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Project Title: Technical Issues of Distributed Generation Interconnection to Grid

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Project Financial Code:	700057	Project Quality Code:	CDVA01
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Keywords:


Distributed Generation, Interconnection to Grid, Penetration Level, Voltage & Frequency Ride Through, Monitoring & Communication, Reactive Power Capability, Guide for Technical Studies, Guide for Tests, Guide for Operation

Project Necessity:

In recent years, due to the benefits of using distributed generation (DG) and due to government incentive policies for the construction of these power plants by the private sector, the use of these small power plants to meet consumption needs has grown significantly. These resources have also posed challenges to the network of trustees of electricity companies. Challenges such as how these resources are connected to the network, how these resources affect the protective coordination of equipment used in the network, the extent of the impact of these resources on network parameters, the impact of these resources on how to operate the power grid, peripherals needed to connect DGs to the network and the tests required for the safe operation of DGs, all of which require detailed and technical studies. The existing instruction and guidelines are general and include only non-inverter DGs and do not adequately address the above challenges. For this purpose, comprehensive instruction for connecting different types of DGs to the network is very necessary and required by the electricity industry.

Project Goals:

- Instruction for DG interconnection to grid and its annexes (guides)
- Adding the inverter-based DG issues to the guidelines
- Determining the maximum DG allowable capacity

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- Determining the reactive power requirements
- Determining the monitoring and communication requirements

Abstract:


One of the main goals of the Ministry of Energy in recent years has been to develop the use of DGs and renewable energy in the electricity grid. Accordingly, the "Instruction for small-scale DG development" were announced in 2008 by the Ministry of Energy. Also, in order to achieve the mentioned goal, the necessary plans were made by Tavanir Company to compile the instruction for DG interconnection to the grid, which its first revision was prepared and announced in 1392 as "Instruction for connecting to the network of distributed generation (small scale generators)".

Since the previous instructions were prepared only for non-inverter DGs (small-scale generators based on synchronous generators with primary propulsion of gas engine or gas turbine), a project was performed in 1396 in Niroy Research Institute to complete the instructions for inverter-based DGs and to update various parts.

Based on the results of the above project and at the same time, considering the development of the use of renewable energy sources in power networks, the subject of updating instructions and related appendices was notified to Tavanir Company in 1398 under a special mission entitled "Updating instructions for DG interconnection to the grid" with a wider coverage area and considering the latest version of the IEEE 1547 series of standards, and in this regard, the present project was defined. As a result, the third edition of the instruction entitled "Instruction for DG interconnection to Iran's electricity network" was developed in this project and after holding several meetings in a working group consisting of representatives of Tavanir Company, distribution companies and university professors, was finalized and announced.

Steps and Methodologies:

1. Studying the international references for DG interconnection to grid
2. Determining the constraints, conditions and requirements of technical studies
3. Modifying and updating the guidelines
4. Determining the maximum DG allowable capacity
5. Determining the reactive power requirements
6. Case studies
7. Modifying on the proposed instruction and guidelines
8. LVRT & HVRT requirements
9. Safety of network operator
10. Monitoring & communication requirements based on the IEEE 1547 and IEC TS 62786 standards
11. Remote tripping and Remote P requirements
12. Final modification and finalizing the instruction and guidelines

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Main Results (technical outputs, patents, papers, books, reports, etc.):

- ✓ Instruction for Distributed Generation Interconnection to Grid and its 5 annexes (guides)
- ✓ 2 conference papers at 28th Iranian Conference on Electrical Engineering (ICEE 2020) and 34th International Power System Conference (PSC 2019)
- ✓ Technical reports of all project phases
- ✓ Project E-report