IEEE PES - Professional Development and Networking for Today and Tomorrow

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Kansas State University

October 12

IEEE PES Mission Statement

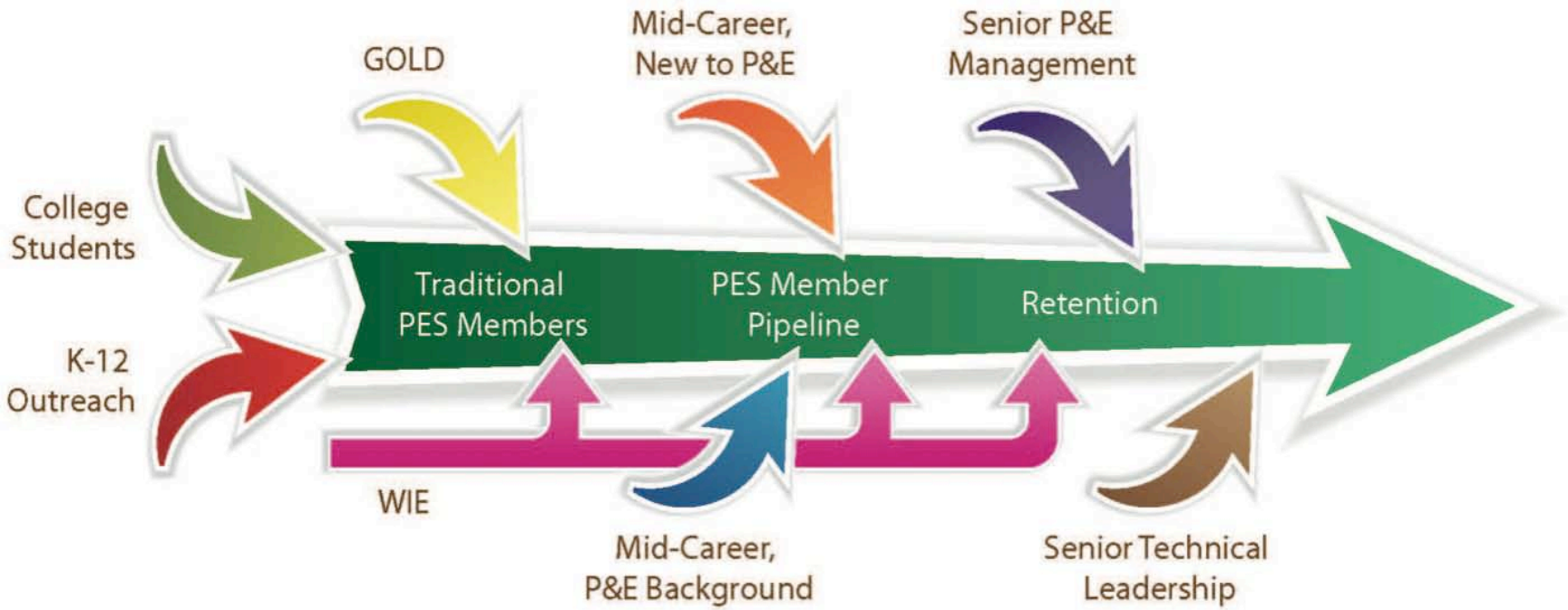
*To be the **leading provider** of scientific and engineering information on electric power and energy for the betterment of society and the preferred professional development source for our members*

IEEE PES
Power & Energy Society®

www.ieee-pes.org

PES Governing Board Volunteer Leaders

PES Pipeline Efforts



IEEE PES – Resources for Today and Tomorrow

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MEMBERSHIP HAS ITS PRIVILEGES!

New Welcome Video for Members
http://www.youtube.com/watch?v=fFWewsHtGM8&feature=youtu.be

Chapters

- Grassroot Interactions of Power & Energy Community
- Over 230 and Growing (9 new Chapters, 9 new Student Chapters in 2011)
- Distinguished Lecturer Program

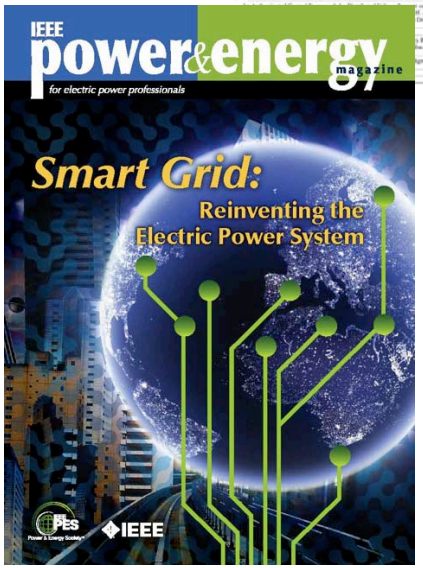
PES Conferences and Meetings

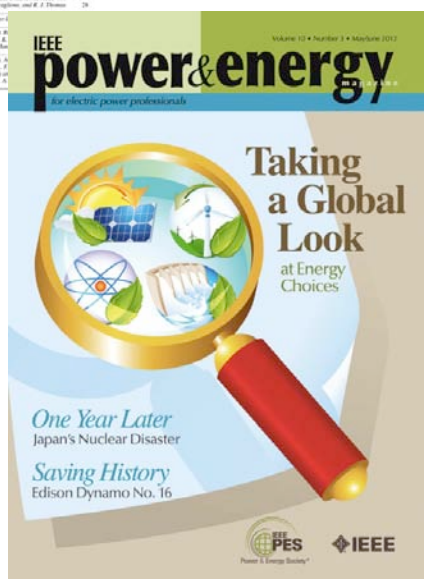
Strategic Activities Worldwide

- EEA –Electricity Engineers' Association, New Zealand
- CSEE – Chinese Society of Electrical Engineers
- CIGRE
- SAIEE – South Africa Institute of Electrical Engineers

PES – Networking & Dissemination through Meetings ’06-’12

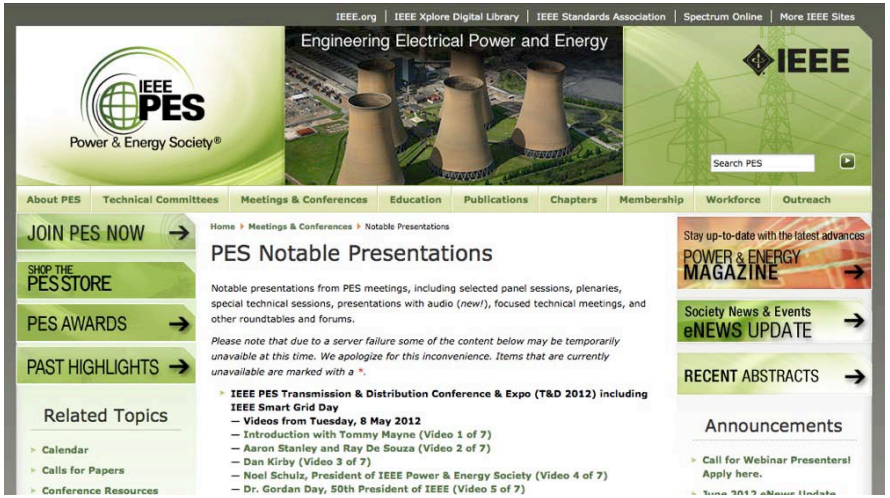
Publications





Education

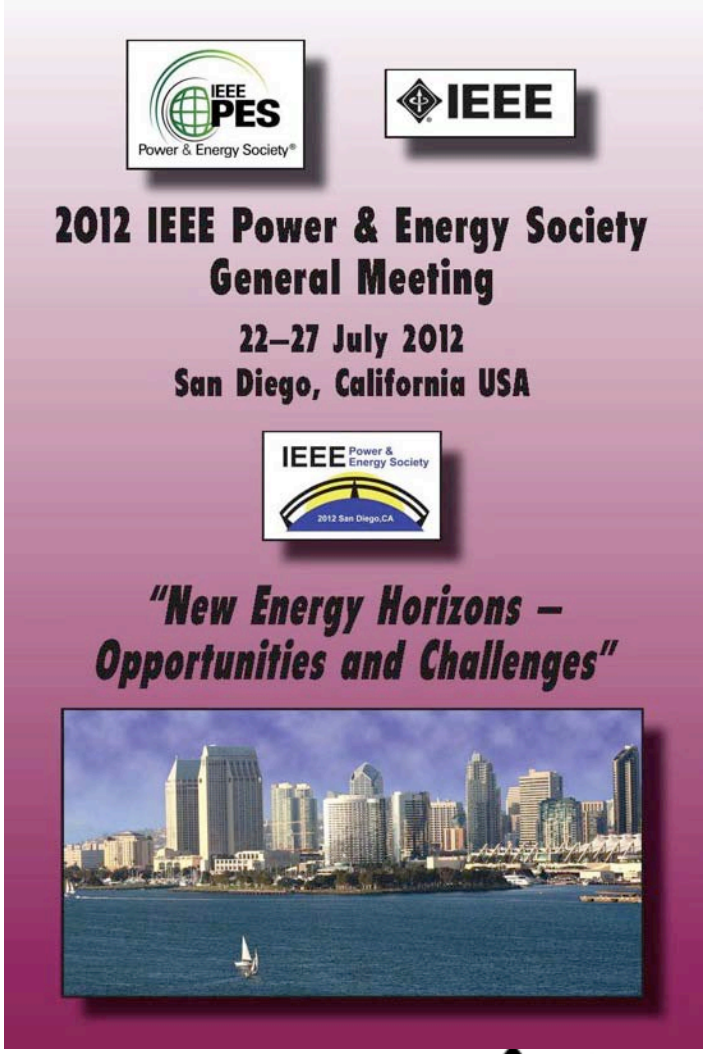
- **Resources**
  - Tutorials
  - E-Learning Module (New Smart Grid units)
  - Plain Talk Courses for Non-Engineering Professionals
  - Videos



Technical Activities

19 Technical Committees and 4 Coordinating Committees Including Intelligent Grid Coordinating Committee

- Reviews for Transactions and GM/T&D Conference Papers
- Panels, Sessions, Subcommittees, Working Groups, Task Forces
- Standards

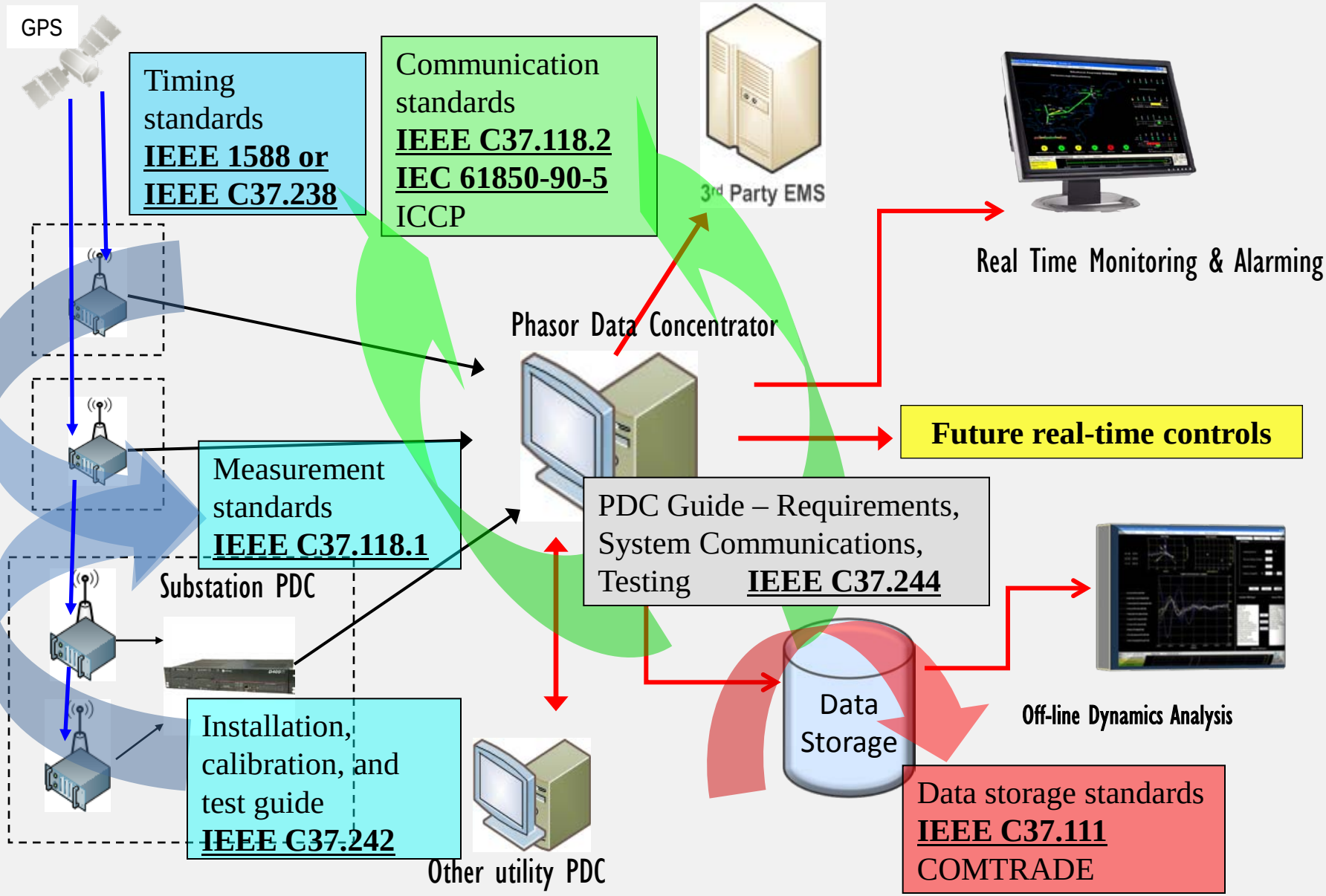


Many Standards and Guides Urgently Needed

- Interoperability among recognized Smart Grid standards
  - E.g. systems that include the use of both IEEE 1815 (DNP3) and IEC 61850 devices / subsystems – huge investments had been made in DNP3 systems and will be made in both DNP3 and 61850 systems in the future
  - Harmonization of IEEE C37.118 and IEC 61850

- Development of new standards / guides
  - Major investment in synchrophasor projects, while standards are still in the development
- Need for guidelines & methodology for AMI meter conformance testing and Cyber security assessment
- Electric vehicles: Assess usage patterns and grid infrastructure impact/needs

Phasor Measurement Systems Standards and Guides



Smart Grid Web Portal

http://smartgrid.ieee.org/

A gateway to IEEE Smart Grid information A few of the features:

- Connections to social media groups
- Smart Grid Videos
- Top articles and auto-import of IEEE IP
- Q&A With Experts
- Content from IEEE Xplore
- Smart Grid “News” and event calendar
- Monthly newsletter

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IEEE

http://electricvehicle.ieee.org/

http://cloudcomputing.ieee.org/

Keep informed and get involved!

Noel's Notes – Update from PES President - IEEE Power and E... http://www.ieee-pes.org/er

Noel's Notes – Update from PES President

Dear PES Members:

Welcome to 2012! I am very excited to have an opportunity to be the PES President for the next two years. It is a great time to be part of the power and energy area. One of my major goals during the next two years is to provide regular communications to PES members about activities of myself, the PES Governing Board and other PES leaders. I will have a monthly article in the e-newsletter to keep you updated on the latest happenings.

We have lots of momentum headed into this new year. I would like to recogniz nd thank Al Rotz for his leadership the last two years 'll continue to rely on Al for his leadership as Im Past President.

Also I would like to acknowledge folks w their Governing Board terms in 2011. Wa

Monthly Update in E-Newsletter

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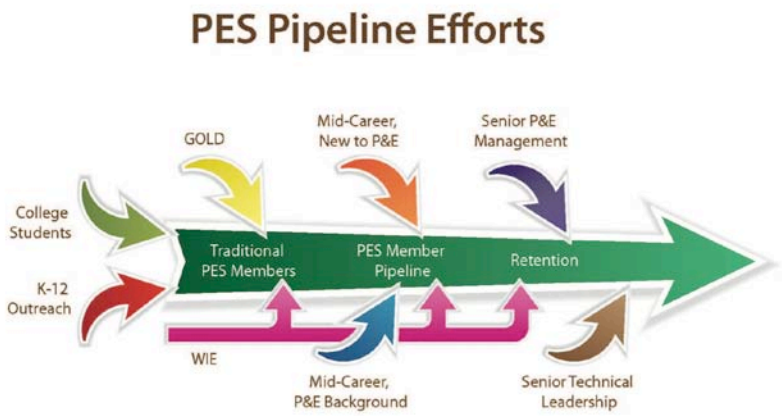
IEEE

Summary

IEEE and PES, through members and volunteers, are working to advance technical knowledge and to provide professional development opportunities at different career levels around the world



U.S. Smart Grid and Distributed Generation

Energy Independence and Security Act of 2007

http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=110_cong_bills&docid=f:h6enr.txt.pdf

TITLE XIII—SMART GRID

- Sec. 1301. Statement of policy on modernization of electricity grid.
- Sec. 1302. Smart grid system report.
- Sec. 1303. Smart grid advisory committee and smart grid task force.
- Sec. 1304. Smart grid technology research, development, and demonstration.
- Sec. 1305. Smart grid interoperability framework.
- Sec. 1306. Federal matching fund for smart grid investment costs.
- Sec. 1307. State consideration of smart grid.
- Sec. 1308. Study of the effect of private wire laws on the development of combined heat and power facilities.
- Sec. 1309. DOE study of security attributes of smart grid systems.

Smart Grid – According to Energy Independence and Security Act of 2007

It is the policy of the United States to support the modernization of the Nation's electricity transmission and distribution system to maintain a reliable and secure electricity infrastructure that can meet future demand growth and to achieve each of the following, which together characterize a Smart Grid:

(1) Increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid.

(2) Dynamic optimization of grid operations and resources, with full cyber-security.

(3) Deployment and integration of distributed resources and generation, including renewable resources.

(4) Development and incorporation of demand response, demand-side resources, and energy-efficiency resources.

(5) Deployment of ''smart'' technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation.

(6) Integration of ''smart'' appliances and consumer devices.

(7) Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.

(8) Provision to consumers of timely information and control options.

(9) Development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid.

(10) Identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

(3) Deployment and integration of distributed resources and generation, including renewable resources.

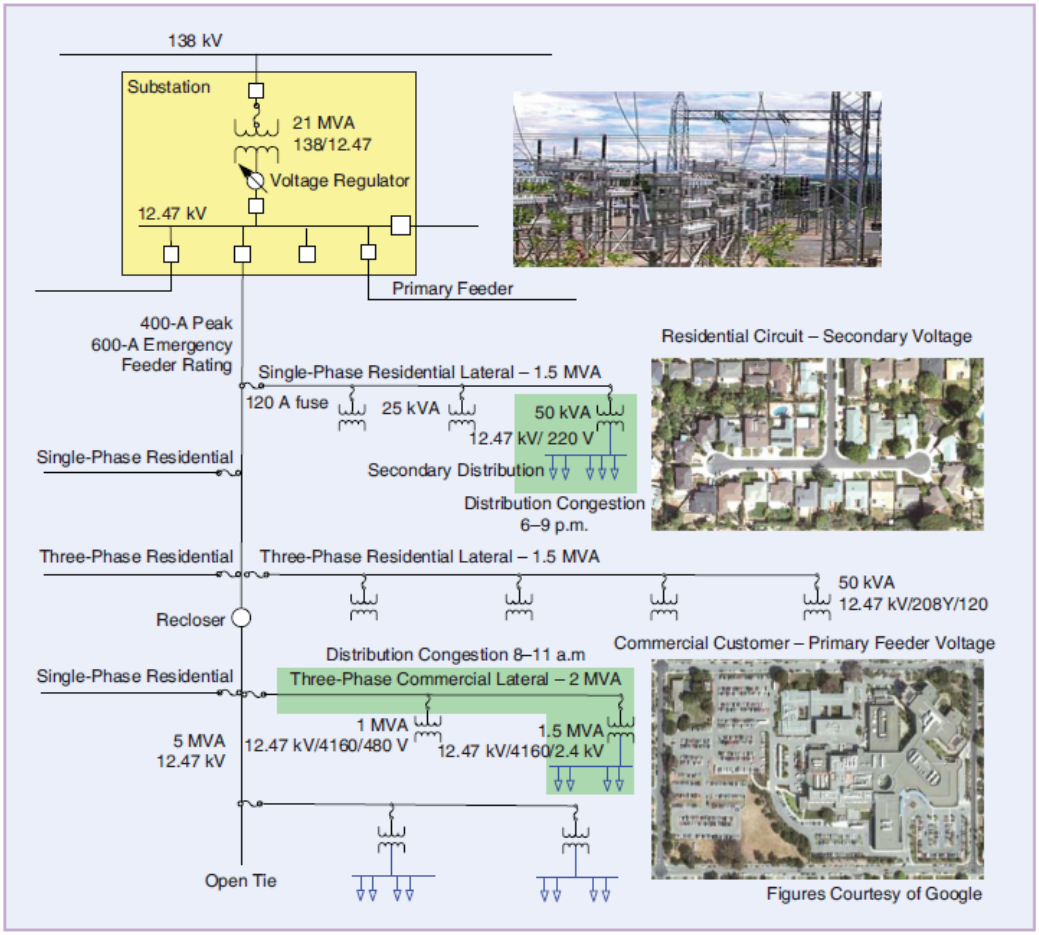
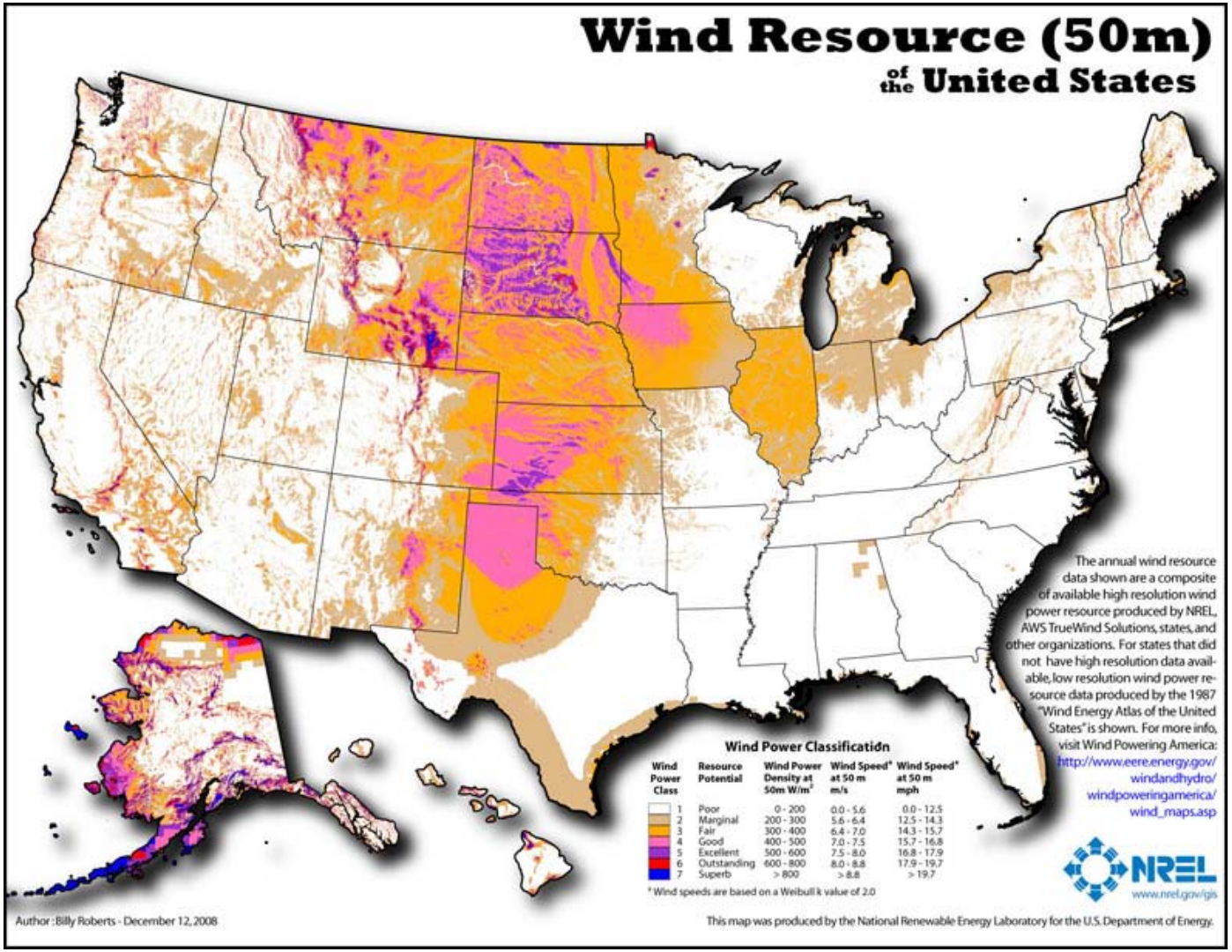
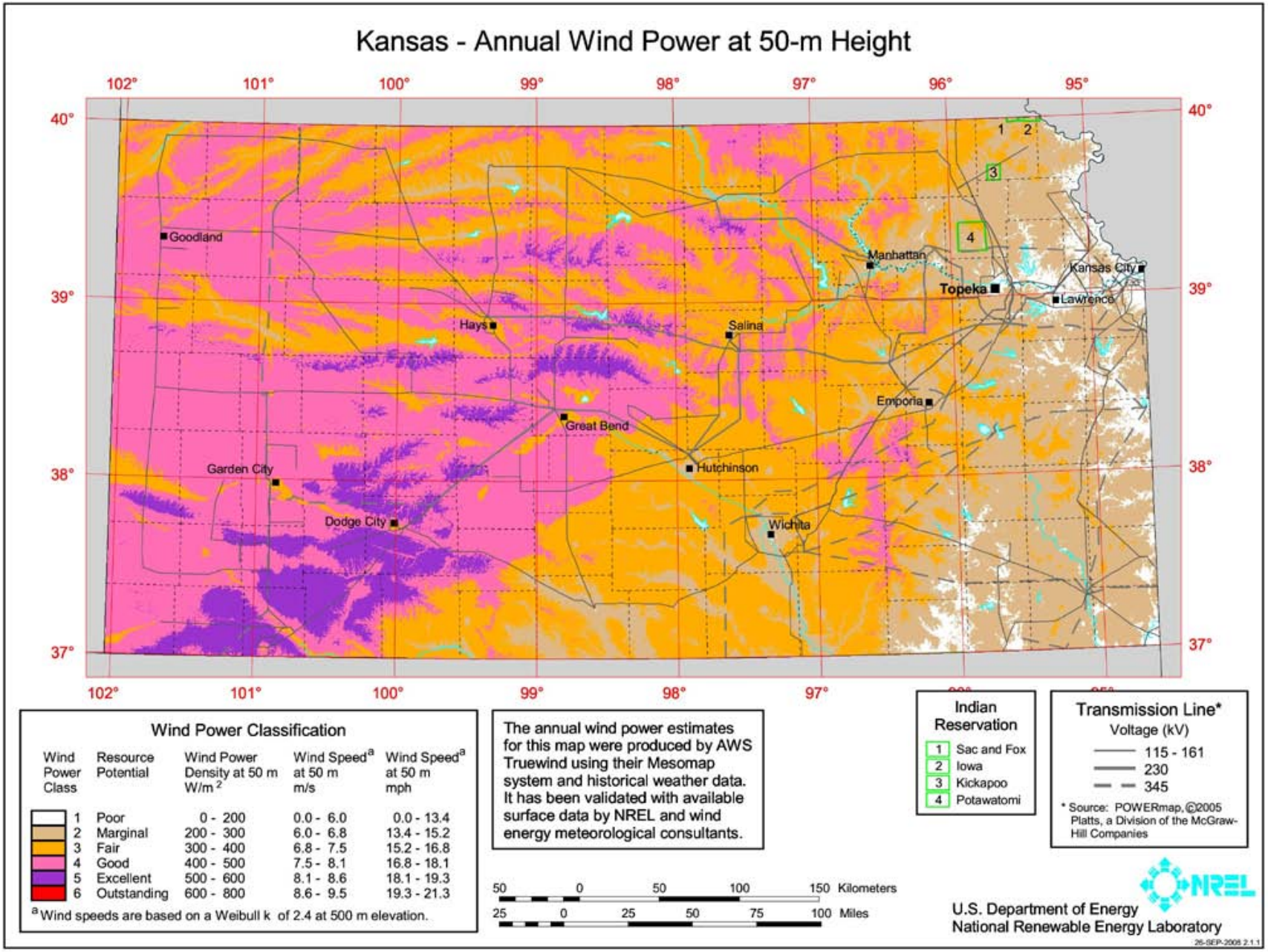


figure 5. A typical radial distribution feeder—potential circuit congestion conditions.


Wind Resource (50m)
of the United States
The annual wind resource data shown are a composite of available high resolution wind power resource produced by NREL, AWS TrueWind Solutions, states, and other organizations. For states that did not have high resolution data available, low resolution wind power resource data produced by the 1987 "Wind Energy Atlas of the United States" is shown. For more info, visit Wind Powering America: http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp
Wind Power Classification
Wind Power Class | Resource Potential | Wind Power Density at 50m W/m² | Wind Speed* at 50 m m/s | Wind Speed* at 50 m mph
1 Poor 0 - 200 0.0 - 5.6 0.0 - 12.5
2 Marginal 200 - 300 5.6 - 6.4 12.5 - 14.3
3 Fair 300 - 400 6.4 - 7.0 14.3 - 15.7
4 Good 400 - 500 7.0 - 7.5 15.7 - 16.8
5 Excellent 500 - 600 7.5 - 8.0 16.8 - 17.9
6 Outstanding 600 - 800 8.0 - 8.8 17.9 - 19.7
7 Superb > 800 > 8.8 > 19.7
* Wind speeds are based on a Weibull k value of 2.0
NREL
www.nrel.gov/gis
Author : Billy Roberts - December 12, 2008
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.



http://www.windpoweringamerica.gov/index.asp

Distributed Generation – New Paradigm – Here to Stay

- Introduction
- Siting and Sizing
- Interconnection Issues (IEEE Standard 1547)
- Modeling Challenges
- Utility Benefits to DG
- Opportunities for Emergency Islanding with DG
- Financial Feasibility and Policies

Distributed Generation

DG is defined as

- Small-scale generation that provides electric power at or near the load site
- Interconnected to the utility distribution system and/or directly to the customer's facilities
- Typically 10MW capacity or less.

Renewable

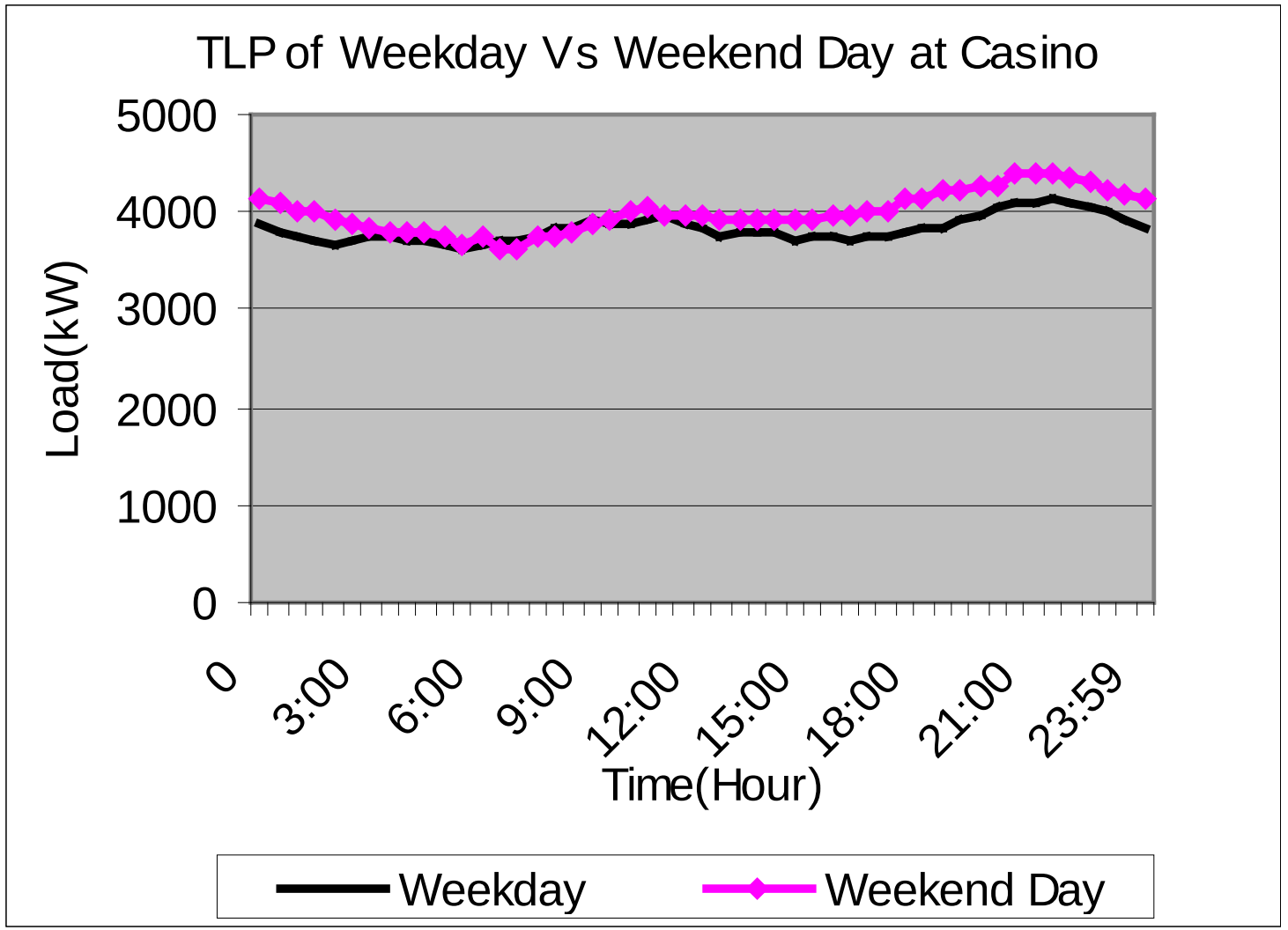
- Solar
- Wind
- Biomass
- Geothermal

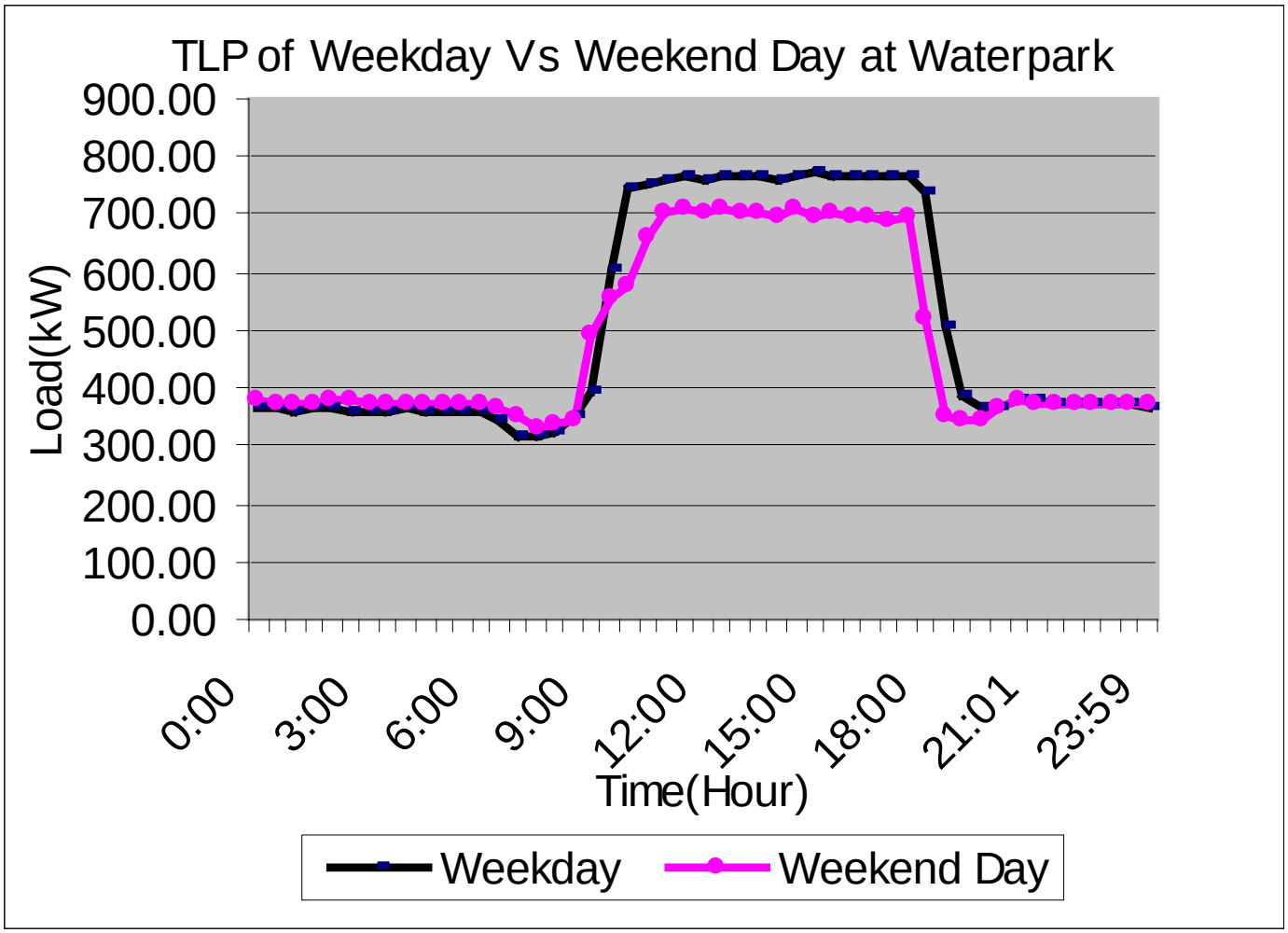
Non-Renewable

- Small Generators (i.e. Natural Gas, Propane, etc)
- Hydro (pumped storage)

Siting and Sizing

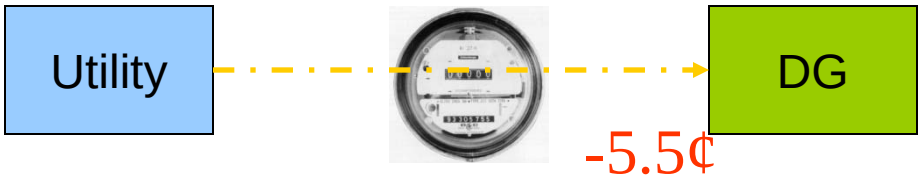
- Flexible Siting
  - Possible Support of the Grid
  - Location where “fuel” is transported for conversion
- Non-Flexible Siting
  - Use fuel as close to origin as possible
  - Smaller farm/business operation
- Sizing
  - Load on Site
  - Available Fuel and DG technology
  - Pricing Structure

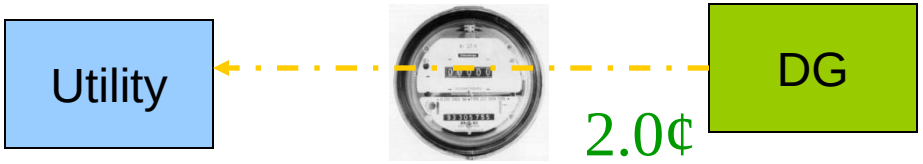

TLP of Weekday Vs Weekend Day at Casino
5000
4000
3000
2000
1000
0
Load(kW)
0
3:00
6:00
9:00
12:00
15:00
18:00
21:00
23:59
Time(Hour)
Weekday
Weekend Day


TLP of Weekday Vs Weekend Day at Waterpark
900.00
800.00
700.00
600.00
500.00
400.00
300.00
200.00
100.00
0.00
Load(kW)
0:00
3:00
6:00
9:00
12:00
15:00
18:00
21:01
23:59
Time(Hour)
Weekday
Weekend Day

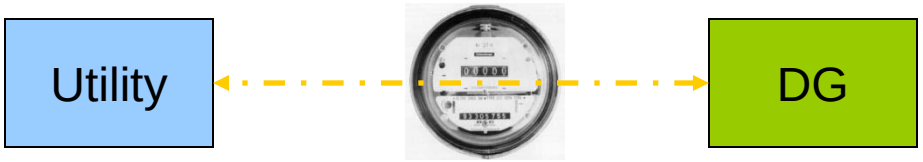
Courtesy of Mississippi Power and Mills Farm

Economics of DG – Vary across US





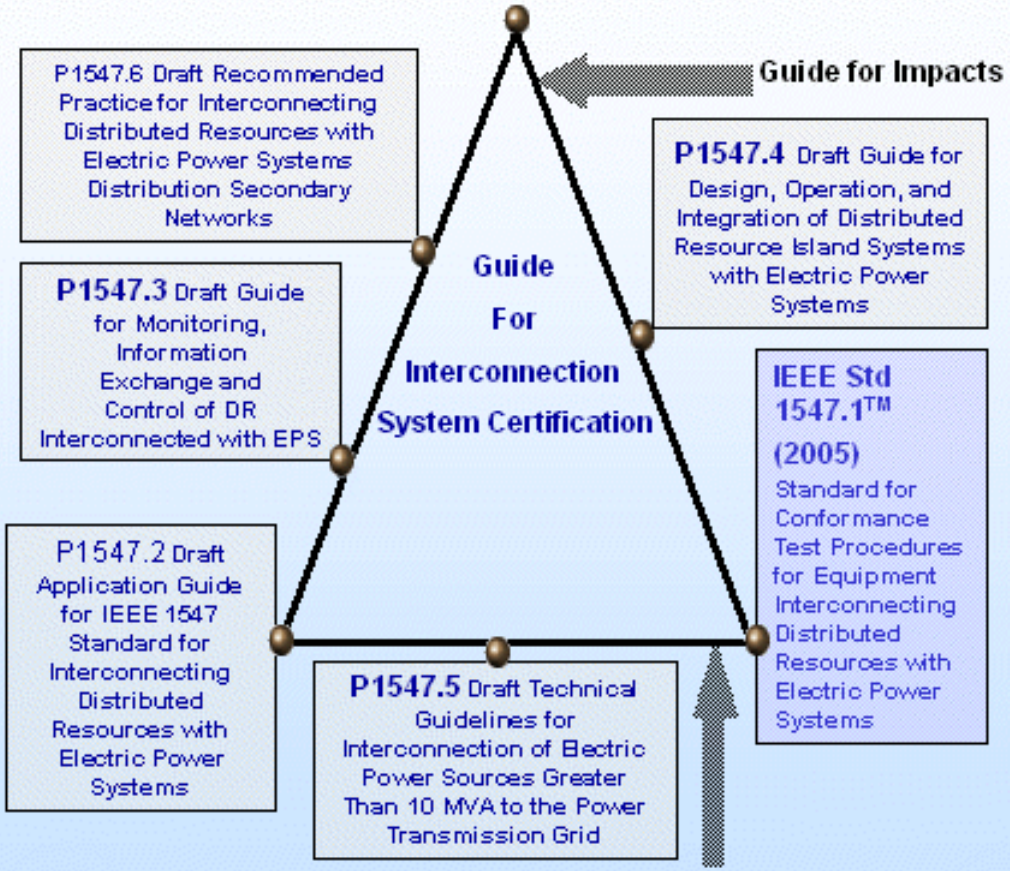
Netmetering



Difference*5.5¢

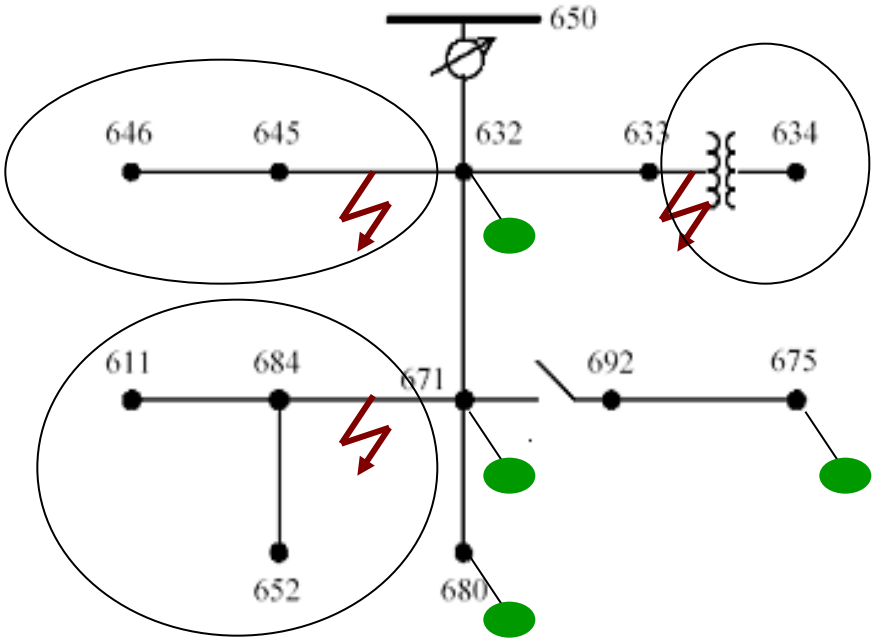
IEEE SCC21 1547 Series of Interconnection Standards

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



(publication year in parentheses; P1547.X are under development; other topics are under consideration by SCC21 work group members)

Key Issues



- Protection of Utility and DG
- Synchronization
- Safety Issues
- Metering
- Modeling

Utility Benefits to DG

- Decreased losses
- Delayed upgrading of infrastructure
- Possible VAR support
- Possible Decrease in Generation Costs
- Emergency Generation and/ or Islanding Capabilities

Some utilities actually talking about doing their own DG

Opportunities for Emergency Islanding with DG

- Reliability expectations are higher and higher
- Natural Disasters create disruptions in infrastructure
  - Tornados
  - Lightning
  - Hurricane Katrina
- Develop a plan for temporary emergency generation to support local pockets until interconnection capabilities available

Financial Feasibility and Policies

- Current paid benefits within some states only avoided costs of generation
- Additional issues with distributors because of sole source agreements
- How to pay for DG to make it beneficial to both parties
- Issues of Net Metering and other payment plans

(7) Deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal-storage air conditioning.

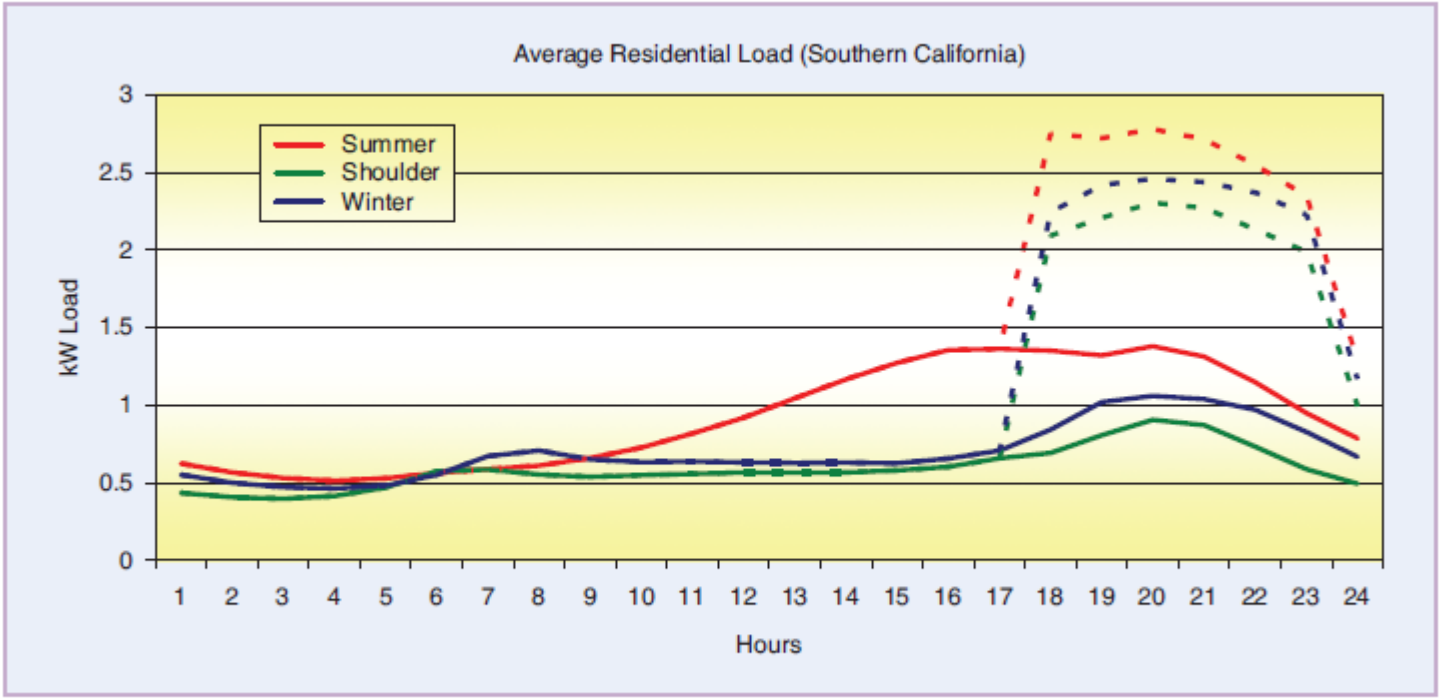


figure 4. Typical residential home load profile in Southern California with superimposed PHEV charging load.

Summary

- Many challenges remain in Smart Grid applications
- Combination of power, controls, communications and computers
- Distributed Generation and Electric Vehicles are here to stay

Thanks for inviting us to talk! Contact me if I can help! Noel Schulz n.schulz@ieee.org