What is the Need?

- FEAR and UNCERTAINTY among utilities about high penetrations of PV –
  - Concerns: system stability, increases in reserves, CPS2 violations, voltage regulation, etc.
- Concerns must be addressed to reach high penetrations.
- Primary barrier?

DATA!

Source: Tom Hansen, Tucson Electric Power
Why?

• **Demand for solar is increasing rapidly.**
• **Unknowns:**
  • Impacts of variability on the grid;
  • Full extent of geographic diversity benefits;
  • Correlation and interaction between PV and other renewable energy resources;
  • Correlation of ramps in power production to ramps in irradiance.
• **Benefits:**
  • Predicted data for integration studies, transmission planning, and other studies;
  • Power production forecasts for utility operations;
  • Model and forecast validation;
  • Better knowledge, better management.

• **High-resolution solar radiation and power production data are not readily available from large plants.**
• Data collection and analysis done on an ad-hoc basis – a more sophisticated approach needed.
What We Know

For wind:
- The variability decreases with increasing geographic diversity within plants and across regions.
- Plant production does not scale linearly with capacity.
- Variability operational impacts tend to be on load following, and not on a regulation time frame.
- Load forecast errors are not linearly related to wind forecast errors.
- Studies suggest storage is unnecessary with penetration levels up to 30%.

For solar:
- Plant production does not scale linearly with capacity.
- Ramps can occur at shorter time scales than wind.
- Adjacent PV plants are more correlated than adjacent wind plants, but correlation decreases with distance.
- Solar power plants may contribute to voltage and frequency regulation within a region.
- More solar data is needed to develop accurate models of large-scale solar plant performance and characterize solar variability.
Solar Data Hub

- Born from PV Variability Working Group.
- Project Team consists of DOE labs, EPRI, and industry partners.
- Development sponsored by DOE.
- Centralized data repository:
  - Collect, manage, store, and provide access;
  - Public and proprietary information will be stored in the data hub;
  - Proprietary information will be secure and have restricted access;
  - Data quality will be evaluated through a semi-automated QA/QC process.
Beta Version — Went Live April 1

http://solardatahub.org
Future Version

Upload Application uploads files (secure, chunked, restartable)

File Upload Application

User

File Upload Manager receives chunked files, & stores meta-data.

File Transformation Adaptor loads files of a given format into a database. Separate adaptors are needed for each file format.

File Processing Daemon combines chunked files and moves them to a shared area.

Contains meta-data about Users, Memberships, Sites & Files

Analysts access time series data through any SQL enabled toolset.

Analyst (AFTER MARCH)

read only query

Time Series Sensor DB (AFTER MARCH)

File Transformation Adapter (AFTER MARCH)

File Upload Manager

File Processor

Uploaded files

Solar data hub DB

Solar data hub Web Interface
## Timeline for Upgrades (TENTATIVE)

<table>
<thead>
<tr>
<th>Objective</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add Feedback form</td>
<td>May 1, 2011</td>
</tr>
<tr>
<td>Semi-automated quality control of data</td>
<td>June 30, 2011</td>
</tr>
<tr>
<td>Basic visualization (time series plots)</td>
<td>August 30, 2011</td>
</tr>
<tr>
<td>Provide real-time data feed capability</td>
<td>November 30, 2011</td>
</tr>
<tr>
<td>Enhanced visualization and coordination with PVDAQ</td>
<td>January 31, 2012</td>
</tr>
<tr>
<td>Incorporate grid integration datasets</td>
<td>June 30, 2012</td>
</tr>
</tbody>
</table>