

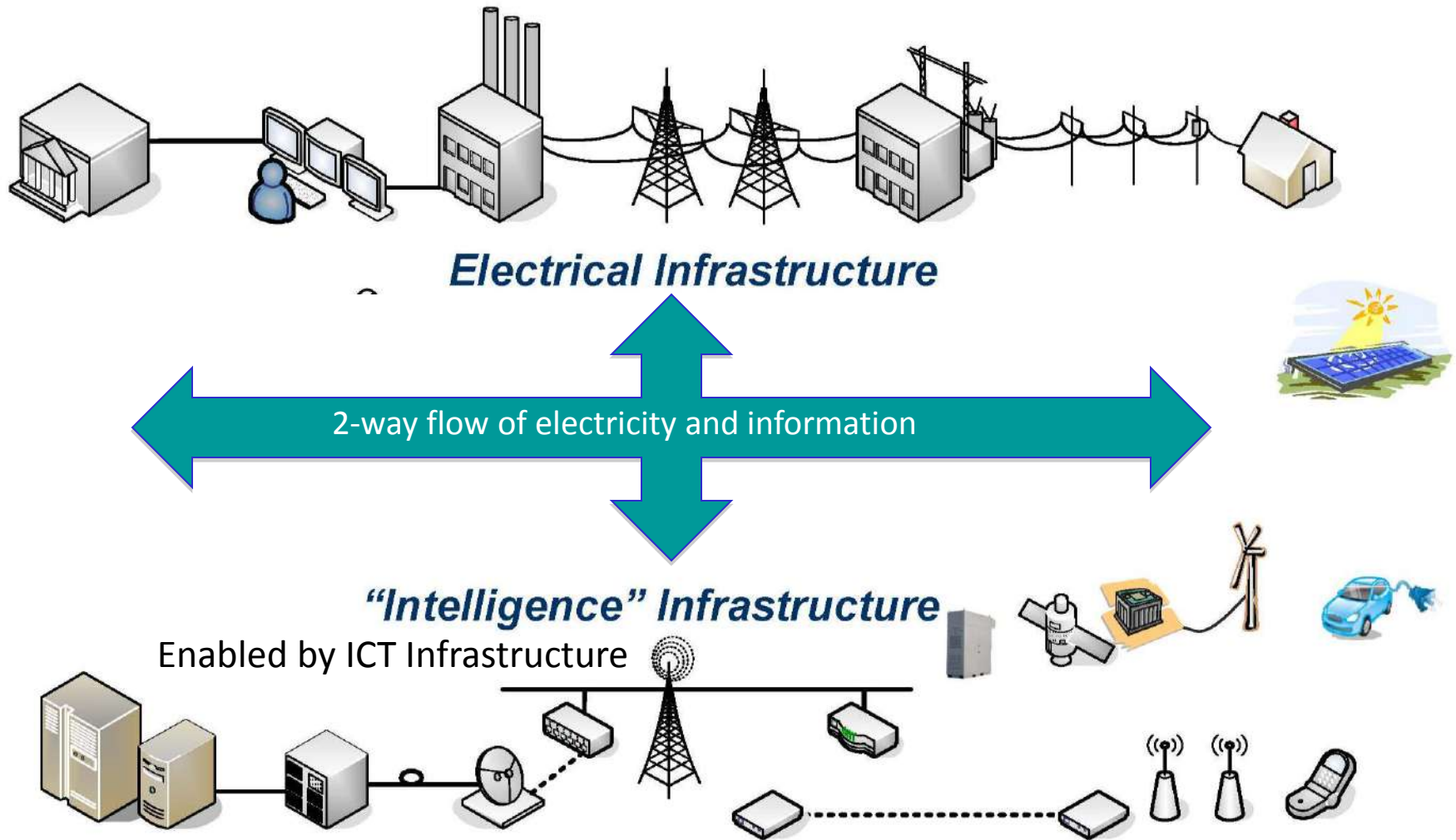
Impact of Smart Grid, ICT on Environment and Climate Change

ITU Symposium on ICTs, the Environment and Climate Change

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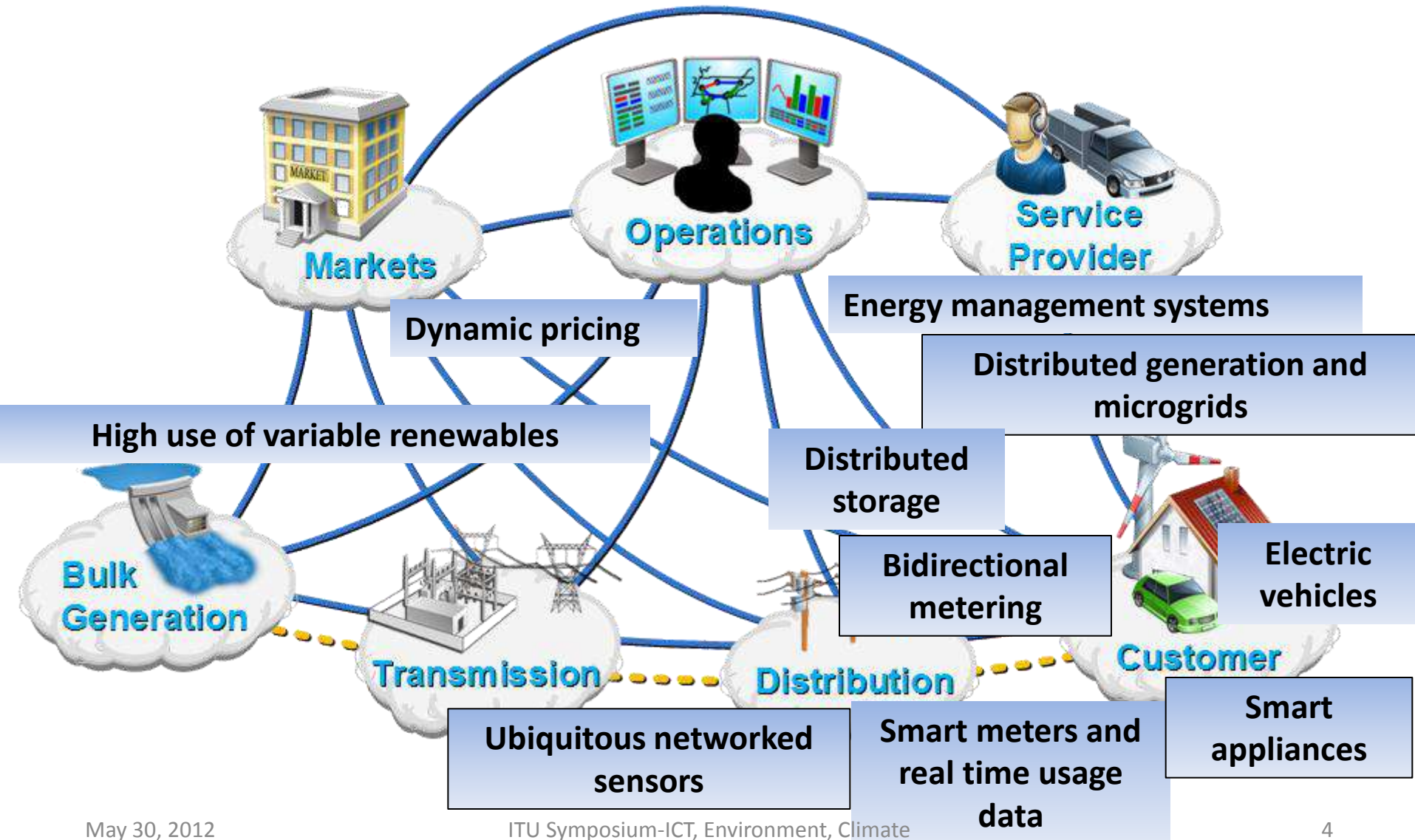
Smart Grid: The “Energy Internet”



How Will Smart Grid Help Environment

- Improve electrical power generation and distribution system
 - Integration of electric infrastructure and ICT infrastructure
 - More efficient and better management of power infrastructure
- Increase use of renewable energy sources
 - Alternate energy sources – Wind, solar generation, power storage
 - Integration of distributed energy sources into power infrastructure
 - Wind and solar generation by nature is variable
 - Matching or supply and demand to reduce traditional bulk generation
- Better management of energy usage
 - Use of smart meters and Demand Response systems to reduce and balance energy usage
 - Enable use of plug-in electrical vehicles – more friendly to environment, also as energy storage

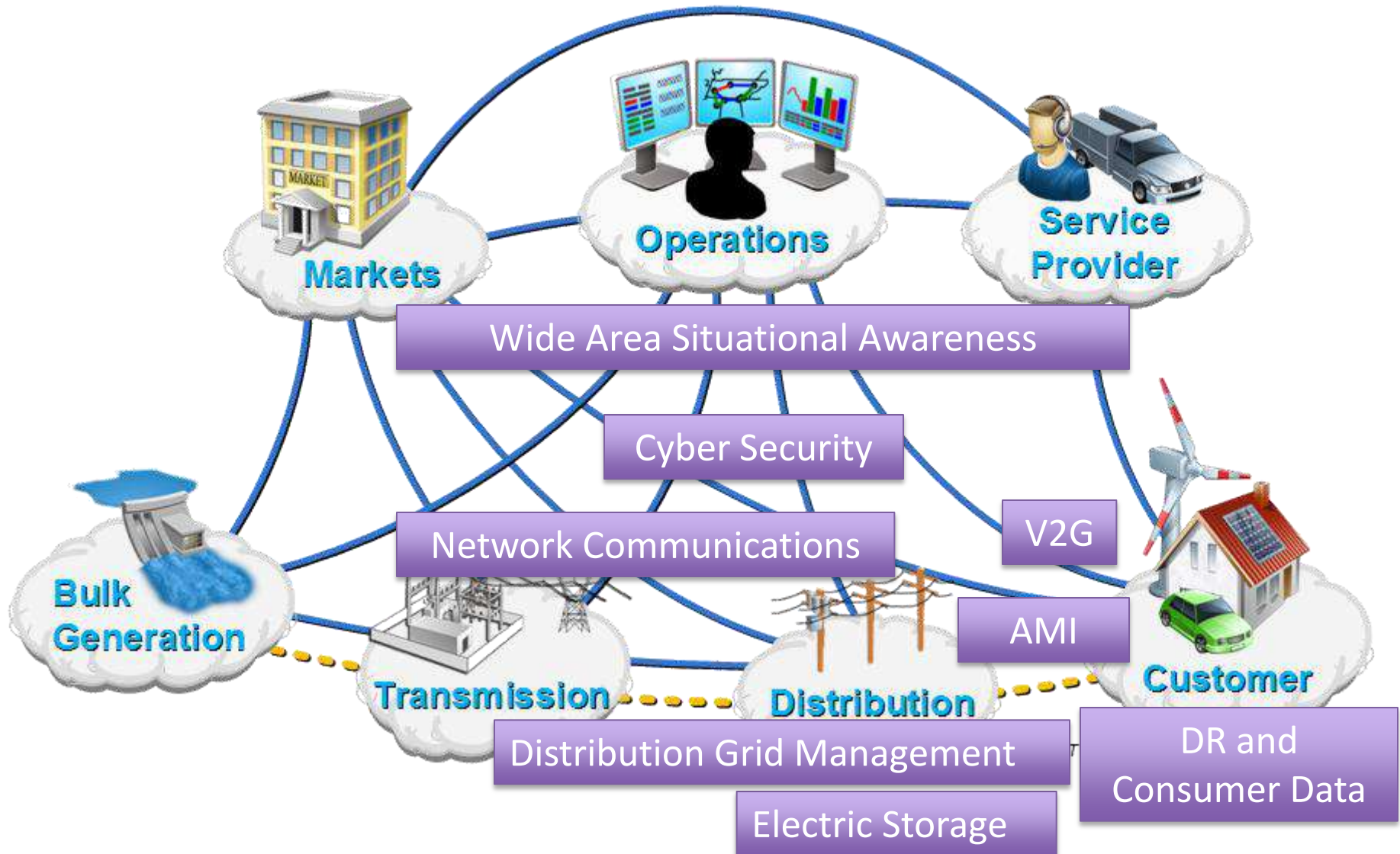
What Will the Smart Grid Look Like?



Standard is the Key

- Information is the foundation
 - Better management of power infrastructure requires accurate, real-time or near real-time data.
 - Capacity management, and energy market trading need data for projection and prediction of demand and supply
 - Common data format and semantic for interoperability
- Communications is the glue
 - Reliable network for meter and sensor data, control and command
 - Standards for device communications, networking and management of smart grid networks
- NIST established Smart Grid Interoperability Panel (SGIP) to determine the need for standards and to coordinate standardization activities

Smart Grid Standardization





NIST Smart Grid Interoperability Panel

- Public-private partnership created in Nov. 2009
- Approx. 750 member organizations, 1900+ participants
- Open, public process with international participation
- Coordinates and accelerates standards development
 - Identifies Requirements
 - Prioritizes standards development programs
 - Works with over 20 SDOs including IEC, ISO, ITU, IEEE, ...
- Web-based participation



SGIP Twiki:

<http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGIP>

Sample Results

- Energy usage data and the Green Button Program
- Guidelines for Smart Grid Communications and Networking
- Guidelines for Smart Grid Cyber Security

Energy Usage Data

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- Smart Meters enables readings of customers electricity usage in a timely manner, but how to make this information useful?
- SGIP's Priority Action Plan 10 (PAP10) was formed to facilitate the standardization of Energy Usage Information, resulted in
 - NAESB (North American Energy Standards Board) REQ18/WEQ19 PAP10 EUI standard, an information model standard
 - NAESB REQ21 Energy Services Provider Interface
 - How to represent EUI in XML, and,
 - How to exchange it between utilities and third parties on behalf of consumers
- Together these define a flexible file format for Green Button based on ratified standards from NAESB
- The implementations of standards resulting in the Green Button supported by the U.S. White House and Utility industry

What is Green Button?

- *Common-sense idea that electricity customers should be able to download their own energy usage information in consumer- and computer-friendly format.*



Some examples of Green Button Data

- Hourly load profile for past billing period plus current period to date
- Fifteen minute load profile for most recent 15 days
- Daily load profile for past month or year
- Summary only data
- Energy usage and energy demand readings
- Gas, Water usage profiles
- Yearly summary data with monthly parts

Green Button Enabling Vision



<https://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonESPIEvolution>

The screenshot shows a web browser window with the address bar displaying the URL: <https://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonESPIEvolution>. The browser's address bar also shows the page title: "PAPXX: GREEN BUTTON ESPI EVOLUTION".

The page content includes a sidebar on the left with the following sections:

- SmartGrid**
- Hello Marty Burns**
- Log Out**
- Create personal sidebar**
- Getting Started**
- Become A Member**
- SPRING 2012 MEETING**
Charlotte, NC
March 20-22
REGISTRATION OPEN
- WANTED**
Outstanding Teams & Individuals to Honor
LEARN MORE
- Member Resources**
- Upcoming Events**

The main content area displays the TWiki page structure:

- NOTE:** This page under construction.
- PAPXX: GREEN BUTTON ESPI EVOLUTION**
- PAGE CONTENTS**
 - Abstract
 - Status
 - Key Questions to Consider
 - Deliverables
 - Success Criteria
 - Tasks
 - Description
 - Path Forward
 - SGIP Standing Committee Involvement
 - NAESB Standards Evolution
 - UCAug Test Plans
 - Reference Implementations
 - International Standardization
 - Architectural Issues
 - Conceptual Model
 - GWAC Stack
 - Testability and Certification Issues
 - Cyber Security Issues
 - Other Technical Issues
 - What is the relationship to the current PAPs
 - What is impact if this PAP is not fulfilled
 - Who
 - Please Enter Any Comments Here

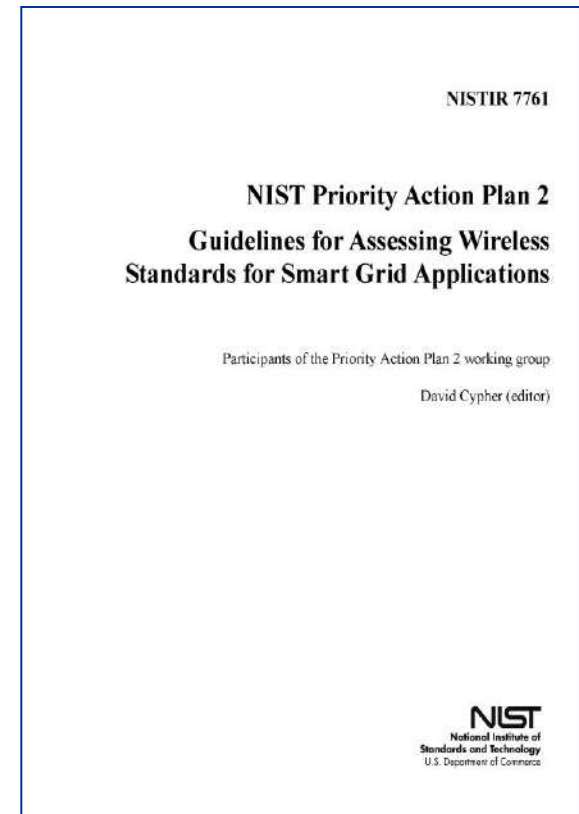
Below the page contents, there is a paragraph of text:

This is a proposal for a new PAP to support the standardization and implementations of the Green Button and its underlying standard ESPI. Note that this represents a new dimension of priority action plan scope in that it goes beyond just the establishment of standards creation, harmonizations and enhancements. It includes the elements necessary to deploy the technologies of the Smart Grid via testing and certification specifications and implementations.

The page also includes an **ABSTRACT** section at the bottom.

Guidelines for Smart Grid Communications and Networking

- RFC 6272, *Internet Protocols for the Smart Grid* – Guideline for setting up IP network for Smart Grid (PAP01)
- NISTIR 7764, *Guidelines for Accessing Wireless Standards for Smart Grid Applications*
- NISTIR 911198, *Guideline for the Implementation of Coexistence for Broadband Power Line Communication Standards*





Guidelines for Smart Grid Cyber Security

(Cyber Security Working Group)

- Building cyber security in from the start has been a paramount concern
- Permanent Working Group
 - Over 575 public and private sector participants
- NIST IR 7624 *Guidelines for Smart Grid Cyber Security*
- Guideline includes:
 - Risk assessment guidance for implementers
 - Recommended security requirements
 - Privacy recommendations

