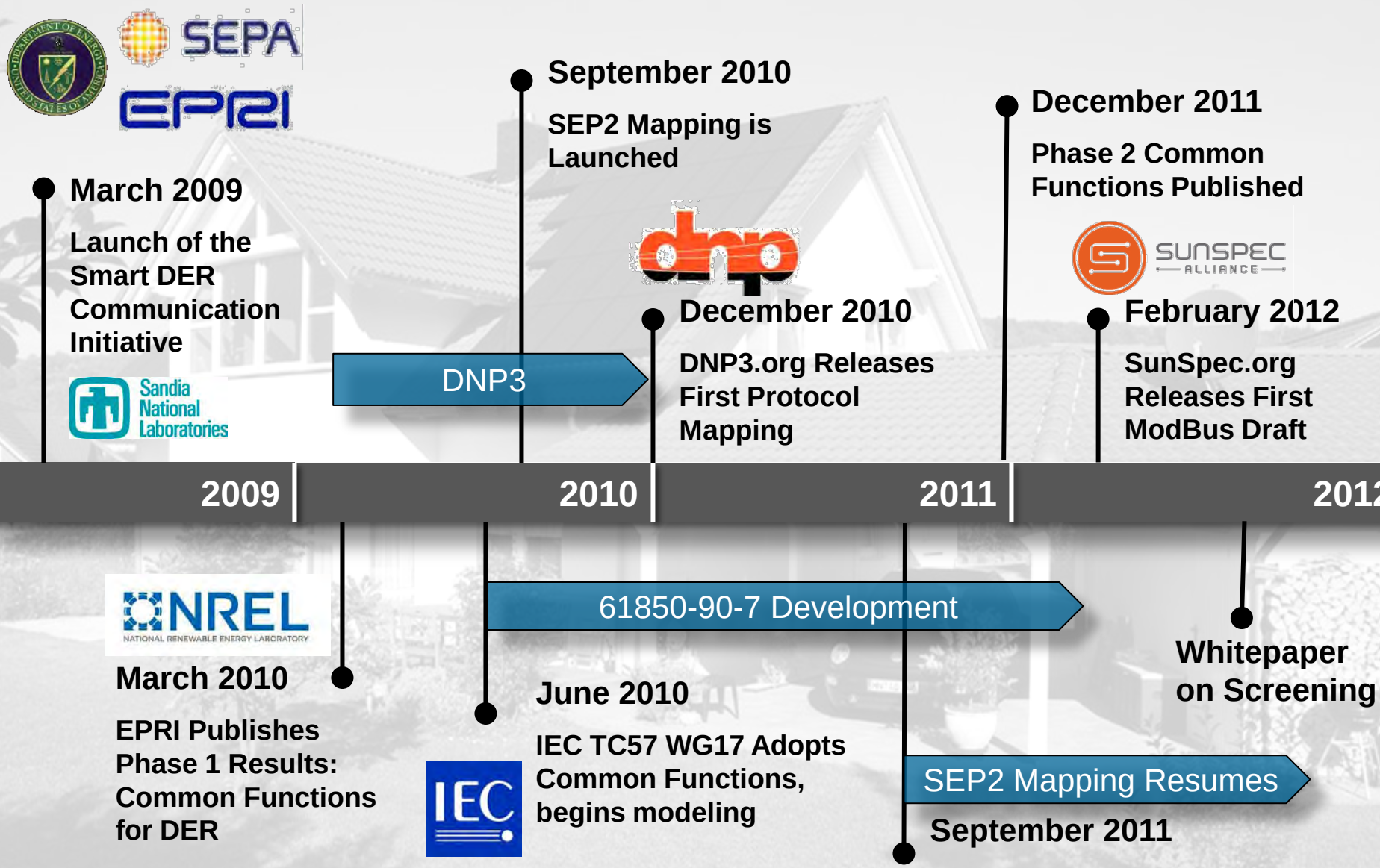
PV Grid Integration Workshop

April 19, 2012
Tucson, AZ

Our work program has been to:

- Better understand PV output variability
- Apply feeder modeling and analysis tools
- Consider screening method for connection
- Promote a standard communication btw inverter and distribution
- Investigate distribution “Hosting Capacity” for variable generation
- Provide a forecast to grid operators

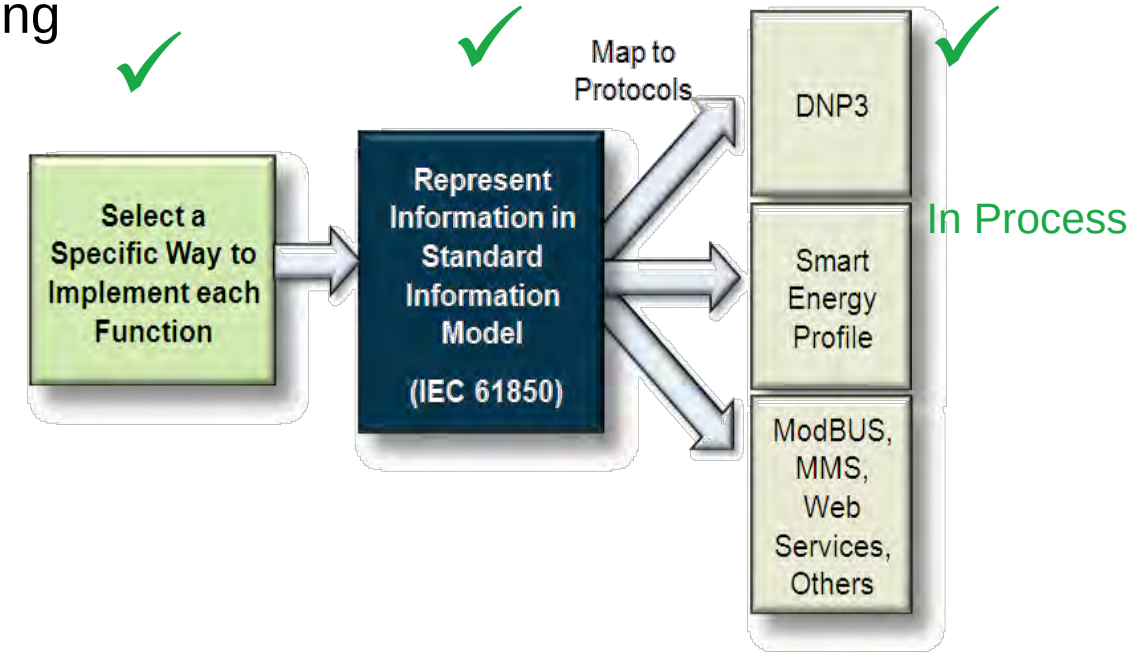
Recognizing a few milestones



EPRI-led Inverter Communication Initiative

Phase 1 Functions (Prior Years):

- Connect/Disconnect – Non-Islanding
- Max Generation Level Control
- Smart VAR Management and Power Factor
- Storage Management (arbitrage, load limiting, etc.)
- State/Status Monitoring
- Event Logging
- Time Adjustment



Work Progress and Status

- Done
  - *Inverters are ready to provide grid support*
  - *Functions and protocols have been defined*
  - *Methods for collecting data, modeling and understanding have be developed*
- To Do
  - *Make the grid ready to accept distributed support*
  - *Demonstrate in a range of systems and applications*
  - *Develop industry accepted way to set penetration limits*

Which way to go with Standards?

California stakeholders settling on changes to Rule 21 for interconnection

Solar Industry asking FERC for special treatment of Solar

System Operators now consider "grid codes for North America

IEEE revising the future role of 1547 Std

Time	Topic	Presenter
8:00am	**Introduction to Workshop** ▪ PV Grid Integration Overview ▪ DOE Grid Integration Efforts	*Tom Key, EPRI* *Kevin Lynn, DOE* *Mike Taylor, SEPA*
8:20am	**Session 1: Experience with High Penetration PV** ▪ Utility Perspectives	*George Rodriguez, Southern California Edison (moderator)* *Dwain Duke, CPS Energy; Steve Steffel, Pepco*
10:00am	**Break**	
10:30am	**Session 2a: Data and Models for High Penetration** ▪ Solar Data Inputs ▪ Feeder/Load Data (Distributed PV Monitoring) ▪ PV Plant Variability, Aggregation, and Impact on Grid Voltage	*Mahesh Morjaria, First Solar (moderator)* *Josh Stein, Sandia* *Kristen Nicole, EPRI* *Rasool Aghatehrani, SunEdison*
12:00pm	**Lunch**	
12:45pm	**Session 2b: Analysis of High Penetration** ▪ High Penetration Modeling and Results ▪ Challenges in Modeling Efforts ▪ High Penetration Case Study (Flagstaff)	*Abraham Ellis, Sandia (moderator)* *Jeff Smith, EPRI* *Barry Mather, NREL* *Jihad Zaghloul, Arizona Public Service*

2:00pm	**Panel Discussion** ▪ Industry Perspectives	*Robert Broderick, Sandia, (panel moderator)* *Greg Shirek, Milsoft Utility Solutions* *Dennis Flinn, DNV/ KEMA* *Paul Cote, PNM*
2:45pm	**Break**	
3:00pm	**Session 3: Activity in Screening Procedures and Interconnection Standards** ▪ Update on Current Renewable Integration Policy Actions ▪ California Rule 21 Settlement & CPUC 15% Project	*Kevin Lynn, DOE (moderator)* *Darren Deffner, SEPA* *Tom Key, EPRI* *Mike Coddington, NREL* *Matt Heling, Pacific Gas & Electric*
4:00pm	**Session 4: Interconnection Standards: Utility & Industry Perceptions** ▪ Panel Discussion – Can IEEE 1547 meet future industry needs?	*Tom Basso, NREL (moderator)* *Mike Grant, Duke Energy; Abraham Ellis, Sandia; Bill Plank, Juwi Solar; Elie Nasr, SMA America*
5:00pm	Adjourn	

Status of PV Integration

1. *Inverters are ready to provide grid support.*
2. *Grid is generally not ready to accept this help.*
3. *What will it take to make the grid more ready?*
   - *Standard way to communicate between resources*
   - *Collaboration to increase "hosting capacity"*
   - *Field demonstrations and learning by doing*