

Global Standards Development:

From Technology to Renewables Integration

Advanced Energy Conference
Hyatt Regency Buffalo
October 12-13, 2011

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P2030.1 Working Group
Integration of Electric Transportation to the Electric Grid



IEEE: Helping You Make Sense of the Global Standards Integration Purpose

*Advancing technology and facilitating
successful Renewables Integration deployments
worldwide*

- Leveraging its global presence and breadth of technology involvement
 - Developing standards
 - Sharing best practices
 - Creating publishing opportunities
 - Providing educational offerings
- Being integral to the transition of the technology to the global marketplace

Global Standards:

Critical to Renewables Integration and Smart Grid Success

- Foster interoperability
 - Ensure any device from any manufacturer can plug into the grid
- IEEE working closely with national and international standards bodies including ISO, ITU, IEC, SAE, AICTO
- IEEE developing or updating *in excess of* 100 global standards relevant to smart grid

Some Major Global Smart Grid Challenges

- Future energy supplies through use of renewables
- Concerns for the environment
- Use of technology to increase system efficiency and reliability
- Policy, regulatory and security debates
- Educating consumers to prepare them for lifestyle changes
- Cross-technology integration (e.g., IT, Communications, and Support Services)

IEEE Smart Grid Standards Initiatives

- New development
 - Interoperability of electric power, IT, and Communications systems
 - Powerline communications and Networking, Regenerative interconnection, Automotive interconnection, Storage, High voltage technology
- 100+ foundational standards updated for Smart Grid
- Incubation and bringing new technologies from research into standards development



A Global Community of Global Standards Development



The model for going forward with Smart Grid!

IEEE 2030 Smart Grid Generic Framework

Methodological Interoperability Framework

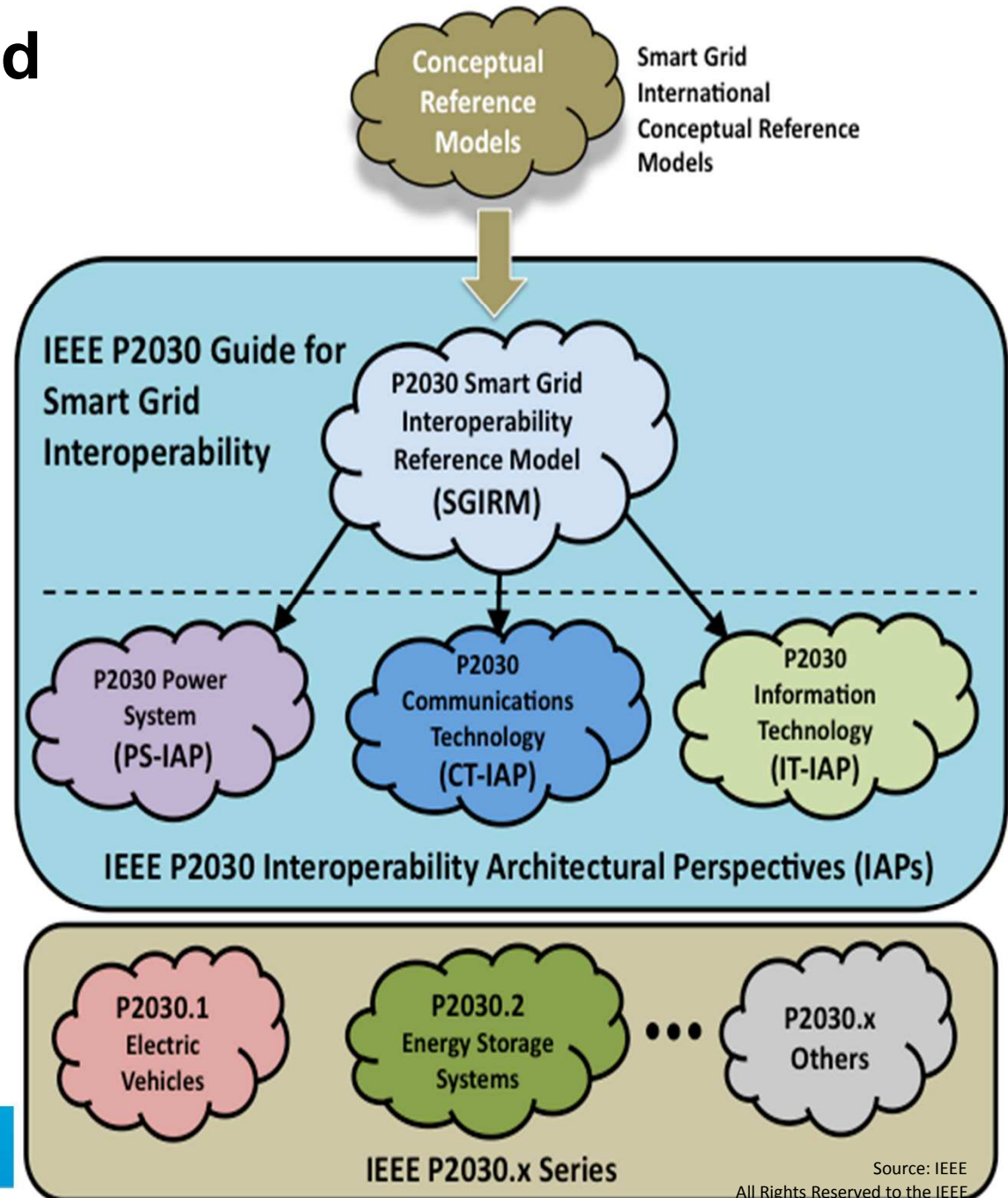
composed of:

- **Three Interoperability Architecture Perspectives (IAP):**

- Power System (PS)
- Communications Technology (CT)
- Information Technology (IT)

- **IAPs Interoperability Tables**

IEEE STANDARDS ASSOCIATION



IEEE P2030 Series: Smart Grid Interoperability

- **IEEE 2030 Draft Guide for Smart Grid Interoperability of Information Technology Operation with Energy Technology and the Electric Power System and End-Use Applications and Loads**
 - **Approved and published 10 September 2011**
- **IEEE P2030.2 Draft Guide Energy Storage Systems for Interoperability with Electric Power Infrastructure**
- **IEEE P2030.3 Draft Standard Test Procedures for Electric Energy Storage Equipment and Systems for Electric Power Systems Applications**

More than 100 standards spanning smart grid spectrum

- **<http://standards.ieee.org/announcements/sginfo.html>**

Examples:

- **IEEE PC37.118.1 and PC37.118.2 Synchronized phasor measurements**
- **IEEE P1686 IEEE Standard for Substation Intelligent Electronic Devices Cyber Security Capabilities**
- **IEEE 1815-2010 Standard for Electric Power Systems Communications - Distributed Network Protocol (DNP3)**

IEEE P2030.1 Working Group Status

- Purpose: Development of a Guide for Electric Sourced Transportation and its Impact on the Electric Grid

Scope:

- Provide guidelines that can be used by utilities, manufacturers, transportation providers, infrastructure developers and end users of electric-sourced vehicles and related support infrastructure in addressing applications for road-based personal and mass transportation.
- Provide a knowledge base addressing terminology, methods, equipment, and planning requirements for such transportation and its impacts on commercial and industrial systems including, for example, generation, transmission, and distribution systems of electrical power.
- Provide a roadmap for users to plan for short, medium, and long-term systems.

IEEE p2030.1 Working Group Continued

Within the Working Groups, Task Forces are established to focus on the following key areas:

1. Vehicle Technology

- **Types of vehicles and their anticipated operation with the power systems**

2. Grid Impact

- **Including load shapes, EV Integration Impacts on Customers, Distribution, Generation and Transmission Impacts**

3. Roadmap

- **Including Roaming and Privacy**

4. Communications and CyberSecurity

- **AMI Metering, Communications between Vehicle and Grid, CyberSecurity Impacts**

5. Battery Technology

- **End of Life Issues**

6. Chargers and Charging

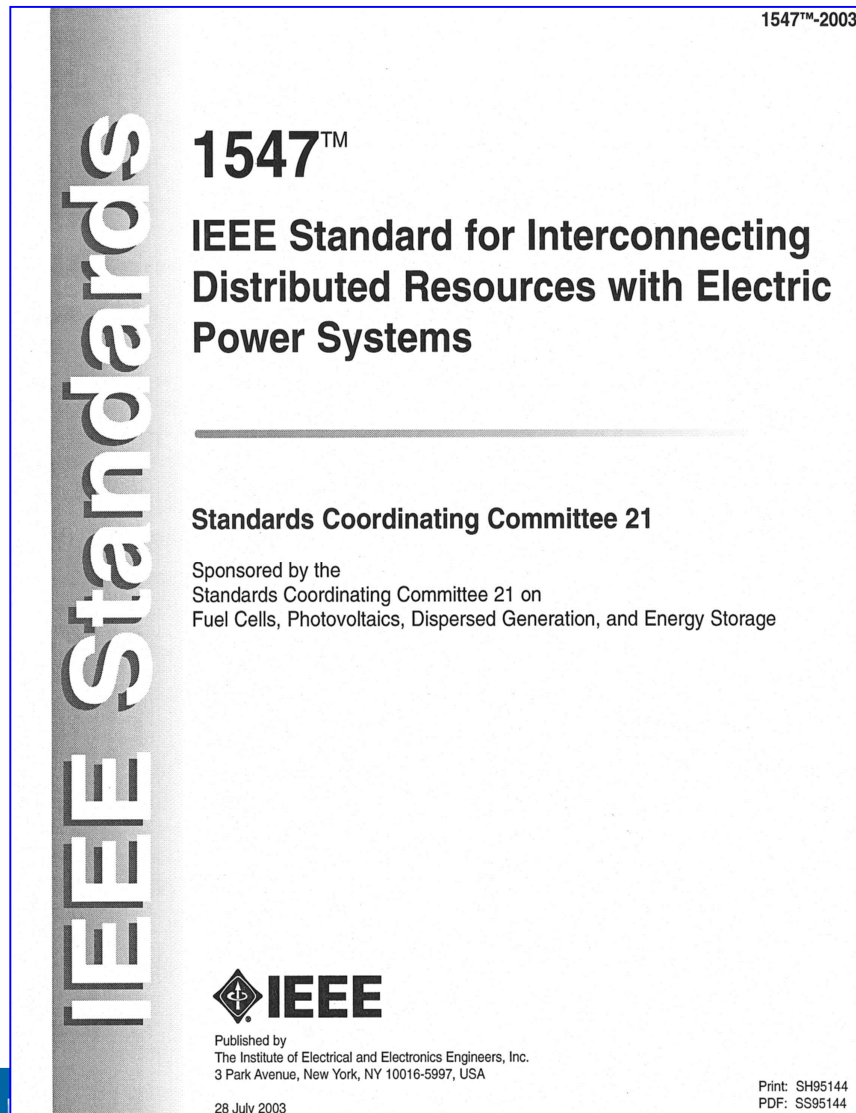
- **On-Board, Off-Site**

7. Gaps in Current Technology

IEEE Standards Association Support

1. The IEEE Standards Association supports an international view and has agreement currently in place and/or pending negotiations from the following organizations:
 1. SAE- Society of Automotive Engineers
 2. JAMA- Japan Automotive Manufacturers Association
 3. KAMA- Korea Automotive Manufacturers Association
2. The P2030.1 Working Group is comprised of over 250 volunteers from North America, Europe, Asia, Africa, New Zealand contributing to an international guide that when completed should assist the readers in an appreciation of a true global guide.

ANSI/IEEE Standard 1547



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4.0 Interconnection Technical Specifications and Requirements:

- . General Requirements
- . Response to Area EPS Abnormal Conditions
- . Power Quality
- . Islanding

5.0 Test Specifications and Requirements:

- . Interconnection Test
- . Production Tests
- . Interconnection Installation Evaluation
- . Commissioning Tests
- . Periodic Interconnection Tests

Distributed Energy Resources Interconnection

Distributed Energy Technologies



Fuel Cell



PV



Microturbine



Wind



Energy Storage



PHEV;
V2G



Generator

Interconnection Technologies



Inverter



Switchgear,
Relays, &
Controls

Functions

- Power Conversion
- Power Conditioning
- Power Quality
- Protection
- DER and Load Control
- Ancillary Services
- Communications
- Metering

Electric Power Systems



Utility System



Microgrids

Loads

Local Load Simulators



IEEE 1547 Interconnection Standards

1547- 2003 Standard for Interconnecting Distributed Resources with Electric Power Systems

1547.1 - 2005 Conformance Test Procedures for Equipment Interconnecting DR with EPS

1547.2 - 2008 Application Guide for IEEE 1547 Standard for Interconnection of DR with EPS

1547.3 - 2007 Guide for Monitoring, Information Exchange and Control of DR

Identified
in Report to
NIST

Current 1547 Projects

P1547.4 Guide for Design, Operation, and Integration of DR Island Systems with EPS

P1547.5 Guidelines for Interconnection of Electric Power Sources Greater Than 10 MVA to the Power Transmission Grid

P1547.6 Recommended Practice for Interconnecting DR With EPS Distribution Secondary Networks

P1547.7 Draft Guide to Conducting Distribution Impact Studies for Distributed Resource Interconnection

Microgrids

Urban
distribution
networks

<http://grouper.ieee.org/groups/scc21/index.html>