
Selected References – Power System Consulting

2015 Nigeria	<p>Grid Capacity Study for Nigeria and Advice on Generation Adequacy Reporting</p> <p>Grid Study looking at limits for the successful integration of utility-scale PV into the transmission system of Nigeria. Identification of regional limits imposed by the grid.</p> <p>Advice on generation adequacy reporting. Proposing structure and contents for generation adequacy reporting.</p>
2015 (ongoing) Netherlands	<p>Offshore Wind Farm Gemini – Design verification and grid code compliance studies</p> <p>Design verification and grid code compliance studies for the 600MW offshore wind farm Gemini in the Netherlands. The grid connection of the Gemini offshore wind farm is realized by two 220kV submarine cables having a length of around 105km.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Review of design and grid code compliance studies (insulation co-ordination, harmonics, low voltage ride through, reactive power capability etc.) - Harmonic studies - General advice to the project developer
2015 (ongoing) Pakistan	<p>Study to Determine the Limit of Integrating Intermittent Renewable Resources (wind and solar) onto Pakistan’s National Grid</p> <p>Grid and system integration study relating to the integration of variable renewables (wind and PV) in the time frame between 2015 and 2022.</p> <p>Main Taks:</p> <ul style="list-style-type: none"> - Steady state studies (load flow, short circuit, contingency analysis) - Identification of required grid reinforcements - Stability studies (transient, oscillatory, frequency, voltage stability) - Flexibility studies (impact on spinning reserve requirements) - Economic assessment
2015 Honduras	<p>Facts Finding Mission about the Grid Integration of Variable Renewable Energies in Honduras</p> <p>Identification of issues and challenges related to the increased use of variable renewable energies in Honduras</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - On-site meetings with network operators - Data collection - Workshops with various stakeholders
2014 Ghana	<p>Advisory to the Implementation of Technical Grid Integration Guidelines to the Low, Medium and High Voltage Grid in Ghana</p> <p>Consultancy assignment related to the definition of grid codes and interconnection rules for variable renewable generators to HV, MV and LV grids.</p>

Main Tasks:

- Elaboration of a Draft Grid Code for variable Renewable Generation with connection to HV and MV levels
- Elaboration of interconnection rules for the grid connection of solar rooftop systems

2014 Tunisia	<p>Grid Integration of variable renewable generation in Tunisia</p> <p>Consultancy assignment related to the grid integration of large scale and medium scale wind and PV farms in Tunisia.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Review of the Tunisian Grid Codes (Transmission) and Distribution Codes - Proposed changes and updates of the relevant codes
2014 Namibia	<p>Assessment of technical and non-technical losses in the transmission system of Namibia</p> <p>Developing a methodology for calculating losses at transmission and distribution levels in the power system of Namibia using power system models (loss forecast) and historical data (historical loss assessment).</p>
2014 Germany	<p>Planning studies for the substation Lubmin</p> <p>Planning studies about the grid integration of up to 1000MW of offshore wind generation in the Baltic sea to the substation Lubmin according to the German offshore network development plan.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Design studies - Stability studies - Variability studies - Technical specifications
2014 Nigeria	<p>Grid Integration of variable renewable generation in Nigeria</p> <p>Consultancy assignment related to the grid integration of renewable generation in Nigeria.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Review of the Nigerian Grid Code (Transmission) and Distribution Code - Inclusion of specific clauses applicable to variable renewable generation into the Nigerian Codes.
2014 Vietnam	<p>Vietnam Wind Grid Integration Studies</p> <p>Studies analyzing the grid integration of wind generation in several Vietnamese provinces and definition of a grid code for wind generation in Vietnam.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Load flow and short circuit studies - Stability studies - Grid code definition

2014/2015 Germany/Denmark	<p>Kriegers Flak Combined Grid Solution</p> <p>(in progress)</p> <p>System studies relating to the offshore HVDC-VSC connection Kriegers Flak, connecting the offshore wind farms Baltic 1, Baltic 2, Kriegers Flak 1 and Kriegers Flag 2 to the transmission grids of Energinet.dk and 50HzT.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Review of the Grid Codes of Energinet.dk and 50HzT - Steady state studies for verifying component ratings - Stability studies for verifying the operation of the KFCGs - Impact studies for analyzing the impact of the KFCGS on the transmission grid of 50HzT
2013-2015 South-East Asia	<p>Grid Integration of Renewable Generation in South-East Asian Countries</p> <ul style="list-style-type: none"> - Review of Grid Connection Conditions for Variable Renewable Energies in South-East Asian Countries (Malaysia, Thailand, Vietnam) - Presentation of Workshops about the Grid Integration of VRE.
2013 Ghana	<p>Grid Integration of Renewable Generation in Ghana</p> <p>Consultancy assignment related to the grid integration of small and large scale renewable generation in Ghana</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Elaboration of interconnection rules for the grid connection small scale embedded generators in Ghana (e.g. rooftop PV) - Workshops about the grid integration of renewable generation in Ghana (small scale and large scale)
2013 Morocco	<p>Grid Connection of RE systems to MV and LV networks in Morocco</p> <p>Consultancy assignment related to the grid connection of embedded generators to MV and LV networks in Morocco.</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Review of standards applicable to the grid connection of embedded generators in Morocco - Elaboration of Draft Interconnection Rules for embedded generation in Morocco

2013	Flexibility Studies for the System Integration of Renewables in El Salvador
El Salvador	<p>Studies analyzing the impact of wind and PV variability on spinning reserve requirements in El Salvador</p> <p>Main Tasks:</p> <ul style="list-style-type: none"> - Residual Load assessment - Predictability assessment - Flexibility assessment of conventional power stations
2013	OWF Butendiek – Offshore Power Supply during Installation Phase
Germany	<p>Analysis of the wind farm Butendiek during the installation phase.</p> <p>Load flow studies for sizing reactive power compensation devices</p> <p>Definition of a switching sequence for subsequent commissioning of cable strings and wind turbine generators.</p>
2013	Grid and System Integration Study for El Salvador
El Salvador	<p>Grid Study looking at the feasibility of integrating up to 200MW of wind and PV generation into the power system of El Salvador.</p> <ul style="list-style-type: none"> - Modelling of wind and PV power plants - Load flow and contingency analysis studies - Transient stability studies - Voltage and frequency stability studies
2012-2017 (ongoing)	Grid Integration of Renewable Generation in South Africa (Grid Integration Component of the GIZ SAGEN project)
South Africa	<p>Supporting South African stakeholders (ESKOM, DoE, NERSA, and others) in the grid and system integration of renewable generation (wind, PV, CSP, biomass).</p> <p>Main Topics:</p> <ul style="list-style-type: none"> - Legal framework - Grid Codes/Connection Conditions for RE - Grid Code compliance procedures - Grid connection studies - Improved system operation and efficient use of wind forecast tools - Strategic system studies - Support of municipalities in the grid integration of renewable generation
2013	Expertise: Impact of renewable generation on protection selectivity in distribution networks
Germany	<p>Analysis of the short circuit contribution of different RE types and assessing the impact on the selectivity of overcurrent protection schemes.</p>

2013 **Expertise: Impact of REpower wind turbine generators on Flicker**

Germany

Simulation study relating to the response of Repower wind turbine generators to background voltage flicker.

- Dynamic simulation studies
- Flicker evaluation
- Recommendation for improved tests and measurements of wind turbine flicker

2012

Mexico

Integrate the methodology for the determination of the capacity credit for electricity generated by renewable and cogeneration plants into the Power Generating System Expansion Planning process of CFE

Integrating models of renewable energy power plants (wind, solar) and CHP into the capacity expansion planning models of CFE (WASP and PEgYT).

Tasks:

- Review the current practice
- Work out models for renewable energy power plants
- Recommendations for further improvements

2012

GIZ

Philippines

Manual for Interconnection of solar rooftop installations in the Philippines

Definition of a Manual for Interconnection of rooftop PV-installations in the Philippines and execution of distribution network impact studies looking at selected 13,8 and 230V feeders

2012

Vietnam

Grid Integration of Wind Power in Vietnam on the example of the Binh Thuan Province

Analysis of the grid impact of up to 300MW of wind generation to the 110kV and 220kV networks in the Binh Thuan Province/Vietnam

Tasks and roles:

- Workshops about the grid integration of renewable generation
 - Support and review of local grid studies
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