APEC Expert Group on New and Renewable Energy Technologies and US Grid/Renewable Energy Research Programs

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Workshop on Addressing Grid-interconnection Issues in Order to Maximize the Utilization of New and Renewable Energy Resources

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What is APEC?

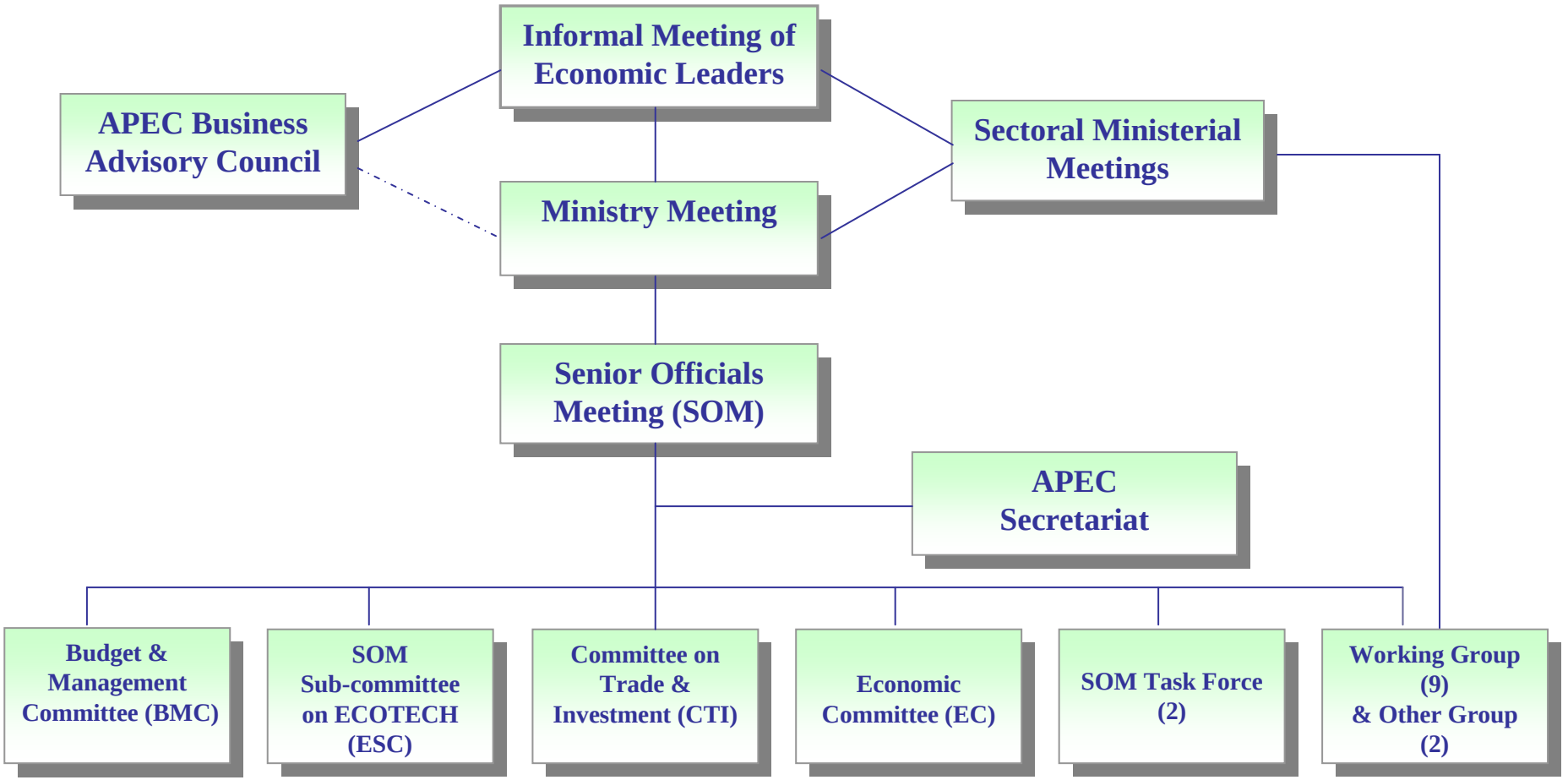
- Asia-Pacific Economic Cooperation (APEC) was created in 1989
- Objective: Promote trade liberalization, trade facilitation and technical assistance
- APEC Economies account for more than one third of the world's population, 60% of world GNP and 50% of world trade
- Implements its activities through 11 working groups including the Energy Working Group

(http://www.apec.org)

APEC Member Economies span the Pacific

- Australia
- Brunei Darussalam
- Canada
- Chile
- Peoples Republic of China
- Hong Kong China
- Indonesia
- Japan
- Republic of Korea
- Malaysia
- Mexico
- New Zealand
- Papua New Guinea
- Peru
- Republic of the Philippines
- Russia
- Singapore
- Chinese Taipei
- Thailand
- United States
- Vietnam

Asia Pacific Economic Cooperation



The eleven APEC working groups support economic and technical cooperation

- Agricultural Technical Cooperation Working Group
- Energy Working Group
- Fisheries Working Group
- Health Working Group
- Human Resources Development Working Group
- Industrial Science and Technology Working Group
- Marine Resource Conservation Working Group
- Small and Medium Enterprises Working Group
- Telecommunications and Information Working Group
- Tourism Working Group
- Transportation Working Group

APEC Energy Working Group (EWG)

- The EWG was launched in 1990
- The EWG seeks to maximize the energy sector's contribution to the region's economic and social well-being, while mitigating the environmental effects of energy supply and use
- Australia was the EWG Lead Shepherd from its inception until 2009. The United States is the current Lead Shepherd
- The Energy Security Initiative (ESI) is the principal mechanism through which the EWG addresses the short and long term energy security challenges in APEC in a sustainable manner
- The APEC Energy Ministers (EMM9) last met in Fukui, Japan in June 2010 under the theme of “Low Carbon Paths to Energy Security—Cooperative Energy Solutions for a Sustainable APEC”

(www.ewg.apec.org)

The Energy Working Group is supported by 7 sub-fora groups

- Expert Group on Clean Fossil Energy (EGCFE) – Chair: USA (www.egcfe.ewg.apec.org)
- Expert Group on Energy Efficiency & Conservation (EGEEC) – Chair: New Zealand (www.egeec.apec.org)
- Expert Group on Energy Data & Analysis (EGEDA) – Chair: Japan (www.ieej.or.jp/egeda/)
- Expert Group on New and Renewable Energy Technologies (EGNRET) – Chair: USA (www.egnret.ewg.apec.org)
- APEC Biofuels Task Force- Chair: USA (www.biofuels.apec.org)
- Asia Pacific Research Center (APERC) (www.ieej.or.jp/aperc/)
- Energy Business Network- Chair: New Zealand (www.ewg.apec.org)

EGNRET's Renewable Energy Activities are Diverse and Complementary

- Lead and work with EWG major initiatives
  - APEC 21st Century Renewable Energy Development Initiative
  - EWG led Energy Security Initiative (2001)
  - Ministerial Level Financing Initiative (2004)
  - Ministerial Level Hydrogen Initiative (2004)
  - Ministerial Level Biofuels Initiative (2006)
- Organize workshops
- Conduct research projects
  - 50 have been completed since 1992
  - 2 are being implemented in 2010-2011

EGNRET Renewables/Grid-Integration Projects

- Using Smart Grids to Enhance Use of Energy Efficiency and Renewable Energy Technologies (EWG 01,2009S) USA
- Addressing Grid Interconnection Issues in Order to Maximize the Utilization of New and Renewable Energy Sources (EWG 02/2009) Japan
- APEC Workshop on Grid Integration of Renewable Energy (USA Self funded, January 12-15, 2009) http://www.sandia.gov/regis/
- 2008 APEC Photovoltaic Conference (EWG Self funded Chinese Taipei, October 7-8, 2008) http://www.apecpv.itri.org.tw

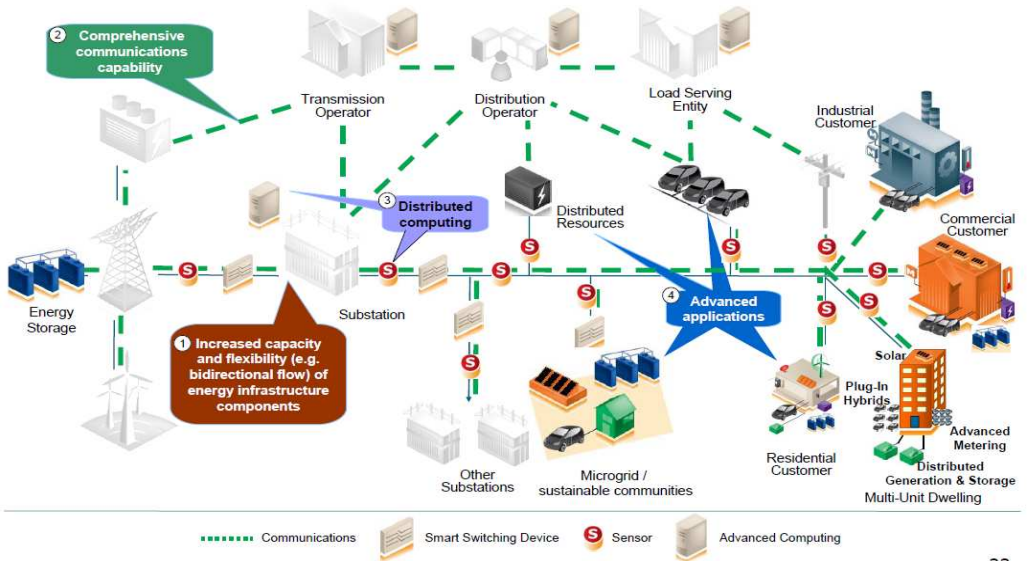
High Penetration Solar Energy Challenges

- For high distributed PV penetration
  - Significant fluctuations in electricity output requires other grid assets to compensate for it
  - Ramping issues (morning and evening) require other generators to ramp up or down
  - Potential issues when feeding electricity back into the grid (circuit breaker protection schemes are designed for uni-directional power flow)
- For solar thermal power plants
  - Operate on the principal of a steam turbine plant
  - No ramping issues because of large thermal storage
  - BUT: significant water requirements for cooling the water/steam medium of steam turbine plant

DOE Programs Addressing High Penetration PV Challenges--Office of Electricity Delivery and Energy Reliability (http://www.oe.energy.gov)

Research and Development

- Base programs that support longer-term technology development for grid modernization
- Four R&D focus areas
  - Clean Energy Transmision and Reliability
  - Distributed Generation/ Smart grid
  - Energy Storage
  - Cyber security for energy delivery systems

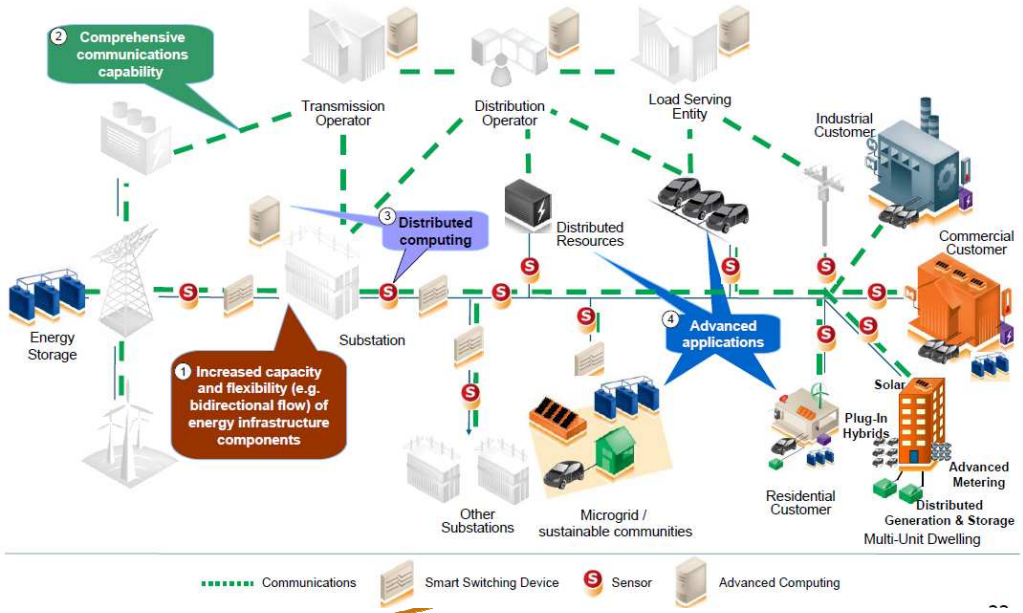


DOE Programs Addressing High Penetration PV Challenges--Office of Energy Efficiency and Renewable Energy (http://www.eere.doe.gov)

Systems Integration

(within Solar Energy Technologies Program)

- Solar Energy Grid Integration systems (SEGIS) to develop inverters/converters with EMS interfaces for integrating solar energy with smart grid applications
- Solar system modeling & benchmarking
- Resource & Safety R&D



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US DOE Smart Grid Information Clearinghouse (http://www.sgiclearinghouse.org/)

Goal is to “make data from smart grid demonstration projects and other sources available to the public”

- Competitive award to Virginia Tech (Lead)/EnerNex/IEEE Team to establish Web-based public info clearinghouse
  - Serving as a central repository for smart grid information, including all Recovery Act smart grid projects
  - Sharing and dissemination of information on knowledge gained, lessons learned, and best practices
  - Supporting decision making by both State/Federal Regulators
- Responded to high priority identified by NARUC/FERC Smart Grid Collaborative & Electricity Advisory Committee
- Clearinghouse User Group comprising key stakeholder groups assembled to guide collaborative development

US DOE Outreach grid integration activities

- **GridWeek 2010**
  - **Washington, DC, October 18-21, 2010**
  - **http://gridweek.com/2010/**
  - **Associated US-EU workshop on Energy Storage**
- **4th International Conference on Integration of Renewable and Distributed Energy Resources**
  - **Albuquerque, New Mexico, December 6-10, 2010**
  - **http://4thintegrationconference.com/**

Thank you for your attention!

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