



U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability

HTS Wire Development and Applications Workshop

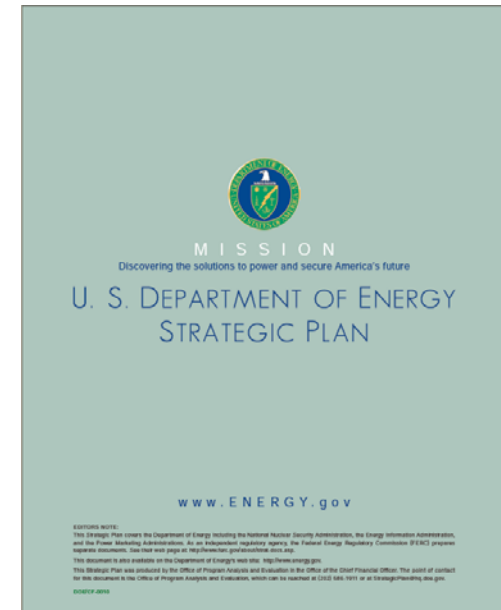
## *HTS Program Metrics- How We're Measured*

January 16, 2006

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R&D Division

# 2006 DOE Strategic Plan (released 10/2006)

- Strategic Theme #1- Energy Security
  - Promoting America's energy security through reliable, clean, and affordable energy
- Strategic Theme #2- Nuclear Security
  - Ensuring America's nuclear security
- Strategic Theme #3- Scientific Discovery & Innovation
  - Strengthening U.S. scientific discovery, economic competitiveness, and improving quality of life through innovations in science and technology
- Strategic Theme #4- Environmental Responsibility
  - Protecting the environment by providing a responsible resolution to the environmental legacy of nuclear weapons production
- Strategic Theme #5- Management Excellence
  - Enabling the mission through sound management





# DOE Strategic Themes and Goals

The Office of Electricity Delivery and Energy Reliability (OE) program supports the Department's Strategic Plan, as follows:

Strategic Theme 1, Energy Security: Promoting America's energy security through reliable, clean, and affordable energy.



Strategic Goal 1.3, Energy Infrastructure: Create a more flexible, more reliable, and higher capacity U.S. energy infrastructure.

The programs funded within the Energy Supply and Conservation Appropriation have one Program goal that contributes to the Strategic Goals. OE's program goal is as follows:

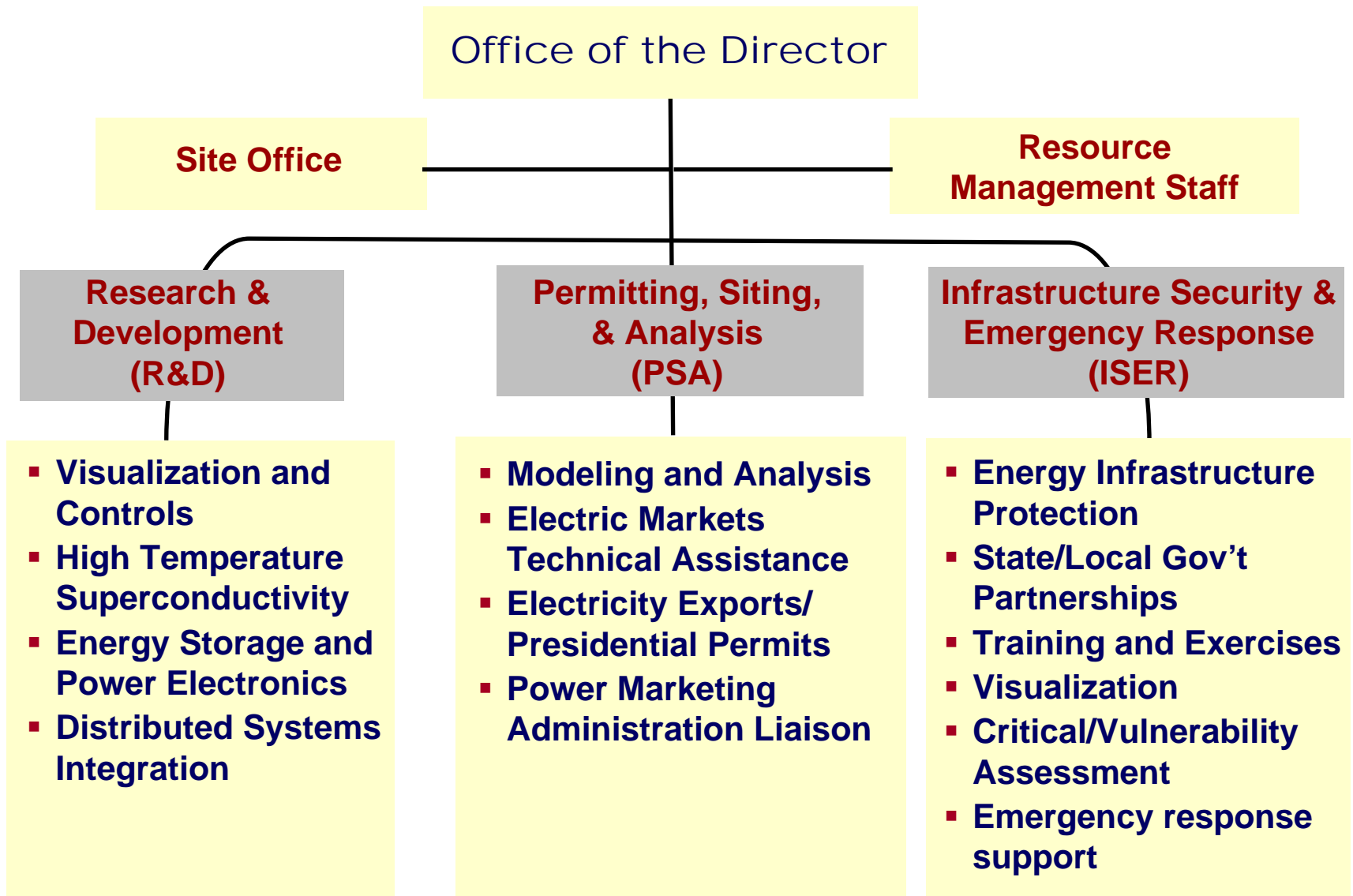
Program Goal 1.3.16.00, Electricity Delivery and Energy Reliability: Lead national efforts to modernize the electric grid, enhance security and reliability of the energy infrastructure, and facilitate recovery from disruptions to the energy supply.

# OE Mission Statement

***Lead national efforts to modernize the electric grid, enhance security and reliability of the energy infrastructure, and facilitate recovery from disruptions to energy supply.***



# Office of Electricity Delivery and Energy Reliability



# Performance Measurement

- President's Management Agenda
  - [www.whitehouse.gov/omb/budintegration/pma\\_index.html](http://www.whitehouse.gov/omb/budintegration/pma_index.html)
- Program Assessment Rating Tool (PART)
  - [www.whitehouse.gov/omb/part/index.html](http://www.whitehouse.gov/omb/part/index.html)
- Government Performance and Results Act (GPRA)
  - [www.whitehouse.gov/omb/mgmt-gpra/gplaw2m.html](http://www.whitehouse.gov/omb/mgmt-gpra/gplaw2m.html)
- Joule metrics
  - Milestones tracked on a yearly basis
- Corporate Planning System (CPS)
  - Milestones tracked on a monthly basis



# Program Assessment Rating Tool (PART)

- OE R&D Program assessed in 2006 – updated from 2003 which only included HTS
- Found that the R&D program has a clear purpose, strong planning and management
- Program rated: Moderately Effective
  - Program Purpose and Design - 80%
  - Strategic planning - 80%
  - Program Management - 82%
  - Program Results/Accountability - 74%
- Technical goals are monitored yearly



# HTS PART Goal and Metrics

**Long-term Goal: Reduce the footprint for new T&D infrastructure and reduce energy losses through the use of high-temperature superconducting wire.**

**HTS Wire: By 2020, develop prototype wire achieving 1,000,000 critical current-length (A-m) for second generation wire**

	2005 – Baseline	2006	2007	2008	2009	2010	2011	2012	2014	2020
Current - Length (A-m)	22,149 (107A x 207m)	30,000	40,000	50,000	50,000	70,000	70,000	100,000	500,000	1,000,000

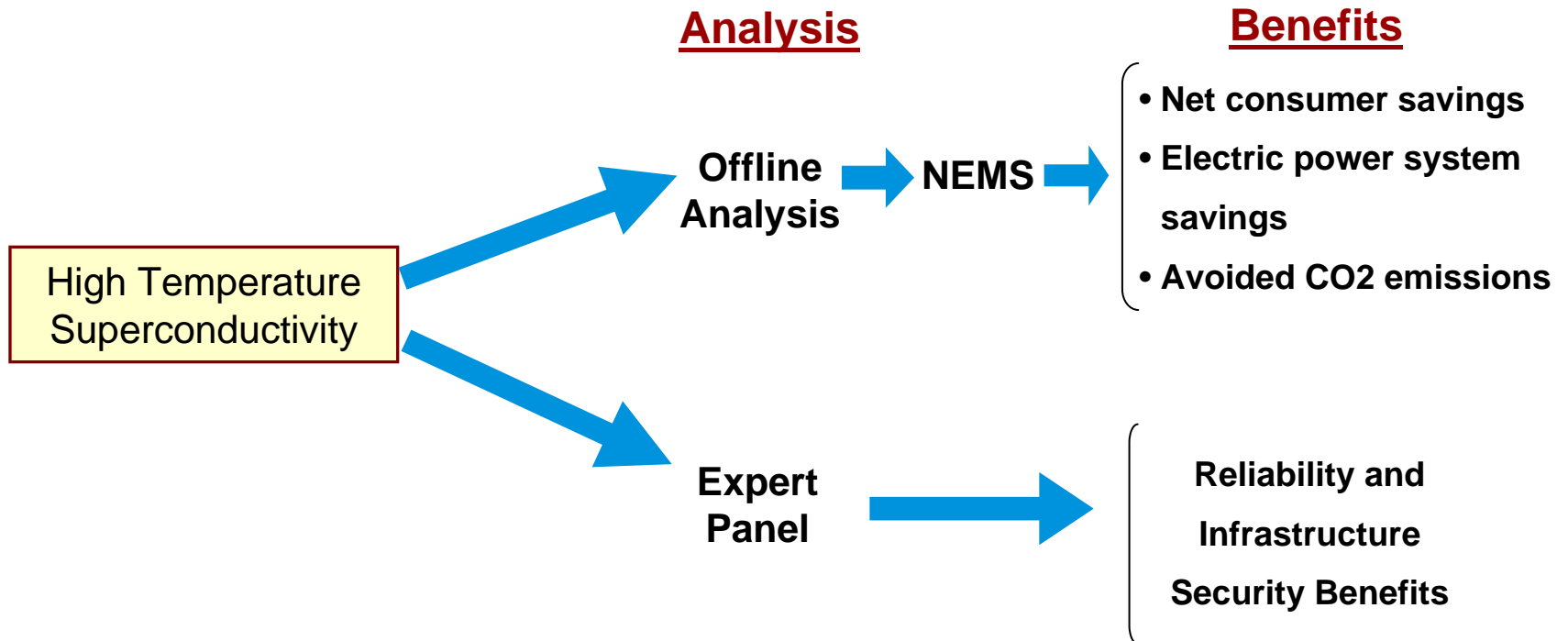
**HTS Coils: Maintain progress in achieving increasingly powerful coils for electric power applications such as transformers and generators, measured by magnetic field (Tesla) produced by test coil at 65K**

	2005 – Baseline	2006	2007	2008	2009	2010	2012	2014
Magnetic field (Tesla at 65K)	0.3	0.3	1.0	1.0	2.0	2.0	3.0	5.0





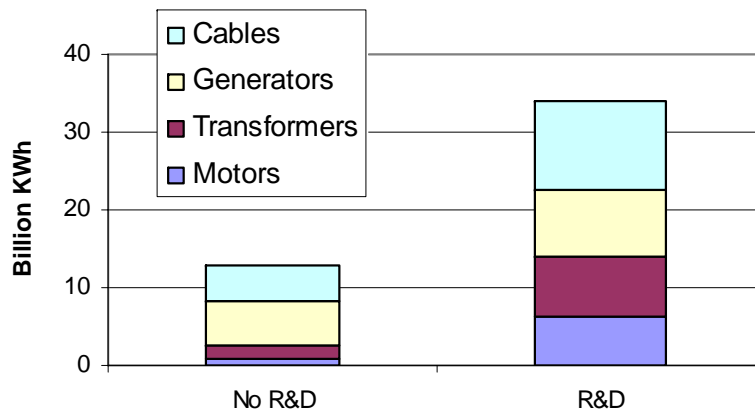
# GPRA 08 Benefits Estimation Framework



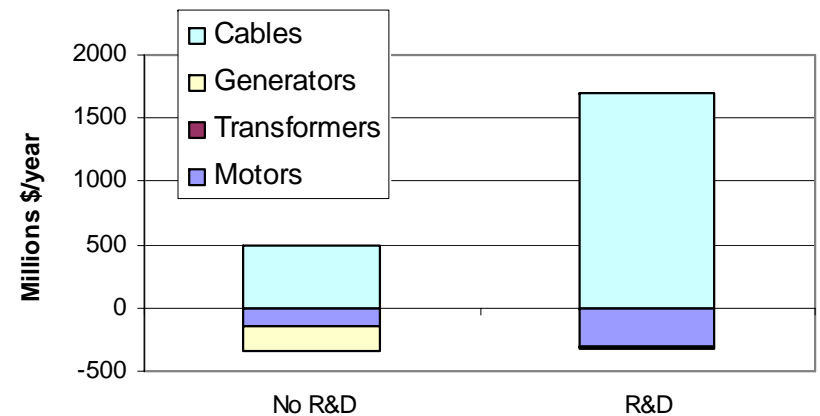
# HTS Expected Savings

HTS program assumptions were translated into expected electricity and equipment cost savings, using AEO 2006 projections for electricity sales and capacity additions.

### HTS Expected Electricity Savings in 2030



### HTS Expected Equipment Cost Savings in 2030



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# Summary of Reliability and Infrastructure Security Benefits

Program or Portfolio	Outages (\$ billions)		Power Quality Events (\$billions)		Trans-mission Congestion (\$ billions)		Total Reliability (\$ billions)		Risk of Attack or Destruction (%)		Mitigating Damage with Supply (%)		Mitigating Damage with Demand Response (%)		Total Infra-structure Security Improve-ment	
	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030	2020	2030
DSI	1.9	5.3	0.51	1.6	0.03	0.09	2.4	7.0	2.0	5.0	2.0	3.0	1.0	2.0	5%	10%
HTS	1.9	5.3	0.29	1.3	0.01	0.07	2.2	6.7	2.0	3.0	2.0	4.0	2.0	5.0	6%	12%
ES&PE	2.8	4.3	1.0	1.7	0.05	0.09	3.9	6.1	4.5	4.0	5.0	8.5	2.0	4.0	11%	16%
V&C	9.5	11	1.1	1.6	0.07	0.07	11	12	10	10	10	7.5	10	7.5	28%	24%
PORT-FOLIO	4.7	11	1.2	1.7	0.07	0.13	6	13	5	4	4	13	7	9	13%	19%

Reliability benefits are expressed as annual reduction in system costs; security benefits are expressed as percentage reduction in risk of power disruptions associated with a catastrophic attack or natural disaster.

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# HTS Targets\* (Joule metrics)

- FY2006 Target
  - Operate a first-of-a-kind- superconducting power cable on the electric grid for 240 hours
- FY2007 Target
  - Complete six months operation of superconducting cable operating on the grid at greater than 10kV

*\*From FY2007 OMB Budget*



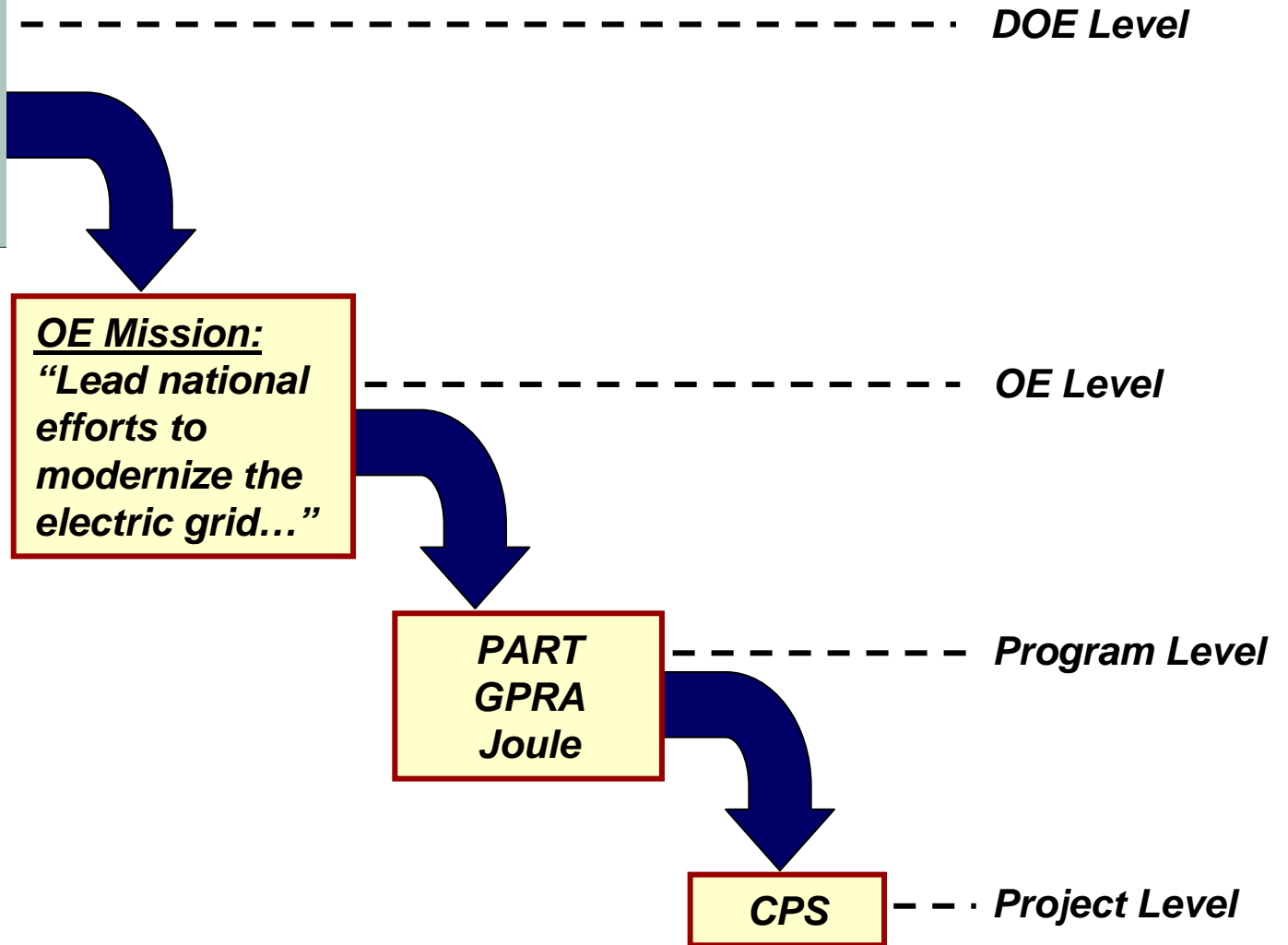
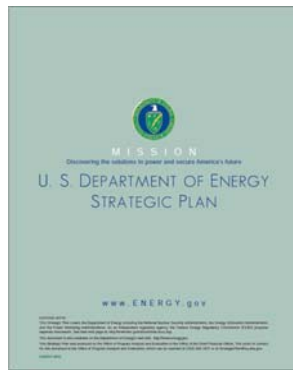
# OE Corporate Planning System (CPS)

Each Fiscal Year - Technical Milestones for are tracked on a monthly basis and reported to DOE Management

Agreement	Title	Plan Complete	Actual Complete	Status
<a href="#"><u>Conductor Research (Agreement Id: 15212)</u></a>	Improve in-field performance flux-pinning factor to less than $\alpha = 0.2$ .	5/31/2007		On Track
<a href="#"><u>Process Development (Agreement Id: 15603)</u></a>	Demonstrate performance levels in coevaporated YBCO films of 300 A/cm-width by January 2007, and 500 A/cm-width by July 2007	7/31/2007		On Track
<a href="#"><u>HTS Underground Cable (Agreement Id: 15102)</u></a>	Complete YBCO cable fabrication	3/1/2007		On Track
<a href="#"><u>5/10 MVA HTS Power Transformer (Agreement Id: 15108)</u></a>	Complete dielectrics qualification testing	9/30/2007		On Track
<a href="#"><u>A Long Length HTS Power Cable (Agreement Id: 15104)</u></a>	Install and begin operation of pulse-tube refrigeration system	9/30/2007		On Track



# Cascading Metrics and Goals



For More Information...

# Office of Electricity Delivery and Energy Reliability's website

[www.electricity.doe.gov](http://www.electricity.doe.gov)

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The United States' energy infrastructure consisting of a vast and complex network of interconnected systems has helped build our Nation into the leading economy in the world. Unfortunately, our energy infrastructure specifically the delivery and storage of electricity, natural gas and oil is aging and increasingly vulnerable to natural and man-made disruptions. These disruptions from the small local electrical disturbances that cascade into a significant regional outage, such as the multi-regional Blackout of August 2003, to the destruction caused by massive hurricanes such as Katrina or Rita, can devastate not only the U.S. economy, but threaten the safety of millions of Americans.

The rapid evolution in information technology, electronics, material sciences, and various consumer demands coupled with the evolving needs to protect against manmade or natural threats, provide both challenges and opportunities. The private sector continues to face market barriers and

**CURRENT EVENTS**

**Emergency Petition & Complaint**

See latest posting regarding Emergency Petition and Complaint. D.C. Public Service Commission [GO](#)

**Hurricane Season**

Volunteers are needed to Serve as Energy Restoration Team Members During Hurricane Season [GO](#)

**Energy Assurance Daily**

Energy Assurance Daily provides a daily summary of public information concerning current energy issues. [GO](#)

**OE's Response to EPACT**

## Upcoming Events

- 2007 National Electricity Delivery Forum, February 21-22, Washington DC
  - [www.electricitydeliveryforum.org](http://www.electricitydeliveryforum.org)
- GridWeek, April 23-26, Washington, DC
  - [www.gridweek.com](http://www.gridweek.com)
- HTS Peer Review, August 7-9, Crystal City, VA

