

The Future of Reliability in Light of New Developments in Various Devices and Services Offering Customers and System Operators New Levels of Flexibility

Summary of Technical Brochure 715

Grid of the Future—Reston, VA

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cigre

For power system expertise

Reliability

Technical Brochure 715

Describes:

- The current definitions of reliability;
- The evolution of variable non-synchronous generation (+ example countries);
- Effect of new tech and digitalization;
- Some key future uncertainties;
- Proposed new Cigré definitions for reliability, security and adequacy: and
- Recommendations for further work

Reliability

Current definition

Reliability

1987: *A measure of the ability of a bulk power system to deliver electricity to all points of utilization within accepted standards and in the amount desired.*

2002: Electric system reliability can be addressed by considering two basic and functional aspects of the electric system adequacy and security.

Adequacy

The ability of the electric system to supply the aggregate electric power and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities.

Security

The ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system facilities.

Reliability

Why change the definition?

In the past

- All the elements were supplied by the single integrated utility.
- Large generators supplied power and, with the bulk transmission system, formed an extensive network
- The single utility also provided a range of necessary additional services that enabled the power system to operate.

In recent years

- Wider recognition of the danger of global climate change,
- Widespread adoption of renewable-energy targets,
- Decreasing costs of PV and wind turbines,
- Potential cost reductions of energy storage,
- Range of developments collectively known as the smart-grid.
- Customers are taking steps to supply more of their own energy use.

Reliability

New definition of reliability

A measure of the ability of a bulk-power system to deliver electricity to all points of ~~utilization~~ consumption and receive electricity from all points of supply within accepted standards and in the amount desired.

Reliability

New definition of Adequacy

A measure of the ability of a power ~~the electric system to~~ meet ~~supply the aggregate electric power and energy requirements of its the customers~~ within acceptable technical limits ~~at all times, taking into account scheduled and unscheduled outages of system facilities~~ components.

Where:

- Power system includes all elements of the generation, transmission and distribution systems, and customer facilities that supply or use power and energy, or provide ancillary services;
- Customers include all parties that supply power and energy or ancillary services, as well as those who consume them;
- Requirements of customers include their basic power and energy needs, and agreed use of customers' ability to vary power supply, adjust demand and provide ancillary services;
- Acceptable technical limits and scheduled and unscheduled outages are those specified in the applicable planning criteria and standards; and
- System components include all elements of the supply, delivery and utilization systems regardless of ownership or control.

Reliability

New definition of security

The ability of the power electric system to withstand sudden disturbances ~~such as~~.

Where:

- Power system includes all elements of the generation, transmission and distribution systems, and customer facilities that supply or use power and energy, or provide ancillary services;
- Ability to withstand will vary depending on specific disturbances and applicable criteria or standards, and includes agreed use of customers' ability to vary power supply, adjust demand and provide ancillary services; and
- Disturbances include electric short circuits, unanticipated loss of system facilities, or other rapid changes such as in wind or solar generation.

Thank you

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