



# **NETL**

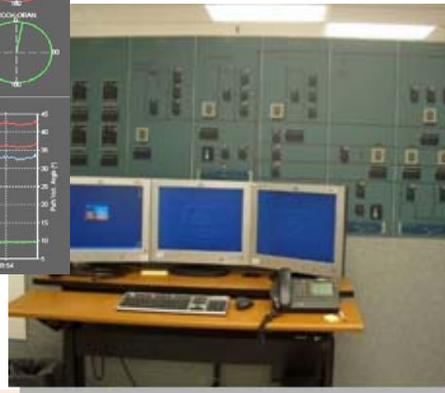
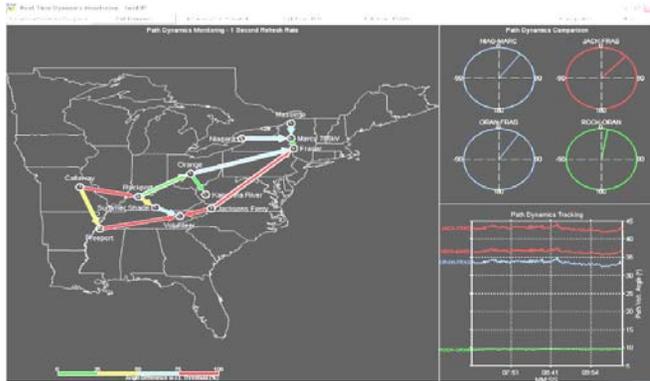
## **Project Management Center**

Charles Zeh, Director  
Project Management Center



# NETL Supports Non-Fossil Infrastructure and Energy Activities

**Energy Efficiency & Renewable Energy**  
Vehicle Technologies  
Building Technologies  
Industrial Technologies  
Weatherization & State Energy Programs



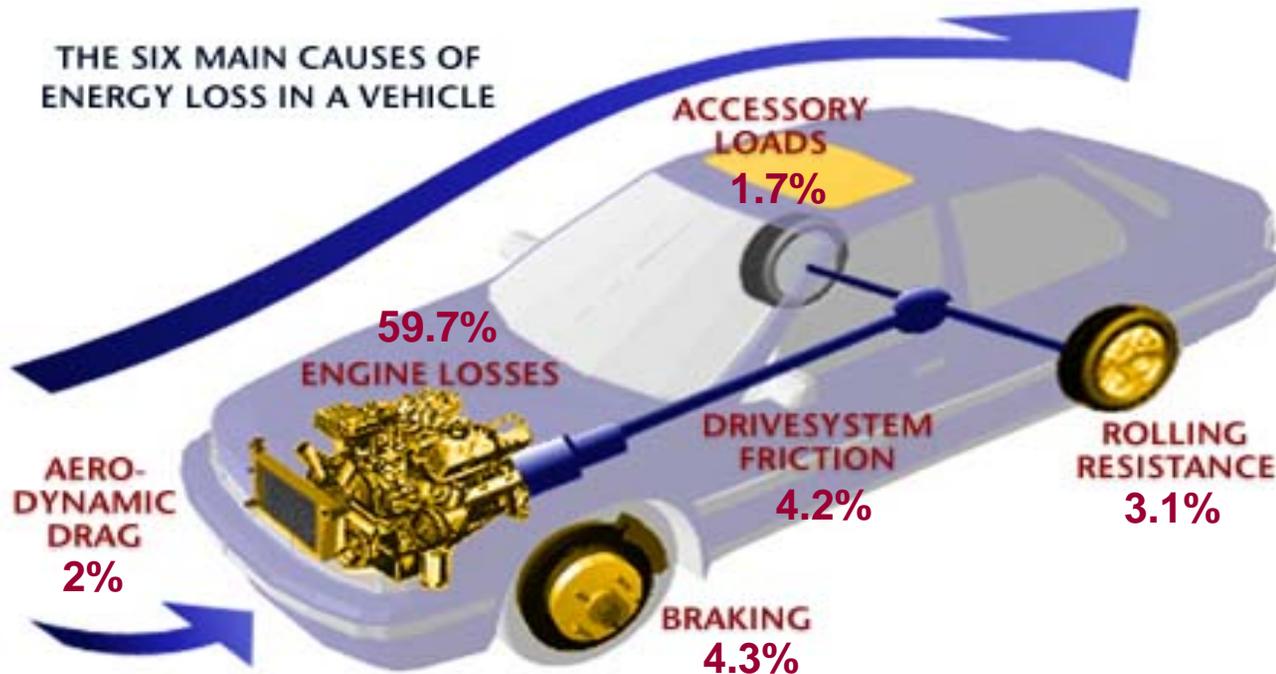
## Electricity Delivery & Energy Reliability

Grid Modernization  
Reliable & Secure Energy Supplies  
Disaster Response



# The Vehicles Challenge

*75% of the energy in every gallon is lost!*



**Hybridization and Advanced Combustion Research Address the Top Losses**

# Vehicle Technologies

*Accelerating Results that Make a Difference*

## **Vehicle Systems**

- Aerodynamics
- Rolling resistance
- Accessory loads
- Systems analysis and target setting



## **Hybrid Propulsion**

- Hybrid electric systems
- Power electronics
- Advanced batteries
- Inverters/Controllers
- Motors

## **Advanced Combustion Engines**

- Low temperature combustion R&D
- Emissions controls
- Light- and heavy-duty engines
- Waste heat recovery
- Health impacts

## **Fuels Technologies**

- Bio-based fuels
- HCCI fuel
- Characteristics
- Fischer-Tropsch fuels and blendstocks
- Advanced lubricants

## **Tech Introduction**

- EPA Act
- Legislative and rulemaking
- Clean Cities
- Validation
- Student competitions
- Graduate Automotive Technology Education

## **Materials Technology**

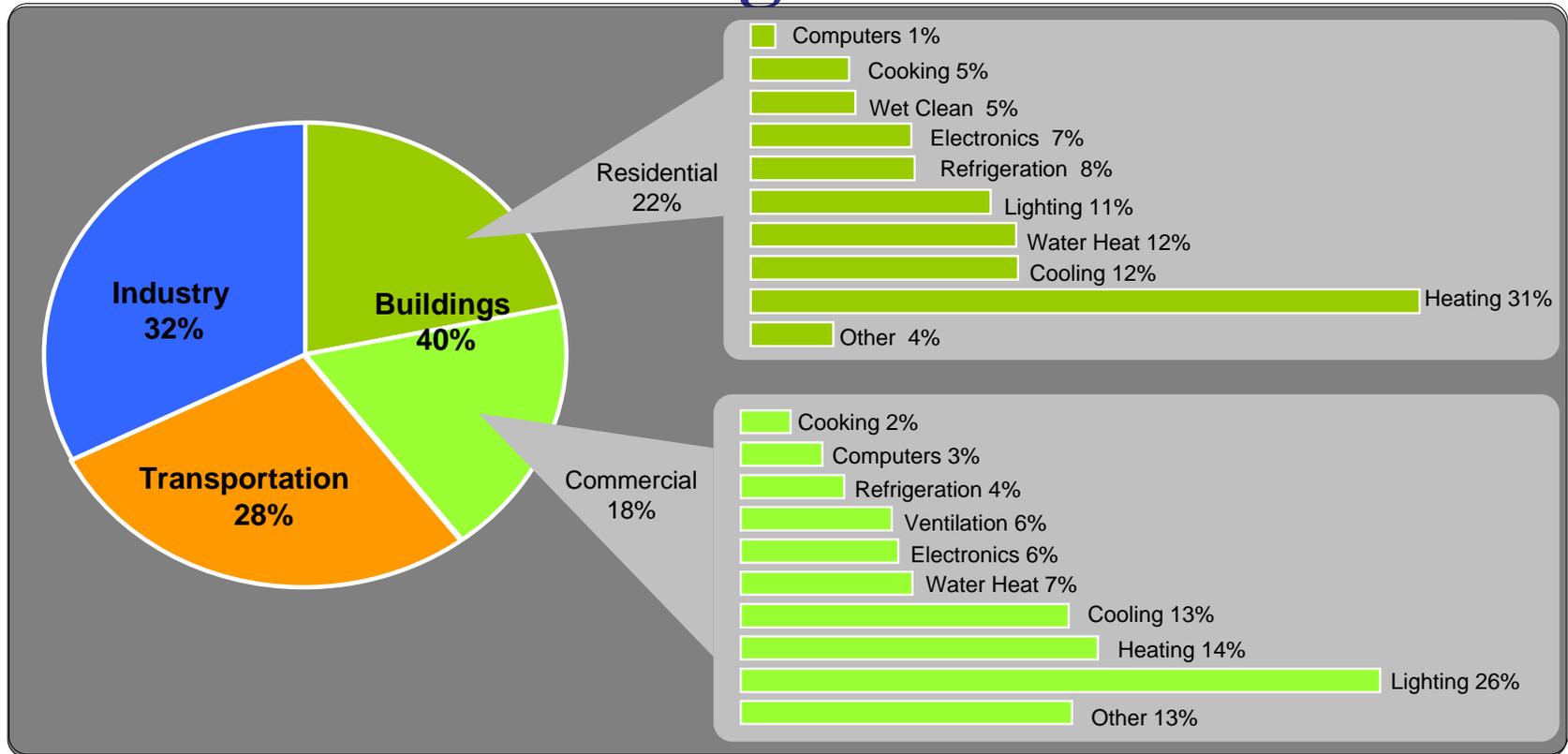
- Lightweight structures
- Metal processing
- Composite development
- Processing and manufacturing
- Design data test methods
- Recycling technology
- High Temperature Materials Laboratory



*Advanced Technologies for High Efficiency Clean Vehicles*



# Buildings Sector



- Accounts for 40% of U.S. energy, 72% of Electricity, 55% of Natural Gas, and 39% of Carbon, 19% of NO<sub>x</sub>, and 52% of SO<sub>2</sub> emissions.
- Buildings construction and renovation accounts for 9% of GDP and employs 8 million people. Energy utility bills totaled \$370B in 2005.

Source: Buildings Energy Data Book, September 2007

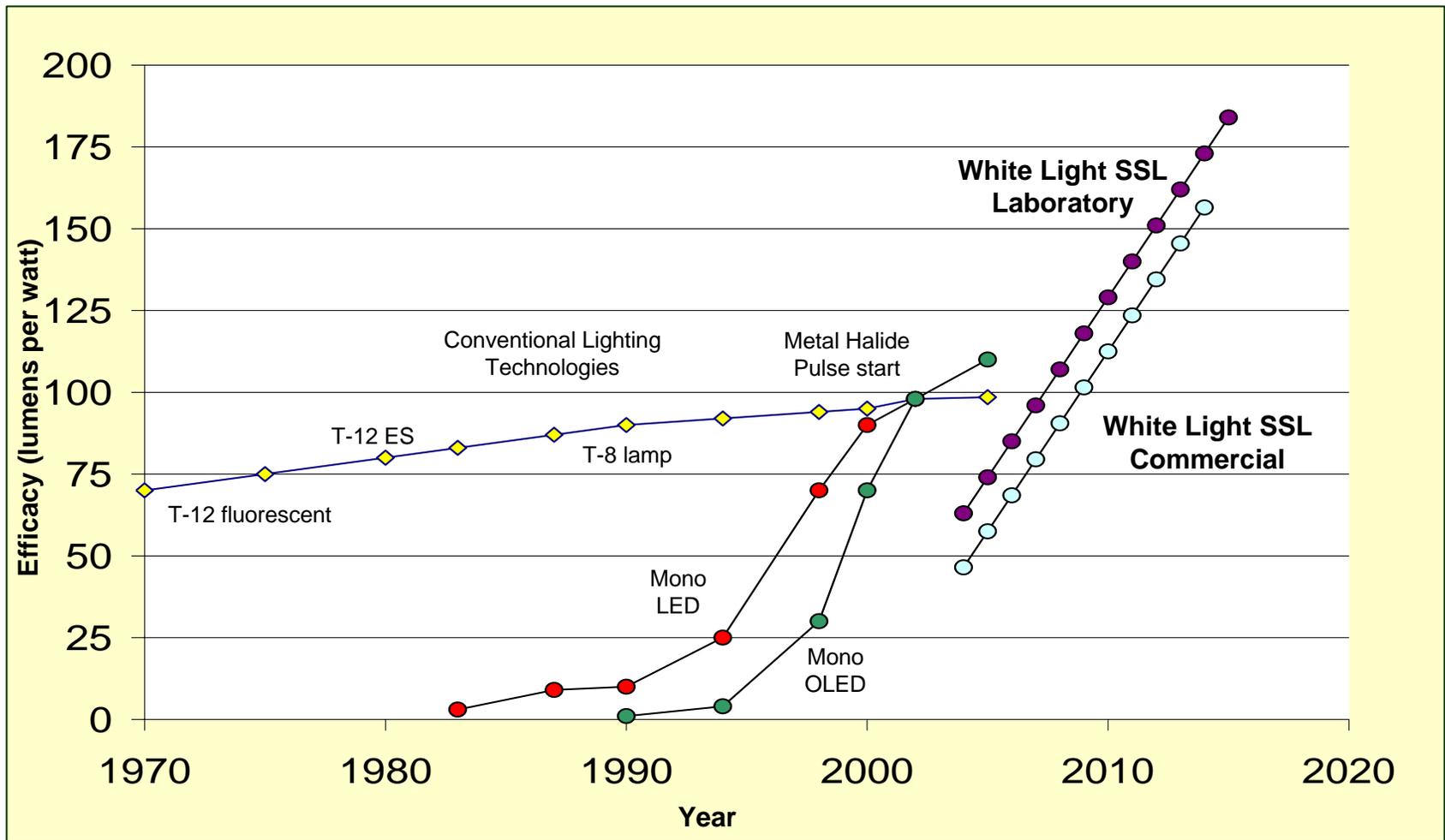
# Building Technologies Program Strategies

**Buildings Technologies Program employs three complementary strategies to achieve its mission:**

- **R&D**
  - Whole Building Integration
  - Component, Equipment, and Materials
- **Appliance Standards**
- **Market Transformation**
  - Energy Star
  - Building Energy Codes



# Accelerated R&D for White Light SSL



Source: SSL Laboratory and Commercial Curves, revised April 2007



# Future BT Efforts Will Overcome Obstacles and Lead to Widespread Deployment

## Technical Challenges

- SSL requires breakthroughs in chemistry and physics of the light emitting system and the nano-scale level
- Miscellaneous electric loads growing in importance
- Component and equipment technical breakthroughs and cost reductions
- Water heating load reduction and system efficiency

## Market Barriers

- Lack of whole building technology integrator
- Risk averse industry
- Lack of informed consumers
- Low private sector R&D investment
- Lack of efficient product availability at point of need

## Policy Obstacles

- ECPA 2005 tax credit due to expire in 2007
- Net metering, utility interconnects
- Rationalize appliance standards



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# Weatherization and Intergovernmental Program

- **State Energy Program**
- **Weatherization Assistance Program**
- **Tribal Energy Program**
- **Renewable Energy Production Incentive**

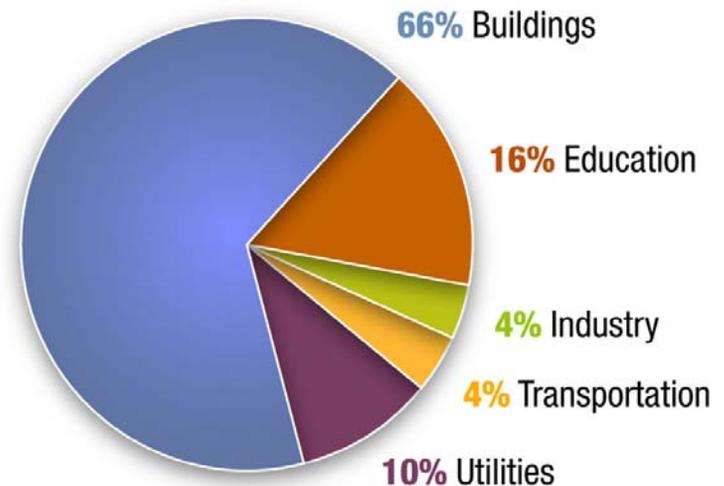


# State Energy Program

*The State Energy Program (SEP) accelerates the market penetration of energy efficiency and renewable energy technologies through a wide range of activities tailored to the unique needs of each state.*

- Strategic energy plans
- Renewable energy projects
- Building retrofits, energy audits, and loans
- Demonstrations of new energy technologies
- Energy efficiency measures in residences, businesses, and government facilities at the state and local community level
- Increasing use of alternative fuel vehicles (AFVs)
- Education and outreach activities

Distribution of SEP Funded Activities

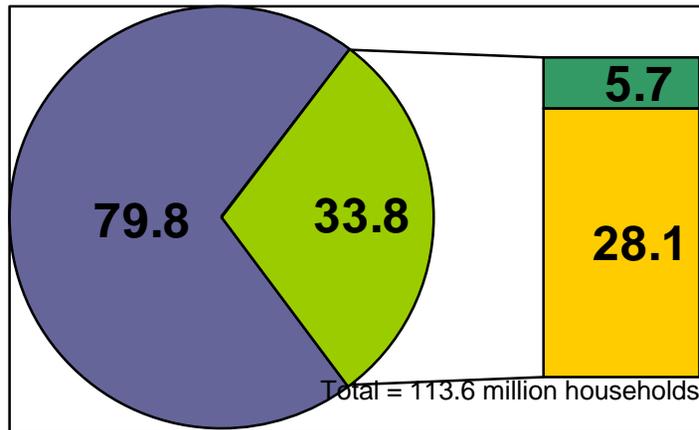


*Primary targets: Building efficiency, transportation (AFVs), power from clean energy, and education*

# Weatherization Assistance Program

## Breakdown of U.S. Households

(figures in millions)



- Other Households
- Eligible for Weatherization
- Households Weatherized
- Target Market

- Weatherization energy savings have been greatly improved by better technology, diagnostics, Energy Star rated refrigerators, and compact fluorescent light bulbs
- A cumulative total of over 5.7 million homes have been weatherized with DOE and leveraged funds since 1976

*The Weatherization Assistance Program reduces energy costs for low-income families, particularly for the elderly, people with disabilities, and children, while ensuring their health and safety through installation of energy efficiency measures.*

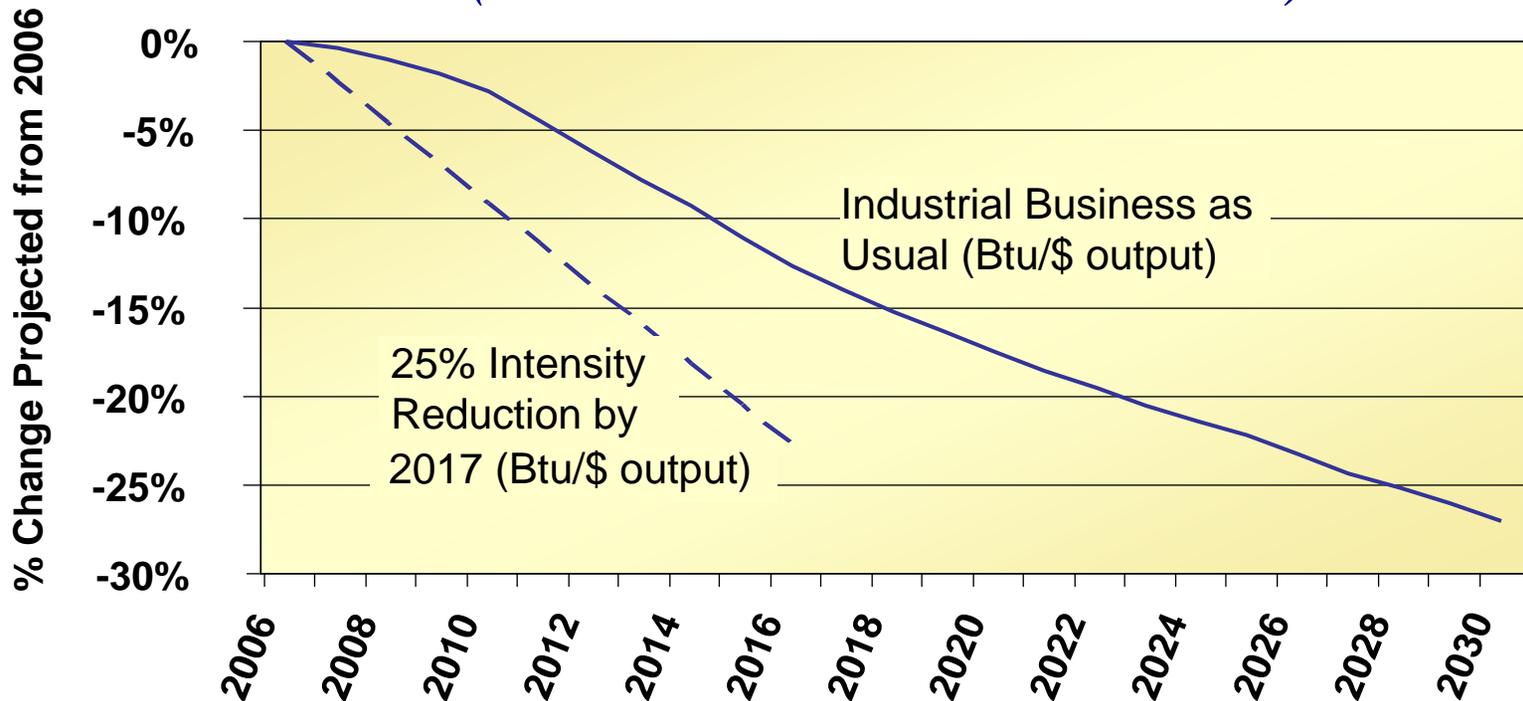
Source: Residential Energy Conservation Survey



# Industrial Technology Program Goal

**Drive a 25% reduction in U.S. industrial energy intensity by 2017 in support of EPA Act 2005 and the President's carbon reduction goals**

*Percent Change in Industrial Energy Intensity  
(Business-as-Usual Case & ITP Goal)*



Source: EIA, AEO 2007, Business As Usual (BAU) case



# ITP Delivers Technology Solutions



## Energy Efficiency R&D

- Develop cross-cutting technologies addressing the top energy savings opportunities across industry



## Fuel and Feedstock Flexibility

- Accelerate market penetration of emerging options for alternative CHP fuels and feedstock



## Technology Delivery

- Help plants save energy today by assessing opportunities and facilitating adoption of best energy management practices and efficient new technologies

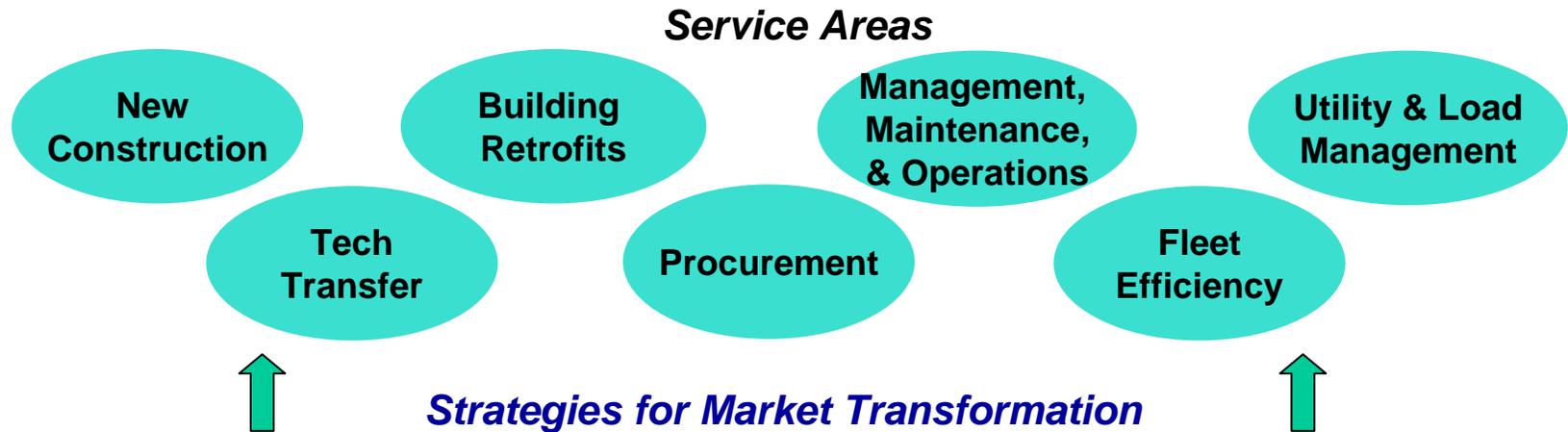


# FEMP: The Deployment Program

- The Department of Energy's Federal Energy Management Program (FEMP) works to reduce the cost and environmental impact of the Federal government by advancing energy efficiency and water conservation, promoting the use of distributed and renewable energy, and improving utility management decisions at Federal sites
- The Federal government consumes 1.6% of the Nation's total energy budget, or \$14.5 billion in annual energy costs
  - Facilities (in over 500,000 buildings): \$5.6 billion
  - Vehicles and Equipment: \$8.9 billion
- FEMP is a leader in market transformation



# FEMP Services and Accomplishments

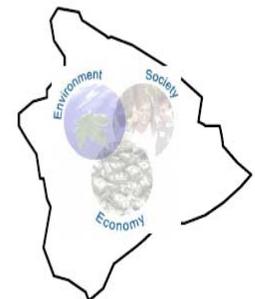
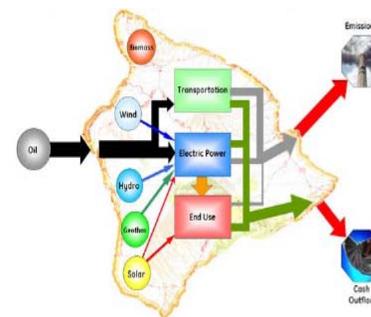


- 1. Financing and Acquisition Support:** 32 Energy Savings Performance Contracts (ESPC)/Utility Energy Services Contract (UESC) FY06 Awards = **\$198.7 million** in Private Sector Investment = **1.61 trillion Btu** in Annual Energy Savings
- 2. Technical Assistance:** 56 technical and design assistance projects in FY06 (target was 27) = **560 billion Btu** in expected Annual Energy Savings
  - Completed 35 ESET's (Energy Savings Expert Teams) during FY06 in response to Hurricane Katrina
  - Identified an average of 10% savings potential in natural gas systems
- 3. Outreach:** Awards and recognition; Energy 2006; newsletters and publications
- 4. Policy and Interagency Coordination:** Guidance (i.e. Renewables, Reporting) and Rulemaking (i.e. Building Standards, Procurement)
  - Federal Procurement criteria (ENERGY STAR or FEMP) now used by 15 states and 6 cities, serving 40% of U.S. population
  - FEMP procurement is an international model: EU, Mexico, China, India, South Africa

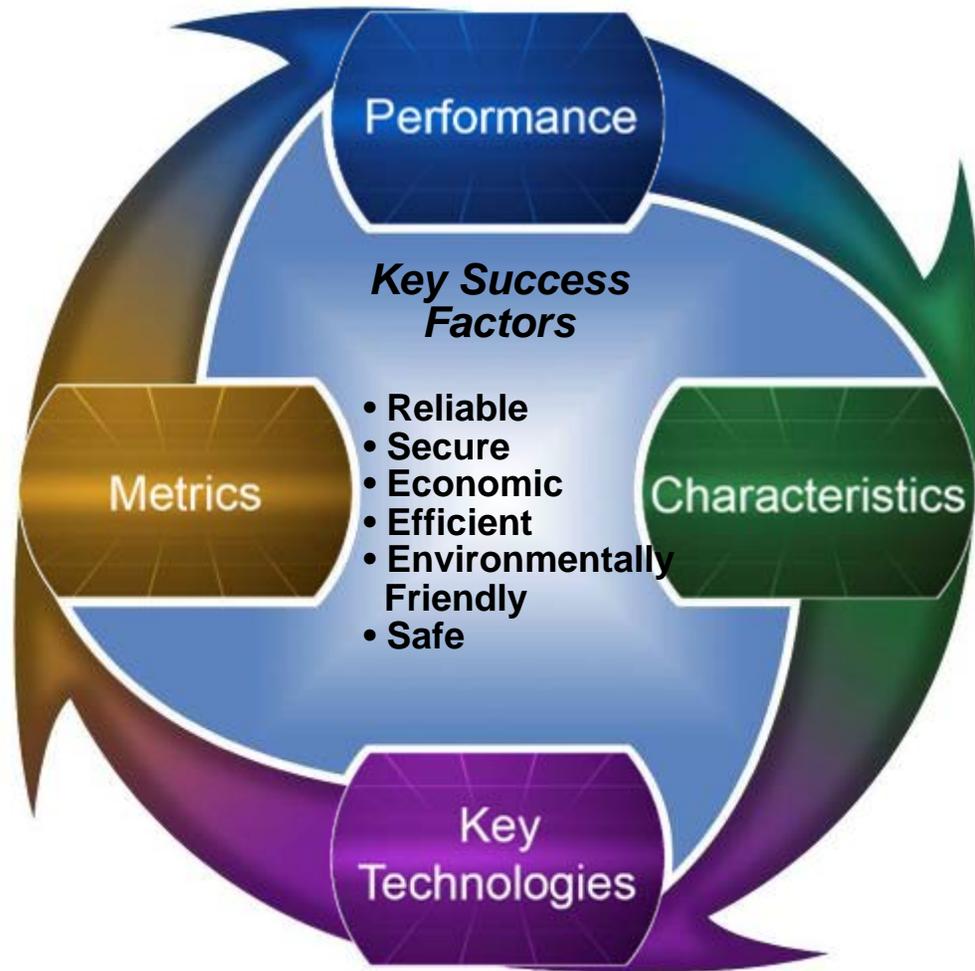
# Project Management Center

## *Supporting Office of Electricity Delivery & Energy Reliability*

- Modern grid strategy
- Visualization, simulation, modeling and analysis of energy infrastructure
- Renewable and Distributed Systems Integration
- High Temperature Superconductivity Program
- Emergency preparedness & response (ESF-12)
- Coordinating multi-agency permitting of transmission facilities

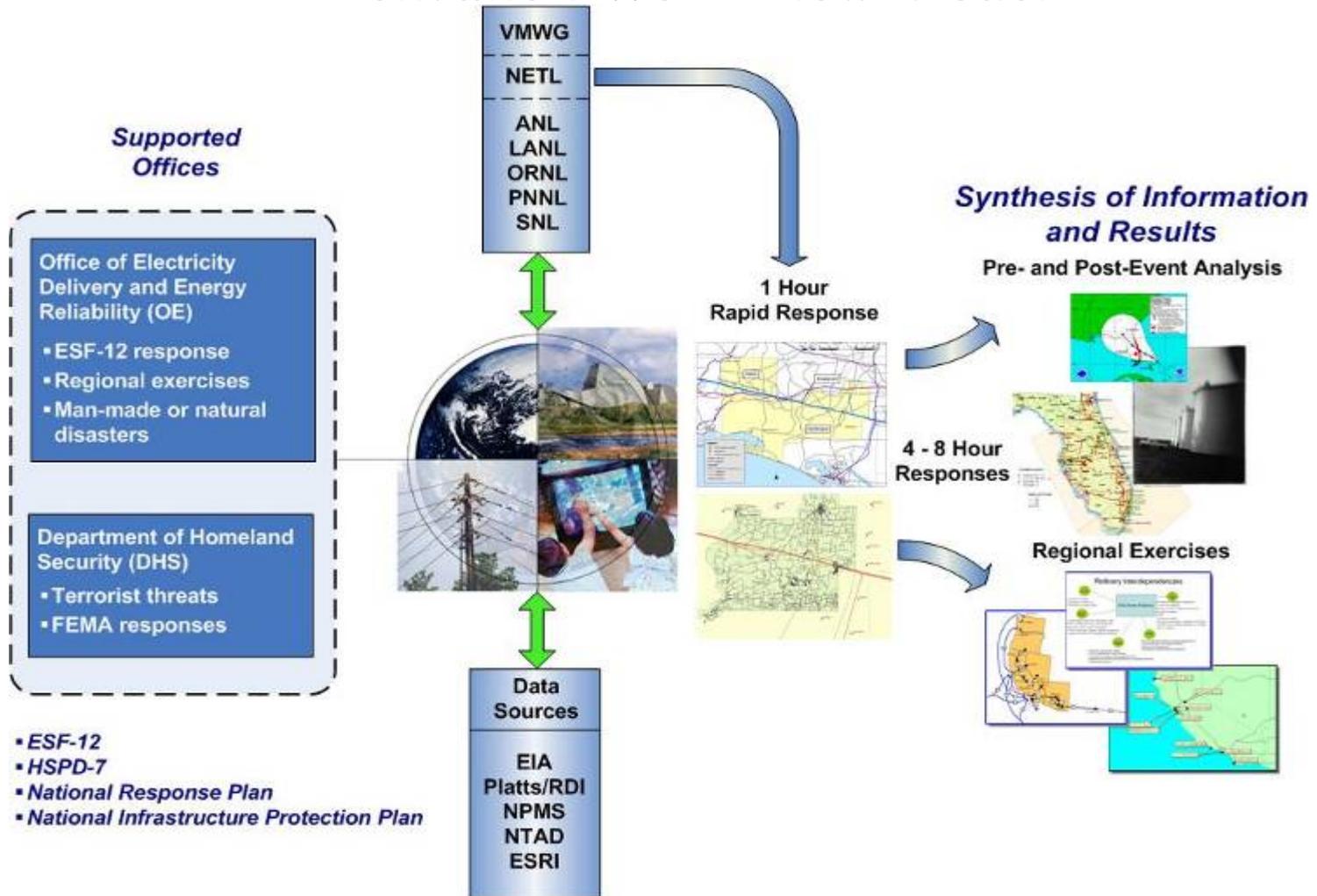


# NETL's Modern Grid Initiative



# Visualization and Modeling Working Group

## Activation Work Flow Model



# Electric Grid Modernization: Distributed Energy

- Involves developing ultra-efficient energy generation systems for on-site applications
- Includes advanced turbines and microturbines, reciprocating engines, thermally activated technologies, and combined heat and power
- Provides energy solutions for utilities, customers, and local energy systems such as district energy, power parks, and microgrids

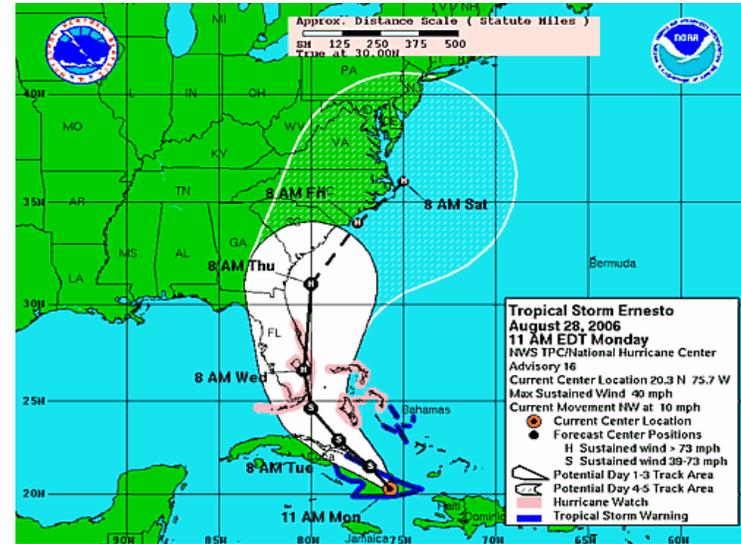
## Benefits

- ✓ Increases grid reliability
- ✓ Addresses vulnerability of critical infrastructure
- ✓ Helps manage peak loads
- ✓ Lowers emissions
- ✓ Helps customers manage energy costs



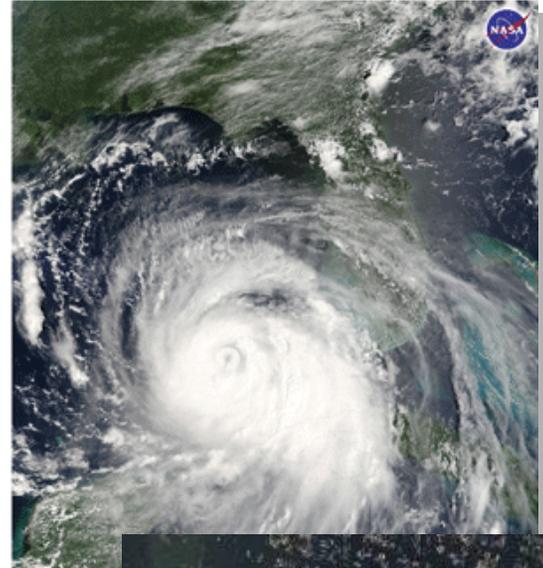
# ESF-12 Support from NETL

- NETL Federal staff deployed to FEMA HQ, FEMA regional offices, state EOCs and state DFOs in support of hurricanes Katrina, Rita, and Wilma
- NETL provided analytical support for:
  - Prudhoe Bay oil disruption
  - Sawtooth Complex forest fire
  - Tropical Storm Ernesto
  - San Joaquin flooding
  - NYC detailed infrastructure maps



# Ongoing Enhancements of Capabilities

- **GIS capabilities**
  - Imagery downloads
  - Data warehousing of energy assets
- **Built additional visualization and analytical capabilities**
  - Enhanced 1-hour response tool created at NETL
  - Deployable to ESF-12 responders
  - Resident in HQ EOC
- **Built energy infrastructure static map library on CD for U.S.**
  - 50 states and District of Columbia
  - 11 layers of infrastructure
  - PDF printable format



*DigitalGlobe.com*



# PMC Activities

- **The PMC supports a diverse set of DOE and other Federal clients.**
  - EERE
  - OE
  - OECM
  - NARA
- **Site Support requirements can vary significantly because of a changing customer base or requirements.**

*For example: The current PMC did not exist when the existing site support contracts were awarded.*