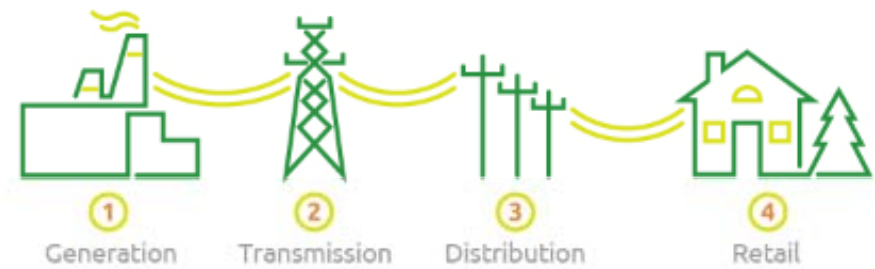


Distributed Resource Planning

U.S. Energy System

- Traditional vertically integrated
- Restructured
 - 1990s until Enron Bankruptcy
 - 17 states and District of Columbia
- 33 states still with investor-owned vertically integrated utilities



Planning for future generation needs

- Vertically integrated utilities
- ‘Least cost planning’
- Almost all production from large central power stations at the time
- Designed to help assure neither too many or too few power plants were built
- Restructured states—the market drives new facilities

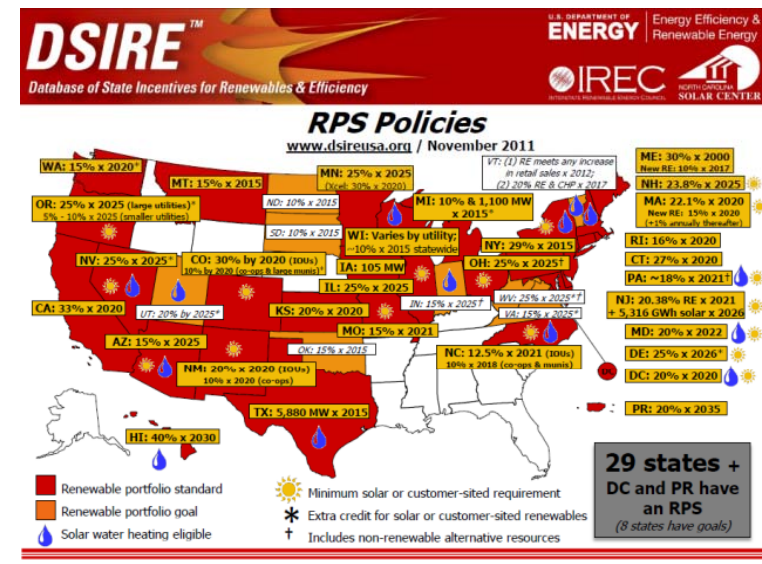


Rapid Expansion of Distributed Resources



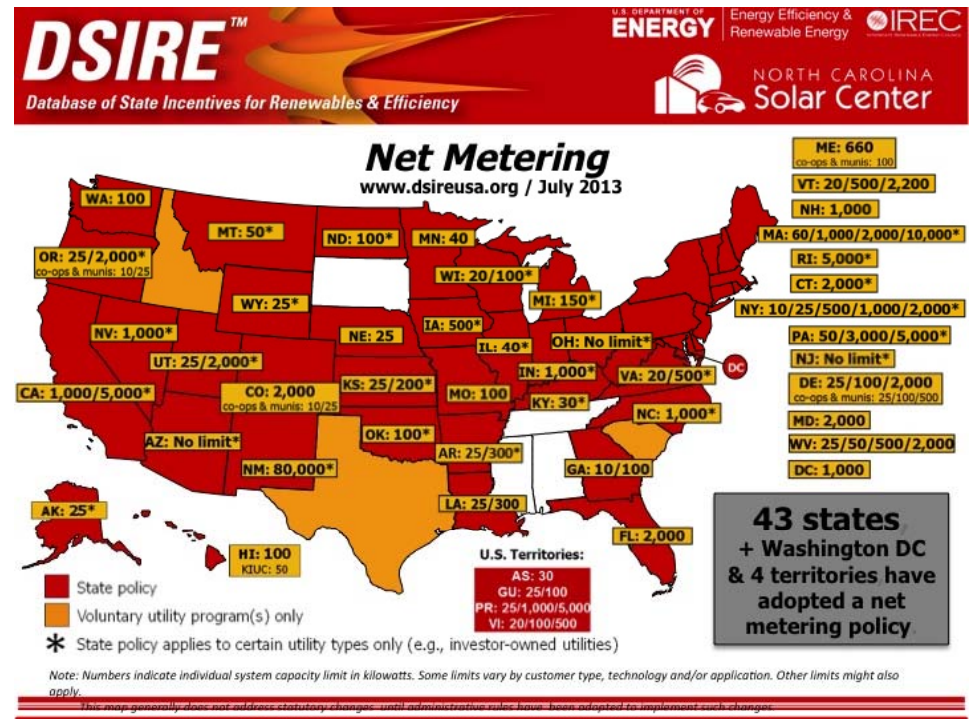
Government support

- Renewable Portfolio Standards
- Requires utilities to utilize a minimum level of renewable energy
- Many in the 20% range but some as high as 50%



Government support

- Net Metering
- Requires utilities to buy excess energy from small generators including households, often at retail prices

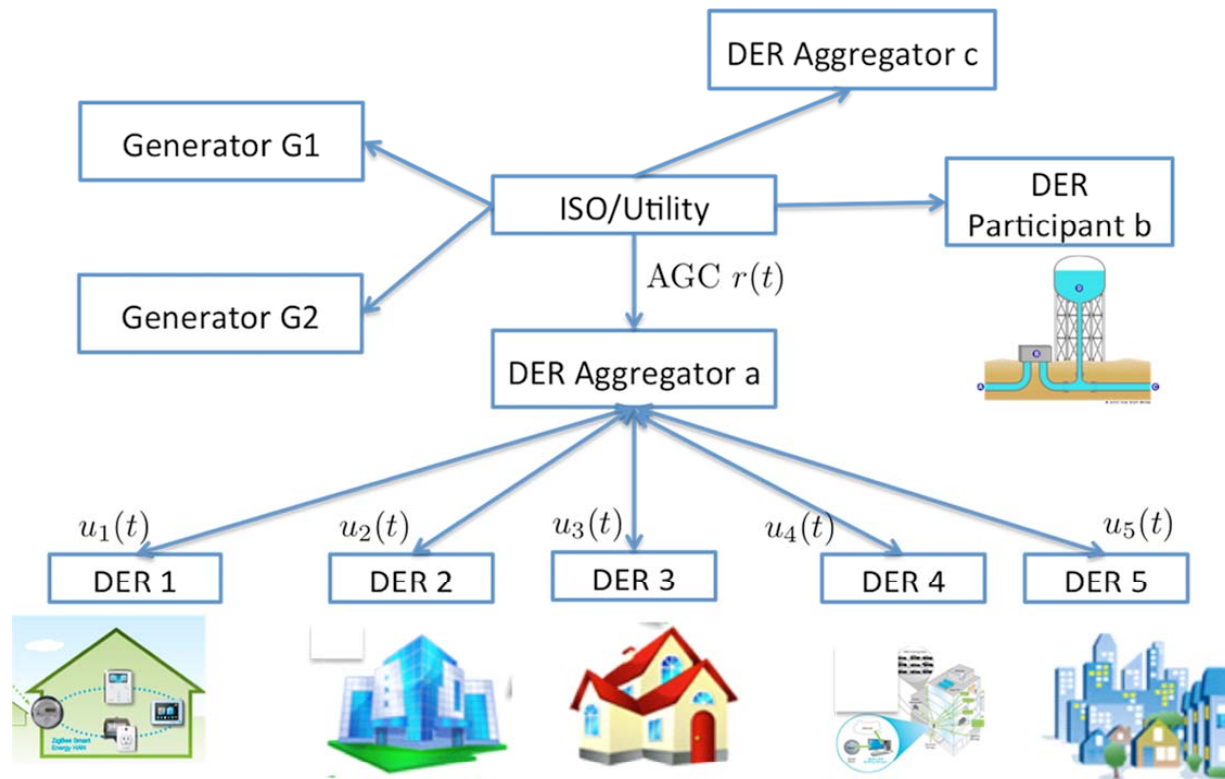


Government Incentives

- Federal production tax credit
- State tax rebates
- Local government property tax exemption or other incentives
- Utility incentives



Rapid Expansion of Distribution Edge Resources



Distribution Edge Resources

- Distributed solar
 - Residential solar
 - Commercial/industrial/governmental solar
 - Community solar



Distribution Edge Resources

- Distributed wind



- Combined heat and power (CHP)/fuel cells



- Methane Digesters



Distribution Edge Resources

- Battery storage
 - Distributed commercial battery storage

- Electric vehicles



Distribution Edge Resources

- Microgrids



- Demand response



Distribution Edge Resources

- Energy efficiency



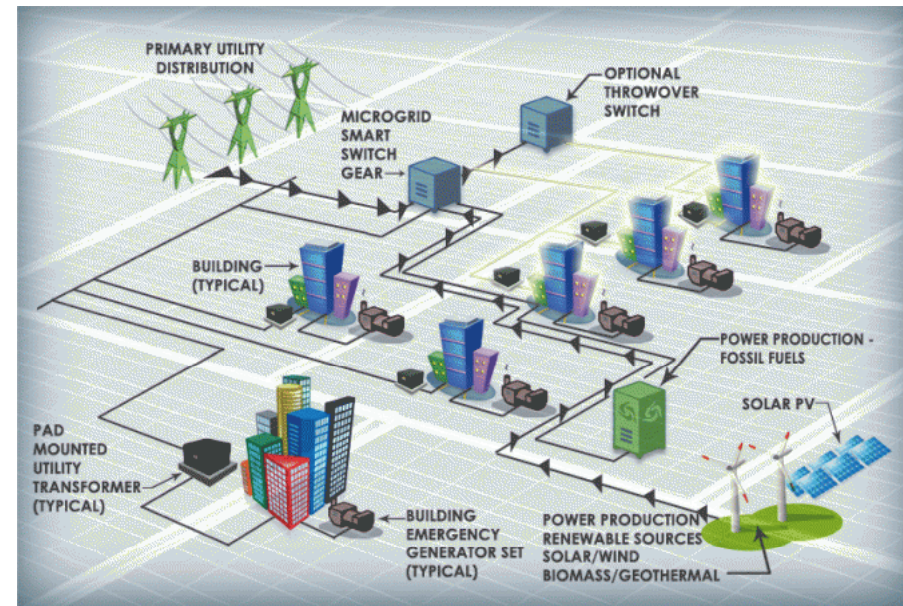
Distributed Resource Planning

- Expand the stakeholders at the table
- Consider costs imposed on utilities to maintain the network
- Consider costs shifted to other consumers



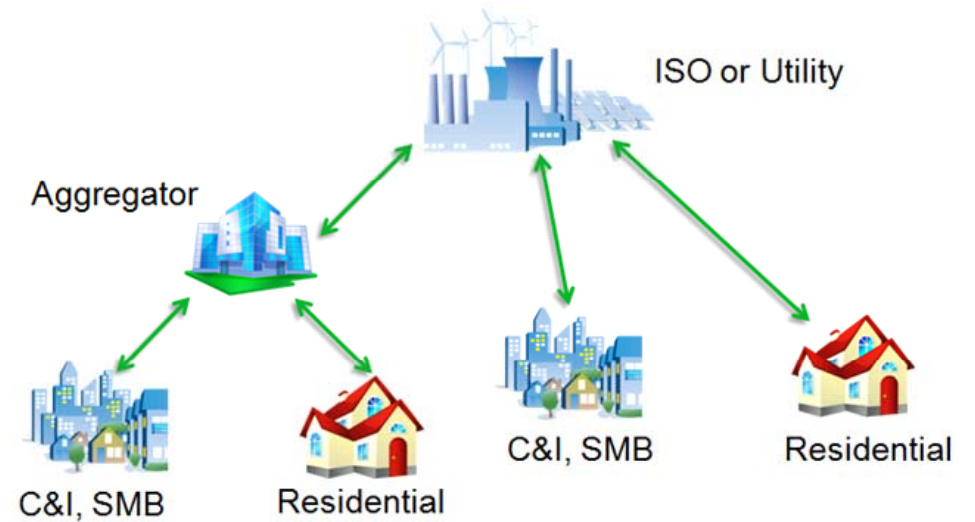
Distributed Resource Planning

- Critical importance of location
- Information is key
- New forms of compensation/incentives for optimal location



Distributed Resource Planning

- Includes impact of demand response and energy efficiency



Adoption of DRP

