Audorf. Length: 65km.	Increase of the transmission capacity from north to south-West Germany, due to the increase of RES in Northern Germany and increase of power exchange capability between Denmark and Germany.	RES integration, improved security of supply and annual re-dispatching costs reduction.	planned	long term	X	Due to the german act "EnLAG"
48	amprion GmbH and transpower stromübertragungs gmbh	Wehrendorf (DE)	Ganderkesee (DE)	New line, extension of existing and erection of substations, erection of 380/110kV-transformers.	Increase of the transmission capacity from north to south-West Germany due to the increase of RES in Northern Germany.	RES integration, improved security of supply and annual re-dispatching costs reduction.	design& permitting	mid term		Due to the german act "EnLAG"
49	transpower stromübertragungs gmbh	Redwitz (DE)	Grafenrheinfeld (DE)	Upgrade of 230kV connection Redwitz - Grafenrheinfeld to 400kV, including new 400kV switchgear Eltmann. Line length: 97km.	Support of RES integration in Germany, maintaining of security of supply and support of the market development.	RES integration, improved security of supply and conventional generation integration.	design& permitting	mid term		Due to the german act "EnLAG"

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
50	amprion GmbH and transpower stromübertragungs gmbh	Niederrhein (DE)	Dörpen/West (DE)	New 400kV double circuit OHL Dörpen - Niederrhein including extension of existing substations. Length: 167km.	Increase of the transmission capacity from north to south-West Germany due to the increase of RES in Northern Germany.	RES integration, improved security of supply and conventional generation integration.	design& permitting	long term		Due to the german act "EnLAG"
51	transpower stromübertragungs gmbh	Wahle (DE)	Mecklar (DE)	New 400kV double circuit OHL Wahle - Mecklar including two new substations. Length: 210km.	Increase of the transmission capacity from north to south-West, due to the increase of RES in Northern Germany.	RES integration, improved security of supply and conventional generation integration.	design& permitting	long term		Due to the german act "EnLAG"
52	transpower stromübertragungs gmbh	Cluster BorWin1 (DE)	Diele (DE)	New line consisting of underground +subsea cable with a total length of 205km. Line capacity: 400MW.	Connection of new offshore wind farm.	RES integration.	under construction	mid term		
53	transpower stromübertragungs gmbh	Offshore- Windpark Nordergründe (DE)	Inhausen (DE)	New line consisting of underground +subsea cable with a total length of 35km.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
54	transpower stromübertragungs gmbh	Offshore- Windpark GEOFreE (DE)	Göhl (DE)	New line consisting of underground +subsea cable with a total length of 32km.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
55	transpower stromübertragungs gmbh	Cluster HelWin1 (DE)	Büttel (DE)	New line consisting of underground +subsea cable with a total length of 145km. Line capacity: aprox. 860MW. This Project includes also a new substation Büttel and connection of this new substation with the existing OHL Brünsbüttel - Wlister.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
56	transpower stromübertragungs gmbh	Cluster SylWin1 (DE)	Büttel (DE)	New line consisting of underground +subsea cable with a total length of 210km. Line capacity: aprox. 690MW.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
57	transpower stromübertragungs gmbh	Cluster DolWin1 (DE)	Dörpen/West (DE)	New line consisting of underground +subsea cable with a total length of 155km. Line capacity: 400MW.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
58	transpower stromübertragungs gmbh	Offshore Windpark Riffgat (DE)	Emden (DE)	New line consisting of underground +subsea cable with a total length of 80km.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
59	transpower stromübertragungs gmbh	Cluster BorWin2 (DE)	Diele (DE)	New line consisting of underground +subsea cable with a total length of 205km. Line capacity: 400-800MW.	Connection of new offshore wind farm.	RES integration.	design& permitting	mid term		
60	EnBW Transportnetze AG	Goldshöfe (DE)	Dellmensigen (DE)	Upgrade the line Goldshöfe - Dellmensigen from 220kV to 380kV . Line length:114km. Included with the project : 3x 380kV substations, 2 transformers.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES Integration, improved security of supply and annual losses reduction.	under construction	mid term		
61	EnBW Transportnetze AG	Großgartach (DE)	Hüffenhardt (DE)	New 380kV OHL. Length: 23km. Included with the project : 1 new 380kV substation, 2 transformers.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES Integration, improved security of supply and annual losses reduction.	planned	mid term		
62	EnBW Transportnetze AG	Hüffenhardt (DE)	Neurott (DE)	Upgrade of the line from 220kV to 380kV. Length: 11km. Included with the project : 1 new 380kV substation.	Ajustment of the transmission capacity of the grid.	Improved security of supply and annual losses reduction.	design& permitting	long term		
63	EnBW Transportnetze AG	Mühlhausen (DE)	Großgartach (DE)	Upgrading line from 220kV to 380kV. Length:35km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES Integration, improved security of supply and annual losses reduction.	design& permitting	mid term		EnLAG (German Law for new lines)
64	amprion GmbH	Rommerskirchen (DE)	Weißenthurm (DE)	New line, extension of existing and erection of substations, erection of 380/110kV-transformers. Total line length: 100km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration, improved security of supply and conventional generation integration.	under construction	mid term		EnLAG (German Law for new lines)
65	amprion GmbH	Mengede (DE)	Kruckel (DE)	Installation of a second circuit 380kV OHL and extension of existing substations. Line length:16km.	Connection of new power plants.	Conventional generation integration.	planned	mid term		

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
66	amprion GmbH	Dauerberg (DE)	Limburg (DE)	New 380kV double circuit OHL, extension of existing and erection of substations, erection of 380/110kV-transformers. Total line length: 46km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration and Improved security of supply.	under construction	mid term		EnLAG (German Law for new lines)
67	amprion GmbH	Kriftel (DE)	Eschborn (DE)	On the main distance upgrading line, extension of existing substations.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES Integration and Improved security of supply.	under construction	mid term		EnLAG (German Law for new lines)
68	amprion GmbH	Area of Muensterland and Westfalia (DE)		New lines and installation of additional circuits, extension of existing and erection of several 380/110kV-substations. Total line length: 240km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration, improved security of supply and conventional generation integration.	planned	long term		EnLAG (German Law for new lines)
69	amprion GmbH	Gütersloh (DE)	Bechterdissen (DE)	New lines and installation of additional circuits, extension of existing and erection of 380/110kV-substation. Total line length: 27km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration and Improved security of supply.	under construction	mid term		EnLAG (German Law for new lines)
70	amprion GmbH	Area of West-Rhineland (DE)		New lines and installation of additional circuits, extension of existing and erection of several 380/110kV-substations.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration, improved security of supply and conventional generation integration.	under construction	mid term		EnLAG (German Law for new lines)
71	amprion GmbH	Kruckel (DE)	Dauersberg (DE)	New lines, extension of existing and erection of several 380/110kV-substations. Total line length: 130km.	Increase of the transmission capacity from North to South-West of Germany, due to the increase of wind energy in Northern part.	RES integration, improved security of supply and conventional generation integration.	planned	long term		EnLAG (German Law for new lines)
72	amprion GmbH	Niederrhein (DE)	Ufport (DE)	New lines and extension of existing 380kV-substations. Total length: 31km.		RES integration, improved security of supply and conventional generation integration.	planned	long term		EnLAG (German Law for new lines)



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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
73	50Hertz Transmission GmbH	Neuenhagen (DE)	Vierraden (DE)	Project of new 380kV double-circuit OHL with 125km length as prerequisite for the planned upgrading of the existing 220kV double-circuit interconnection Krajnik (PL) – Vierraden (DE, 50Hertz Transmission).	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	In particular the project will support RES integration in North Germany/Poland, maintaining the security of supply and support of market development in CCE.	design& permitting	2011	X	Top priority project according to German act for acceleration of transmission grid extension (EnLAG)
74	50Hertz Transmission GmbH	Hamburg/Krömmel (DE)	Schwerin (DE)	This 380kV double-circuit OHL project will close the missing gap in North-East German grid infrastructure. Only 65km of new line must be constructed, 22km already exist.	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Support of RES integration in North Germany, maintaining of security of supply and support of market development.	under construction	2010	X	Top priority project according to German act for acceleration of transmission grid extension (EnLAG)
75	50Hertz Transmission GmbH and transpower stromübertragungs gmbh	Halle/Saale (DE)	Schweinfurt (DE)	New 380kV double-circuit OHL between the substations Lauchstädt-Vieselbach-Altenfeld-Redwitz with 215km length combined with upgrade between Redwitz and Grafenheinfeld (see project 49).	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Support of RES integration in Germany, annual redispatching cost reduction, maintaining of security of supply and support of the market development.	partly completed; design& permitting	mid term	X	Top priority project according to German act for acceleration of transmission grid extension (EnLAG); project is also part of the European Energy Programme for Recovery
76	50 Hertz Transmission GmbH	Lubmin (DE)	Erfurt area (DE)	New 380kV double-circuit OHL from the Northern part of the 50Hertz Transmission control area to the South-Western part of the 50Hertz Transmission control area with considered further extension to South-Western part of Germany. Length ca. 800km.	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Support of RES and conventional generation integration in North Germany, maintaining of security of supply and support of market development.	planned	long term		Suitable project extension under consideration of ongoing long term system studies.

## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
77	50Hertz Transmission GmbH	Bärwalde (DE)	Schmölln (DE)	Upgrade of the existing double-circuit 380kV OHL. Project will be realized earlier than originally planned as part of project 203. Line length: 50km.	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Support of RES and conventional generation integration in North Germany, maintaining of security of supply and support of market development.	design& permitting	2013		
78	50Hertz Transmission GmbH	380kV grid reinforcement and extension in Saxony (DE)		Upgrade of the existing double-circuit 380kV OHL and also construction of 230km of new 380kV double circuit OHLs in Saxony (control area of 50Hertz Transmission). Length: 80km.	Project will alleviate mainly the need to increase 1) the capability of the grid to accommodate additional generation capacity and 2) the transmission capacity of the grid.	Support of RES and conventional generation integration in North Germany, maintaining of security of supply and support of market development.	under consideration	long term		
79	transpower stromübertragungs gmbh and Verbund - Austrian Power Grid	Isar (DE)	St. Peter (AT)	New 400kV double circuit OHL Isar - St. Peter including new 400kV switchgears Altheim, Simbach and St. Peter, one new 400/230kV transformer in substation Altheim and 4. circuit Isar - Ottenhoffen. Line length: 90km.	This project will increase the current power exchange capacity between Austria and Germany.	Increase of NTC and RES integration.	under consideration	2017		
80	Verbund - Austrian Power Grid	St. Peter (AT)	Salzach neu (AT)	New internal double circuit 380kV-line connecting the substations St. Peter and Salzach neu (replacement of the existing 220kV-line). Length: 46km.	Alleviation of North-to-South congestions, creation of strongly needed enhanced North-to-South transmission capacities.	Improved security of supply, annual re-dispatching costs reduction and annual losses reduction.	under construction	2011	X	
81	Verbund - Austrian Power Grid	Salzach neu (AT)	Tauern (AT)	New internal double circuit 380kV-line connecting the substations Salzach neu and Tauern and erection of the new 380/220/110kV-substation Pongau (replacement of the existing 220kV-line) . Line length: 115km.	Alleviation of North-to-South congestions, creation of strongly needed enhanced North-to-South transmission capacities.	Improved security of supply, RES integration and annual re-dispatching costs reduction.	planned	2017	X	
82	Elektro Slovenija d.o.o.	Krsko (SI)	Bericevo (SI)	New 400kV double circuit OHL. This project will strengthen connection between East and Central part of Slovenia and connect an internal loop. Line length: 80km.	Need to improve the security & quality of supply.	The project should benefit in improved security of supply, grid annual losses & annual re-dispatching costs reduction.	design& permitting	short term	X	

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
83	Hellenic Transmission System Operator S.A.	Patras (GR)	400kV Continental System (GR)	New 400kV substation in Patras (GIS Technology) and in&out connection to the existing Axeloos - Distomo 400kV OHL via a new 15km double circuit line, part of which will consist of subsea cable. The project shall constitute the first 400kV corridor to Peloponnese.	Future generation evacuation and demand growth.	The project will improve the security of supply, favour conventional generation &RES integration.	design& permitting	2011	X	
84	Hellenic Transmission System Operator S.A.	Patras (GR)	Megalopolis (GR)	New 400kV substation in Megalopolis and connection to Patras 400kV substation via a 110km double circuit OHL. 2nd corridor to Peloponnese.	Future generation evacuation and demand growth.	The project will improve the security of supply, favour conventional generation &RES integration.	design& permitting	2011	X	
85	Hellenic Transmission System Operator S.A.	Megalopolis (GR)	Korinthos (GR)	Construction of a new 400kV substation in Korinthos (GIS Technology) and connection to the Megalopolis substation via a 110km double circuit 400kV OHL.	Future generation evacuation and demand growth.	The project will improve the security of supply, favour conventional generation &RES integration.	design& permitting	2012	X	
86	Hellenic Transmission System Operator S.A.	Korinthos (GR)	Koymoyndoyros (GR)	Replacement of the existing 150kV double circuit line by a 87km double circuit 400kV OHL.	Future generation evacuation and demand growth.	The project will improve the security of supply, favour conventional generation &RES integration.	design& permitting	2012	X	
87	Hellenic Transmission System Operator S.A.	Filippi(GR)	Lagadas (GR)	New 400kV substation in Lagadas in Thessaloniki area and connection to the existng substation of Filippi via a new 110km double circuit 400kV OHL.	Market integration, future RES and conventional generation evacuation and improvement of security of supply.	The project will improve the security of supply, favour conventional generation & RES integration.	design& permitting	2011		
88	Hellenic Transmission System Operator S.A.	N.Santa (GR)		Construction of the new 400kV S/S N.Santa in North Greece. This S/S will serve as the interface for the new line GR-TR, as well as for the interconnection of new wind farms and conventional generation.	Market integration, future RES and conventional generation evacuation and improvement of security of supply.Future interconnection with Turkey.	Increase of NTC, conventional generation integration and RES integration.	under construction	2012		
89	Hellenic Transmission System Operator S.A.	Aliveri(GR)	System (GR)	Construction of the new 400kV S/S Aliveri in Evia area and a new 400kV double circuit line Aliveri-System. Line length: 72km.	Future RES and conventional generation evacuation.	Improved security of supply, conventional generation integration and RES integration.	design& permitting	2011		

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90	Hellenic Transmission System Operator S.A.	Aliveri(GR)	Larimna (GR)	Construction of the new 400kV S/S Aliveri in Evia area and a new 400kV double circuit line Aliveri-System. Line length: 128km.	Future RES and conventional generation evacuation.	Improved security of supply, conventional generation integration and RES integration.	design& permitting	2014		
91	Hellenic Transmission System Operator S.A.	Polypotamo (GR)	N. Makri (GR)	New 150kV double circuit subsea cable. Line length:33km.	Radial connection of windfarms.	RES integration.	under construction	2011		
92	Hellenic Transmission System Operator S.A.	Polypotamo (GR)	N. Evia (GR)	New 150kV double circuit OHL. Line length: 40km. Along the new transmission line, 4 new 150/20kV substations shall be build for the interconnection of new wind farms in Evia island.	Radial connection of windfarms.	RES integration.	design& permitting	2010		
93	Hellenic Transmission System Operator S.A.	Lavrión (GR)	Syros (GR)	New 150kV subsea cable DC connection. There is also the possibility to use AC if proved technically and economically feasible.	Connection of isolated systems and future RES integration.	Improved security of supply and reduce energy costs.	design& permitting	long term	X	
94	Hellenic Transmission System Operator S.A.	Syros (GR)	Cyclades (GR)	New 150kV subsea cables and 4x150kV Substations to islands of Paros, Naxos, Mykonos, Evia.	Connection of isolated systems and future RES integration.	Improved security of supply.	design& permitting	long term	X	
95	ČEPS a.s.	Vyskov (CZ)	Cechy střed (CZ)	New second circuit 400kV OHL; 1385 MVA.	Need to strengthen the grid in the central part of CZ through doubling the OHL line. Facilitate flow from West to East.	Enhancing security of supply of CZ grid.	planned	2015		
96	ČEPS a.s.	Vitkov (CZ)		New 400/110kV substation equipped with transformers 2x350MVA.	Need to facilitate connection of RES power generation from 110kV to 400kV, new 400kV interconnection node to DE.	RES integration.	planned	2015		
97	ČEPS a.s.	Vernerov (CZ)		New 400/110kV substation equipped with transformers 2x350MVA.	Need to facilitate connection of RES power generation from 110kV to 400kV, new 400kV connection node to rest of the network.	RES integration ; reduction of infrastructure vulnerability.	planned	>2015		Connection of 2 new 400 kV substations and facilitate power flow between CEPS and tsp

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
98	ČEPS a.s.	Vernerov (CZ)	Vitkov (CZ)	New 400kV double circuit OHL, 1385 MVA.	Need to facilitate connection of RES in CZ and enhance security of supply; Facilitate flow between CZ and DE.	RES integration ; improved security of supply.	under consideration	>2015		
99	ČEPS a.s.	Hradec (CZ)	Reporýje (CZ)	Upgrade of existing 400kV single circuit OHL with length of 116.9km. Target capacity 1385 MVA.	Need to facilitate flow from West to East and enhance security of supply.	Enhancing security of supply of CZ grid; RES integration.	design& permitting	2014		
100	PSE Operator S.A.	Piła Krzewina (PL)	Bydgoszcz Zachód (PL)	New 84km 400kV 1870 MVA OHL interconnection line Piła Krzewina - Bydgoszcz Zachód temporarily on 220kV.	Power output from RES.	RES integration ; improved security of supply.	design& permitting	2015		
101	PSE Operator S.A.	Żydowo (PL)	Gdańsk Przyjaźń (PL)	A new AC substation in Gdańsk Agglomeration Area. New substation Gdańsk Przyjaźń is connected by splitting and extending of one circuit of existing line Żarnowiec - Gdańsk Błonia and new 150km 400kV 2x1870 MVA double circuit OHL line Żydowo - Gdańsk Przyjaźń with one circuit from Żydowo to Gdańsk temporarily on 220kV after dismantling of 220kV line Żydowo - Gdańsk.	Power output from RES.	RES integration ; improved security of supply.	planned	2015		
102	PSE Operator S.A.	Pałnów (PL)	Grudziądz (PL)	New 174km 400kV 2x1870 MVA double circuit OHL line Pałnów - Grudziądz after dismantling of 220kV line Pałnów - Jasiniec (two parallel lines) and Jasiniec - Grudziądz. One circuit from Pałnów to Grudziądz via Jasiniec temporarily on 220kV.	Safe operation of the system - change of the voltage in the network (elimination of the network congestions).	Improved security of supply; Increase of NTC.	design& permitting	2015	X	

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
103	PSE Operator S.A.	Dunowo (PL)	Plewiska (PL)	Construction of a new double circuit 400kV OHL Dunowo - Żydowo (2x1870 MVA) partly using existing 220kV line + Construction of a new 400kV OHL Plewiska - Pila Krzewina - Żydowo (2x1870 MVA); single circuit temporarily working as a 220kV + A new AC 400kV switchgear in existing substation Pila Krzewina with transformation 400/220kV 500 MVA.	Power output from RES and connection to the network of RES.	RES integration ; improved security of supply.	design& permitting	2020	X	
104	PSE Operator S.A.	Krajnik (PL)	Baczyna (PL)	Construction of a new double circuit 400kV OHL Krajnik - Baczyna (2x1870 MVA, 91km); single circuit temporarily working at 220kV on Krajnik - Gorzów part + New substation 400kV Baczyna will be connected by splitting and extending existing line Krajnik-Plewiska + Upgrading of limitations line Krajnik - Plewiska.	Power output from RES + Reinforcement of Polish internal grid.	RES integration ; improved security of supply; Increase of NTC.	planned	2020		
105	PSE Operator S.A.	Mikulowa (PL)	Świebodzice (PL)	Double circuit line 220kV Mikulowa-Świebodzice will be upgraded to 400kV - single circuit temporarily working at 220kV (2x1870 MVA).	Safe operation of the system - change of the voltage in the network (elimination of the network congestions).	Improved security of supply; Increase of NTC.	planned	2020	X	
106	Affärsverket Svenska Kraftnät and Statnett SF	Hurva/Hallsberg (SE)	Tveiten (NO)	"South West link"consisting of three main parts: 1) New 400kV line between Hallsberg and Barkeryd 2) New double HVDC VSC underground cable line between Barkeryd and Hurva 3) New HVDC VSC line between Barkeryd and Tveiten/Norway. The project also include new substations and converter stations in the connection points line double circuit new OHL Hallsberg - Barkeryd 170km, underground VSC Barkeryd - Hurva 250km and VSC Barkeryd - Tveiten with 103km on the Norwegian side. Expected capacity: 1200MW.	Market integration. Integration of new renewable power generation.	Increase of NTC, improved security of supply and RES integration.	planned	2014		
107	Statnett SF	Ørskog (NO)	Fardal (NO)	New 300km single circuit 400kV OHL.	Critical situation with security of supply in the Mid-Norway area.	Improved security of supply, RES integration and increase of NTC.	design& permitting	2013/2014		

## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
108	Statnett SF	Namsos (NO)	Storheia (NO)	New 119km 800MVA single circuit Namsos-Roan-Storheia OHL to connect new wind power generation at Fosen.	Enabling RES (wind and small scale hydro power) to connect to the grid (currently limited grid capacity).	RES integration.	design& permitting	2013		The project will be part of a future/potential "Arctic Circle", including reinforcements in Finland, Sweden and Norway.
109	Statnett SF	Ofoten (NO)	Balsfjord (NO)	New 150km single circuit 400kV OHL.	Enabling RES (wind in Northern Norway) to connect to the grid (currently limited grid capacity). Enhance the Security of Supply of the Finnmark area, including critical oil and gas installations.	Improved security of supply; RES integration.	design& permitting	2014-2015		The project will be part of a future/potential "Arctic Circle", including reinforcements in Finland, Sweden and Norway.
110	Statnett SF	Balsfjord (NO)	Hammerfest (NO)	New 355km single circuit 400kV OHL.	Enabling RES (wind in Northern Norway) to connect to the grid (currently limited grid capacity). Enhance the Security of Supply for the Finnmark area, including critical oil and gas installations.	Improved security of supply; RES integration.	design& permitting	2016		
111	Statnett SF and National Grid Electricity Transmission plc	kVilldal (NO)	UK (substation to be determined)	A new 1400MW HVDC bipolar installation connecting Western Norway and the UK via 800km subsea cable; DC voltage is to be determined.	Currently there is no connection between UK and Norway.	1400MW increase of NTC; RES integration; diversity of supply: connection between a hydro and a thermal power system.	under consideration	2017-2020		
112	National Grid Electricity Transmission plc	Bramford (UK)	Twinstead(UK)	New 400kV double circuit.	Limit to renewable and nuclear export.	Reduce congestion.	under consideration	2017		
113	Statnett SF and TenneT TSO B.V.	Feda (NO)	Eemshaven (?) (NL), to be determined (NL)	NorNed 2: a 2nd HVDC connection between Norway and The Netherlands via 570km 450kV DC subsea cable with 700 - 1400MW capacity.	Need to increase the current transfer capacity between both countries.	700-1400MW increase of NTC; RES integration; diversity of supply: connection between a hydro and a thermal power system.	under consideration	2015-2017		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Skagerrak+4/">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Skagerrak+4/</a>
114	Statnett SF and Energinet.dk	Kristiansand (DK)	Tjele (NO)	Skagerrak 4: 4th HVDC connection between Southern Norway and Western Denmark, built in parallel with the existing 3 HVDC cables; new 700MW including 230km 500kV DC subsea cable.	Need to increase the current transfer capacity between both countries.	700 MW increase of NTC ; Diversity of supply: connection between a hydro and a thermal power system. Enabling increased RES integration.	design& permitting	2014	X	<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cobra+cable/">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cobra+cable/</a>

## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
115	Energinet.dk and TenneT TSO B.V.	Endrup (DK)	Eemshaven (NL)	COBRA: New single circuit HVDC connection between Jutland and the Netherlands via 350km subsea cable; the DC voltage will be up to 450kV and the capacity 600-700MW.	Need to increase the current transfer capacity between both countries.	Increase of NTC ; improved security of supply; RES integration ; 600-700MW ; The purpose of the link is to allow for the exchange and integration of wind energy and increase the value of renewable energy into the Dutch and Danish power systems and to increase security of supply.	design& permitting	2016		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Kassø-Tjele/">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Kassø-Tjele/</a>
116	Energinet.dk	Kassø (DK)	Tjele (DK)	Rebuilding of a 400kV OHL of 173km from a single-circuit to a double-circuit . This increases the transfer capacity with approx 1000 MW.	Need for increased capacity Norway-Jutland-Germany.	1000MW increase of NTC; RES integration.	design& permitting	2012-14		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm</a>
117	Energinet.dk	Ferslev (DK)	Vester Hassing (DK)	New 20km single circuit 400kV line via a cable with a capacity of approx 800 MW.	Need for improving the ability to transport Læsø off-shore wind power in N-1 security conditions.	RES integration ; improved security of supply.	Planned	2018		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm</a>
118	Energinet.dk	Revsing (DK)	Landerupgård (DK)	New 18km single circuit 400kV line via cable with capacity of approx. 1200 MW.	Need for transporting windpower from the West Coast to the consumption centre on the East Coast.	RES integration; improved security of supply.	Planned	2017		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm</a>
119	Energinet.dk	Tjele (DK)	Trige (DK)	New 46km single circuit 400kV line via cable with capacity of approx. 1200 MW.	Need for transporting windpower from the West Coast to the consumption centre on the East Coast.	RES integration; improved security of supply.	Planned	2017		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Great+Belt/">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Great+Belt/</a>
120	Energinet.dk	Fraugde (DK)	Herslev(DK)	New single circuit HVDC-LCC installation including a 56km 450kV DC subsea cable with 600MW capacity.	Need for interconnection between Eastern and Western Denmark to exchange windpower & regulation power.	Improved security of supply; RES integration.	under construction	2010		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm</a>
121	Energinet.dk	Endrup (DK)	Revsing(DK)	Upgrade of 50km double-circuit 400kV OHL to reach a capacity of approx. 2000MW.	Need to connect COBRA line; improve n-1 security; need to increase transport capacity between West coast to East coast.	RES integration; improved security of supply.	Planned	2017		<a href="http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm">http://www.energinet.dk/en/menu/Transmission/New+projects/New+electricity+transmission+installations/Cable+action+plan/Cable+action+plan.htm</a>



## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
122	Energinet.dk	Idomlund (DK)	Tjele (DK)	New 74km single circuit 400kV line via cable with capacity of approx. 1200MW.	Need for a second 400kV connection to Idomlund for security of supply and to evacuate wind power from Western Jutland.	RES integration; improved security of supply.	under consideration	2018-2020		commissioned in 2010 but commercial operation as from 2011
123	National Grid Electricity Transmission plc and TenneT TSO B.V.	Grain (UK)	Maasvlakte (NL)	New 1290MW HVDC bipolar installation including 260km of 450kV DC subsea cable.	Currently there is no connection between UK and Netherlands.	Project results in 1000MW NTC between both countries; enhanced diversity and security of supply for both markets open access for all market parties by explicit auction and market coupling increase of interconnection capacity and market transparency.	under construction	2010	X	
124	TenneT TSO B.V.	Eemshaven (NL)	Diemen (NL)	New AC bipole including 175-200km OHL with capacity of 2x2650 MVA (AC voltage: 380kV).	need for connection from the generation locations in the vicinity of Eemshaven to the Dutch 380kV central ring.	Conventional generation integration; RES integration.	design& permitting	2016		
125	TenneT TSO B.V.	Borssele (NL)	Geertruidenberg (NL)	New 100-130km double-circuit 380kV OHL with 2x2650 MVA capacity.	Need for connection from the generation locations in the vicinity of Borssele to the Dutch 380kV central ring.	Conventional generation integration; RES integration.	design& permitting	2014		
126	TenneT TSO B.V.	Maasvlakte (NL)	Beverwijk (NL)	New 110kV double-circuit 380kV mixed project (OHL+ underground cable) including approx 20km of underground cable for 2650 MVA. The cable sections are a pilot project. The total length of cable at 380kV is frozen until more experience is gained.	Need for connection from the generation locations in the vicinity of Rotterdam and Amsterdam to the Dutch 380kV central ring.	Conventional generation integration; feed of load increase; RES integration.	under construction	2013		
127	TenneT TSO B.V.	Zwolle (NL)	Hengelo (NL)	Upgrade of the capacity of the existing 60km double circuit 380kV OHL to reach a capacity of 2x2650 MVA.	Need to increase the capacity of the existing line to avoid overloads due to different flow patterns in the grid.	Improved security of supply; conventional generation integration; RES integration.	under consideration	tbd		
128	TenneT TSO B.V.	Krimpen aan de IJssel (NL)	Maasbracht (NL)	Upgrade of the capacity of the existing 150km double circuit 380kV OHL to reach a capacity of 2x2650 MVA.	Need to increase the capacity of the existing line to avoid overloads due to different flow patterns in the grid.	Improved security of supply; conventional generation integration; RES integration.	under consideration	tbd		

## Grid reinforcement projects identified or confirmed within EWIS

No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
129	National Grid Electricity Transmission plc and Elia System Operator S.A.	Richborough (UK)	Zeebrugge (BE)	Nemo project: new DC sea link including 135km of 250kV DC subsea cable with 1000MW capacity.	Currently there is no connection between BE and UK.	Increase of NTC by 1000MW.	planned	2016		
130	Elia System Operator S.A.	Zomergem (BE)	Zeebrugge (BE)	New approx 50km double-circuit 380kV 5000MVA OHL line between Zomergem and Zeebrugge to evacuate the locally (offshore) produced power line.	Required to further realise the renewable offshore resources available to Belgium.	RES integration; Increase of NTC.	design& permitting	2014		
131	Elia System Operator S.A.	Zandvliet (BE)	Lillo (BE)	Doubling of the axis Zandvliet-Mercator via Lillo by erecting a new 35km 380kV double circuit OHL with 1500 MVA capacity.	Needed to avoid overloading of the line during certain contingencies as a result of new generation and increasing demand.	Conventional generation integration; improved security of supply; Increase of NTC.	design& permitting	2014		
132	National Grid Electricity Transmission plc	Thames estuary (UK)		Double-circuit 400kV line upgrade around the Thames estuary.	Low cross border capacity.	Increase of NTC (investment needed to accommodate additional interconnectors and integrate offshore RES.	under construction	2011		
133	National Grid Electricity Transmission plc	Richborough (UK)	Canterbury (UK)	New double-circuit 400kV OHL and new 400kV substation in Richborough.	Low cross border capacity.	Increase of NTC (investment needed to accommodate additional interconnectors).	planned	2019		
134	National Grid Electricity Transmission plc	Sellindge (UK)	Dungeness (UK)	Reconductoring existing double-circuit 400kV OHL.	Low cross border capacity.	Increase of NTC (investment needed to accommodate additional interconnectors).	planned	2019		
135	National Grid Electricity Transmission plc	Rowdown (UK)		New 400kV quadboosters.	Low cross border capacity.	Increase of NTC (investment needed to accommodate additional interconnectors).	planned	2019		

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
136	National Grid Electricity Transmission plc	Deeside (UK)	Hunterston (UK)	New 2000MW HVDC link via 360km 500kV DC subsea cable on the West coast of the UK and new 400kV substation in Deeside - CSC Technology.	Limit to renewable export.	RES integration.	planned	2015		
137	National Grid Electricity Transmission plc	Peterhead (UK)	Hawthorn Pit (UK)	New 1800MW HVDC link via 365km 500kV DC subsea cable on the East coast of the UK and new 400kV substation in Hawthorn Pit - CSC Technology.	Limit to renewable export.	RES integration.	planned	2018		
138	National Grid Electricity Transmission plc	Hawthorn Pit (UK)	Norton (UK)	Upgrade of double circuit OHL from 275 to 400kV.	Limit to renewable export.	RES integration.	planned	2018		
139	National Grid Electricity Transmission plc	Beaulieu (UK)	Denny (UK)	New double circuit 400kV OHL (220km) with new terminal substations and substation extensions en route.	Limit to renewable export.	RES integration.	under construction	2014		
140	National Grid Electricity Transmission plc	Harker (UK)	Hutton (UK)	Upgrade to double-circuit Harker - Hutton 400kV OHL.	Limit to renewable export.	RES integration.	planned	2013		
141	National Grid Electricity Transmission plc	Harker(UK)	Quernmore(UK)	New 400kV double circuit.	Limit to renewable and nuclear export .	Reduce congestion.	under consideration	2020		
142	National Grid Electricity Transmission plc	Quernmore(UK)	Padiham(UK)	New 400kV double circuit.	Limit to renewable and nuclear export.	Reduce congestion.	under consideration	2020		
143	National Grid Electricity Transmission plc	Harker (UK)	Stella (UK)	New 400kV series compensation at a number of locations across the Anglo-Scottish border.	Limit to renewable export.	RES integration.	planned	2014		

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No	TSO	Substation 1	Substation 2	Project characteristics	Investment need alleviated	Expected benefits	Progress status	Expected time of commissioning	TENE	Comments
144	National Grid Electricity Transmission plc	Pentir (UK)	Trawsfynydd (UK)	Upgrade of existing 48km single circuit 400kV line to double circuit to accommodate new wind generation off Anglesey and nuclear replanting at Wylfa.	Integration of nuclear plant and limit to renewable export.	RES and conventional integration.	under consideration	2015		
145	EirGrid plc	Woodland (IE)	Deeside (UK)	A new 260km HVDC (380kV DC) underground and subsea connection between Ireland and Britain with 500MW capacity. On the Irish side, a 45km direct current underground cable will be built to the Woodland substation where the VSC converter station will be placed. The link will consist of two identical circuits.	Future generation import and export to and from Ireland respectively.	RES integration; improved security of supply; diversity of supply. The project will enhance market opportunities and benefit competition.	under construction	2011	X	
146	EirGrid plc, System Operation Northern Ireland Ltd plc and NIE(TAO)	Moyhill (IE)	Turleenan (UK)	A new 80km single circuit 400kV 1500MVA OHL from a new Moyhill 400/220kV substation in Ireland to a new Turleenan 400/275kV substation in Northern Ireland. This project is an integral part of the new interconnection project Moyhill- Woodland between Ireland and Northern Ireland.	Low cross border capacity.	Increase of NTC up to 1000MW NTC from IE to NI (today <450MW); improved security of supply; improved access for renewable generation.	design& permitting	2012	X	
147	EirGrid plc, System Operation Northern Ireland Ltd plc and NIE(TAO)	IE (substation to be determined)	UK (substation to be determined)	Strengthening of EHV networks (partial uprate and new) into Donegal and West of Northern Ireland and enhanced links between the two systems.	This project needs to be completed to facilitate the development of renewable energy in the North-West and Border Regions.	RES integration; improved security of supply; Annual losses reduction.	under consideration	2015+		
148	EirGrid plc	Moyhill (IE)	Woodland (IE)	A new 60km single circuit 400kV 1500MVA OHL from Woodland station north of Dublin up to a new Moyhill 400/220kV station in Co. Meath. This project together with Moyhill-Turleenan constitute the new interconnection project between Ireland and Northern Ireland.	Low cross border capacity.	Increase of NTC up to 1000 MW NTC from IE to NI (today <450MW); improved security of supply; improve access for renewable generation.	design& permitting	2012	X	The 110kV works associated with this project have been completed
149	EirGrid plc	Flagford (IE)	Srananagh (IE)	The construction of a new 55km single circuit 220kV line connecting the existing Flagford 220/100kV station to a new Srananagh 220/110kV station.	This development is needed to reinforce the network in the North-West area by supporting the voltage and reducing the risk of loss of supply during the winter peaks and the summer maintenance outages. This project will help alleviate constraints on the network in the South-West Region.	Improved security of supply; RES integration; reduce Losses.	under construction	2011		
150	EirGrid plc	Moneypoint (IE)	Tarbert or Kilpaddoge (IE)	A new 10km single circuit 220kV 500MVA (underground+subsea) cable constructed across the River Shannon Estuary from Moneypoint in Co. Clare to Tarbert or a new Kilpaddoge station in Co. Kerry. A new 400/220kV transformer at Moneypoint station is included in this project.	This project will provide an alternative route to import to or export power from the south West.	Improved security of supply; RES integration; Reduce Losses.	planned	2012		

# EWIS Grid Reinforcement Measures

## SUCCESSFUL INTEGRATION

of wind generation in electricity grids

## SECURITY

Manage variability of the wind

## RELIABILITY

Accomodate new generation technologies

## COST EFFICIENCY

Economic network operation and development

GRID DEVELOPMENT PLANNED TO BE REALIZED UNTIL 2015

Specific projects

- ..... Submarine Cable
- Transmission Line

GRID DEVELOPMENT PLANNED TO BE REALIZED BEYOND 2015, BUT NEEDED UNTIL 2015 ACCORDING TO EWIS RESULTS

Specific projects

- ..... Submarine Cable
- Transmission Line

IDENTIFIED BOTTLENECKS UNDER EWIS ASSUMPTIONS FOR THE TIME HORIZON 2015

- Sustainable Grid Reinforcement
- Mitigation Measure To Enhance Grid Flexibility

GRID DEVELOPMENT PLANNED TO BE REALIZED BEYOND 2015, BUT NEEDED UNTIL 2015 ACCORDING TO EWIS RESULTS

Projects subject to definition

- Sustainable Grid Reinforcement

IRELAND & NORTHERN IRELAND



UK



NORTH



SOUTH WEST



CENTRAL EUROPE



SOUTH



FIG 5 OVERVIEW OF NETWORK STRENGTHENING MEASURES

