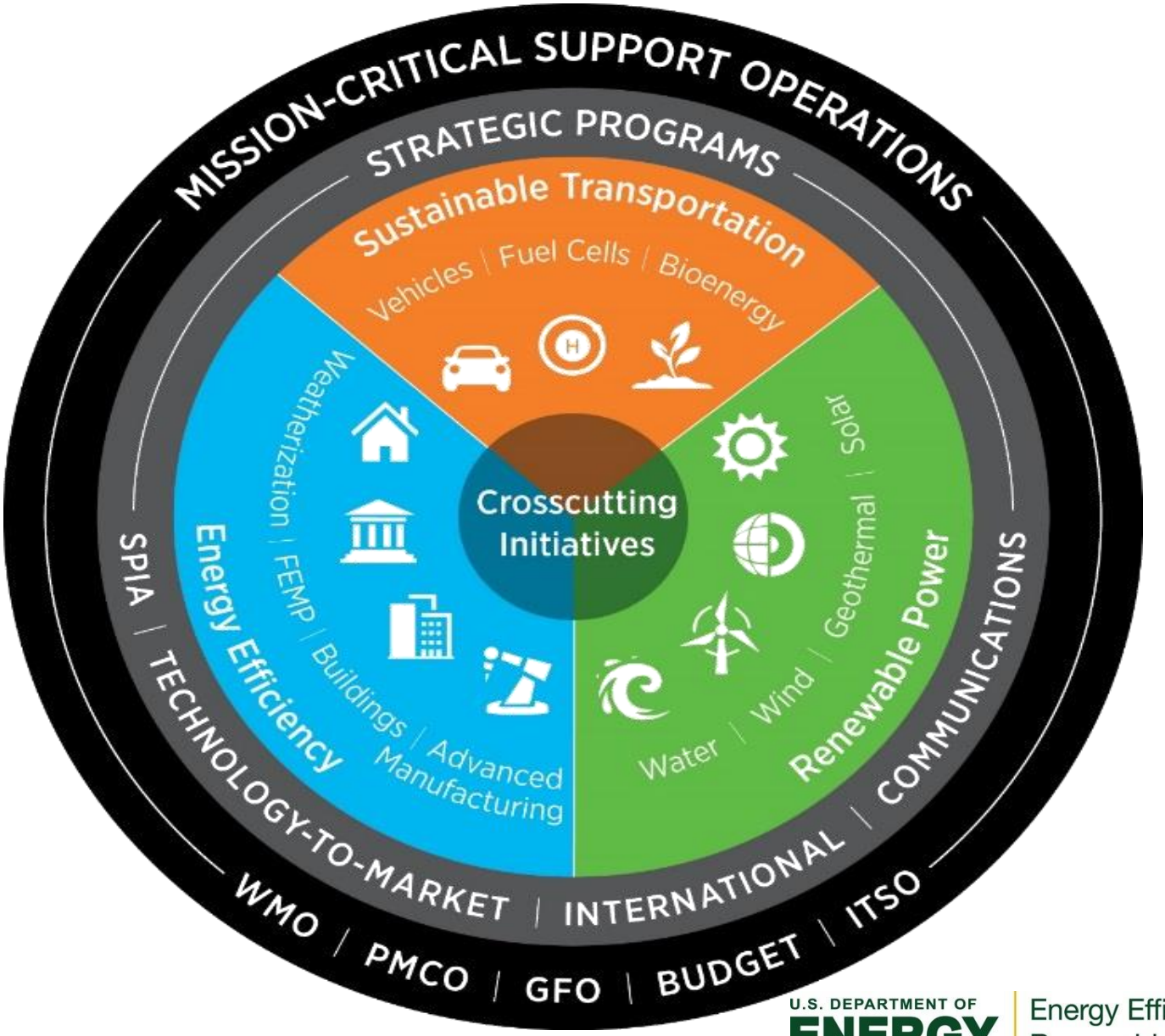
Office of Energy Efficiency and Renewable Energy

FY 2017 Budget Overview

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

David Friedman
Principal Deputy Assistant Secretary
March 2016

Office of Energy Efficiency and Renewable Energy



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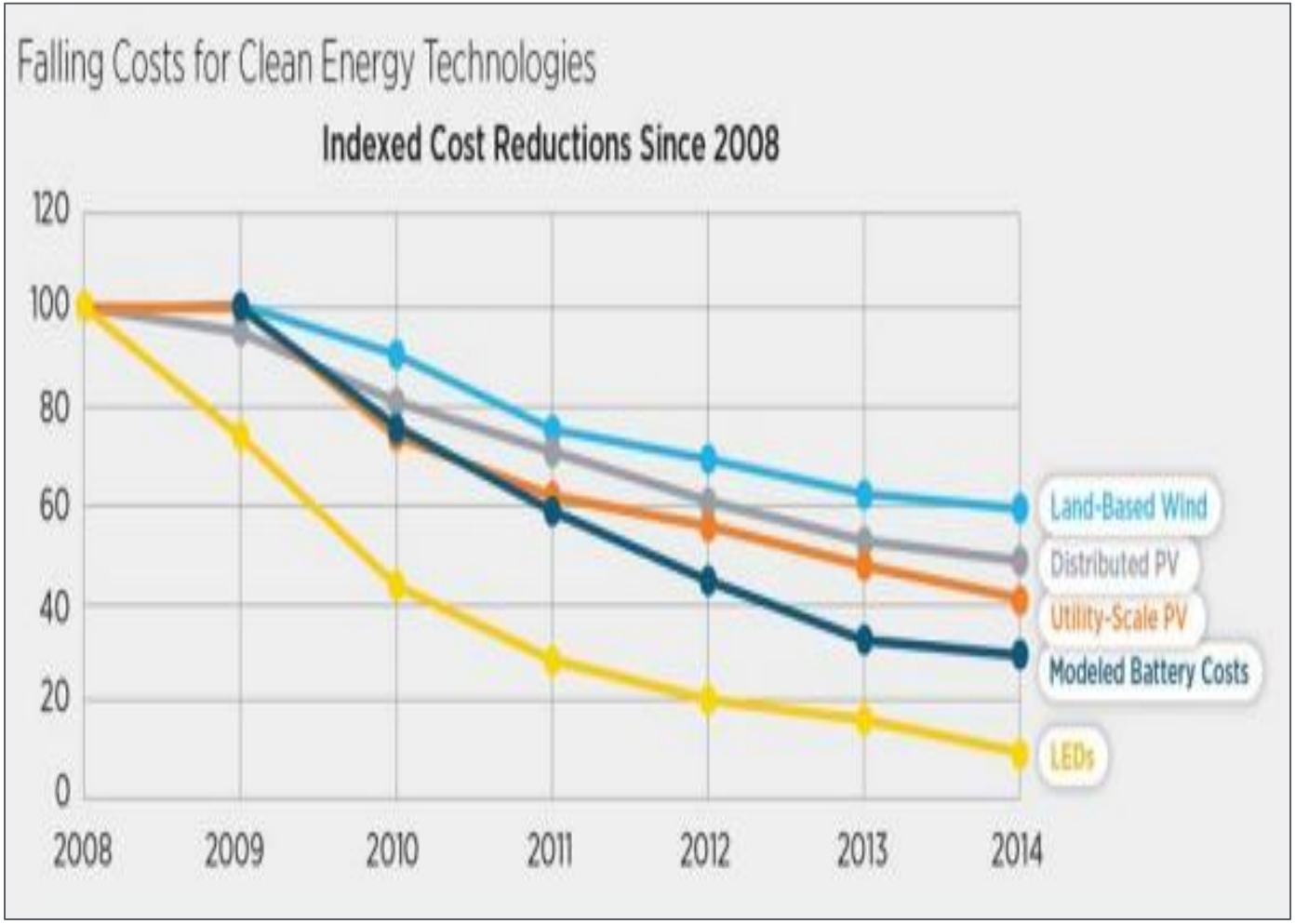
EERE Track Record/Return on Investment

- EERE R&D portfolio—**14:1 benefit to cost ratio, annual return on investment of 20%***
- Impact varies based on technology area and maturity of investment:
  - Combustion engine R&D from 1986 to 2007: 66:1 benefit to cost ratio.
  - Solar photovoltaic R&D from 1975 to 2008: 3:1 benefit to cost ratio so far.

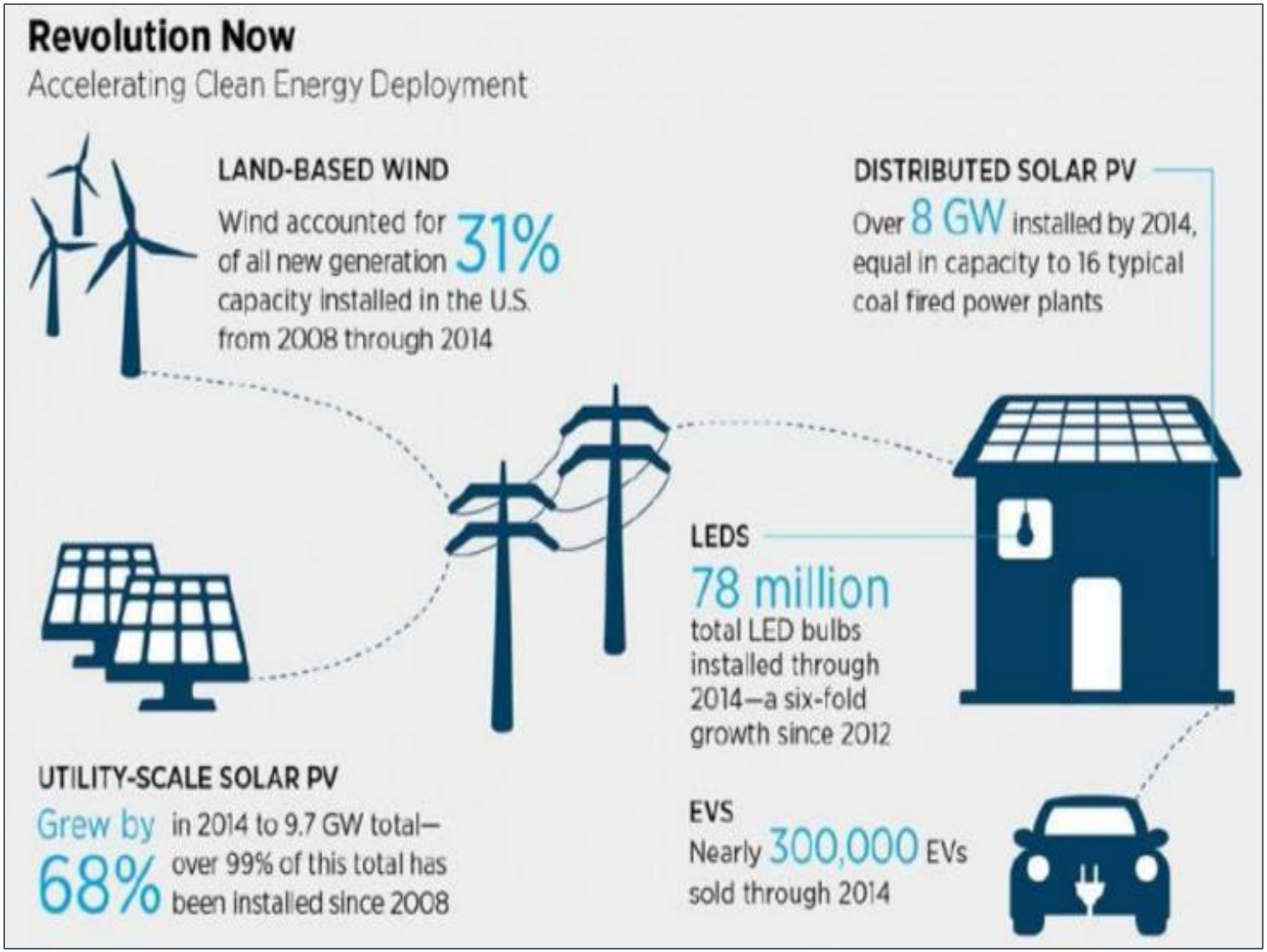
*Based on an independent assessment of a 1/3rd sample of EERE's portfolio from 1976-2012 (years). All number based on net present value with 3% discount rate.

A Revolution Now



We are on the cusp of greatness; the clean energy revolution is real, and it is happening!

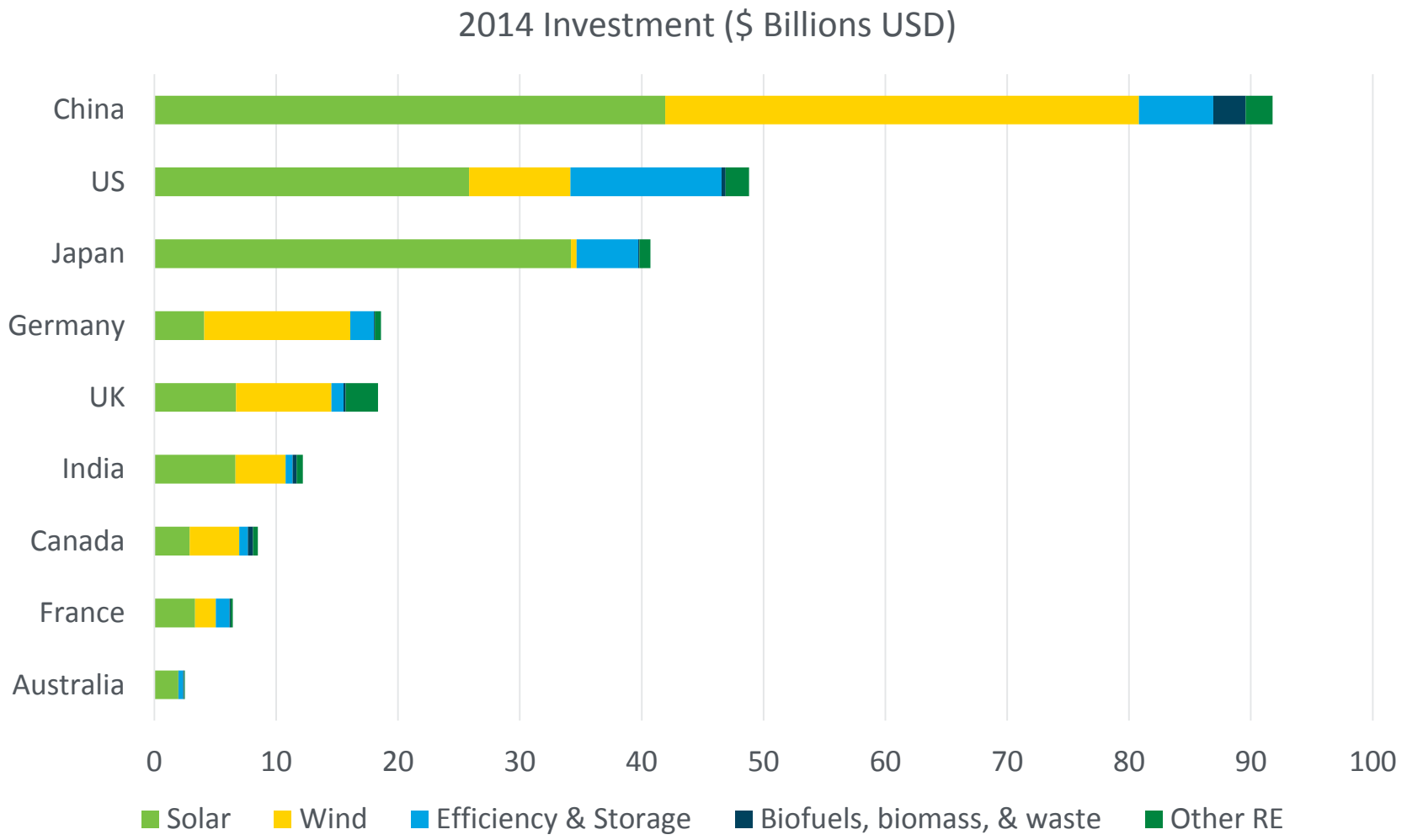
A Revolution Now



Major National Energy Goals

- Reduce greenhouse gas (GHG) emissions 26-28% by 2025, more than 80% by 2050.
- By 2035, generate 80% of electricity from a diverse set of clean energy resources.
- Double energy productivity by 2030.
- Reduce net oil imports by half by 2020.
- Reduce CO_2 emissions by 3 billion metric tons cumulatively by 2030 through efficiency standards.

Huge Opportunity, Fierce Race for Clean Energy Leadership



Source: Bloomberg New Energy Finance

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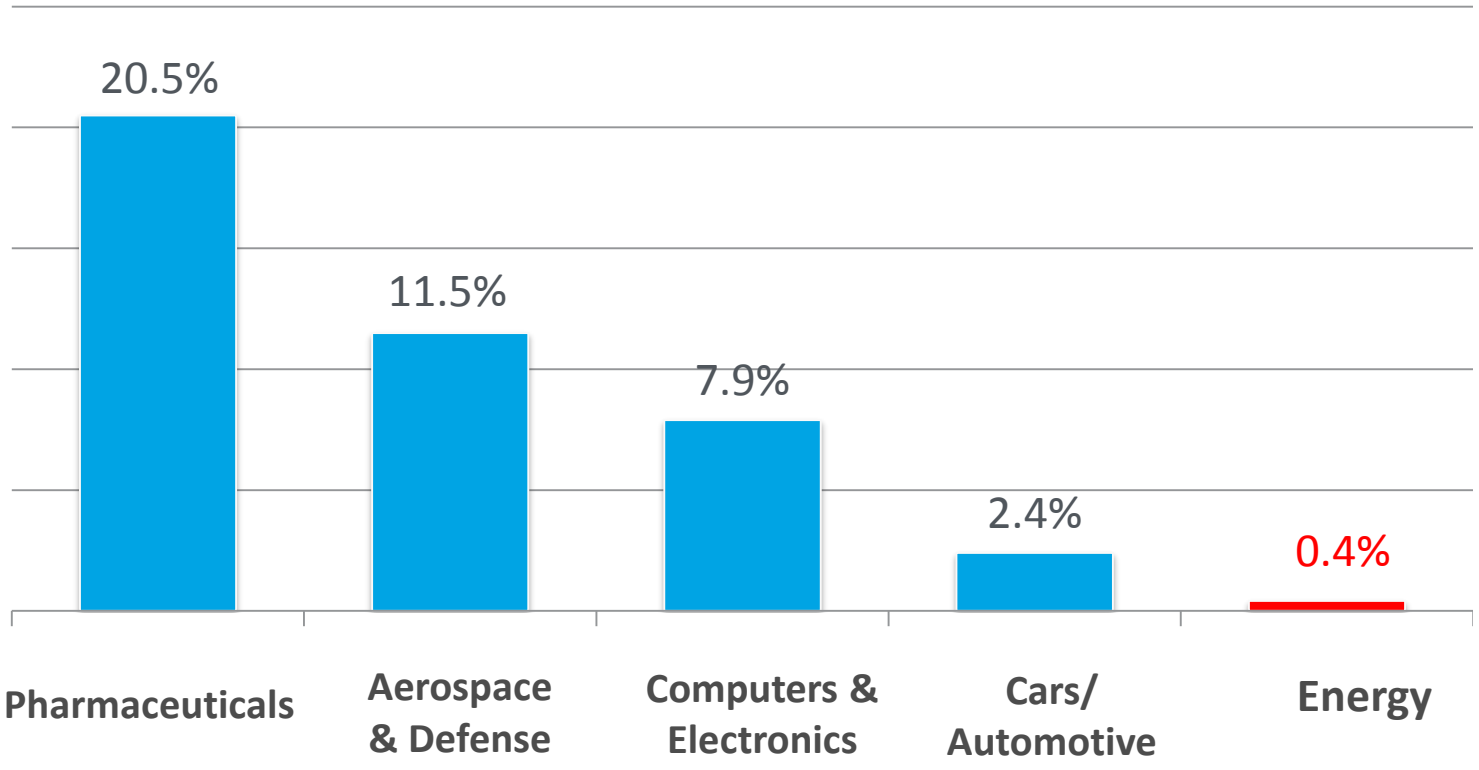
Private and Public Sector are Underinvesting in Energy Innovation

Private Investment in R&D (as % of sales)



Source: American Energy Innovation Council, *Catalyzing American Ingenuity: The Role of Government in Energy Innovation,* 2011

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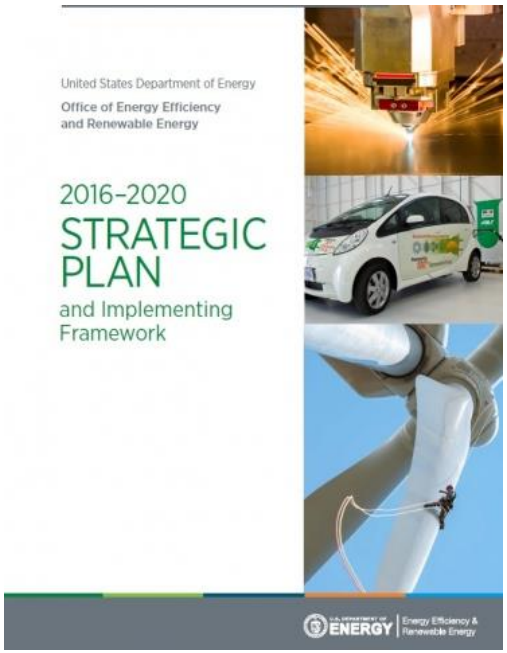


EERE Vision

A strong and prosperous America powered by clean, affordable, and secure energy

EERE Mission

To create and sustain American leadership in the transition to a global clean energy economy

Other Key Strategy Documents

- President's Climate Action Plan
- DOE Strategic Plan (2014-2018)
- Quadrennial Energy Review (QER)
- Quadrennial Technology Review (QTR)

EERE Budget Strategy

- Double clean energy R&D investment over 5 years.
  - Full innovation spectrum from use-inspired research and applied energy R&D (including demonstration)
  - Includes all clean energy technologies (e.g., renewable energy, energy efficiency, and other DOE Offices)

MISSION INNOVATION

Accelerating the Clean Energy Revolution

- Enhance efforts to overcome market barriers
- Invest in a 21st Century Transportation System

FY 2017 Budget Summary Table

Dollars in Thousands	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs FY 2016	
Transportation	**602,000**	**635,950**	**852,900**	**216,950**	**34%**
- Vehicle Technologies	280,000	310,000	468,500	158,500	51%
- Bioenergy Technologies	225,000	225,000	278,900	53,900	24%
- Hydrogen and Fuel Cell Technologies	97,000	100,950	105,500	4,550	5%
Renewable Energy	**456,000**	**478,050**	**620,600**	**142,550**	**30%**
- Solar Energy	233,000	241,600	285,100	43,500	18%
- Wind Energy	107,000	95,450	156,000	60,550	63%
- Water Power	61,000	70,000	80,000	10,000	14%
- Geothermal Technologies	55,000	71,000	99,500	28,500	40%
Energy Efficiency	**642,000**	**721,000**	**919,000**	**198,000**	**27%**
- Advanced Manufacturing	200,000	228,500	261,000	32,500	14%
- Federal Energy Management Program	27,000	27,000	43,000	16,000	59%
- Building Technologies	172,000	200,500	289,000	88,500	44%
- Weatherization and Intergovernmental Programs	243,000	265,000	326,000	61,000	23%
Crosscutting Innovation Initiatives	**0**	**0**	**215,000**	**215,000**	
- Regional Energy Innovation Partnerships	0	0	110,000	110,000	-
- Next-Generation Innovation	0	0	60,000	60,000	-
- Small Business Partnerships	0	0	20,000	20,000	-
- Energy Technology Innovation Accelerators	0	0	25,000	25,000	-
Program Support	**237,000**	**238,000**	**290,900**	**52,900**	**22%**
Subtotal, Energy Efficiency and Renewable Energy	**1,937,000**	**2,073,000**	**2,898,400**	**825,400**	**40%**
- Rescission of Prior Year Balances	-22,805	-3,806	0	3,806	-
Total, Energy Efficiency and Renewable Energy	**1,914,195**	**2,069,194**	**2,898,400**	**829,206**	**40%**

Mission Innovation

Mission Innovation

FY 2016 Enacted	FY 2017 Request	FY17 vs. FY16	R&D Growth
$1,406M	$2,060M	+$654M	+47%

- EERE MI budget represents a strategic investment portfolio approach
  - Expands successful existing collaborative R&D arrangements (e.g., NNMIs)
  - Targets new areas of potentially transformational research (e.g., Advanced Materials Crosscut)
  - Expands high payoff applied R&D programs (e.g., SuperTruck II)
  - Launches new, innovative, “investible” R&D efforts.

MISSION INNOVATION
Accelerating the Clean Energy Revolution

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Crosscutting Mission Innovation Initiatives

- **Regional Energy Innovation Partnerships ($110M)**: Regionally relevant, tech-neutral, clean energy RD&D, supports accelerated clean energy technology commercialization, economic development, and manufacturing.
- **Next Generation Innovation ($60M)**: New and/or cross-cutting R&D with greatest potential to change the trajectory of EERE technology roadmaps.
- **Energy Technology Innovation Accelerators ($25M)**: Talent of early-stage clean energy entrepreneurs combined with world-class tools and expertise of National Labs for new company creation, successful commercialization strategies.
- **Small Business Partnerships ($20M)**: Enables small businesses to partner with National Labs to address critical clean energy RD&D challenges and opportunities while providing key engine for job growth.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY17 vs. FY16
Regional Energy Innovation Partnerships	0	0	110,000	+110,000
Next Generation Innovation	0	0	60,000	+60,000
Energy Tech Innovation Accelerators	0	0	25,000	+25,000
Small Business Partnerships	0	0	20,000	+20,000
Total, Crosscutting Innovation Initiatives	0	0	**215,000**	**+215,000**

EERE Traditional Portfolio

Renewable Power

Increase the Generation of Electric Power from Renewable Sources

($ millions)	FY 2016	FY 2017	% Change
Renewable Energy	478	621	+30%

- **Advanced Power Electronics Solutions for Distributed PV ($20M):** To reduce cost and improve reliability and functionality of power electronics.
- **Offshore Wind R&D Consortium ($25M):** To accelerate R&D targeted at U.S.-specific challenges and continue efforts to achieve a 16.7 cents/kWh cost target for offshore wind by 2020.
- **Frontier Observatory for Research in Geothermal Energy (FORGE) ($35M):** Select the final site for FORGE. Investment in drilling, site characterization, and competitive solicitation for R&D on reservoir creation technologies.
- **Open Water Wave Test Facility ($20M):** Critical infrastructure needed for a grid-connected facility to provide affordable access and accelerate deployment of U.S.-developed technologies through reductions in technical and financial risk, testing cost, and time-to-market.

Energy Efficiency

Improve the Energy Efficiency of our Homes, Buildings and Industries

($ millions)	FY 2016	FY 2017	% Change
Energy Efficiency	721	919	+27%

- **Clean Energy Manufacturing Innovation Institutes ($84M):** Support five existing Institutes, and two to-be-announced Institutes from prior year FOAs. Establish one new Institute to focus on one of the advanced manufacturing challenges identified in the DOE QTR published in 2015.
- **Federal Energy Management Core Activities ($28M):** Support agencies in meeting the President's Performance Contracting Challenge of investing $4 billion in energy efficiency and renewable energy projects, and support the Federal Government's goal of reducing its GHG emissions by 40% by 2025.
- **Low-GWP Advanced Cooling (HVAC) R&D:** Multi-year effort to transition to climate-friendly refrigerant technologies ($169M, increase of $83M)
- **Weatherization Assistance:** Increase weatherization retrofits to approximately 35,700 low-income homes nationwide

Sustainable Transportation

Accelerate the Development and Adoption of Sustainable Transportation Technologies

($ millions)	FY 2016	FY 2017	% Change
Sustainable Transportation	636	853	+34%

- **EV Everywhere ($282.7M):** To produce a wide array of plug-in electric vehicle models that are as affordable and convenient as gasoline vehicles by 2022.
- **SuperTruck II ($60M):** To increase the freight hauling efficiency of heavy-duty Class 8 long-haul trucks by greater than 100% by 2020.
- **Fuel Cell R&D ($35M):** Develop innovative technologies to reduce cost and improve durability: Increasing PEM fuel cell power output per gram of platinum-group metal catalyst to 7.2kW/g from 2.8kW/g in 2008. (2020 goal: 8 kW/g PGM).
- **Synthetic Biology Foundry ($35M):** To modify organisms, and develop robust processing capabilities, and scale-up, which can be easily transferred to industry.

21st Century Clean Transportation Plan Investment

21st Century Clean Transportation Plan Investment

- **Clean transportation R&D**:
  - Battery MDF & End-to-End Efficient Freight Innovation Initiative ($200M)
  - Next generation R&D for low cost, low carbon biofuels ($100M)
- **Transportation Systems Integration R&D** Initiative on information and communication technologies (ICT), vehicle technologies, low carbon fuels, and disruptive transportation business models ($200M)
- Support **Regional Low-carbon Fueling Infrastructure,** launch **EV Accelerator Communities** public-private partnerships for 10,000 grid connected solar fast charge/renewable H2 stations by 2025 ($750M)
- **Clean Fleets Competition** challenge grants to support state, tribal, and local government vehicle fleets to purchase clean transportation options operating on low-carbon fuels, first responders ($85M).

(Dollars in Thousands)	FY16 Enacted	FY17 Request	FY17 vs. FY16
Total, 21st Century Clean Transportation	**0**	**1,335,000**	**+1,335,000**

DOE Crosscuts

Grid Modernization
Subsurface
Energy-Water Nexus
Advanced Materials

Grid Modernization Initiative (EERE $190M; DOE $379M)

Enable the integration of clean electricity into a reliable, resilient, and efficient electricity grid

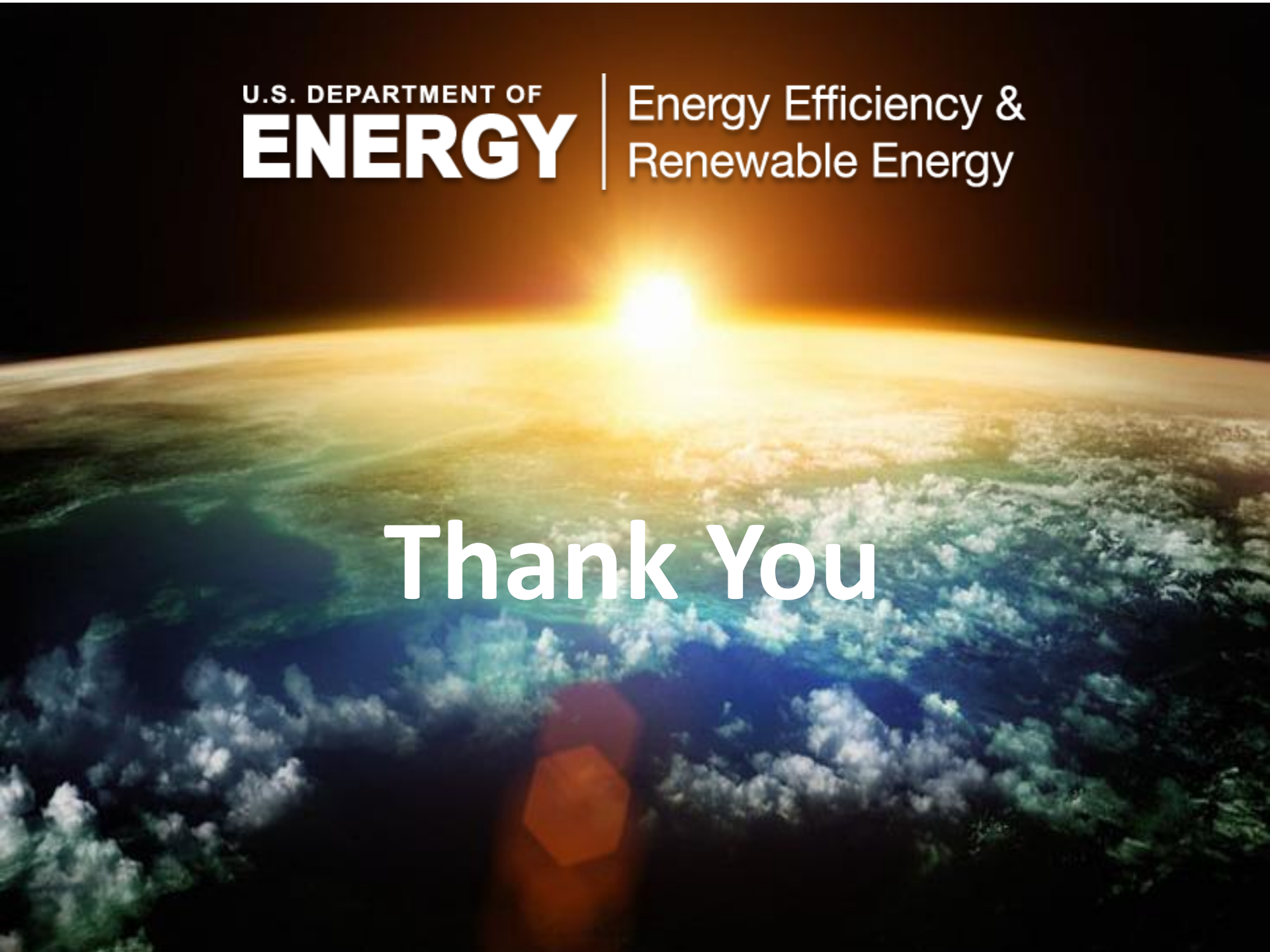
Changing Electricity Supply Mix	Threats to Resilience and Reliability	New Market Opportunities for Consumers	Information and Control Technologies	Aging Infrastructure

Grid Modernization Multi-Year Program Plan

Devices and Integrated System Testing ($74.6M)	• Develops devices and integrated systems, coordinates integration standards and test procedures, and evaluates the grid characteristics of both individual devices and integrated systems to provide grid-friendly energy services
Sensing and Measurement ($34.3M)	• Focuses on tools and strategies to determine the type, number, and placement of sensors to improve system visibility
System Operations, Power Flow, and Control ($23.1M)	• Focuses on new control technologies to support new generation, load, and storage technologies
Design and Planning Tools ($17.7M)	• Develops the next generation of modeling and simulation tools needed for power system planning
Security and Resilience ($11.5M)	• Addresses physical and cybersecurity challenges and assesses ways to minimize risk and provide situational awareness during energy-related emergencies
Institutional Support ($28.5M)	• Provides technical assistance to key decision-makers so they can address the high priority grid modernization challenges and needs identified by electric power industry stakeholders

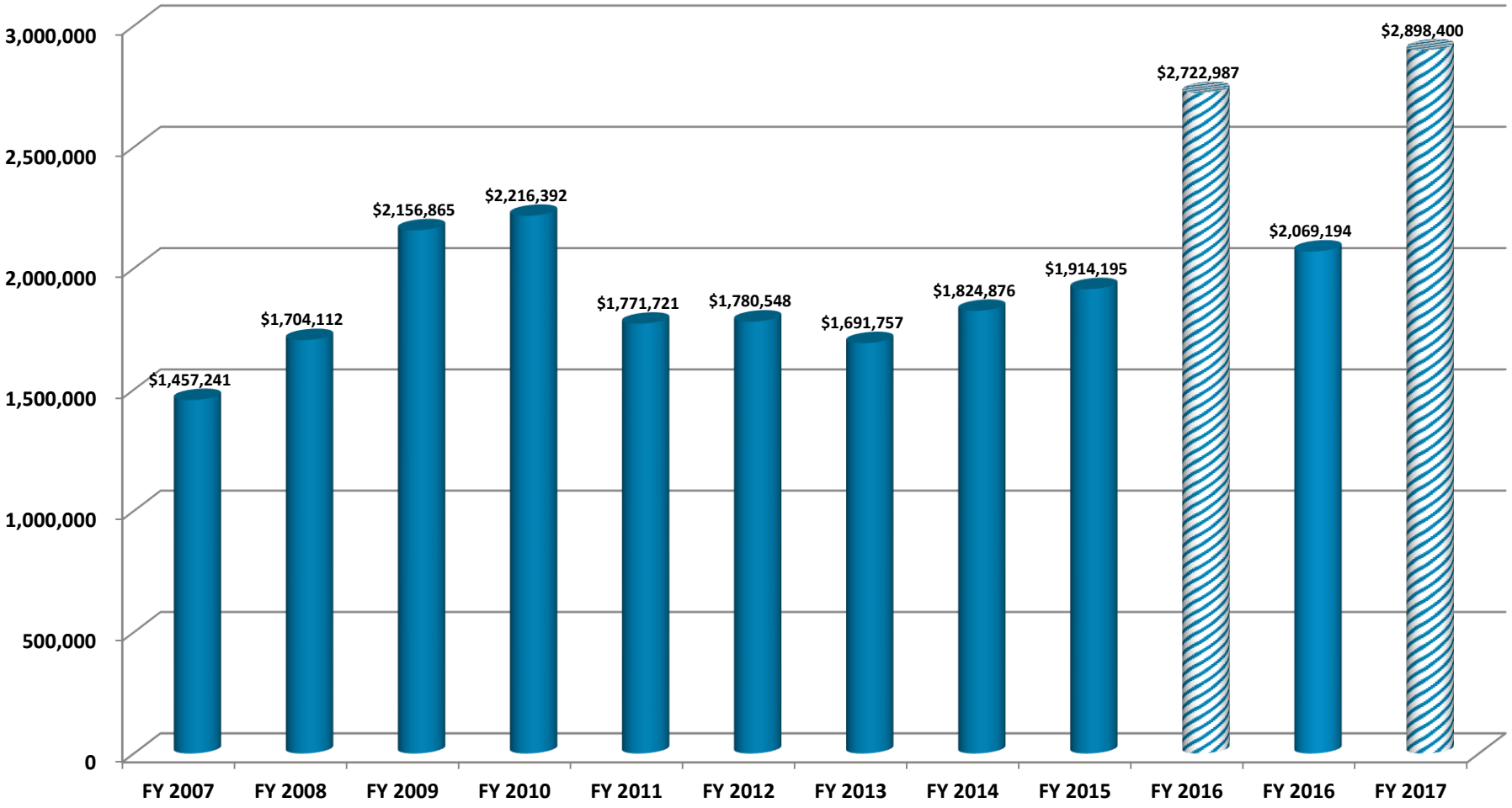
EERE Offices

- Buildings
- Solar
- Vehicles
- Fuel Cells
- Wind


U.S. DEPARTMENT OF
ENERGY
Energy Efficiency &
Renewable Energy
Thank You

- BACK UP slides

EERE Budget Trends: FY 2007 – FY 2017, ($K)

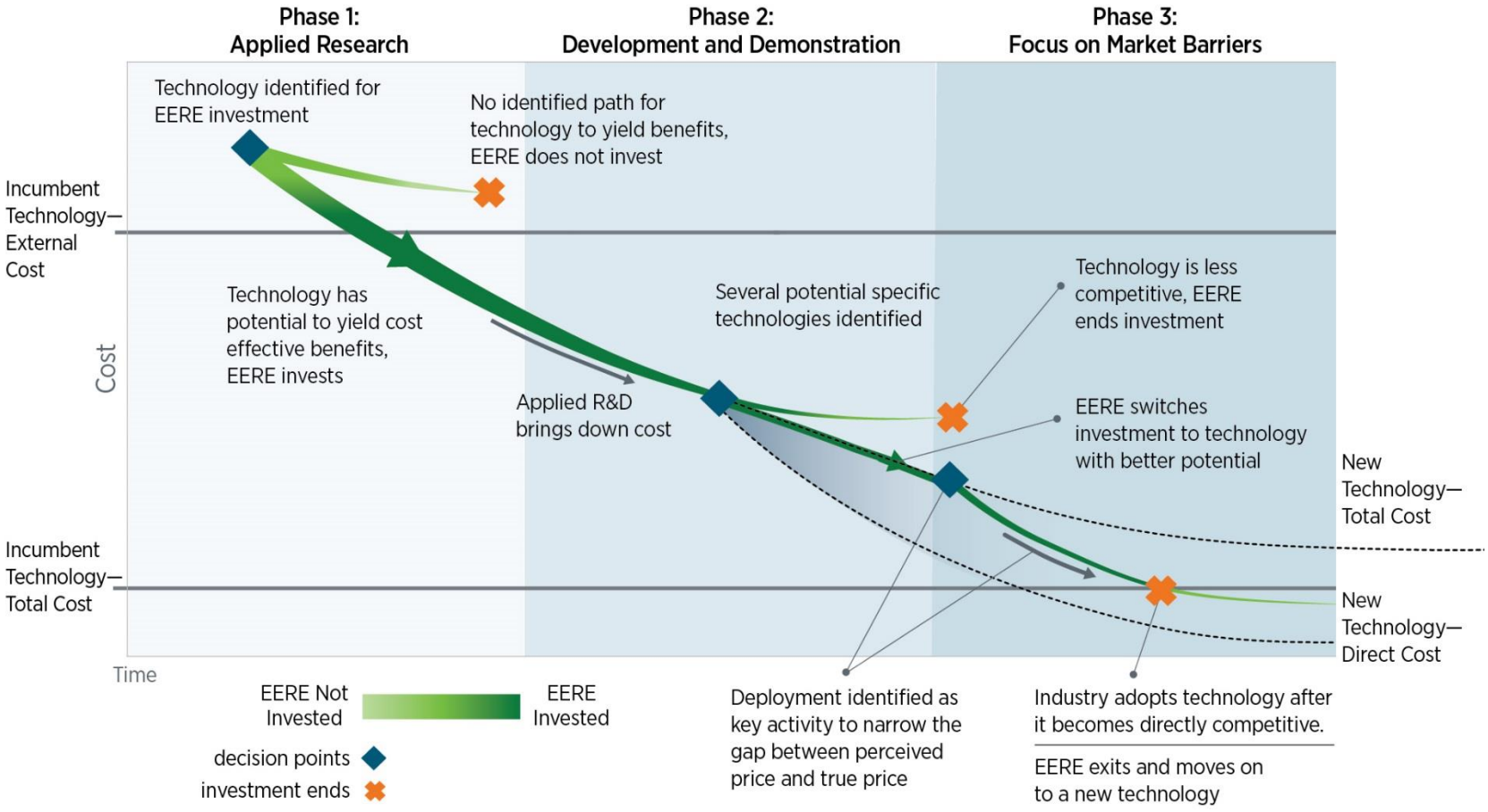


Congressional Request

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

EERE's RDD&D Model

EERE identifies high-impact opportunity areas, creates aggressive long-term cost-reduction goals, develops and implements targeted multi-year R&D program plans/roadmaps, and updates them on a regular basis.



Sustainable TRANSPORTATION

Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Strategic Goal: Accelerate the development and adoption of sustainable transportation technologies

Vehicle Technologies – FY 2017 Budget Request

Goals/Metrics

- Reduce the cost of batteries from $264/kWh[1] in 2015 to $125/kWh by 2022.
- Reduce the cost of electric drive systems from $12/kW[1] in 2015 to $8/kW by 2022.
- Eliminate 30% of vehicle weight for light-duty vehicles through lightweighting by 2022, compared to a 2012 baseline.
- Demonstrate 35% fuel economy gain for passenger vehicles through engine efficiency improvements by 2020 compared to a 2009 baseline.
- Improve engine efficiency of commercial vehicles by 30% by 2020 compared to a 2009 baseline.
- Improve the freight hauling efficiency of heavy-duty Class 8 long-haul vehicles by more than 100% by 2020, compared to a 2009 baseline vehicle.
- Reduce petroleum use by 2.5 billion gallons annually by 2020 through Clean Cities deployment activities.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Batteries and Electric Drive Technologies	103,701	141,100	0	-141,100
Battery Technology R&D	0	0	130,000	+130,000
Electric Drive Technologies R&D	0	0	39,000	+39,000
Vehicle Systems	40,393	30,600	90,000	+59,400
Advanced Combustion Engine R&D	49,000	37,141	74,800	+37,659
Materials Technology	35,602	26,959	82,700	+55,741
Fuel and Lubricant Technologies	20,000	22,500	20,500	-2,000
Outreach, Deployment and Analysis	28,304	48,400	31,500	-16,900
NREL Site-Wide Facility Support	3,000	3,300	0	-3,300
Total, Vehicle Technologies	**280,000**	**310,000**	**468,500**	**+158,500**

1. Modeled production cost at high volume

Bioenergy Technologies – FY 2017 Budget Request

Goals/Metrics

- In 2017, validate technologies that produce drop-in fuels at $3/gge[1] with GHG emissions reduction of at least 50% at bench or pilot scale.
- By 2017, using fuel produced at a pioneer integrated biorefinery, validate that the projected price of cellulosic ethanol is comparable to the 2012 R&D target of $2.15/gallon of ethanol.[2]

1. Modeled mature price (2011$)
2. Modeled mature price (2007$)

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Feedstocks	32,000	46,500	0	-46,500
Feedstock Supply and Logistics	0	0	22,000	+22,000
Advanced Algal Systems	0	0	30,000	+30,000
Conversion Technologies	95,800	85,500	140,900	+55,400
Demonstration and Market Transformation	79,700	75,100	75,000	-100
Strategic Analysis and Cross-Cutting Sustainability	11,000	11,000	11,000	0
NREL Site-Wide Facility Support	6,500	6,900	0	-6,900
Total, Bioenergy Technologies	**225,000**	**225,000**	**278,900**	**+53,900**

Fuel Cell Technologies – FY 2017 Budget Request

Goals/Metrics

- By 2020, reduce fuel cell system cost to $40/kW[1] (on par with advanced technology vehicles on a $/mile basis), with an ultimate target of $30/kW and improve durability to 5,000 hours (equivalent to 150,000 miles of driving).
- By 2020, reduce cost of renewably produced hydrogen to less than $4/gge[1] and the early market cost to $7/gge.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Fuel Cell R&D	33,000	35,000	35,000	0
Hydrogen Fuel R&D	35,200	41,050	44,500	+3,450
Manufacturing R&D	3,000	3,000	0	-3,000
Systems Analysis	3,000	3,000	3,000	0
Technology Validation	11,000	7,000	0	-7,000
Safety, Codes and Standards	7,000	7,000	10,000	+3,000
Market Transformation	3,000	3,000	0	-3,000
Technology Acceleration	0	0	13,000	+13,000
NREL Site-Wide Facility Support	1,800	1,900	0	-1,900
Total, Hydrogen and Fuel Cell Technologies	**97,000**	**100,950**	**105,500**	**+4,550**

1. Modeled production cost at high volume

Renewable ELECTRICITY GENERATION

Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Strategic Goal: Increase the generation of electric power from renewable sources

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Solar Energy Technologies – FY 2017 Budget Request

Goals/Metrics

By 2020, achieve cost competitiveness without subsidies.

- For PV systems, this goal translates to approximately:
  - Utility-scale installed system price: $1.00/Wdc from a 2010 baseline of $3.80/Wdc.
  - Commercial-scale installed system price: $1.25/Wdc from a 2010 baseline of $5.00/Wdc.
  - Residential-scale installed system price: $1.50/Wdc from a 2010 baseline of $6.80/Wdc.
- For CSP, the goal of $0.06/kWh translates to about $3.50/W including 16 hours of thermal storage.

By the end of 2015, progress 70% of the way to the 2020 objectives has been achieved.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Concentrating Solar Power	46,400	48,400	43,000	-5,400
Photovoltaic R&D	35,300	53,152	64,000	+10,848
System Integration	43,700	52,447	83,000	+30,553
Balance of Systems Soft Cost Reduction	40,700	34,913	23,100	-11,813
Innovations in Manufacturing Competitiveness	57,800	43,488	62,000	+18,512
Next Generation Renewable Fuels and Chemicals R&D	0	0	10,000	+10,000
NREL Site-Wide Facility Support	9,100	9,200	0	-9,200
Total, Solar Energy Technologies Office	**233,000**	**241,600**	**285,100**	**+43,500**

Wind Power Technologies – FY 2017 Budget Request

Goals/Metrics

- Achieve the office's wind power LCOE goals to support deployment of wind at high penetration levels, sufficient to meet up to 20% of projected U.S. electricity demand in 2030.
- Reduce the unsubsidized market LCOE for utility-scale land wind energy systems to $0.057/kWh by 2020 and $0.042/kWh by 2030 (from a reference wind cost of $0.069/kWh in 2014).
- Reduce the unsubsidized market LCOE for offshore fixed-bottom wind energy systems to $0.17/kWh by 2020 and $0.14/kWh by 2030 (from a reference of $0.20/kWh in 2014).

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Technology RD&T and Resource Characterization	34,658	24,789	87,500	+62,711
Technology Validation and Market Transformation	46,250	47,650	30,200	-17,450
Mitigate Market Barriers	11,207	12,395	34,000	+21,605
Modeling and Analysis	10,185	8,166	4,300	-3,866
NREL Site-Wide Facility Support	4,700	2,450	0	-2,450
Total, Wind Power Technologies	**107,000**	**95,450**	**156,000**	**+60,550**

Water Power Technologies – FY 2017 Budget Request

Goals/Metrics

- MHK: A new cost of energy FY 2017 target of 66 cents/kWh has been estimated based on information on 2015 baseline data with a 2030 goal of achieving cost competitiveness with local hurdle rates by 2030.
- Hydropower: A new metric has been developed for cost of energy from small, low-head non-powered dams from 9.7 cents/kWh today to 7.5 cents/kWh by 2030.
- Hydropower: A new metric for New Stream Developments (NSD) for cost of energy from small, low-head new stream developments from 11.5 cents/kWh today to 8.9 cents/kWh by 2030.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Marine and Hydrokinetic Technologies	41,100	44,250	55,000	+10,750
Hydropower Technologies	19,200	24,750	25,000	+250
NREL Site-Wide Facility Support	700	1,000	0	-1,000
Total, Water Power Technologies	**61,000**	**70,000**	**80,000**	**+10,000**

Geothermal Technologies – FY 2017 Budget Request

Goals/Metrics

- Demonstrate the capability to create and sustain a greenfield 5 MW Enhanced Geothermal Systems reservoir by 2020.
- Reduce the modeled cost of geothermal power from currently undiscovered hydrothermal resources to $0.10/kWh by 2020.
- Lower the levelized cost of electricity from newly developed geothermal systems to $0.06/kWh by 2030.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Enhanced Geothermal Systems	32,100	45,000	45,000	0
Hydrothermal	12,500	13,800	40,500	+26,700
Low Temperature and Coproduced Resources	6,000	8,000	10,000	+2,000
Systems Analysis	3,900	3,700	4,000	+300
NREL Site-Wide Facility Support	500	500	0	-500
Total, Geothermal Technologies	**55,000**	**71,000**	**99,500**	**+28,500**

Energy Saving HOMES, BUILDINGS, & MANUFACTURING

Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

Strategic Goals:

- Improve the energy efficiency of our homes, buildings and industries.
- Lead efforts to improve federal sustainability and implementation of clean energy solutions.

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Building Technologies – FY 2017 Budget Request

Goals/Metrics

- Reduce the energy use intensity (EUI) of the U.S. buildings sector by 30% by 2030, relative to 2010, with a long-term goal of achieving a 50% reduction.

Achieving these goals by 2030 would decrease total U.S. annual energy use by more than 5%, total energy-related CO2 emissions by 450 million metric tons, and save consumers and businesses over $100 billion in annual energy costs (compared to 2010).

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Emerging Technologies (ET)	55,740	85,915	169,000	+83,085
Commercial Buildings Integration (CBI)	27,643	32,000	28,000	-4,000
Penn State Consortium for Building Energy Innovation	10,000	0	0	0
Residential Buildings Integration (RBI)	22,758	23,000	23,000	0
Equipment and Buildings Standards	53,359	57,485	54,000	-3,485
Metropolitan Systems	0	0	15,000	+15,000
NREL Site-Wide Facility Support	2,500	2,100	0	-2,100
Total, Building Technologies	**172,000**	**200,500**	**289,000**	**+88,500**

Advanced Manufacturing – FY 2017 Budget Request

Goals/Metrics

- By 2020, demonstrate at scale market-based industrial programs and practices providing energy savings of 25% or more..
- By 2025, introduce new industrial technologies and/or advanced materials that lower facility-level energy costs 50% or more, and/or provide 50% savings over targeted product lifecycles, compared to a 2010 baseline.
- Develop, demonstrate, and assist industry with adoption of cost-competitive combined heat and power technologies (supporting EO 13624) towards a national goal of 40 GW of new CHP by 2020.
- Demonstrate technical and economic viability of energy management approaches building off of ISO 50001.
- Establish a total of up to six Clean Energy Manufacturing Institutes as the DOE-led component of the NNMI.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Advanced Manufacturing R&D Projects	84,000	101,500	102,500	+1,000
Advanced Manufacturing R&D Facilities	92,500	98,500	129,000	+30,500
Industrial Technical Assistance	23,500	28,500	29,500	+1,000
Total, Advanced Manufacturing	**200,000**	**228,500**	**261,000**	**+32,500**

Weatherization and Intergovernmental Programs – FY 2017 Budget Request

Goals/Metrics

- WAP Performance Measure: Retrofits - Weatherized homes of low income families
  - FY 2015 Target: 30,000 homes weatherized.
  - FY 2015 Result: Exceeded, 34,220 homes weatherized.
  - FY 2016 Target: 33,600 homes weatherized.
  - FY 2017 Target: 35,700 homes weatherized.
  - Cumulative Target: 150,000 homes weatherized between FY 2017 and FY 2022.
- SEP Performance Measures:
  - FY 2015 Target: Recruit 15 – 20 public-sector partners per year with commitments in Better Building initiatives.
  - FY 2015 Result: Met.
  - FY 2016 Target: Recruit 15 – 20 public-sector partners per year with commitments in Better Building initiatives.
  - FY 2016 Target: Accelerating investments in state and local government use of ESPCs by $2 billion by 2016.
  - Cumulative Target: Reduce state government facilities and operations energy use by 2% per year thru FY 2020.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Weatherization Grants (formula and competitive grants)	189,600	211,600	225,000	+13,400
Training and Technical Assistance	3,000	3,000	5,000	+2,000
NREL Site-Wide Facility Support	400	400	0	-400
Total, Weatherization Assistance Program	**193,000**	**215,000**	**230,000**	**+15,000**
State Energy Program	**50,000**	**50,000**	**70,000**	**+20,000**
Cities, Counties & Communities Energy Program	**0**	**0**	**26,000**	**+26,000**
Total, Weatherization and Intergovernmental	**243,000**	**265,000**	**326,000**	**+61,000**

Federal Energy Management Program – FY 2017 Budget Request

Goals/Metrics

The Federal Government is currently striving to achieve the following mandated goals from Executive Order 13693:

- Improve energy efficiency of each agency through the reduction of energy intensity by 2.5% annually, or 25% by the end of FY 2025, relative to the baseline of the agency's energy use in FY 2015.
- Reduce Government-wide scope 1 and 2 (direct) GHG emissions from targeted sources by 40% in FY 2025 compared to FY 2008.
- Ensure that at least 10% of Federal building electric energy and thermal energy is clean energy in FY 2017 and 25% in 2025.
- Ensure that at least 10% of Federal electricity consumption is generated from renewable sources in FY 2017 and 30% in 2025.
- Reduce water consumption intensity by 2% annually, or 36% by the end of FY 2025 as compared to the FY 2007 base year.
- Reduce the motor vehicle fleet's per-mile greenhouse gas emissions by 4% in 2017 and 30% in 2025 compared to FY 2014.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Federal Energy Efficiency Fund	2,850	3,000	15,000	+12,000
Federal Energy Management	0	23,100	28,000	+4,900
Project Financing, Technical Guidance and Assistance, Planning, Reporting and Evaluation, and Federal Fleet	21,190	0	0	0
DOE Specific Investments	2,160	0	0	0
NREL Site-Wide Facility Support	800	900	0	-900
Total, Federal Energy Management Program	**27,000**	**27,000**	**43,000**	**+16,000**

Mission-Critical Support

OPERATIONS

Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy

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Strategic Programs – FY 2017 Budget Request

Goals/Metrics

Strategic Programs supports all of the goals and metrics of EERE's technical programs. Progress of particular activities is monitored through detailed dashboard elements on a quarterly basis.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Technology-to-Market	6,263	5,974	11,500	+5,526
Strategic Priorities and Impact Analysis	6,506	6,769	6,000	-769
International	3,682	3,789	6,000	+2,211
Communications and Outreach	4,549	4,468	4,500	+32
Total, Strategic Programs	**21,000**	**21,000**	**28,000**	**+7,000**

Program Direction – FY 2017 Budget Request

Motivation/Focus

Program Direction Budget Request provides necessary resources for program and project management, administrative support, contract administration, human capital management, headquarters and field site non-laboratory facilities and infrastructure, and contractor support.

	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	(Dollars in Thousands)
Salaries and Benefits	105,747	105,747	106,470	+723
Travel	3,543	3,500	4,000	+500
Support Services	21,330	16,330	21,330	+5,000
Other Related Expenses	29,380	29,423	39,100	+9,677
Total, Program Direction	**160,000**	**155,000**	**170,900**	**+15,900**
Total, FTEs	**697**	**697**	**707**	**+10**

Facilities and Infrastructure – FY 2017 Budget Request

Goals/Metrics

- Maintain low deferred maintenance, Asset Condition Index >0.97
- Consolidate NREL Site-wide support into single budget account- budget neutral across EERE
- Increase computational capability (2.2 petaflops) and ESIF grid integration testing capability (finalize REDB 1 MW expansion)
- ESIF Success Metrics (50 non-NREL users, availability 210 days, 125 technical outputs)
- Successful Grid Modernization outcomes addressing grid architecture/optimization, interoperability, standards-based testing, grid services valuation, specific-partner testing/validation, etc.

(Dollars in Thousands)	FY 2015 Enacted	FY 2016 Enacted	FY 2017 Request	FY 2017 vs. FY 2016
Operations and Maintenance	26,000	26,000	26,000	0
Facility Management	30,000	36,000	36,000	0
NREL Site-Wide Facility Support	0	0	30,000	+30,000
Total, Facilities and Infrastructure	**56,000**	**62,000**	**92,000**	**+30,000**

Subsurface Crosscut (EERE $81M; DOE $258M)

Adaptive Control of Subsurface Fractures and Fluid Flow

Wellbore Integrity $8M	Subsurface Stress & Induced Seismicity $9M	Permeability Manipulation $4M	New Subsurface Signals $12M
Materials: adaptive cements, muds, casing	Stress state beyond the borehole	Physicochemical rock physics, including fluid-rock interactions	Diagnostic signatures of system behavior and critical thresholds
Real time, in-situ data acquisition and transmission system	Signal acquisition and processing and inversion	New approaches to remotely characterize in-situ fractures and to monitor fracture initiation/branching and fluid flow	Autonomous acquisition, processing and assimilation approaches
Diagnostics tools, remediation tools and techniques	Localized manipulation of subsurface stress	Manipulating (enhancing, reducing and eliminating) flow paths	Integration of different measurements collected over different scales to quantify critical parameters and improve spatial and temporal resolutions
Quantification of material/seal fatigue and failure		Novel stimulation methods	Advanced Imaging of Geophysical &Geochemical Signals in the Subsurface
Advanced drilling and completion tools (e.g., anticipative drilling & centralizers)			
Well abandonment analysis/ R&D			

Energy Field Observatories

Risk Assessment Tools and Methodologies

Ongoing Subsurface Related R&D $47.6M

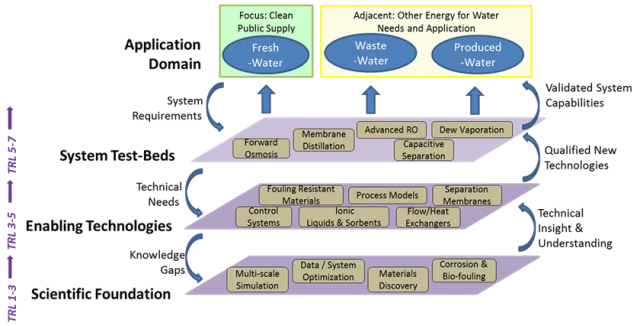
Energy-Water Nexus and Advanced Materials Crosscuts

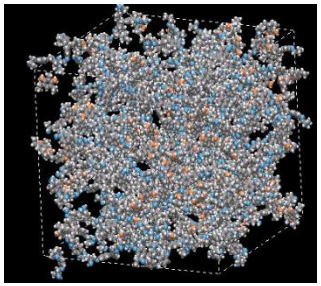
Collaboration Across DOE

Energy-Water Nexus EERE: $52M DOE: $96M	Advanced Materials Manufacturing for Clean Energy EERE: $63M DOE: $113M
Leverage integrated analysis, innovation and outreach to accelerate Nation's transition to more resilient coupled energy-water systems	Enduring public-private partnership that accelerates material development for energy from discovery through deployment twice as fast as today, building capabilities to focus on processing and end use performance

EERE RD&D Focus

AMO ($25.0M):	Low-Energy, Low-Carbon, Low-Cost Desalination Hub	VTO ($34.0M):	Lightweight materials polymer composites and manufacturing FOA and Lab consortium.
BETO ($4.0M):	Conversion technologies	VTO ($5.3M):	Materials under extreme environments
GTO ($2.0M):	Desalination from geothermal brines	AMO ($10.0M):	Additive Manufacturing and Carbon Fiber (within MDF project support).
SETO ($15.0M):	Concentrating Solar Power desalination	AMO ($14.0M):	National Network for Manufacturing Institute for Innovative Advanced Composites
Water ($6.0M):	Water supply system energy recovery and integrated energy assessment modeling		





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