

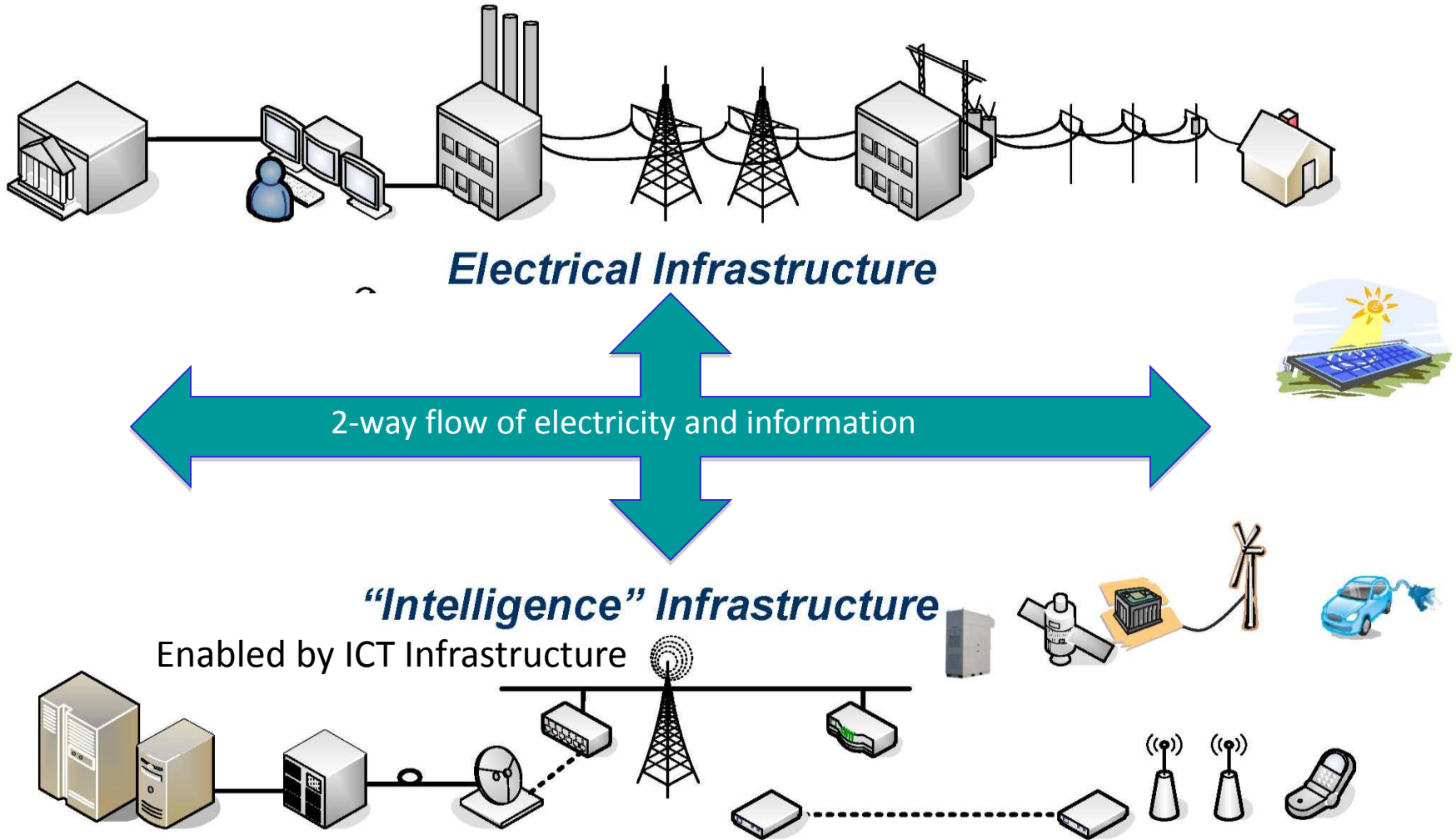
Impact of Smart Grid, ICT on Environment and Climate Change

ITU Symposium on ICTs, the Environment and Climate Change

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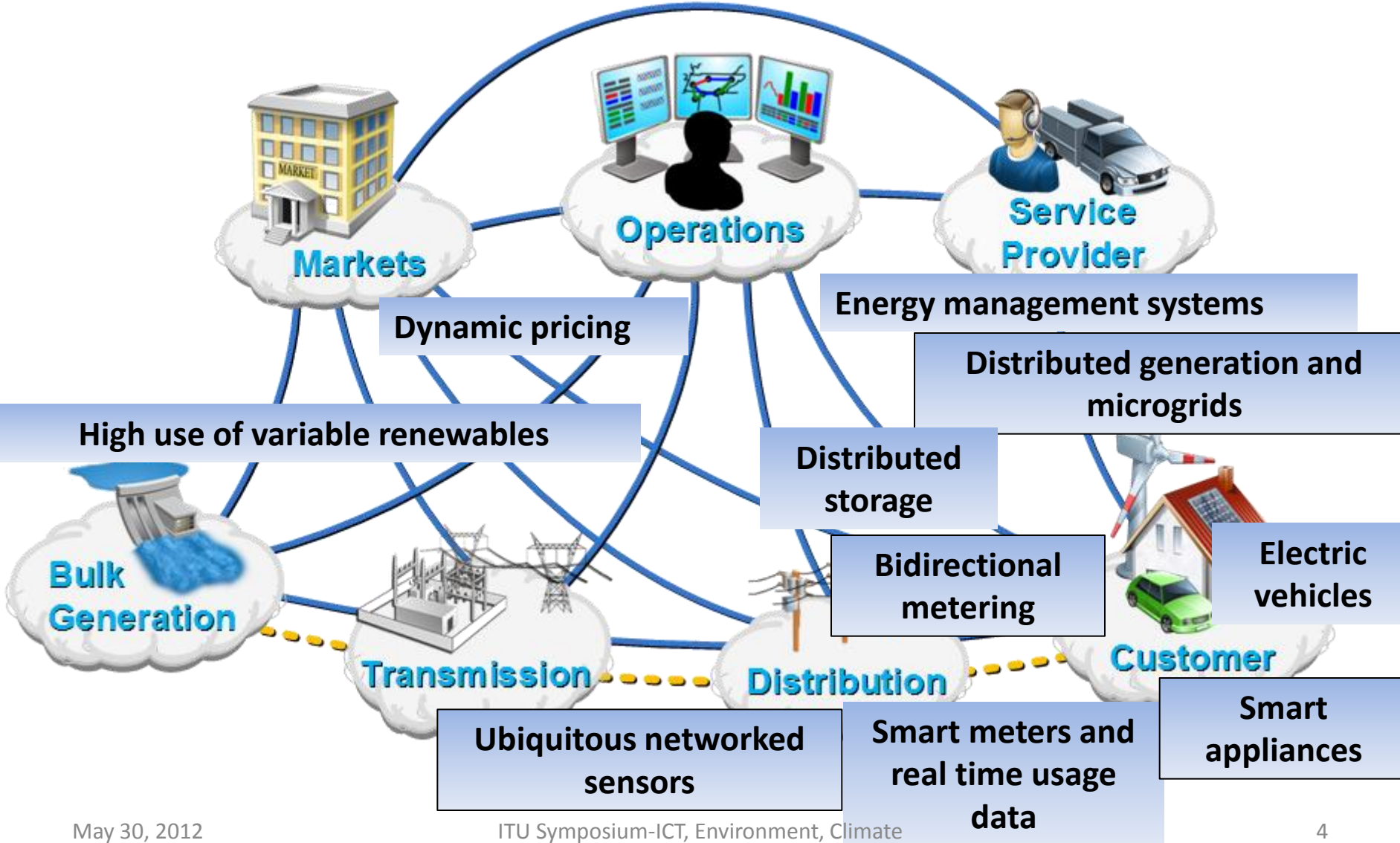
Smart Grid: The “Energy Internet”



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

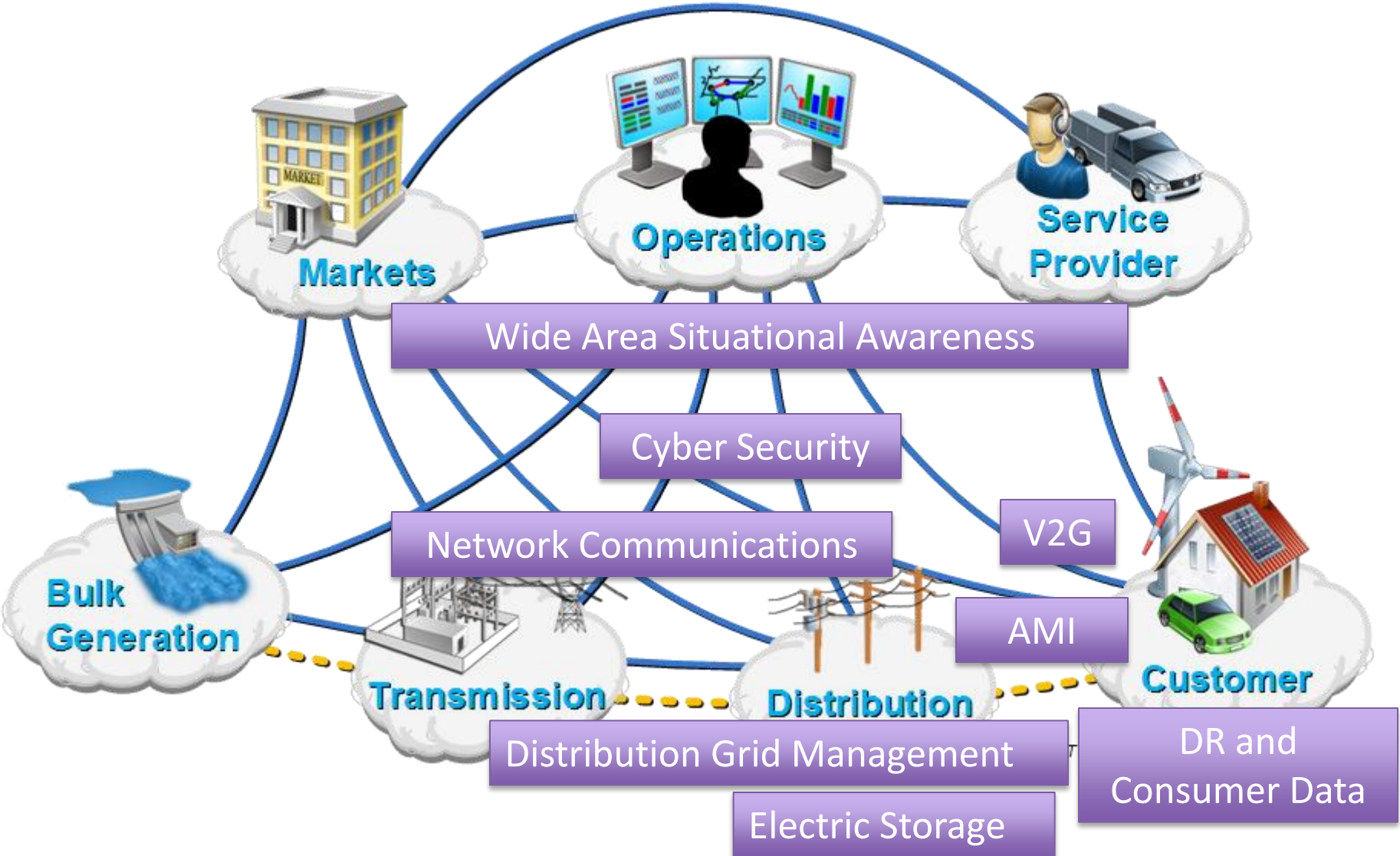
What Will the Smart Grid Look Like?



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



Usage Profile

Overall Usage

Cost of Usage



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

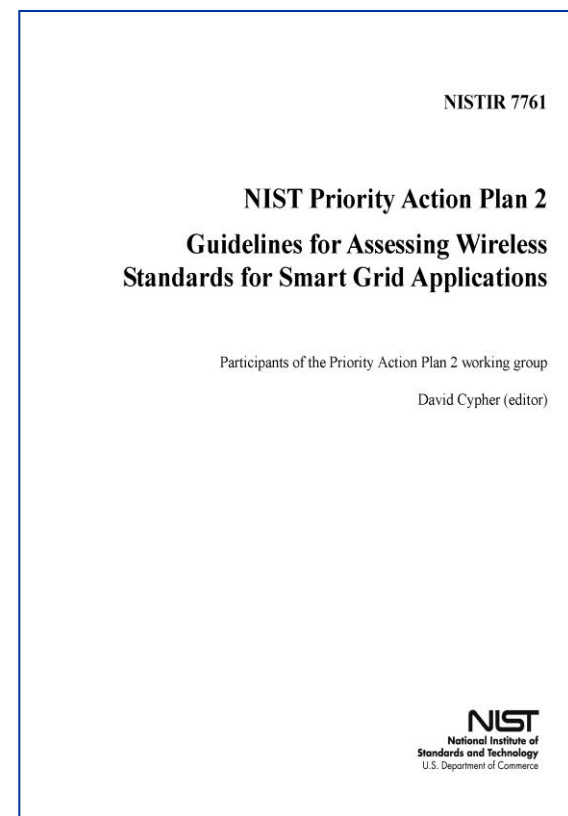
The screenshot shows a web browser window with the URL <https://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/GreenButtonESPIEvolution>. The browser's address bar and tabs are visible at the top. The page content is as follows:

- Left Sidebar:**
 - SmartGrid logo
 - 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
- Main Content Area:**
 - Path: TWiki > SmartGrid Web > PriorityActionPlans > GreenButtonESPIEvolution (2012-03-07, MartyBurns)
 - 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
 - UCAIug 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
 - ABSTRACT:**

Green Button Challenge is one step towards realizing the common goal of providing consumers with access to their own energy usage information in a downloadable, easy-to-use electronic format.

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

