



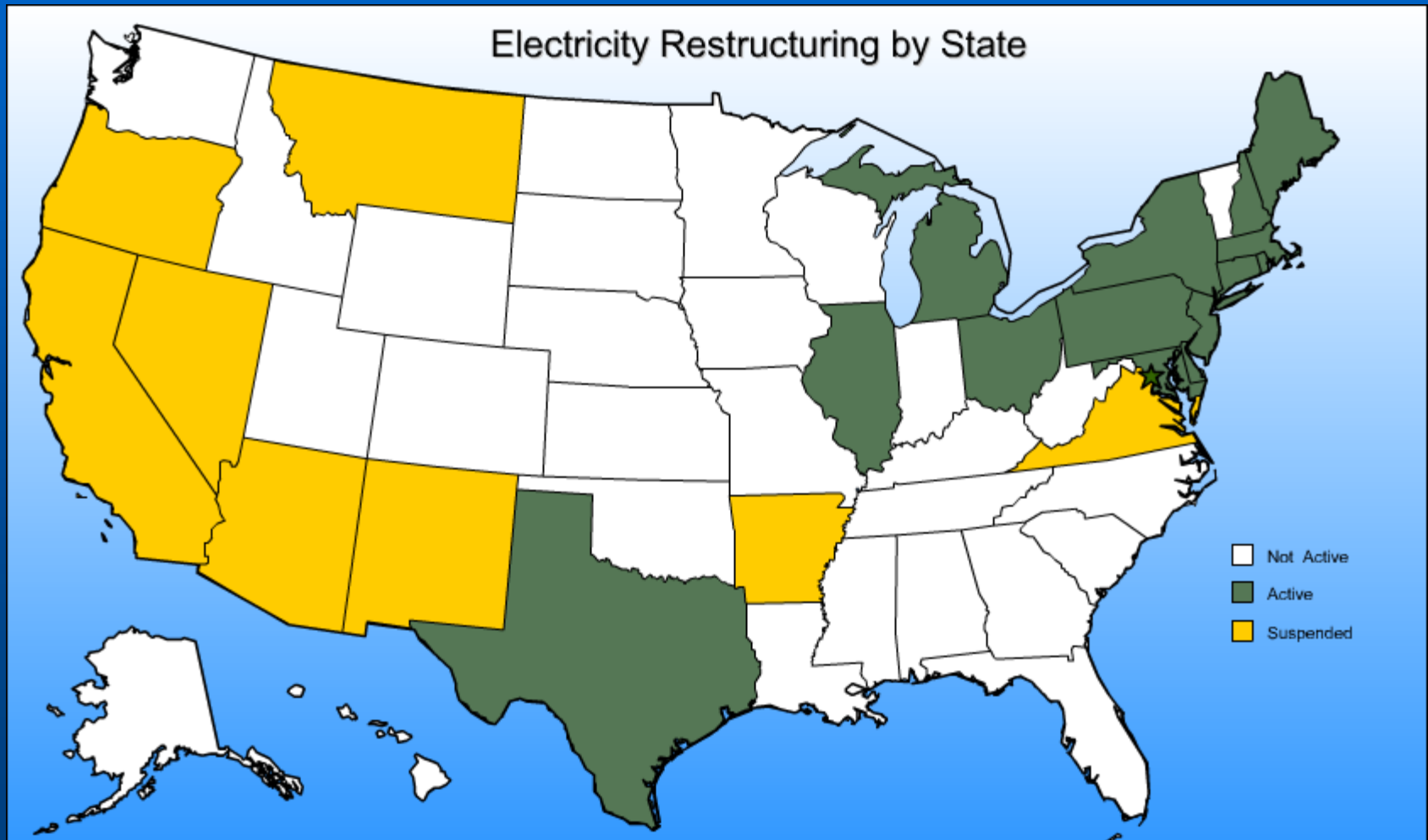
UNIVERSITY OF
MARYLAND

UMD Energy Overview

Joan Kowal
Energy Manager, UMCP
October 1, 2009



Retail Electric Competition



Retail Competition

- **Vertically Integrated Utilities divested their generating stations**
- **Retail Access was established in MD in 2000**
- **As part of deregulation, many state policymakers required that customers' rates be frozen – in most cases below the wholesale cost of power**
- **As rate freezes expired, rates increased to reflect market rates**

The Electric Utility Industry

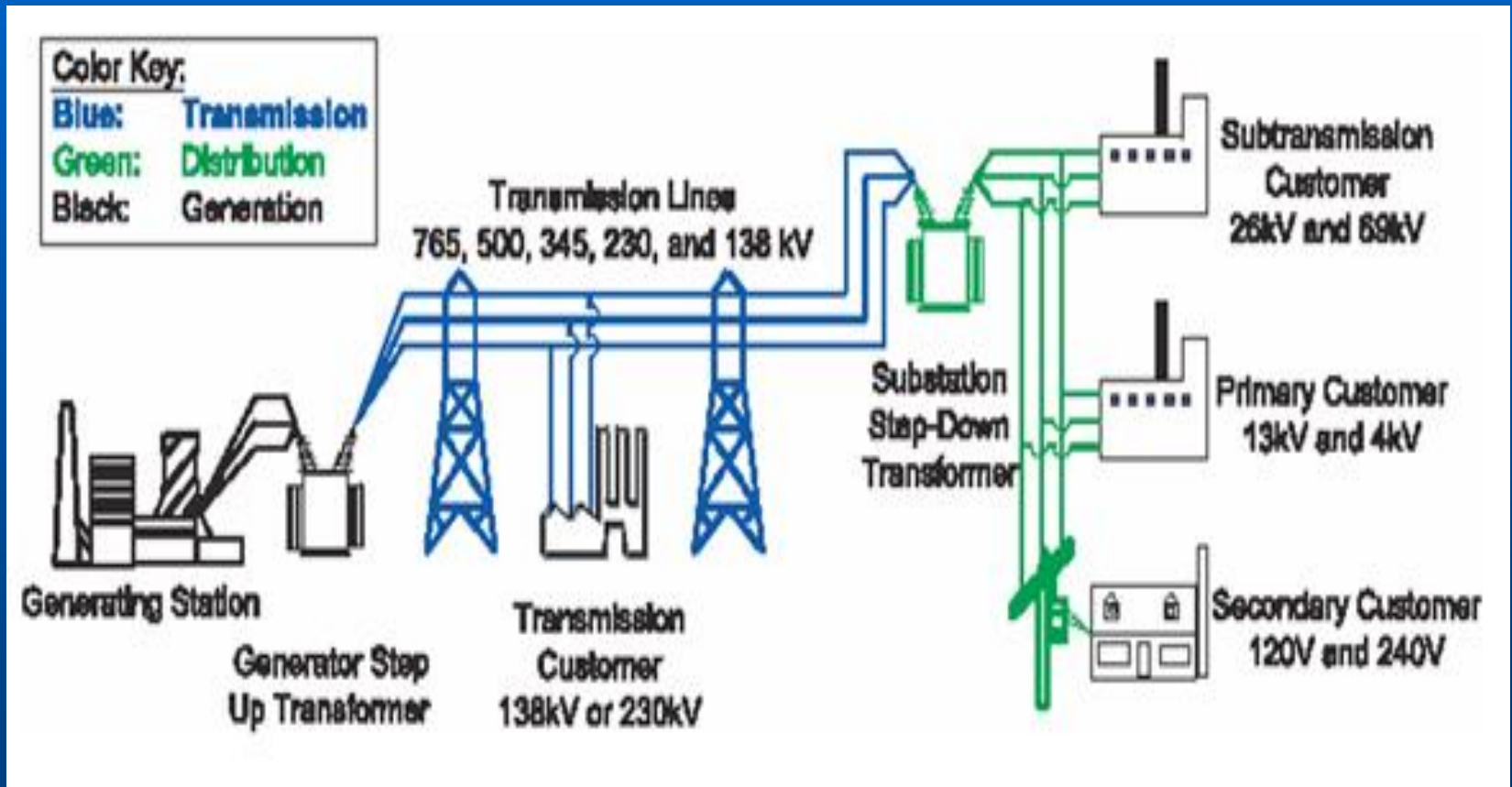
The electric utility industry consists of three functions needed to deliver power to customer loads:

- Generation
- Transmission
- Distribution

It consists of many entities. Most notable are:

- Generators (Fossil, Nuclear, and Renewable)
- Regional Transmission Organizations (PJM)
- Distribution Companies (PEPCO, BGE)
- Load Serving Entities or Supplier (Constellation, Washington Gas Energy Services, Pepco Energy Services)
- Government Regulators (FERC, PSC)
- End-users (UMD, homeowners, retail stores)

Typical Electrical System



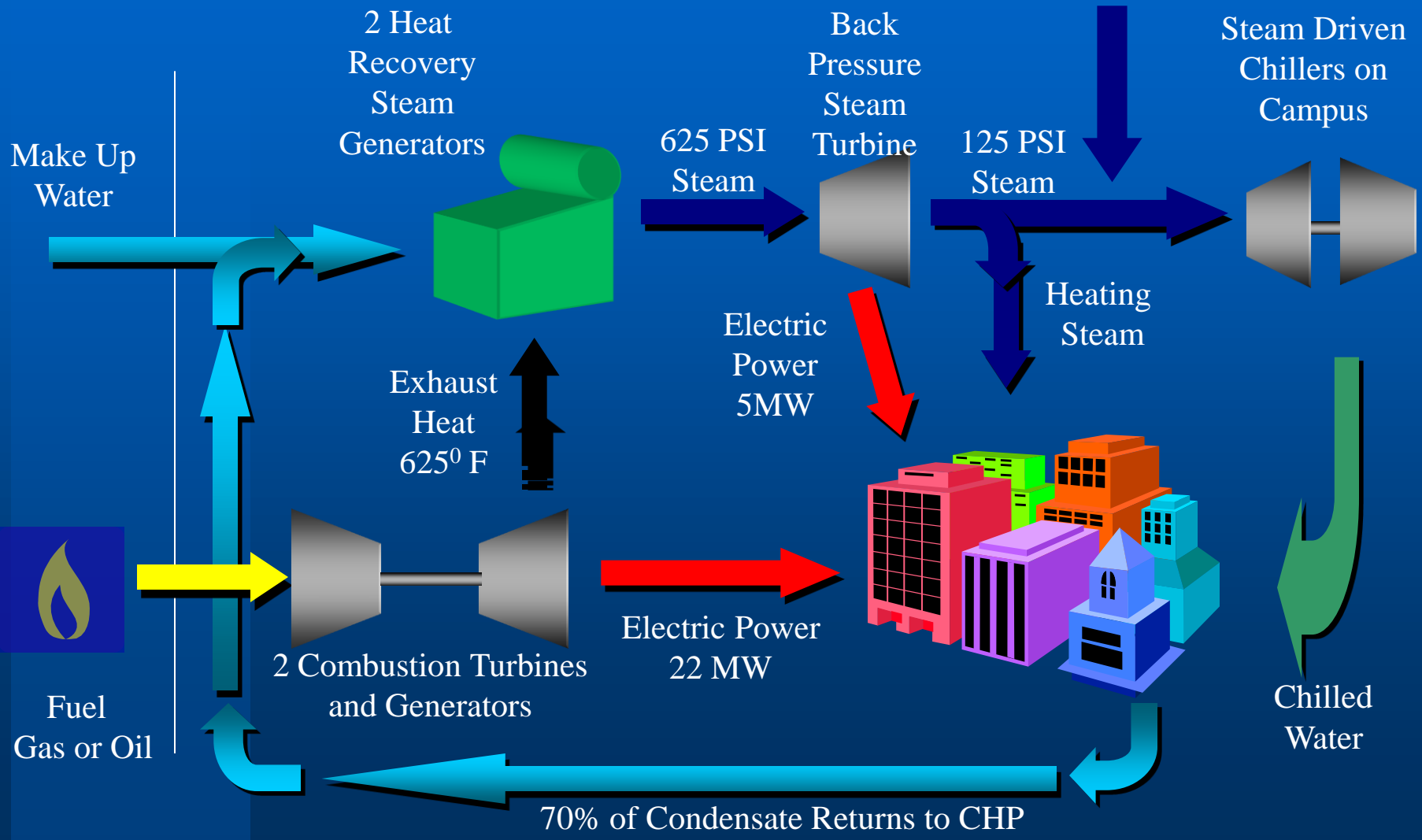
UMD Combined Heat and Power Plant

- **27.5 MW natural gas, CHP plant installed at the College Park Campus**
 - **Doubled steam efficiency from 35% to nearly 70%**
 - **Energy Star award for 2005**
 - **Annual CO2 reductions of 53,000 tons**
 - **Also produces chilled water for air conditioning using steam in summer**

How System Works:

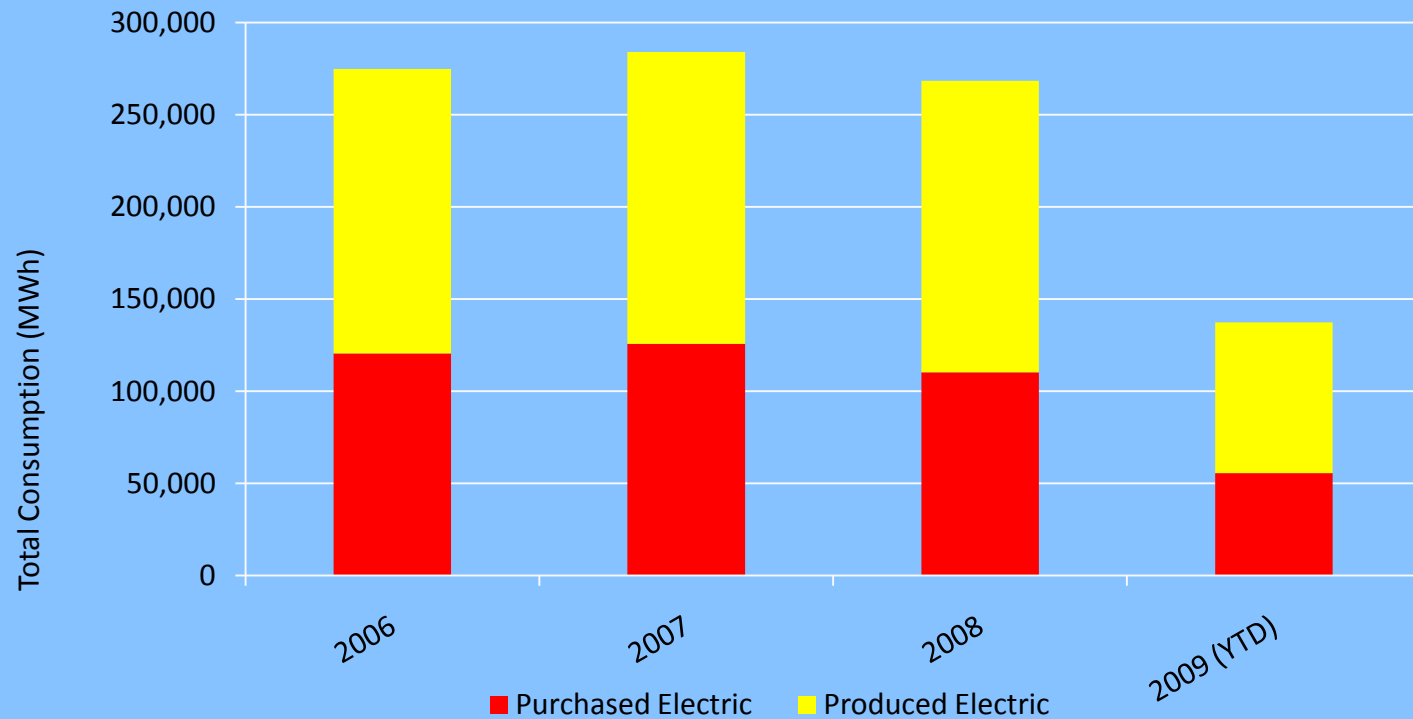


Auxiliary Boilers



Campus Electric Consumption

University of Maryland Electric Consumption
2006 - June 2009



Campus Energy Costs

Historical Energy Spend by Fiscal Year

| Fiscal Year ¹ | Energy Spend (\$M) | | | | | Campus Operating Budget (\$M) | % of Campus Budget |
|--------------------------|--------------------|---------|-------------------|--------------------|--------|-------------------------------|--------------------|
| | Fixed ² | Nat Gas | Elec ³ | Water ⁴ | Total | | |
| 2006 | \$13.4 | \$25.9 | \$8.7 | \$5.0 | \$53.0 | \$1,205.2 | 4.40% |
| 2007 | \$12.4 | \$26.5 | \$8.8 | \$5.0 | \$52.7 | \$1,277.7 | 4.12% |
| 2008 | \$12.5 | \$26.9 | \$14.4 | \$5.3 | \$59.1 | \$1,328.1 | 4.45% |
| 2009 | \$12.3 | \$27.8 | \$14.0 | \$5.4 | \$59.5 | \$1,531.9 | 3.88% |

¹ Each fiscal year runs from 7/1 - 6/30 (i.e. FY 2006 is 7/1/05 - 6/30/06)

² Fixed costs include bond repayment for utility system upgrades and the Combined Heat & Power Plant (CHP). Also included are loan repayments for campus energy efficiency upgrades including lighting retrofits and energy performance contracts.

³ Start of new electric contract in FY 2008; rate increase of approximately 50%

⁴ WSSC began implementing annual rate increases for water in FY 2008

Energy Procurement

- **Electricity**

- **Supplier – WGES**

- **Distribution Company – PEPCO**

- **Contract Structure (main campus)**

- **Block and Index**

- **Fixed Supplier Fee**

- **All other costs are a pass-through**

- **Term is 3 years with two, 1 year options**

Electric Contract (cont'd)

- **Block and Index Contract**

- **Advantages**

- Reduces risk premiums from supplier
 - Allows UMD to reduce costs by reducing load in high priced hours
 - Allows rate to more closely reflect market over term of contract in lieu of locking in fixed-price for entire term on one day

- **Disadvantages**

- Reduced price certainty

Natural Gas Procurement

- **Supplier – Pepco Energy Services**
- **Distribution Company – Washington Gas Light**
- **Contract Structure**
 - **Fixed Price for small accounts**
 - **Block and Index contract for CHP supply**
 - **Large account is interruptible; oil used as back-up fuel**

MD Renewable Energy

- **State has a renewable portfolio standard (RPS) that requires electric suppliers to meet certain standards:**
 - **In 2009, 2.01% from Tier 1 renewable sources (including at least .005% from solar); and 2.5% from Tier 2 resources**
 - **In 2022, 20% from Tier 1 renewable sources (including at least 2% from solar); and 0% from Tier 2 resources**

RPS Definitions – Tier I

- (1) solar;
- (2) wind;
- (3) qualifying biomass;
- (4) methane from the anaerobic decomposition of organic materials in a landfill or wastewater treatment plant;
- (5) geothermal;
- (6) ocean, including energy from waves, tides, currents, and thermal differences;
- (7) a fuel cell that produces electricity from a Tier 1 renewable source under item (3) or (4) of this subsection;
- (8) a small hydroelectric power plant of less than 30 megawatts in capacity that is licensed or exempt from licensing by the Federal Energy Regulatory Commission; and
- (9) poultry litter-to-energy.

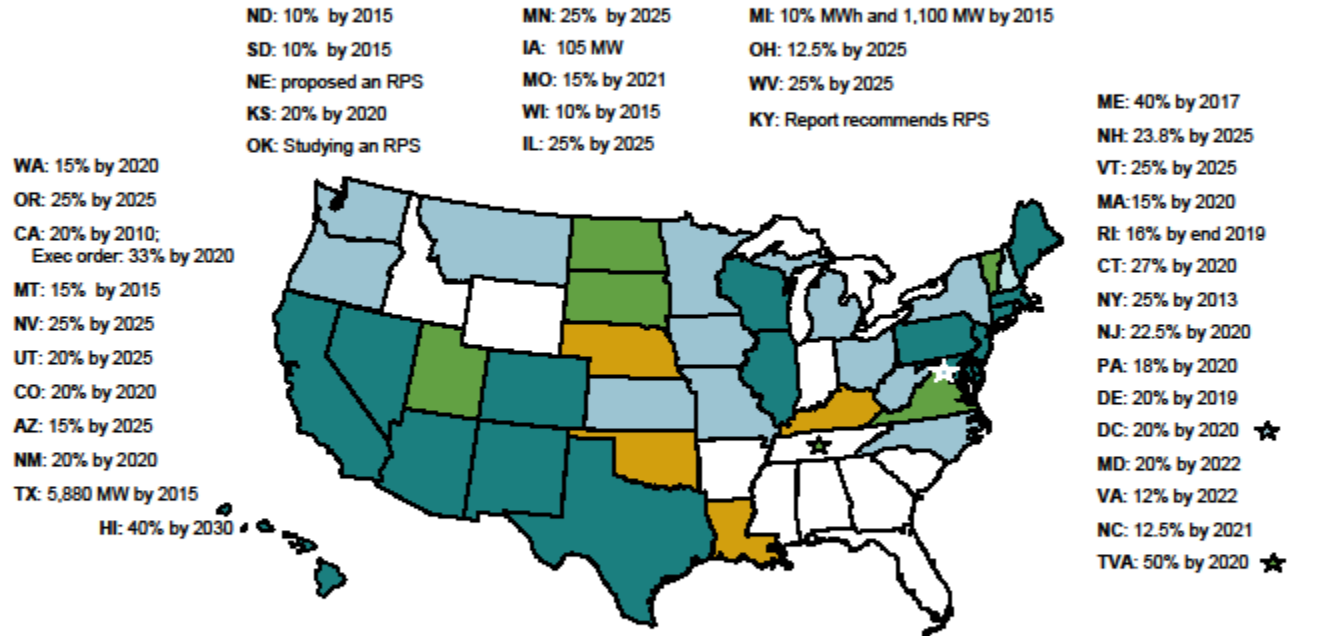
RPS Definitions – Tier II

- (1) hydroelectric power other than pump storage generation; and
- (2) waste-to-energy.

Renewable Power & Energy Efficiency Market: Renewable Portfolio Standards

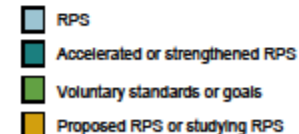
Federal Energy Regulatory Commission • Market Oversight @ FERC.gov

31 States including D.C. have Renewable Energy Portfolio Standards (RPS)



Updates at: <http://www.ferc.gov/market-oversight/mkt-electric/overview/elec-ovr-rps.pdf>

Notes: An RPS requires a percent of an electric provider's energy sales (MWh) or installed capacity (MW) to come from renewable resources. Most specify sales (MWh). Map percents are final years' targets. *TVA's goal is not state policy; it calls for 50% zero- or low-carbon generation by 2020. Alaska has no RPS.
Sources: Derived from data in: LBNL, *RPS in the U.S. through 2007* (4/08), PUCs, State legislative tracking services, Pew Center, and the Union of Concerned Scientists. Details, including timelines, are in the Database of State Incentives for Renewables and Energy Efficiency: <http://www.dsireusa.org>



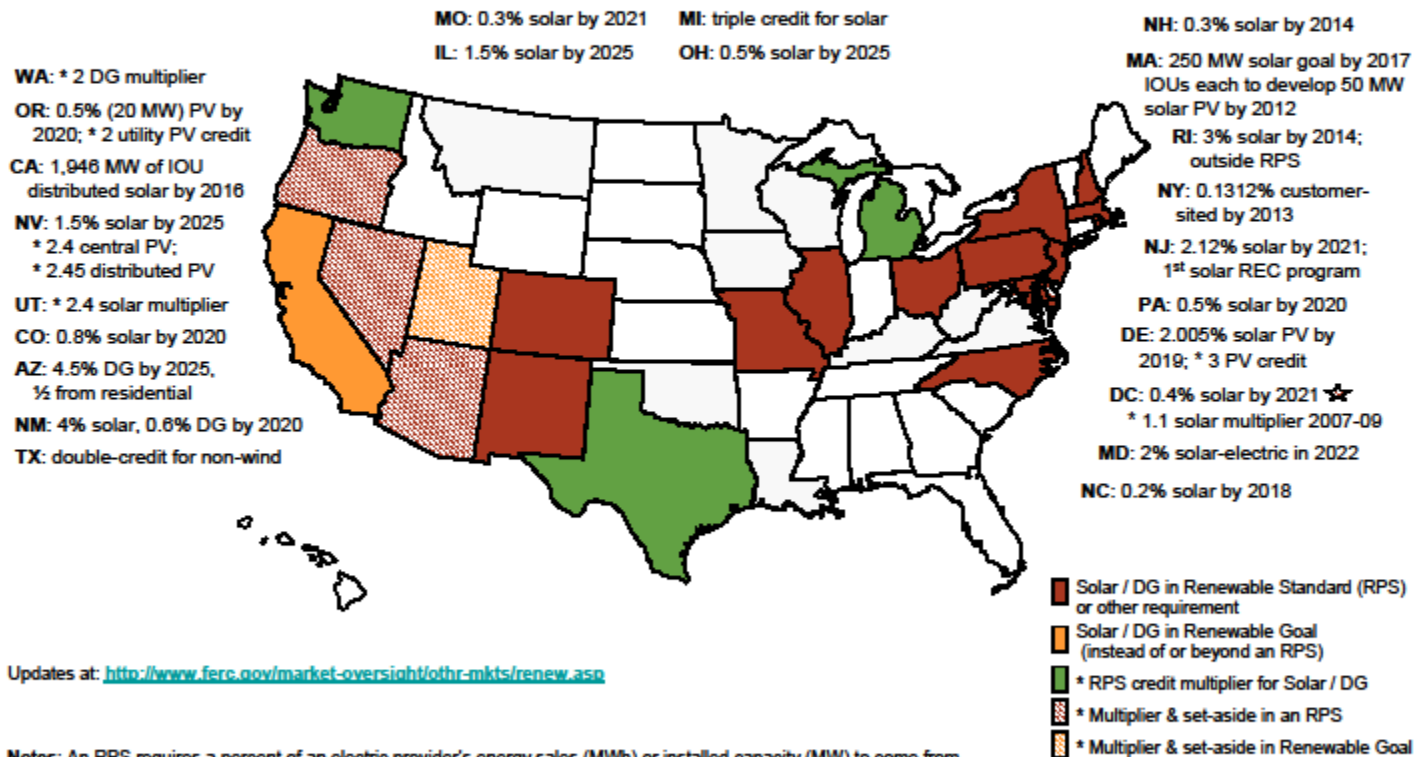
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Renewable Power & Energy Efficiency Market: Solar and Distributed Generation RPS

Federal Energy Regulatory Commission • Market Oversight @ FERC.gov

16 States and D.C. have Solar or Distributed Generation RPS Provisions



Updates at: <http://www.ferc.gov/market-oversight/ofhr-mkts/renew.asp>

Notes: An RPS requires a percent of an electric provider's energy sales (MWh) or installed capacity (MW) to come from renewable resources. (*) Multipliers receive extra credit towards RPS compliance.
 Abbreviations: DG – Distributed Generation; PV – solar photo-voltaic; RPS – Renewable Portfolio Standard
 Sources: Derived from data in: LBNL, *RPS in the U.S. through 2007* (4/08), PUCs, and the Database of State Incentives for Renewables and Energy Efficiency: <http://www.dsireusa.org>

Updated September 3, 2009 34003

On-site Renewable Energy

- **Coordinating with State to promote applications on state property**
- **Structure third party installations as a power purchase agreement; allows use of tax credits by vendor**
- **Evaluating applicability in all new building designs**

On-site Renewable Energy

- Solar hot water heating system to be installed at Ellicott Dining Hall
- Solar photovoltaic at Cole Field House – 5.25 kW
- Anemometer installed at Hagerstown Dorm
- Design study of geothermal for new Physical Sciences building

Off-Site Clean Energy

- Pursuit of a long term power purchase agreement
- Aggregation of University System of Maryland Institutions with state and local agencies
- Procurement from several projects to diversify risk



Lighting:

- **Currently, most lighting is not remotely controlled;**
 - we need assistance from the campus to turn off classroom and office lights
- **Renovations taking place to allow for remote control in the hallways and public areas;**
- **Lighting levels reduced by almost 50-75%**
- **Occupancy sensors added where feasible**

Energy Demand Management

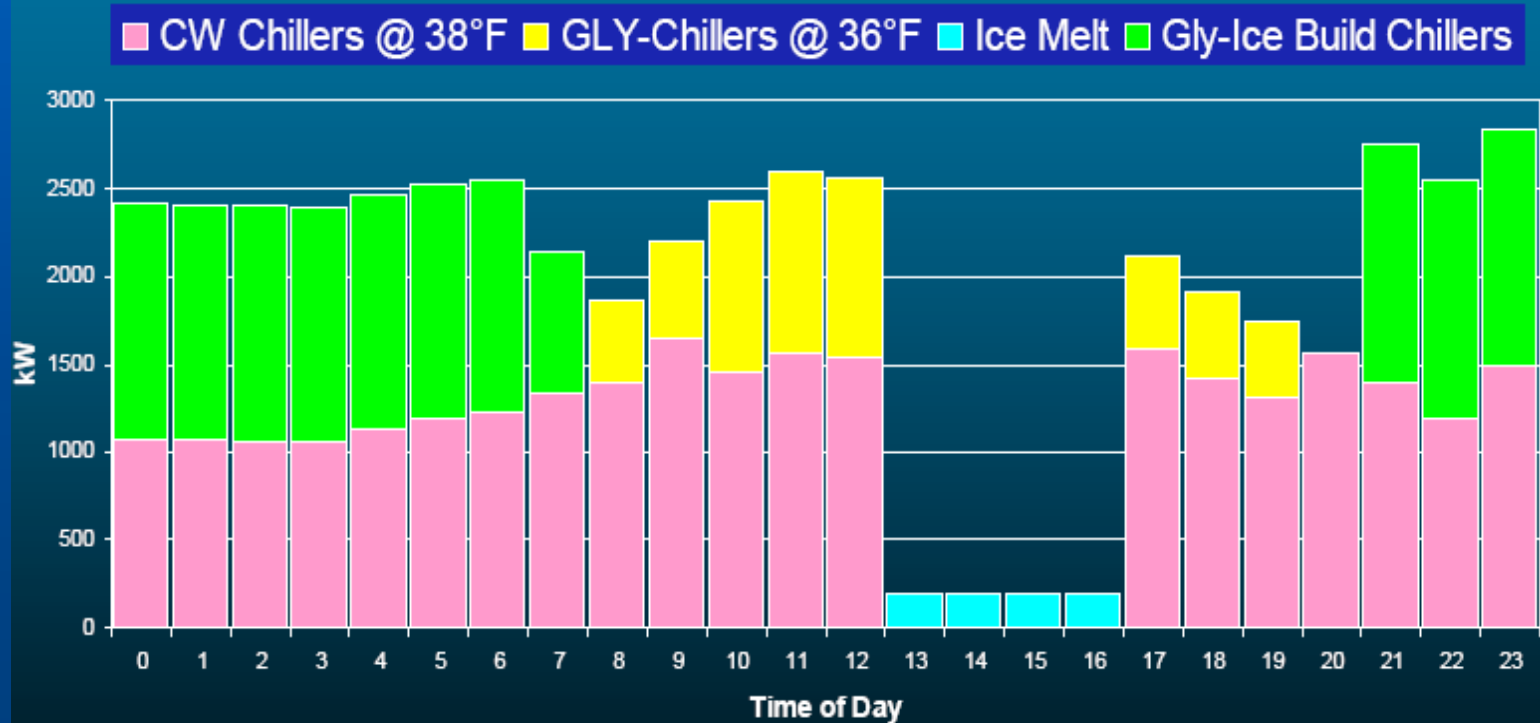
- **Demand Response (DR)**

- Load reduction paid equivalent to generation
- Integrate energy data and building controls to reduce demand in high cost hours
 - Dimming of lights
 - Temperature setbacks
 - Dispatch of thermal ice storage
- Occupant participation is essential

Demand Response

Full Storage – Peak Day (kW)

Full Storage - PJM-PLC-Four (4) Hours



Building Temperature Controls

- The campus utilizes Satellite Central Utility Buildings (SCUBS) to produce chilled water and heating water for a number of connected buildings.



Energy Software



- **Capability to track and trend energy use at the building and sub-meter level**
- **15-minute interval data for electricity; hourly data for water and steam**
- **Goal is to integrate building automation system data with energy data**
- **Campus has ability to trend usage through web access**

References

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- <http://www.ferc.gov/>
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- <http://www.chpcenterma.org/>
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