

Interconnection Issues for Electricity Generation Using Small RES & CHP: Project results

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Energy policy of the EU

- Directive 2001/77/EC on the promotion of the electricity produced from renewable energy source in the internal electricity market. The Directive requires:
 - Every Member State to have a support scheme for the production of electricity from RES
 - Guaranteed access to transmission and distribution grid for the producers of “green” energy

- On 23.01.2008, the European Commission made a proposal for a Directive on the promotion of the use of energy from renewable sources. Key elements of the proposal are:
 - 20% of the final energy consumption in the EU to come from RES
 - Each Member State should develop their electricity system in such a way that future producers of electricity from RES have access to the grid
 - Administrative procedures should be reduced to a minimum

Results

- The project results are summarized on the basis of national reports from the following countries:
 - Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Poland, Portugal, Romania, Slovakia, Spain, Sweden and the UK
- Target groups for the dissemination of the results are policy makers, regulators and the industry. The main elements are:
 - State policies;
 - Supporting and financial schemes;
 - Distributed generation (DG);
 - Interconnection rules:
 - Breakpoint for small system (simplified rules);
 - Net metering rules;
 - Safety and power quality requirements.

State policies

- The state policy in the countries is targeted towards enforcement of the Directive for the promotion of electricity produced from RES (Directive 2001/77/EC)
- The targets for the total electricity production from RES by 2010 are given in the national reports. The RES-E is generated mainly from HPPs.
- The production of electricity from RES and CHP for homeowners is mainly by PV, small wind turbines and micro-CHP.

Support schemes

The main measures, which the countries apply for encouraging the development of RES-E and CHP are:

- Subsidizing the necessary equipment for production of electricity from RES and micro-CHP;
- Setting of preferential prices for green electricity
- Compulsory priority connection of producers of electricity from RES & CHP to the electrical grid by the grid operator closest to the point of power generation.
- Obligatory purchase of green electricity at the preferential price for a set period of time
- Each producer is issued a “certificate of origin” for the power produced from RES.

Financial schemes

The supporting financial schemes can be divided into two categories:

- Purchase of electrical energy from RES and small CHP producers at preferential prices; The contracts are for 12 years in BG, 15 years in IE and CY. In CZ is 20 years for PV and wind and 30 years for SHPP
 - Subsidizing installations for green electricity
- Feed-in tariffs (FIT) have been adopted in AT, BG, CY, HR, CZ, GR, DK, DE, HU, IE – 98% of REFIT is for wind farms
 - Investment subsidies for green electricity installations have been adopted in AT, HR, FI, HU etc.
 - In Belgium a new subsidy for renewable energy investments is still under consideration
 - Until 2003 Latvia had a FIT which was equal to twice the electricity prices over 8 years.
 - In Poland and Slovakia RES for homeowners are PV systems, but they receive little support
 - No real voluntary market for RES-E exists



Results from different financial measures

- Generally, the adoption of preferential prices for green electricity without a differentiation in the installed capacity results in a lot of large installations and a few small RES-E plants.
- For example, in Bulgaria
 - the average price per kWh is 0.15 BGN (8 c€/kWh).
 - electricity from wind is sold at 0.18 BGN/kWh (9 c€/kWh).
 - electricity from PV is sold at 0.75 BGN/kWh (38 c€/kWh).

This lead to the installation of large wind farms and PV plants

Financial support of up to 100% or 70% of the investment in small renewable energy and CHP projects is foreseen in the Rural Development Programme (2007 - 2013);

- In Cyprus, the price of the electricity produced by small PV systems of up to 20 kW can be 38.27 c€/kWh;
- In France, EDF buys electricity from PV at 55c€/kWh;
- In Hungary, all RES receive 9.4 c€/kWh (tariff for 2001-2007). Utilities are obligated to purchase electricity from RES if their capacity is over 100 kW. In case of smaller installations individual arrangements are possible. The FIT from 01/02/2008 is 10,5 cE/kWh

Distributed generation (DG)

- The long era of monopolies in the electric systems has still a strong influence. New requirements are needed to face the new challenges imposed by DG.
- Technical characteristics of RES plants:
 - Different technologies for the generation of electricity
 - Dependence on meteorological conditions which leads to an uncontrollably variable and intermittent production
 - Backflow power
- Higher investment cost due to:
 - Construction of new or retrofitting of existing transmission / distribution lines
 - Back-up capacity
 - Management of power flows, voltages and frequency
 - Relay protection and control

Distributed generation (DG)

- The sale of electricity from RES at preferential prices increases the electricity price of the respective utility.
- The higher costs of renewable energy should be allocated to all consumers
 - For example in Bulgaria, there is an unbalanced portfolio of renewables among the three DSOs. For a balanced allocation of the higher costs due to renewable energy, the price increase should be reflected in the price for distribution.
- The development of Distributed Generation should be considered differently for small and large installations. This is necessary because the capacity of the DG determines the voltage of the grid to which the plant should be connected. In small RES-E (PV or wind turbine) and micro CHP the interconnection is usually to the low voltage grid and in rare cases to 20 kV lines.

Interconnection General Rules

- Interconnection rules of small systems comprise the procedural, financial and technical rules that must be met in order for a small electricity unit of a home or small business owner to be connected to the grid.
- The DSO is obligated to connect every producer of electricity from RES who is also a consumer of electricity. The commercial metering equipment should be located near to the border of ownership of the generation facility. The DSO should facilitate the establishment of a direct interconnection.
- Rules for the correct calculations of the costs for interconnection and their fair allocation between investor and utility should be established.
- Simplified specifications for electricity generation using small RES and CHP
 - In most countries there are no such specifications (Bulgaria, Romania, Italy, Finland, etc.)

Interconnection of small RES-E and CHP plants

The main economic and technical factors for interconnection are:

- Existing network infrastructure;
- Cost of grid reinforcement and extension works;
- Technical limits of the grid;
- Effects on power quality (voltage, protection, etc.)
- Procedural barriers;
- Lack of incentives for active involvement in grid management.

Interconnection Technical and Organization Rules

- The interconnection rules in the EU countries are determined by national institutions and they should comply with respective European standards.
- In **Bulgaria**, the Regulation “Connection of producers and users of electrical energy to the transmission and distribution grids” defines the terms and procedures for connection. To this moment there are no specific conditions for the connection of small plants.
- In **Portugal**, a system for legal simplification for micro photovoltaic and wind power systems called “Time for Renewables” was launched in order to simplify the licensing of new micro-generation plants.
- The technical and organizational rules (TOR) are applicable for all capacities in Austria, Bulgaria and other countries.

Breakpoint for small plants

- The breakpoint for small plants should be defined and “simplified rules” should be applied
- Simplified rules should include:
 - Clear definition and speeding up of the permitting, certification and licensing procedures
 - Streamlined procedures and priority access for small RES-E and micro CHP
- The breakpoint for small plants:
 - 20kW in Cyprus for PV, Greece, Italy, Finland, Portugal, etc.
 - 30 kW for wind in Cyprus and Croatia
 - 50 kW in Germany
 - 150 kW in Portugal

Some Member States have adopted a breakpoint for the licensing (for example in Bulgaria and Croatia – 5 MW, France 12 MW)

In Croatia the breakpoint for small plants is 5 kW for a single-phase and 30 kW for three-phase connection. Power stations of up to 500 kW are connected to the LV grid.

In the Czech Republic and Germany, PV plants are connected to LV, single-phase with max. power up to 4.6 kVA.

Net Metering Rules

- Generally the metering point for small RES-E and CHP is installed at the connection point of the plant of the distribution grid.

Examples:

In **Bulgaria**, the generated and consumed energy is metered by means of commercial metering owned by the respective distribution company.

In **Austria**, the location of the metering point is not determined. Generally it is installed at the connection point from the plant to the distribution grid.

In **Cyprus**, the metering unit for the PV system must be separate from the traditional metering.

- The metering system has to meet the TOR for grid operators and users (AT, HR, BG, DE, etc.)
- Net metering is not used as a policy measure in **Finland**.

Safety and Power Quality Requirements

- The TOR of each European Country determines the criteria, which have to be met by DG. They are based on specific national and European standards
- Commonly applied European and international standards are EN 50160 and IEC 61000.
- Usual safety equipment is a disconnection switch accessible to the grid operator.
- The voltage range, the range of frequency and power factor must be between acceptable values.
- Special Safety and Power Quality Requirements for small RES-E and micro CHP have been adopted in very few Member States: Croatia, Cyprus, Greece, Germany, Slovakia.

Conclusions

The main points of the interconnection to the grid of small RES-E and micro-CHP sites that must be resolved between the owner, the utility and the permitting authorities are:

- **Introduction of “Simplified Rules” for getting licenses and permissions for construction and interconnection.**
- **Transparent and fair regulations between the owner and the utility company.**
- **The distribution of expanses for the interconnection should be objective and justified.**
- **The technical and organizational rules are determined by the national institutions and consist of national standards regarding the operation of electricity supply and distribution grids and the installation of power plants, which differ from country to country.**

Conclusions

- **Development of the grid infrastructure and obligatory priority interconnection of small RES-E and micro-CHP plants to the grid**
- **Incentives for the grid operators for active involvement.**
- **The diffusion of small RES-E and micro-CHP is at different stage in the different countries. In some countries, the application of small RES-E and micro-CHP is just starting and they have no simplified rules for the connection to the grid. In other countries, simplified rules have been adopted. This information can give general guidelines for the application of DG.**
- **Additional data and information can be found at:**
www.home-electricity.org

Thank you for your attention!



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