Talking Points Presented To FERC by T. Basso, National Renewable Energy Laboratory, IEEE SCC21 1547 Secretary.

Good morning ladies and gentlemen. I am pleased to be here to participate in this conference on interconnection of wind and other distributed resources (DR) to the grid. I am here to offer you background on IEEE Standards Coordinating Committee 21 (SCC21) development of the IEEE 1547 interconnection standards for DR. I work for the National Renewable Energy Laboratory Distributed Energy and Electricity Reliability Program. Support for me and the 1547 development has been through the US DOE Distributed Power Program and also the Office of Electric Transmission and Distribution. The views expressed here are my own and do not constitute a formal IEEE nor DOE position.

SCC21 is an industry driven IEEE group that develops standards in an open consensus forum. The IEEE 1547 standard for interconnecting DR with the electric power systems is the first in a series of standards documents being developed. There are five other documents in the series:

- IEEE P1547.1 ***Draft Standard For Conformance Test Procedures for Equipment Interconnecting Distributed Resources With Electric Power Systems***;
- IEEE P1547.2 ***Draft Application Guide for IEEE Std. 1547 Standard for Interconnecting Distributed Resources With Electric Power Systems***;
- IEEE P1547.3 ***Draft Guide for Monitoring, Information Exchange, and Control of Distributed Resources Interconnected With Electric Power Systems***;
- IEEE P1547.4 ***Draft Guide for Design, Operation, and Integration of Distributed Resource Island Systems with Electric Power Systems***; and
- IEEE P1547.5 ***Draft Technical Guidelines for Interconnection of Electric Power Sources Greater than 10 MVA To The Power Transmission Grid***.

In addition to the 1547 series underway, IEEE SCC21 1547 work group members have identified the need and desire to have a guide for DR interconnection system certification to substantiate DR equipment indeed conforms to the interconnection requirements. At NREL, we have developed a draft model program for certification of DR interconnection. That program involves Nationally Recognized Test Labs being responsible for equipment certification. But now, back to the 1547 interconnection standards.

The 1547 standard was published in 2003 and designated as an American National Standard – ANSI/IEEE. The 1547.1 test standard is going to ballot this fall. The 1547.2 application guide and the 1547.3 communications guide are targeting 2005 for ballot. The 1547.4 guide had its inaugural meeting August 2004. And, the 1547.5 guide for transmission interconnection was just approved to start by the IEEE Standards Board this week.

The 1547 standard defines the minimum, universal mandatory requirements that are needed for interconnection and testing. The requirements are functional and not equipment prescriptive. Functional technical requirements are statements of what the system needs to do or what behavior must be available. 1547 requirements are technology neutral and apply to all interconnections whether they are synchronous, induction, or inverter based machines. 1547 does recognize there are system impacts and differences due to grid operations and design differences and that there are differences in generators and local operations. 1547 does not require the equipment be at the point of common coupling nor does it require all the equipment be either on the customer side of the interconnection nor on the grid side. The 1547 requirements apply to interconnection up to 10 MVA on the distribution system. Work group developers are now expanding 1547 series with the start of 1547.5 for interconnection greater than 10 MVA to the transmission grid. The 1547.3 communications guide is not necessarily limited to 10 MVA nor would 1547.4.

I'll close here, reiterating that the 1547 standard presents a major success for its work group developers who have established an American National Standard based on consensus development by the 444 ballot and work group members. They have developed a document of universal functional technical requirements that are technology neutral.

Thank you.

A national laboratory of the U.S. Department of Energy

National Renewable Energy Laboratory

Innovation for Our Energy Future

IEEE SCC21 1547 Interconnection Standards

Tom Basso* and Dick DeBlasio-- NREL**

FERC Technical Conference

September 24, 2004 - FERC HQ Washington DC

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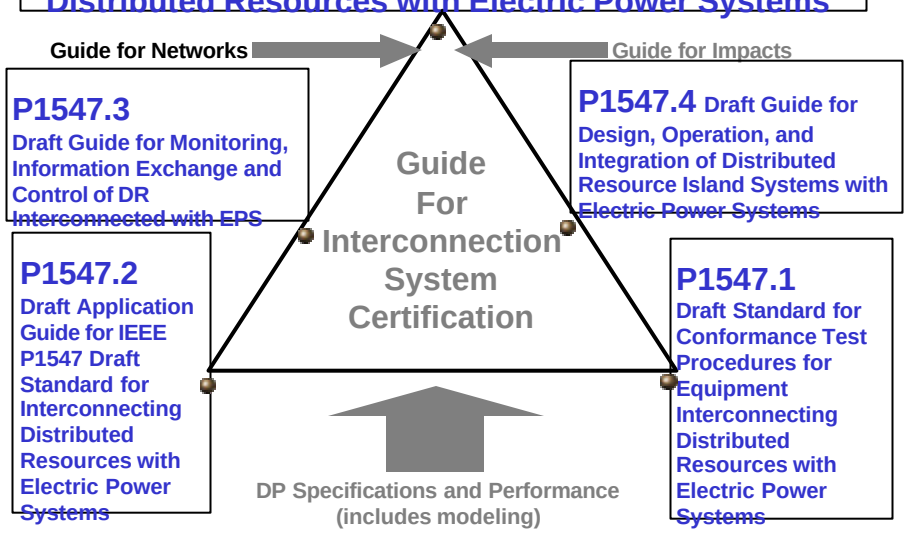
* NREL DEER Distribution & Interconnection R&D; Secretariat IEEE SCC21

** Technology Manager: NREL Distributed Energy & Electric Reliability (DEER) Program; IEEE Standards Board Liaison to DOE; Chair IEEE SCC21

IEEE SCC21 1547 Series of Interconnection Standards

IEEE Std 1547™ (2003) Standard for Interconnecting Distributed Resources with Electric Power Systems



The above identifies existing IEEE SCC21 standards development projects (1547 series) and activities under discussion by SCC21 Work Group members.

IEEE P1547.5 Project

Title. **P1547.5 Draft Technical Guidelines for Interconnection of Electric Power Sources Greater than 10MVA to the Power Transmission Grid**

Scope. This document provides guidelines regarding the technical requirements, including design, construction, commissioning acceptance testing and maintenance /performance requirements, for interconnecting dispatchable electric power sources with a capacity of more than 10 MVA to a bulk power transmission grid.

Purpose. The purpose of this project is to provide technical information and guidance to all parties involved in the interconnection of dispatchable electric power sources to a transmission grid about the various considerations needed to be evaluated for establishing acceptable parameters such that the interconnection is technically correct.

Sponsor: SCC21 - Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage

Sponsoring Committee Chair: Dick DeBlasio

PAR approved by IEEE September 2004 (project authorization request); ballot to be completed by December 2007.

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Content

- **Background**
- **IEEE Standards**
- **1547 Series of Standards**
  - **ANSI/IEEE Std 1547 (2003): Standard for interconnection system & interconnection test requirements for interconnecting DR with Electric Power Systems (EPS)**
  - **P1547.1 Standard for interconnection test procedures**
  - **P1547.2 Guide to 1547 standard**
  - **P1547.3 Guide for information exchange for DR interconnected with EPS**
  - **P1547.4 Guide for DR island systems**
  - **P1547.5 Guide for interconnection to transmission grid**

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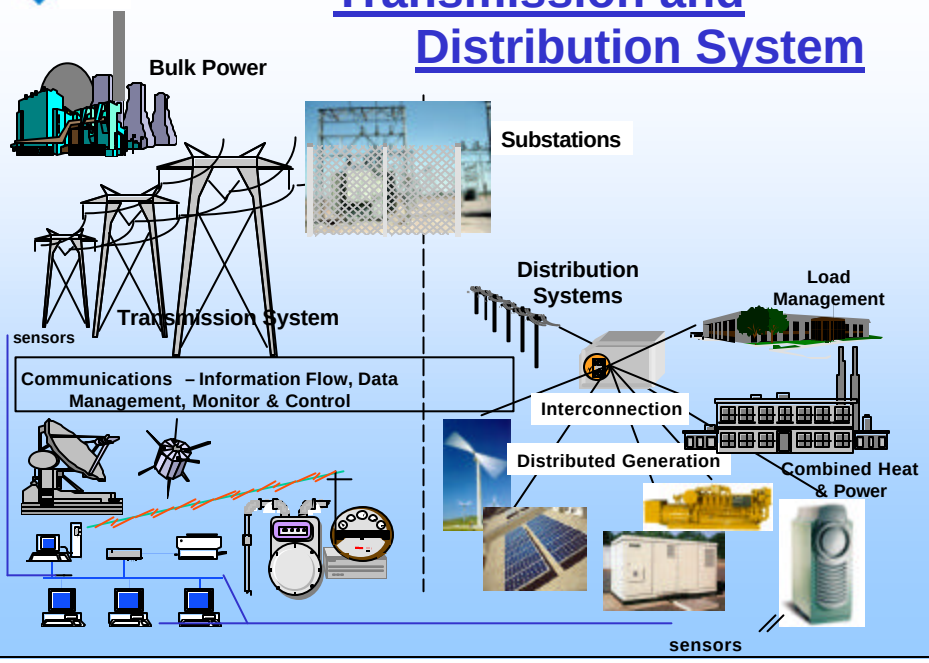
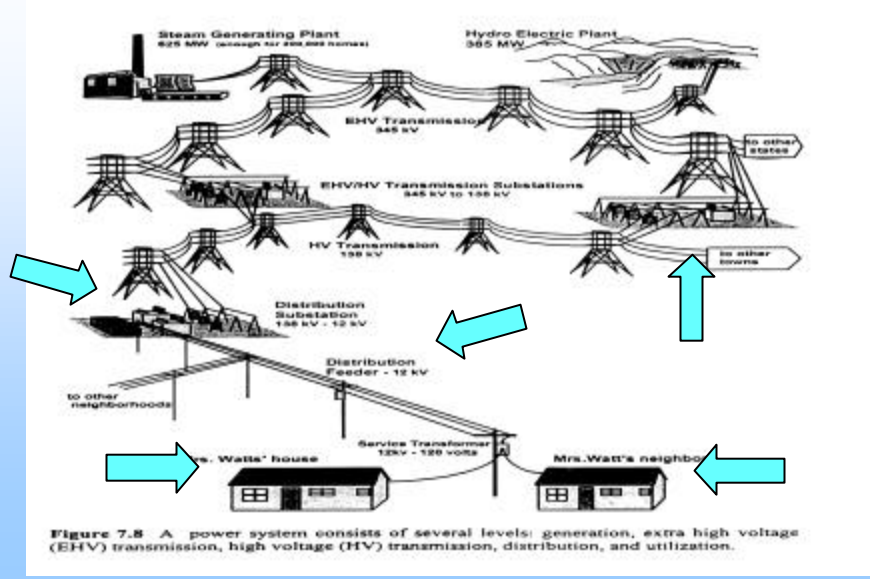
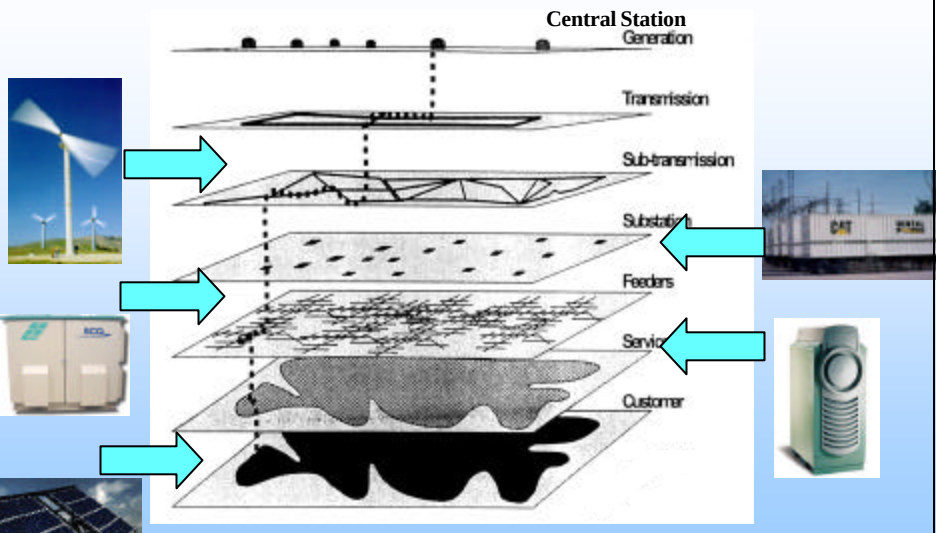
Transmission and Distribution System



DR Interconnection



Interconnecting Power Systems



The overall power system is traditionally viewed in terms of 7 layers; each performing its function from central station generation supplying power out to customers.

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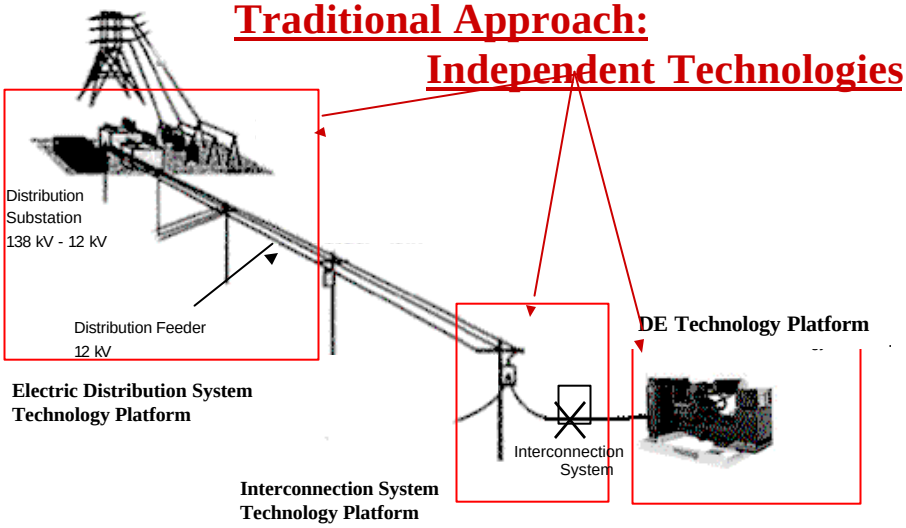
Traditional Approach: Independent Technologies



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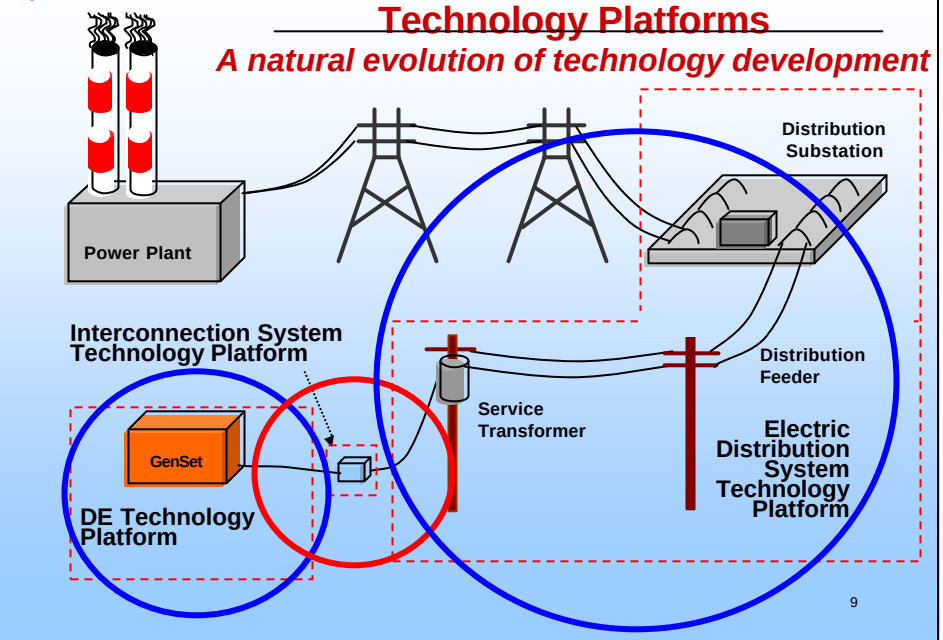
Technology Platforms

A natural evolution of technology development



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Institute of Electrical and Electronic Engineers - IEEE

- IEEE - international technical professional society
- More than 375,000 members from 150 countries
- Advances the theory and application of electro-technologies and allied sciences
- Produces over 30% of world's published literature in electrical engineering, computers, and controls
- One of the pre-eminent standards bodies

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IEEE Standards Board

- Approves all IEEE standards projects and standards for publication
- Establishes Standards Coordinating Committees (SCC) that report directly to Board
- Established new liaison to DOE (R. DeBlasio, Chair SCC21)
- IEEE standards are recognized nationally and worldwide
  - IEEE standards may qualify as American National Standard (ANSI/IEEE status)
  - IEEE and IEC dual logo arrangement

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IEEE Standards Coordinating Committee 21

SCC21 Fuel Cells, Photovoltaics, Dispersed Generation, & Energy Storage

Scope and Purpose.

SCC21 Oversees the development of standards in the areas of Fuel Cells, Photovoltaics, Dispersed Generation, and Energy Storage, and coordinates efforts in these fields among the various IEEE Societies and other affected organizations to ensure that all standards are consistent and properly reflect the views of all applicable disciplines.

SCC21 reviews all proposed IEEE standards in these fields before their submission to the IEEE-SA Standards Board for approval and coordinates submission to other organizations.

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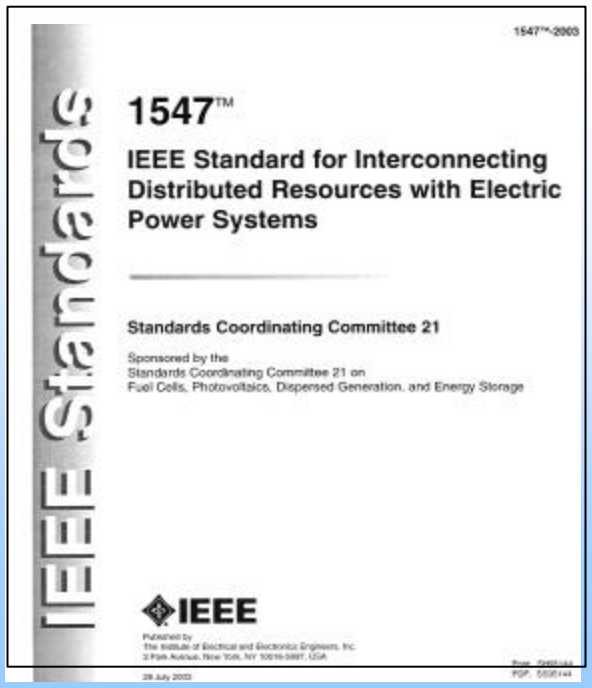
American National Standard
ANSI/IEEE 1547 Std

IEEE Std 1547 (2003) published summer 2003

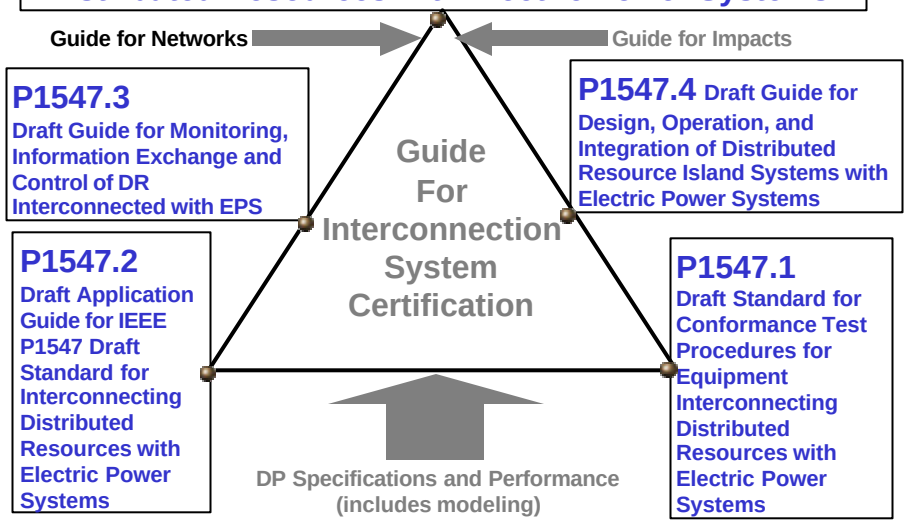
- **Affirmative IEEE Ballot February 2003**
  - Voting Membership
    - 230 members (31% general interest, 35% utility/user, 30% manufacturer/producer, 4% government,)
    - 91% affirmatives
  - **444 Work Group & Ballot Group Members at time of ballot**
- **Approved by IEEE Standards Board June 12, 2003**
- **American National Standard designation**

→ **ANSI/IEEE Std 1547 - October 20, 2003** ←



IEEE SCC21 1547 Series of Interconnection Standards

IEEE Std 1547™ (2003) Standard for Interconnecting Distributed Resources with Electric Power Systems



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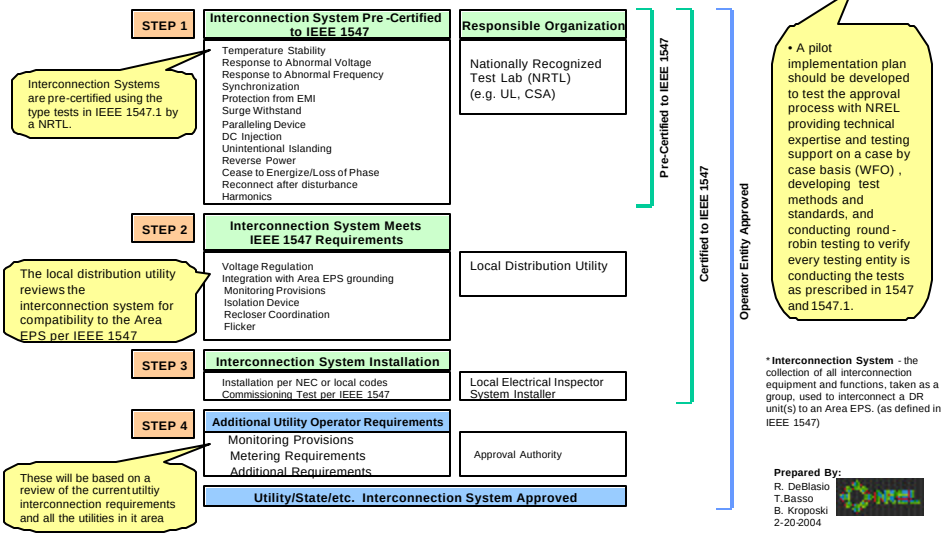
NREL Model 1547 Pre-certification and Certification Program for DG Interconnection Systems*

DRAFT Design for Utility, State, etc.Certification Interconnection Program



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  1617 Cole Blvd. MS-1614 Golden, CO 80401-3393
- **IEEE SCC21 -- IEEE Standards Coordinating Committee 21** on Fuel Cells, Photovoltaics, Dispersed Generation, & Energy Storage
  http://grouper.ieee.org/groups/scc21/
- **IEEE Std 1547™ (2003)** ***Standard for Interconnecting Distributed Resources with Electric Power Systems*** --
  http://grouper.ieee.org/groups/scc21/dr_shared/

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