



Smart Grid:

A Beginner's Guide

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Smart Grid:

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Smart Grid Standards: A Beginner's Guide



Who?

Who will be affected by Smart Grid Standards?

Just about all of us will be affected by Smart Grid Standards. The electrical grid of the 20th century—our existing grid—is essential to modern life, as we quickly discover when the power goes out. The electrical grid of the 21st century will be even more integrated into our daily lives. At NIST, we've identified [22 stakeholder groups](#) that we're involving in the standards coordination process, including: utility companies; appliance and consumer electronics providers; consumers—residential, commercial, and industrial; renewable power producers; and state and local regulators.



How?

How are Smart Grid Standards identified, developed, and coordinated?

Under federal law (Energy Independence and Security Act of 2007), NIST has been given the key role of coordinating development of a framework for Smart Grid standards. NIST's National Coordinator for Smart Grid Interoperability launched a three-phase plan to jump-start development and promote widespread adoption of Smart Grid interoperability standards:

- Engage stakeholders in a participatory public process to identify applicable standards, gaps in currently available standards, and priorities for new standardization activities.
- Establish a formal private-public partnership to drive longer-term progress.
- Develop and implement a framework for testing and certification.

For more information, see:

- [NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0.](#)
- [Smart Grid Interoperability Panel \(SGIP\)](#), the private-public partnership established by NIST in 2009.
- [Interoperability Process Reference Manual \(IPRM\), Version 2.0.](#)



What?

What is the Smart Grid?



What is the Smart Grid? Before we look at the importance of standards for the Smart Grid, you'll want to know a bit more about the Smart Grid itself. The Smart Grid is a planned nationwide network that uses information technology to deliver electricity efficiently, reliably, and securely. It's been called "electricity with a brain," "the energy internet," and "the electronet." A more comprehensive definition we use at NIST is "a modernized grid that enables bidirectional flows of energy and uses two-way communication and control capabilities that will lead to an array of new functionalities and applications." Unlike today's grid, which primarily delivers electricity in a one-way flow from generator to outlet, the Smart Grid will permit the two way flow of both electricity and information. Want to learn more about the Smart Grid?

- www.smartgrid.gov is the gateway to information on federal initiatives that support the development of the technologies, policies, and projects transforming the electric power industry.

- This nine-minute video overview, produced by NOVA, was first aired in February 2011.

- "Electricity 101" The U.S. Department of Energy (DOE), which is the lead federal agency for the Smart Grid, has developed this information center about electricity and the electric system.

- The Smart Grid Information Clearinghouse Want even more information? You'll find hundreds of links at this government-sponsored clearinghouse.



Why?

Why do we need standards for the Smart Grid? Or here's an even more basic question: Why do we need standards?

Human beings have long recognized the value of measurements and standards. From the very first civilizations, we've adopted many systems of measurement—for length (cubits, ells, inches, centimeters), distance (leagues, fathoms, miles, kilometers, light years), weight (grams, stones, pounds, tons), and calendars (Julian, Mayan, Chinese, Jewish).

With each system of measurement, it became useful to develop standards. For example, the "Royal Egyptian Cubit," one of the earliest units for measuring length, was based on the specific length of the fore-

arm of the Pharaoh or King ruling at that time. With each new leader, the actual length of a cubit would change. Finally, in 1120 AD, King Henry the First of England standardized the measurement of length by establishing the "Ell," which was equivalent to the length of his arm.

We've become so used to accepting and using many standards that we don't realize how important they are. In today's world, standards encourage innovation and competition, promote international trade, and improve the quality of life.

In addition to physical (measurement) standards, such as the examples listed above, there is also another type of standard known as a "documentary standard." A documentary standard is a written agreement containing technical specifications or other precise criteria that may contain rules, guidelines, or definitions of characteristics. Standards can specify product characteristics; establish accepted test methods and procedures; characterize materials; define processes and systems; or specify knowledge, training, and competencies for specific tasks.

These types of standards ensure that materials, products, personnel qualifications, processes, and services:

- are adequate for their purpose;
- are compatible and/or interchangeable, if necessary;
- ensure public health and safety;
- protect the environment; and/or
- improve economic performance.



To learn more about standards in general, visit:

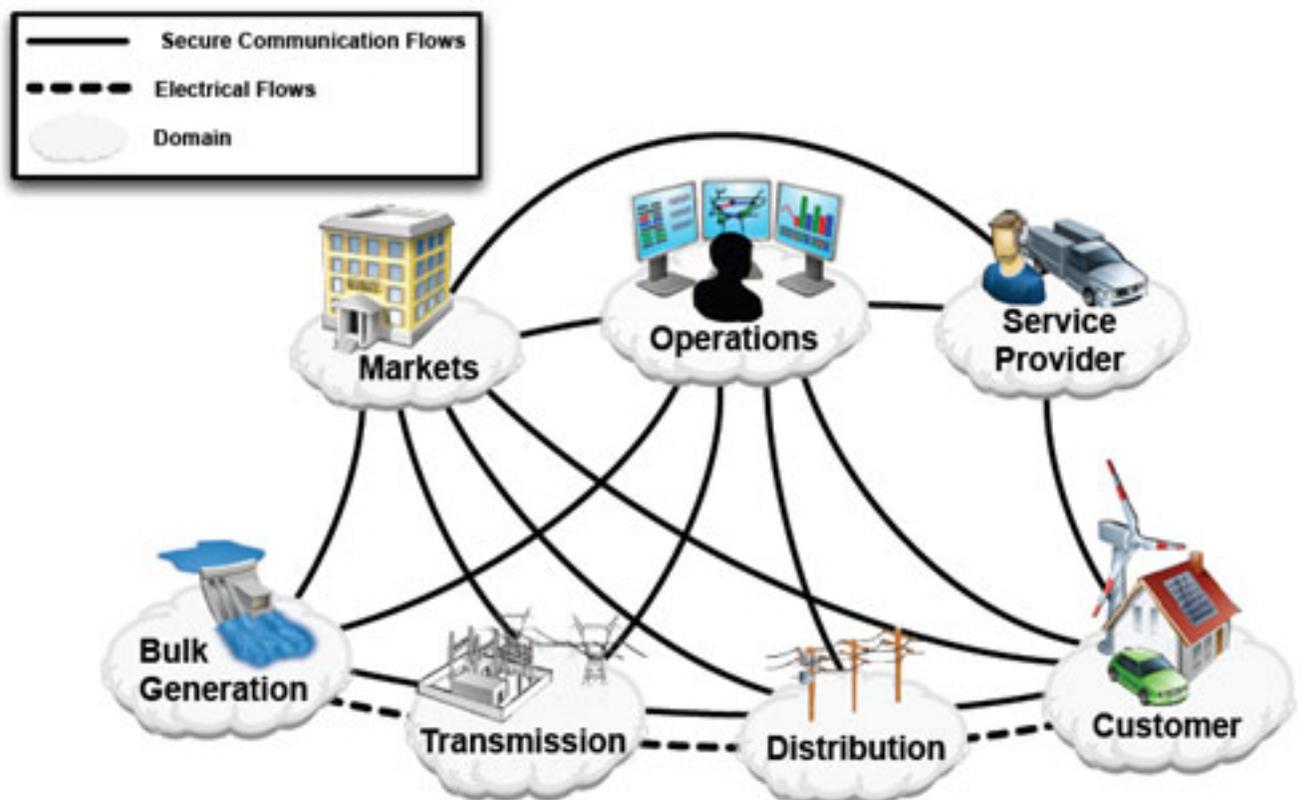
- <http://www.standardslearn.org/> This web resource provides easy-to-use, self-paced educational tools for everyone who wants or needs an introduction to standards.
- The National Institute of Standards and Technology's Standards Coordination Office maintains a website that discusses the importance of standards.
- A recent New York Times editorial, "Let There Be More Efficient Light," makes the case for standards, using a simple example—the electric light bulb.
- American National Standards Institute (ANSI)



What? (A second "what")

What exactly are the Smart Grid Standards?

Hundreds and hundreds of standards will be required to ensure the building of an efficient and effective Smart Grid. (For comparison purposes, one of today's smartphones typically incorporates over 150 standards.) For the Smart Grid, we're still in the early stages of developing the framework for the standards and the lists of specific standards. Go to the [Examples of Smart Grid Standards](#) page for descriptions—both non-technical and technical—of some already-established, individual standards that are expected to enable the growth of the Smart Grid.





When?

When do we need Smart Grid Standards?



As soon as possible - and we've already made significant progress in developing these standards. Smart Grid standards have been recognized as a national priority since the Energy Independence and Security Act in 2007. And the Administration has further accelerated the process through the American Resource and Recovery Act. However, standards development can take a long time.

For the Smart Grid, we're trying to put those standards in place in less than five years. (For comparison purposes, the standards for the telecommunications industry were developed over a period of several decades.) Here's a [timeline](#) of some major developments related to Smart Grid Standards.



Where?

Where are standards developed?

Within each industry, there are groups of experts who come together to discuss, develop, and update standards. These groups are called standards development organizations (SDOs) or standards-setting organizations (SSOs). For the Smart Grid, there are over 25 SDOs and SSOs involved in updating current standards and developing new standards. These include, for example, IEC, IEEE, IETF, ISO, ITU, NAESB, NEMA, SAE, and many more.