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A River of Energy Solutions

Technical Challenges to Renewable Instattions

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Technical Challenges

- **Siting**
- **Environmental**
- **System Safety and Interface Control**

Renewable Energy Siting

Challenges

Turbines and solar towers can interfere with military radar

Problem arises in 3 contexts:
surveillance; weapon system testing; and operations & training

DoD weighs in late in process b/c of nature of the FAA review process

Way Forward

Energy Siting Clearinghouse

R&D to better model impact and mitigate potential effects

Accelerate upgrades to/replacement of surveillance radars



Environmental

National Environmental Protection Act

- **Requirements**
 - **Major Federal action**
 - **Assess environmental impact**
 - **Biological species impact**
 - **Air & water impact**
 - **Cultural impact**
 - **Social-economic impact**
 - **Actions**
 - **Categorical Exclusion**
 - **Environmental Assessment**
 - **Environmental Impact Statement**

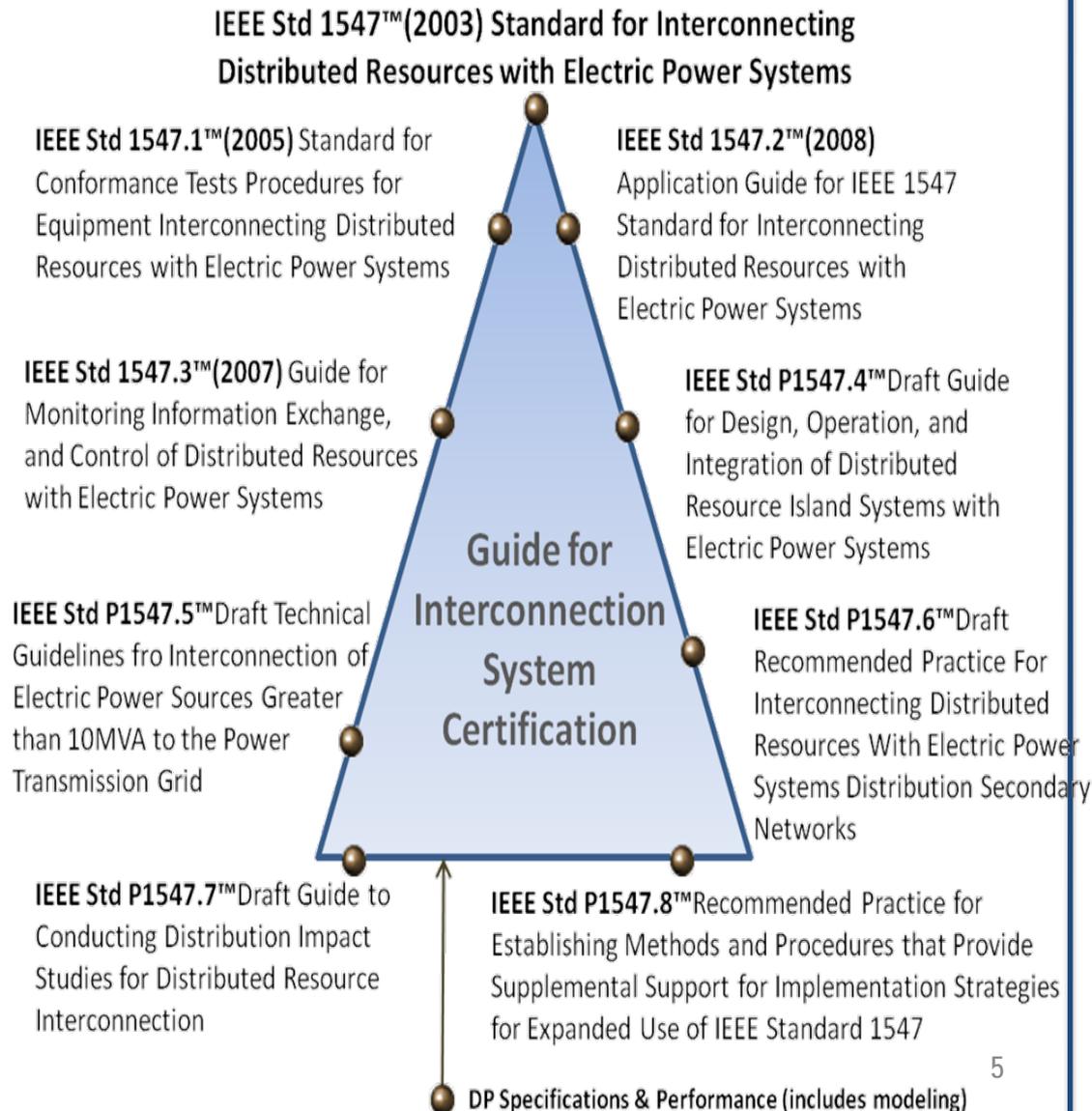
Drivers for Renewable Energy Standards

• **The Federal Energy Policy Act of 2005 calls for state commissions to consider certain standards for electric utilities**

• **Under Section 1254 of the act: "Interconnection services shall be offered based upon the standards developed by IEEE Standard 1547 for Interconnecting Distributed Resources With Electric Power Systems, as they may be amended from time to time."**



Source for the Chart: NREL



Drivers for Renewable Energy Standards

- The Energy Independence and Security Act (EISA) of 2007 calls for the development of protocols and standards to increase the flexibility of use for Smart Grid equipment and systems
 - Under Section 1305 of the act, this interoperability framework "shall be flexible, uniform, and technology neutral" and "align policy, business, and technology approaches in a manner that would enable all electric resources, including demand-side resources, to contribute to an efficient, reliable electricity network."

IEEE Std P2030 Draft Guide for Smart Grid Interoperability of Energy Technology and Information Technology Operation with the Electric Power System (EPS), and End-Use Applications and Loads

IEEE Std P2030.1 Draft Guide for Electric-Sourced Transportation Infrastructure

IEEE Std P2030.2 Draft Guide for the Interoperability of Energy Storage Systems Integrated with the Electric Power Infrastructure

Future Smart Grid Interoperability Standards (TBD)

Applying IEEE 1547

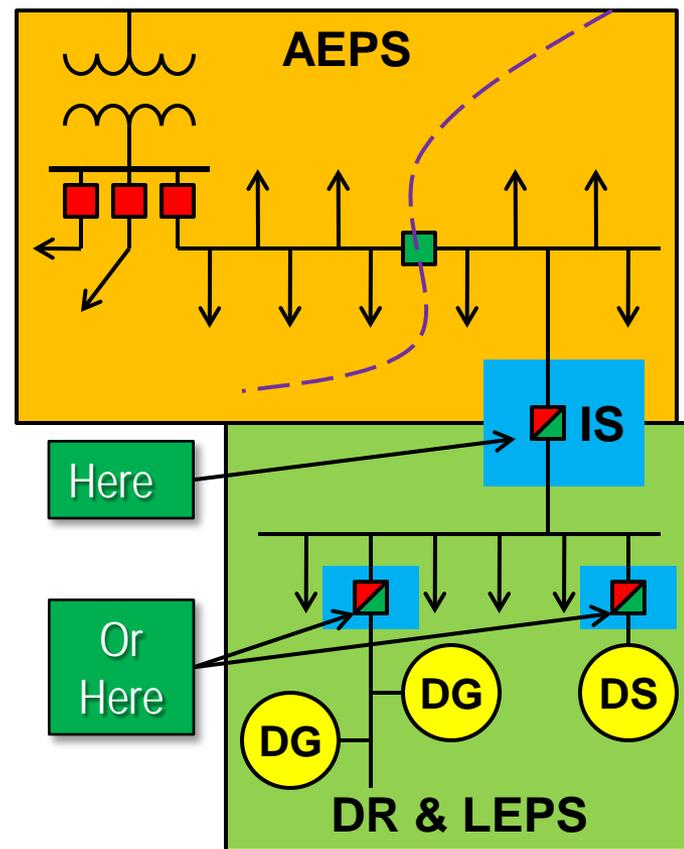
Paralleling & Synchronization

- **Requirements**
 - **The interconnection system paralleling-device shall be capable of withstanding 220% of the interconnection system rated voltage**
 - **The Distributed Resource (eg., PV system) unit shall parallel with the Area Electric Power System without causing a voltage fluctuation at the PCC greater than 5% of the prevailing voltage level of the Area EPS at the PCC, and meet the flicker requirements**

Applying IEEE 1547

Unintentional Islanding

- Action by the Interconnecting System
- For an unintentional island in which the DR energizes a portion of the Area EPS through the PCC, the DR interconnection system shall detect the island and cease to energize the Area EPS within two seconds of the formation of an island



Applying IEEE 1547

Inadvertent Unintentional Islanding

- Action by the Interconnecting System
- Likewise, the DR shall not energize the Area EPS when the Area EPS is de-energized
- Safety issues
 - Any energization of the AEPS by back feeding electricity from the DR creates an electrocution hazard to utility line crews and the public

