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**Project Title:** Study and compilation instructions, standards, and tests required for power electronic equipment

<b>Department:</b>	Power electronics technology development plan in the country's power distribution network	<b>Employer:</b>	Niroo Research Institute (NRI)
<b>Project/Program Manager:</b>	Sara Laali	<b>Executor:</b>	Ahmad Esmacili
<b>Project Financial Code:</b>	146105	<b>Project Quality Code:</b>	PPEEPN04
<b>Type of Project/Program:</b>	Research	<b>Assistant:</b>	Technology

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**Keywords:** Power electronics, static converter, reactive power, compensator, inverter, FACTs, standard

### Project Necessity:

Because of environmental pollution caused by fossil fuels and increasing attention to renewable energy sources such as solar cells, wind, biomass, etc., and increasing penetration of electric vehicles, attention to power electronic devices in the power grid is increasing. For example, power plants based on renewable energy sources produce low levels of dc voltage, so it is necessary to use power electronic converters to increase these levels and convert it into injectable voltage to the grid. On the other hand, in order to increase the power quality in the network and create a high level of customer satisfaction, various power devices have been used. These devices are used to reduce harmonic distortions, regulate dynamic voltage, reduce losses and create a flexible AC transmission system. In this regard, and considering the use of power electronic equipment in industry, commercial, household and power grids at different levels of production, transmission and distribution, the need for a specific standard of this equipment seems more than ever. In general, there are specific instructions, different standards and specific tests to check the correct operation of power electronic equipment. In other words, power electronic equipment, along with all the available benefits, may create problems such as harmonic injection, unwanted voltage drops, etc., which will be propagated throughout the power system. One of the problematic positions will be when transferring generated electricity to other countries, because the generated electricity must meet the standards and quality required by the consumer, so the relevant standards for this category of devices in both directions are necessary. On the other hand, and according to the macro policies of

the Ministry of Energy to pay attention to domestically produced goods, preparation of standards and technical tests required for power converters and electronic devices used in the network, is necessary for production by engineers, designers and domestic companies. Therefore, reviewing the technical specifications, existing international standards for power electronics equipment and the required technical instructions are necessary. These standards, like the roadmap, will be used to improve the quality of power electronic equipment and increase the quality of power, followed by increasing the reliability of the network.

### **Project Goals:**

Due to the growing importance of the power electronic equipment in the power grid, Niroo Research Institute has defined this project. This project can provide a suitable roadmap for the use of power electronic equipment in the power network. In this regard, while reviewing and studying the existing standards for power electronic equipment, including electronic power converters, FACTs, etc., the necessary technical specifications, instructions and tests to verify the performance of this equipment will be extracted. Due to the very high variety of power electronic equipment used in the power grid, the focus will be on a limited number of these devices. This equipment will include equipment used to improve power quality, FACTs and HVDC transmission lines, power electronic equipment used in power plant systems, and equipment used in distributed generation.

### **Abstract:**

For the imported power electronic equipment which produced abroad, it is necessary to meet the needs of the Iranian standards, so that no problem occurs. Therefore, reviewing the technical specifications, existing international standards for power electronics equipment and the required technical instructions are necessary. These standards, like the roadmap, will be used to improve the quality of power electronic components and increase the quality of power, followed by increasing the reliability of the network. In this regard, while reviewing and studying the existing standards in the world for power electronic components, including electronic power converters, FACTs, etc., the necessary technical specifications, instructions and tests to verify the performance of this equipment will be extracted. Due to the very high variety of power equipment and electronics used in the power grid, the focus will be on a limited number of these devices. This equipment will include power electronics used to improve power quality, FACTs and HVDC transmission lines, power electronics used in power plant equipment, and power electronics used in distributed sources and generation. It is worth mentioning that first the necessary needs assessment will be done to determine the priorities between these components and the relevant instructions will be reviewed and prepared according to the needs.

### **Steps and Methodologies:**

- 1- Studying and reviewing the necessary standards and instructions for the use of power electronic equipment in the power network.
- 2- Extraction of standards and instructions of power electronic related to power quality improvement.

- 3- Extraction of standards and instructions for power electronic components related to FACTs and HVDC transmission lines.
- 4- Extraction of standards and instructions for power electronic equipment used in distributed generation.
- 5- Extraction of standards and instructions for power electronic components used in power plant instruments.
- 6- extraction of standards related to other power electronic equipments
- 7- Preparation of a manual for standards, instructions and technical specifications of power electronic components for use in Iran power grid

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

- 1- Standards and instructions for the use of power electronic equipment in the power network.
- 2- Standards and guidelines for power electronics components related to power quality improvement.
- 3- Standards and guidelines for power electronic equipment associated with FACTs and HVDC transmission lines.
- 4- Standards and guidelines for power electronics equipment used in distributed generation.
- 5- Standards and guidelines for power electronic equipment used in power plant.
- 6- Standard of other power electronic equipment such as electric vehicles, industrial drives, battery chargers, etc.
- 7- Manual of standards, instructions and technical specifications of power electronic components in the power grid.