Office of Energy Efficiency and Renewable Energy

Fiscal Year 2014 Budget Rollout – Sustainable Transportation

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

Steve Chalk, Deputy Assistant Secretary
Dr. Kathleen Hogan, Deputy Assistant Secretary

May 2, 2013

EERE's National Mission

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

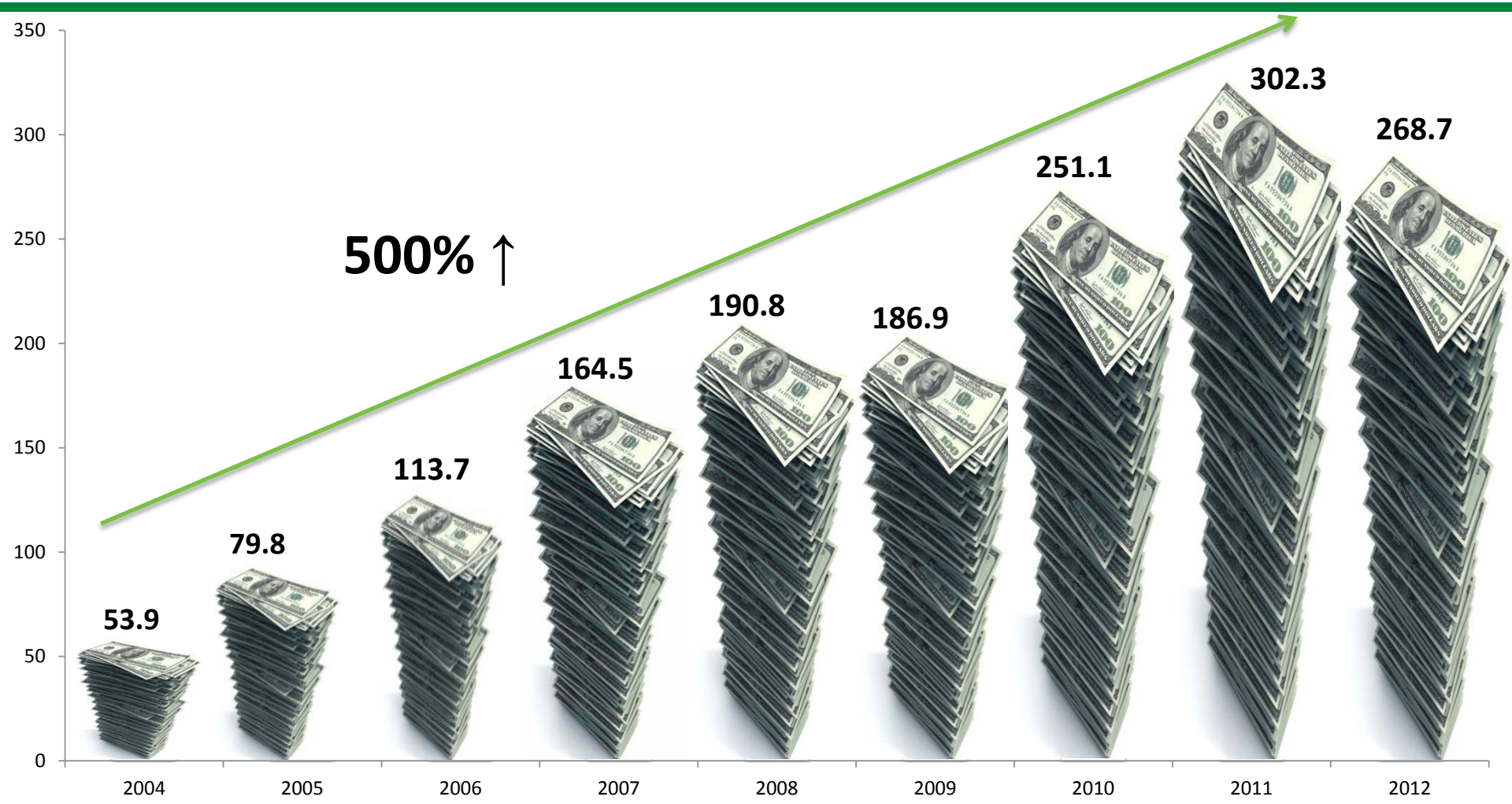
1) **High-Impact Research, Development, and Demonstration to Make Clean Energy as Affordable and Convenient as Traditional Forms of Energy**

2) **Breaking Down Barriers to Market Entry**

Why Clean Energy Matters To America

- Winning the most important **global economic development race** of the 21st century
- Creating **jobs** through American innovation
- Enhancing **energy security** by reducing our dependence on foreign oil and gas
- **Saving money** by cutting energy costs for American families and businesses
- **Protecting health and safety** by mitigating the impact of energy production on air quality and climate

Why Clean Energy Matters: Global Race



Global Clean Energy Investment, 2004-2012 (Billions of $)

Source: Bloomberg New Energy Finance, "*Global Trends in Clean Energy Investment" January 2013*

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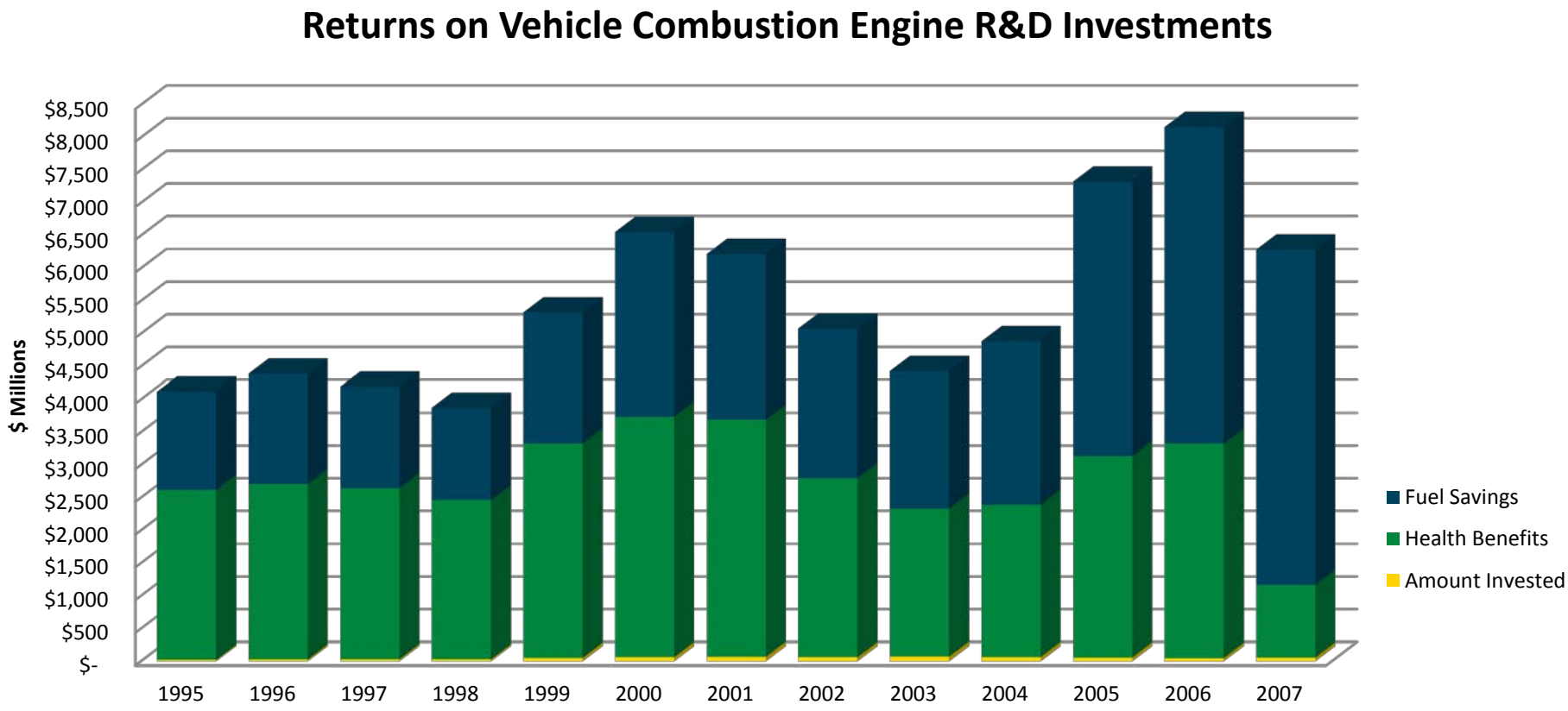
A Proven Track Record of Success

- EERE-funded combustion R&D on heavy-duty trucking efficiency over past 20 years has yielded total benefit of more than $70B *(70:1 return-on-investment)*
- Virtually every hybrid-electric vehicle has EERE battery technology inside
- Reduced plug-in electric vehicle battery costs by 50% in past 4 years
- Reduced fuel cell costs by 35% in past 4 years
- In 2012, achieved 10-year goal of demonstrating technology for $2.15/gallon cellulosic ethanol
- First EERE-supported commercial cellulosic ethanol plant will be on-line in 2013

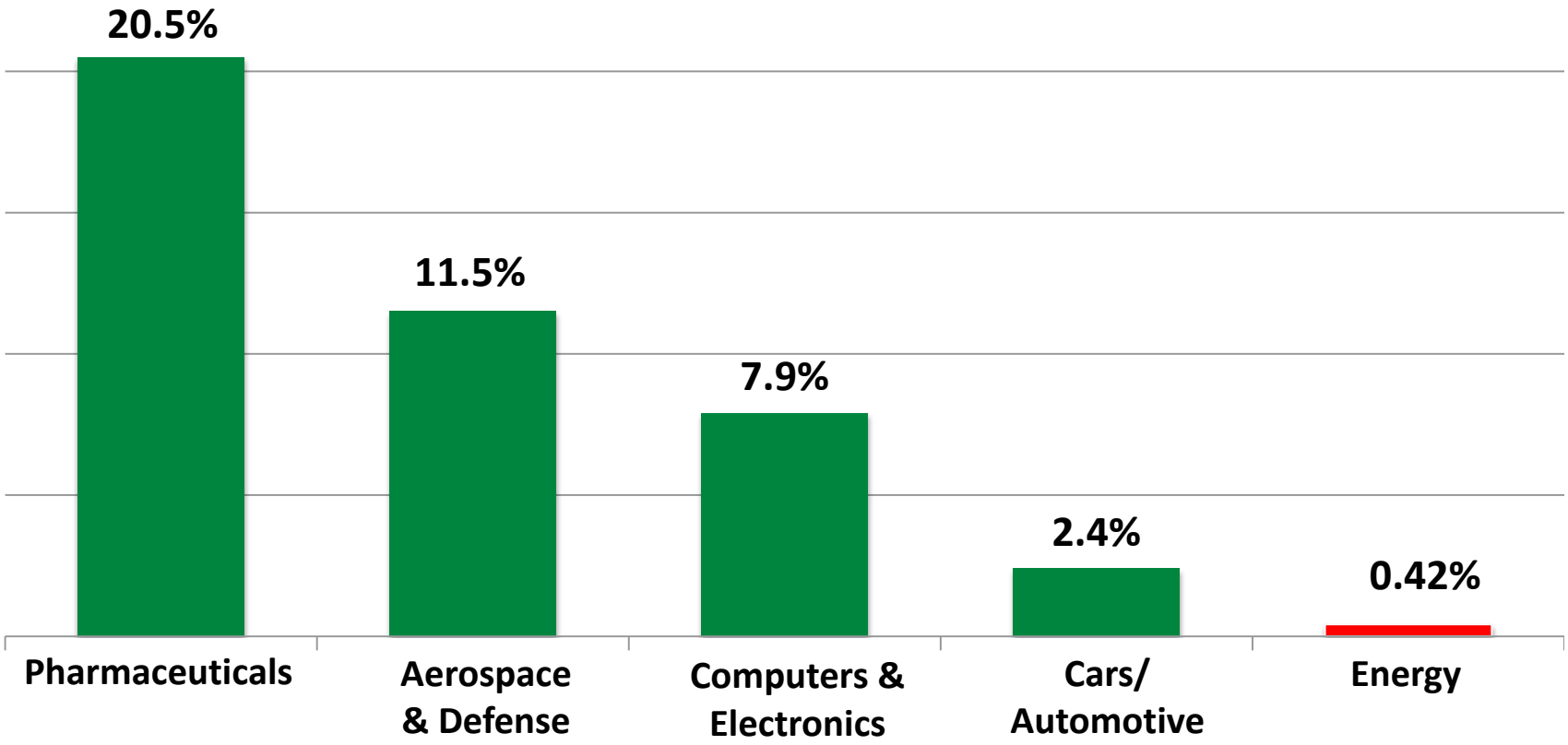
Return on Investment: Vehicle R&D



Investments of **$931 million** in vehicles combustion engine R&D from 1986-2007 resulted in a net benefit of about **$70 billion** (2008 dollars) in fuel savings for users of heavy-duty diesel trucks, and associated environmental and health benefits.

Source: U.S. DOE "Retrospective Benefit-Cost Evaluation of U.S. DOE Vehicle Combustion Engine R&D Investments: Impacts of a Cluster of Energy Technologies," May 2010.

Why Federal Investment?
Low Private Investment in Energy R&D (as % of sales)



Source: American Energy Innovation Council, *Catalyzing American Ingenuity,* 2012

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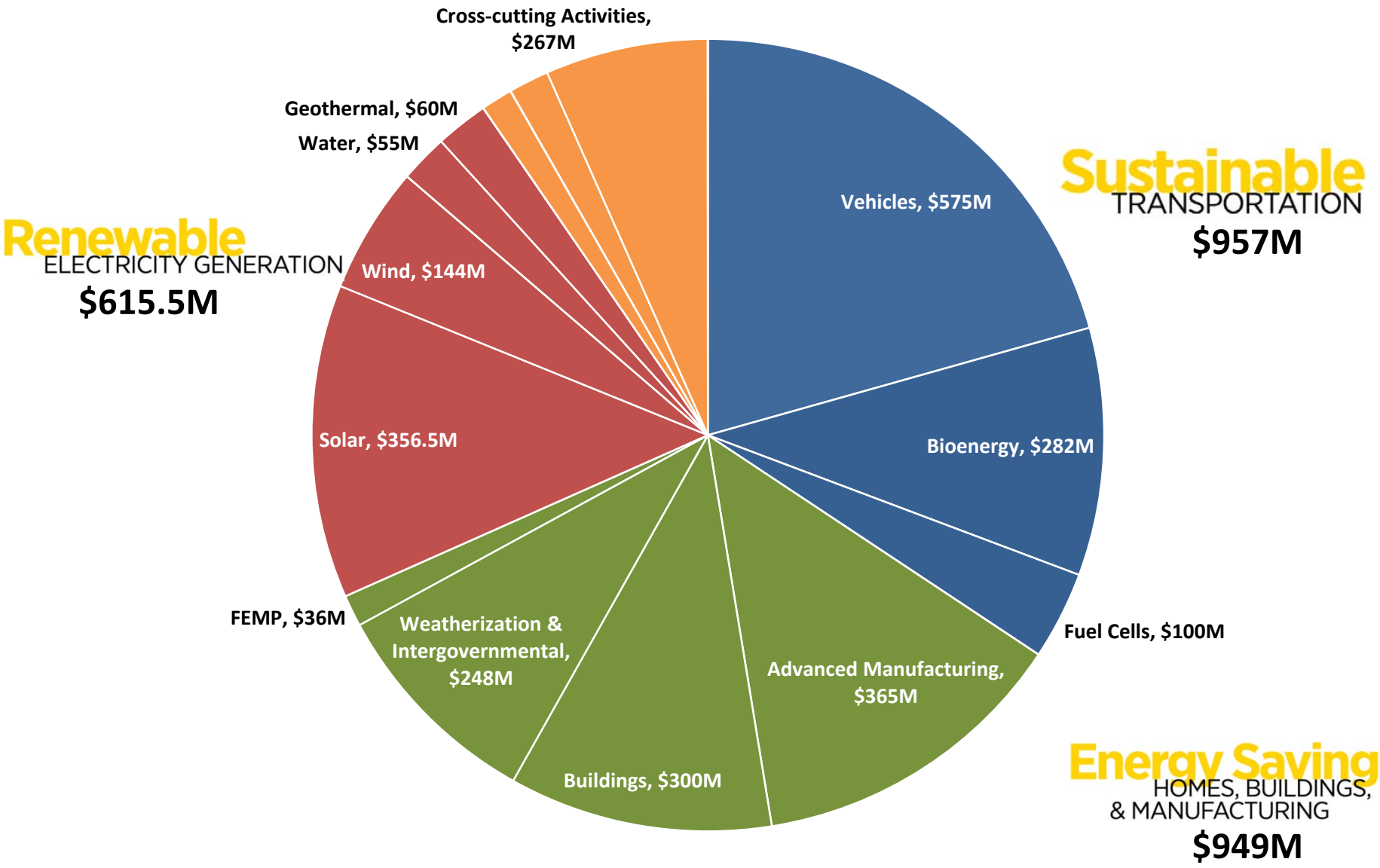
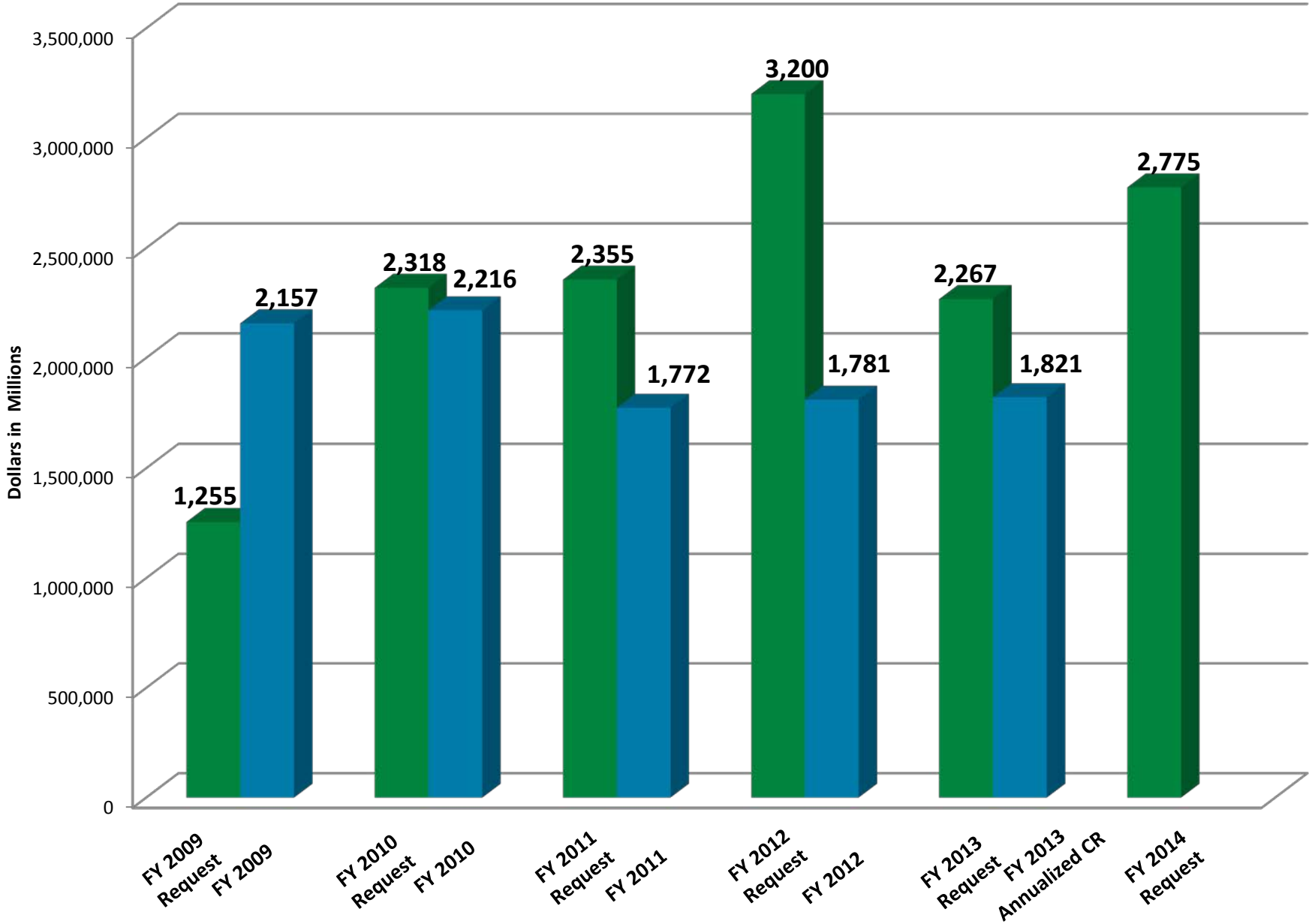
Fiscal Year 2014 EERE Budget Request - $2.78B



EERE Budget Summary

	FY 2012 Current	FY 2013 Request	FY 2013 Annualized CR	FY 2014 Request
Sustainable Transportation	**617,287**	**770,000**	**635,573**	**957,000**
Vehicle Technologies	320,966	420,000	330,819	575,000
Bioenergy Technologies	194,995	270,000	200,496	282,000
Hydrogen and Fuel Cell Technologies	101,326	80,000	104,258	100,000
Energy Efficiency	**485,289**	**872,000**	**495,690**	**949,000**
Advanced Manufacturing	112,692	290,000	116,287	365,000
Building Technologies	214,706	310,000	220,546	300,000
Federal Energy Management Program	29,891	32,000	30,074	36,000
Weatherization and Intergovernmental Activities	128,000	195,000	128,783	248,000
Renewable Electricity	**471,570**	**490,000**	**481,785**	**615,500**
Solar Energy	284,702	310,000	290,719	356,500
Wind Energy	91,813	95,000	93,825	144,000
Geothermal Technologies	36,979	65,000	38,094	60,000
Water Power	58,076	20,000	59,147	55,000
Corporate	**216,311**	**250,000**	**217,635**	**267,000**
Facilities and Infrastructure	26,311	26,400	26,472	46,000
Program Direction	165,000	164,700	166,010	185,000
Strategic Programs	25,000	58,900	25,153	36,000
Subtotal Energy Efficiency and Renewable Energy	**1,790,457**	**2,337,000**	**1,830,683**	**2,788,500**
Use of Prior Year Balances	**-9,909**	**-69,667**	**-9,970**	**-12,800**
Total Energy Efficiency and Renewable Energy	**1,780,548**	**2,267,333**	**1,820,713**	**2,775,700**

EERE Budget Trends: FY 2009[1] – FY 2014 Request



[1] Baseline funding does not include ARRA. In Current levels

Sustainable
TRANSPORTATION

Vehicle Technologies - Overview

Motivation/Focus

- EERE's Vehicle Technologies Office develops and deploys advanced highway transportation technologies that reduce petroleum consumption and greenhouse gas emissions while meeting or exceeding vehicle performance expectations.
- The U.S. imports 45% of the oil it uses, sending more than $1 billion/day overseas for foreign oil.
- The transportation sector accounts for 2/3 of U.S. petroleum use and on-road vehicles are responsible for 80% of this amount.
- CAFE standards will require a nearly doubling of fuel economy to 54.5 mpg light-duty average by 2025.

Achievements

- Generated $70.2 billion (2008 $) in total benefits from combustion engine R&D due to fuel savings for users of heavy-duty trucks and associated monetized health benefits, based on $931 million in DOE investments from 1986 to 2007 (ROI of 70:1).
- Virtually all hybrid electric vehicles on the road in the U.S. today use EERE-developed battery technology.
- Reduced the high-volume production cost of high-energy, high-power batteries cost from $1200/kWh to $500/kWh (2008-2012).
- Innovative mixed-metal cathode material invented at DOE's Argonne National Laboratory through a decade of sustained Vehicle Technologies Office support enables 50% more energy storage capacity. This material has been licensed by several companies, including a start-up that announced it has achieved a breakthrough enabling 2x energy density of current lithium-ion batteries that, as a result, could reduce cost by more than half.
- Demonstrated a 20% engine efficiency improvement (laboratory) through SuperTruck. One awardee has shown a 54% improvement in vehicle fuel economy.

Goals/Metrics

- Save 1.8 million barrels per day of highway vehicle petroleum by 2020 (compared to EIA's Annual Energy Outlook-projected baseline of 11.2 million barrels per day in 2020).
- Develop technologies to enable a corporate average fuel economy (CAFE) of 144gCO2/mi (61.6 miles per gallon [mpg]) for cars and 203gCO2/mi (43.7 mpg) for light trucks by 2025 (54.5 mpg light-duty average).
- Technology Goals:
  - Reduce battery cost from $500/kWh (2012) to $300/kWh by 2015 and $125/kWh by 2022.
  - By 2015, develop an electric drive system with a cost of $12/kW and efficiency of greater than 93%.
  - By 2014, using multi-material technology, demonstrate the cost-effective 45% weight reduction of passenger vehicles (full vehicle, compared to a 2009 baseline).
  - By 2014, improve engine efficiency to demonstrate a 23% fuel economy improvement for passenger vehicles and 18% engine efficiency improvement for commercial vehicles compared to 2009 baseline.

Vehicle Technologies – FY2014 Budget Request

(Dollars in Thousands)	FY 2012 Current	FY 2013 Annualized CR*	FY 2014 Request
Batteries and Electric Drive Technology	117,740	—	240,200
Vehicle and Systems Simulation & Testing	47,198	—	70,000
Advanced Combustion Engine R&D	58,027	—	59,500
Materials Technology	40,830	—	59,500
Fuels and Lubricant Technologies	17,904	—	17,500
Outreach, Deployment and Analysis	39,267	—	126,300
NREL User Facility	0	—	2,000
Total, Vehicle Technologies	**320,966**	**330,819**	**575,000**

*FY 2013 amounts shown reflect the P.L. 112 175 continuing resolution level annualized to a full year. These amounts are shown only at the "congressional control" level and above; below that level, a dash (—) is shown.

Vehicle Technologies – FY2014 Budget Highlights

Fiscal Year 2014 Priorities:

- ***EV Everywhere* Grand Challenge ($325.6M):** Accelerate the development of advanced batteries with better performance and reduced system cost, high performance/low cost power electronics, improved motor technologies with reduced or no rare earth materials, lightweight materials to increase vehicle efficiency and electric range, and advanced technologies for convenient and efficient vehicle charging from the electric grid. A companion Workplace Charging Challenge will encourage private-sector leadership in the deployment of vehicle charging for consumers. *(VT Subprograms: Batteries and Electric Drive Technology, Vehicle and Systems Simulation & Testing, Materials Technology)*
- **Alternative Fuel Vehicle Community Partner Projects ($90M)**: Accelerate the adoption of PEVs, natural gas vehicles, and other alternative fuels through highly-leveraged community partnerships to introduce alternative fuel and advanced vehicles at scale. *(VT Subprogram: Outreach, Deployment, and Analysis)*
- **Advanced Combustion R&D ($59.5M):** Continue to support the SuperTruck projects, promising to increase the fuel efficiency of Class 8 Heavy Duty trucks by at least 50%, as well as low-temperature combustion regimes which can dramatically increase the fuel economy of passenger vehicle.
- **SuperTruck Initiative ($10.1M):** Develop and demonstrate technologies that improve heavy-duty, class 8 vehicle fuel economy by 50% (relative to a comparable 2009 vehicle) by increasing energy efficiency, reducing aerodynamic drag and weight, and hybridization. One SuperTruck awardee showed a 54 percent improvement in vehicle fuel economy and a 61% improvement in freight efficiency. *(VT Subprograms: Vehicle and Systems Simulation & Testing, Advanced Combustion Engine R&D, Materials Technology)*
- **Grid Integration Initiative ($20M):** Coordinate with EERE's Building and Solar Energy Technologies Offices, to develop and advance the platform of technologies necessary to fully integrate PEVs and other clean energy technologies into the distribution system in a safe, reliable, and cost effective manner. *(VT Subprogram: Vehicle & Systems Simulation & Testing)*
- **Vehicle Technologies Incubator ($30M):** Funding program to introduce potentially high-impact promising "off-road-map" new technologies and learning curves into the Vehicle Technologies portfolio. *(VT Subprograms: Batteries and Electric Drive Technology, Advanced Combustion Engine R&D, Materials Technology, Fuels and Lubricant Technologies)*

Alternative Fuel Vehicle Community Partner Projects ($90M)

Purpose: Accelerate the widespread introduction and adoption of commercially-available advanced technologies to reduce U.S. dependence on petroleum, increase local fuel diversification, and catalyze the adoption of clean transportation technologies in other communities through best practices and the collecting and sharing data.

- Emphasize community-based partnerships among state and local governments and the private sector, as well as long-term sustainability beyond the initial Federal investment.
- Select high-impact state and local community-based efforts through a competitive solicitation to implement operating policies and procedures and develop infrastructure to displace on-road vehicle petroleum use with alternatives such as natural gas, electricity, or biofuels.
- Capture data and lessons learned to develop best practices, case studies, and success stories that will serve as templates for other communities. Facilitate communities' ability to share experiences, develop essential expertise, and establish local service and support industries much more rapidly, while demonstrating to others the viability of adopting alternative fuels and advanced vehicles.
- Award up to 9 projects with cost share of at least 50%, up to $10M each, 3-4 years in length.
  - Federal funding would be available for incremental vehicle costs only.
  - Applicants can choose the alternative fuel technologies (e.g., electric drive, natural gas, biofuels) that best suit local/regional needs.
  - Proposals must include a sustainability plan that clearly articulates how efforts will continue following depletion of Federal funds and the strong business case for project viability.

Bioenergy Technologies - Overview

Motivation/Focus

- Through targeted research, development, demonstration, and deployment (RDD&D), BETO enables sustainable, nationwide production of advanced biofuels that are compatible with today's transportation infrastructure and can displace a significant share of petroleum-derived fuels to reduce U.S. dependence on oil.

Achievements

- **Cost-Competitive Cellulosic Ethanol Demonstration:** In FY 2012, the office demonstrated a biochemical and thermochemical conversion process in integrated systems at the pilot scale to convert biomass to ethanol and other industrial alcohols, which validated that these fuels can be produced cost-competitively with gasoline. The data from the office's efforts directed at alcohol fuels will be available to industry and others looking to commercialize any of these technology pathways. Specific technical accomplishments include the following:
  - Achieved a modeled total cost of cellulosic ethanol for mature technology of $2.05–$2.15/gallon of ethanol (less than $3.21/gallon of gasoline equivalent [gge]).
    - Reduced modeled **conversion cost** through targeted R&D to $1.33/gallon of ethanol.
    - Reduced **feedstock costs** for dry herbaceous biomass (i.e., field-dried corn stover) from harvest to biochemical conversion plant gate to $0.83/gallon of ethanol (including grower payment), equivalent to approximately $35/dry ton in 2007 dollars.
- **Cost-Competitive Hydrocarbon Fuels Demonstration:** Achieved a conversion cost of $3.95/gge (combined fuel) from a bio-oil pathway, which equates to $5.23/gge total fuel cost. This is on track to support the $3/gge program goal for 2017.
- **Biorefinery Projects:** Expect to complete 3 commercial biorefinery projects by FY 2015. One pre-commercial-scale (8 million gallons/year) biorefinergy (INEOS) is expected to come online in the summer of 2013. It will be the first operating cellulosic ethanol production facility cost-shared with DOE in the United States.
- On track to validate 80 million gallons of annual advanced biofuel production capacity by fiscal year 2015.

Goals/Metrics

- Reduce the cost of advanced biofuels to be competitive with petroleum-based fuels (gasoline, diesel, and jet fuels) in the market, reducing U.S. need for imported petroleum and reducing emissions from the transportation sector.
- By 2017, achieve a modeled cost of $3/gge for the pyrolysis pathway to drop-in renewable gasoline, diesel, and jet fuel.
- Diversify portfolio by developing additional pathways to enable utilization of a larger variety of biomass resources and conversion technologies that also aim to achieve $3/gge by 2022.

Bioenergy Technologies – FY2014 Budget Request

(Dollars in Thousands)	FY 2012 Current	FY 2013 Annualized CR*	FY 2014 Request
Feedstocks	35,038	—	40,500
Conversion Technologies	102,418	—	141,000
Integrated Biorefineries	42,897	—	78,000
Analysis and Sustainability	9,813	—	13,500
Biopower	4,829	—	4,000
NREL Site Wide Facility Support	0	—	5,000
Total, Bioenergy Technologies Office	**194,995**	**200,496**	**282,000**

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Bioenergy Technologies – FY2014 Budget Highlights

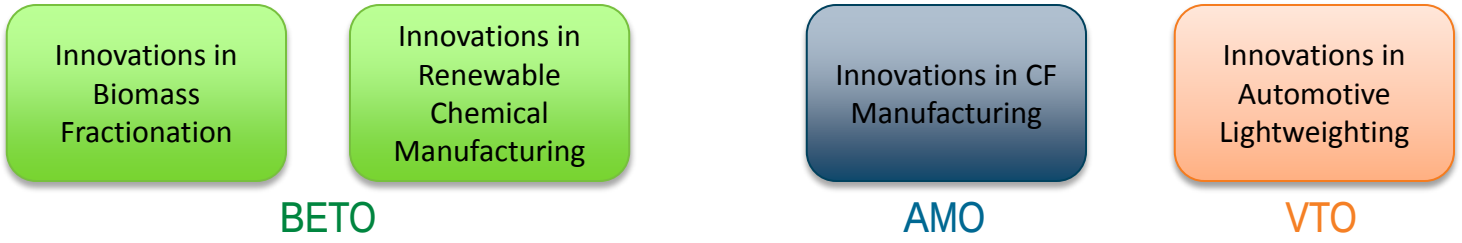
Fiscal Year 2014 Priorities:

- **Feedstocks, Sustainable Production and Logistics ($25M):** Focus on developing technologies, processes, and engineered systems to cost-effectively deliver high-quality biomass to the entire spectrum of potential conversion processes. Activities in 2014 will reduce the feedstock logistics cost target for delivery to plant from $55/dry-matter ton to $53/dry-matter ton for woody biomass. (*BETO subprogram: Feedstocks)*
- **Algae and Advanced Feedstocks ($15.5M):** Focus on developing technologies for the cost-effective production, handling, and conversion of algal biomass into advanced biofuels to replace petroleum fuels including gasoline, diesel, and jet fuel. Activities in 2014 will reduce the modeled mature plant cost of open pond algal biofuels by $2.35/gge to $14.31/gge by improving overall algal biomass productivity toward the $3.00/gge in 2022 goal. (*BETO subprogram: Feedstocks)*
- **Biochemical Conversion ($77M):** Focus on optimizing biomass deconstruction technologies, reducing the cost of intermediates, and exploring innovative upgrading technologies for maximum carbon utilization to lower the cost of advanced biofuels to displace petroleum fuels including gasoline, diesel, and jet fuel. Funds are increased to initiate three new programs beyond fuels to include use of wastes to produce energy and products ($5M), lignin and cellulosic sugar utilization to produce carbon fibers ($20M), and a new Bioenergy Technologies Incubator Program to bring "off roadmap" technologies into portfolio ($10M). (*BETO sub-program: Conversion Technologies)*
- **Thermochemical Conversion ($64M):** Reduce the modeled conversion cost from $3.18/gge to $2.70/gge for producing gasoline/diesel from biomass by way of pyrolysis or direct liquefaction technologies followed by catalytic upgrading. Initiate new Bioenergy Technologies Incubator Program to bring "off roadmap" technologies into portfolio ($10M). (*BETO subprogram: Conversion Technologies)*
- **Integrated Biorefineries ($78M):** Advance BETO's portfolio of innovative pilot-scale and demonstration-scale biorefineries for biofuel and bioproduct manufacturing. Continue efforts in commercial demonstration through DOD/Navy's Defense Production Act authority ($45M). Funding will complete previous mortgages for pilots and demonstration-scale biorefineries selected in 2008. (*BETO subprogram: Integrated Biorefineries*)

Biomass-Derived Carbon Fiber ($20M)

- BETO is collaborating with the Advanced Manufacturing Office (AMO) and the Vehicle Technologies Office (VTO) to develop low-cost biomass-derived carbon fibers for light-weight vehicles and other applications.
- This initiative will investigate promising routes to use biomass as the feedstock to carbon fiber, to make advancements in the fiber manufacturing process, and to develop critical tools to model and predict carbon fiber performance in vehicle components and systems.
  - Produce carbon fiber (CF) from biomass
  - Two Paths for R&D
    - Lignin
    - Bio-derived PAN precursor
  - Enable lower cost precursors and lessen dependence on oil

EERE Partnerships



Value Proposition

$0.10/lb
cellulosic sugars & lignin that meets spec for biorefining

→ 10X

$1.00/lb
chemical intermediates that meets spec for CF

→ 5X

$5.00/lb
CF that meets specs for autos and trucks

Hydrogen and Fuel Cell Technologies - Overview

Motivation/Focus

- EERE's Fuel Cell Technologies Office supports research, development, and demonstration (RD&D) of technologies to enable fuel cells and hydrogen technologies to be cost-competitive in diverse applications—including light-duty vehicles and stationary power—and supports diverse activities to overcome non-technical barriers to widespread adoption.
- Benefits include >90% reduction in petroleum and GHG emissions for light-duty vehicles (on a life-cycle basis, with renewably produced hydrogen).

Achievements

- Fuel Cell R&D:
  - Reduced cost of automotive fuel cells (projected at high volumes) to $47/kW in 2012, a >35% reduction since 2008 and >80% reduction since 2002
  - Reduced platinum content of fuel cells by more than doubling catalyst specific power from the 2008 baseline of 2.8 kW/g of platinum group metal (PGM) to 5.8 kW/g in 2012.
- Hydrogen Fuel R&D:
  - Reduced the capital cost of electrolyzer stacks by 80% since 2001 to less than $400/kW.
- Technology Validation:
  - Doubled automotive fuel cell system durability, under real-world conditions (to >2,500 hours, about 75,000 miles)
  - Validated 250-mile driving range (one vehicle capable of up to 430 miles)
  - Demonstrated the world's first tri-generation fuel cell systems providing electricity, heat, and hydrogen fuel.
  - Funded 690 fuel cell forklifts which led to more than 3,500 forklifts being ordered by industry with no DOE funding.

FCT funding led to >360 patents, 35 commercial technologies, and >65 "emerging" technologies.

Goals/Metrics

- By 2017, reduce cost of automotive fuel cells to $30/kW (at high volumes) and improve durability to 5,000 hours (approx. 150,000 miles of driving)
- By 2020, reduce stationary fuel cell cost to $1,500/kW, and improve durability to 60,000 to 80,000 hours.
- By 2020, reduce the cost of technologies for hydrogen production and delivery to enable a cost of $2.00–$4.00/gge for renewable hydrogen, delivered and dispensed.

Hydrogen and Fuel Cell Technologies – FY 2014 Budget Request

(Dollars in Thousands)	FY 2012 Current	FY 2013 Annualized CR*	FY 2014 Request
Fuel Cell R&D	43,634	—	37,500
Hydrogen Fuel R&D	33,824	—	38,500
Manufacturing R&D	1,944	—	4,000
Systems Analysis	3,000	—	3,000
Technology Validation	8,986	—	6,000
Safety, Codes and Standards	6,938	—	7,000
Market Transformation	3,000	—	3,000
NREL User Facility	0	—	1,000
Total, Fuel Cell Technologies	**101,326**	**104,258**	**100,000**

*FY 2013 amounts shown reflect the P.L. 112 175 continuing resolution level annualized to a full year. These amounts are shown only at the "congressional control" level and above; below that level, a dash (—) is shown.

Hydrogen and Fuel Cell Technologies – FY 2014 Budget Highlights

Fiscal Year 2014 Priorities:

- **Fuel Cell R&D ($37.5M):** Innovation to increase PEM fuel cell power output per gram of platinum-group catalyst from 2.8 kW/g (in 2008) to 6.0 kW/g in 2014 and 8.0 kW/g by 2017.

- **Hydrogen Fuel R&D ($38.5M):** Reduce the delivered, untaxed cost of renewable hydrogen to $7.20/gge (from the 2011 baseline of $8/gge), and will reduce hydrogen storage costs by >10% to $15/kWh. Focus on renewable hydrogen generation, high pressure hydrogen storage tanks, and solid-state hydrogen storage.

- **Technology Validation ($6M):** Collect and analyze data on fuel cell system durability (toward 2019 goal of 5000 hours for light-duty vehicles and 25,000 hours for buses).

- **Manufacturing R&D ($4M:** Develop fabrication processes and technologies for fuel cell components, to enable an automotive fuel cell cost of $30/kW (projected to high-volume manufacturing) in 2017.

- **Systems Analysis ($3M):** Identify technology gaps, assess the economic/jobs potential, identify fueling infrastructure cost reduction opportunities through synergies with natural gas and other renewable technologies, and analyze the potential of hydrogen and fuel cells for energy storage.

Cross-Cutting EERE Initiatives

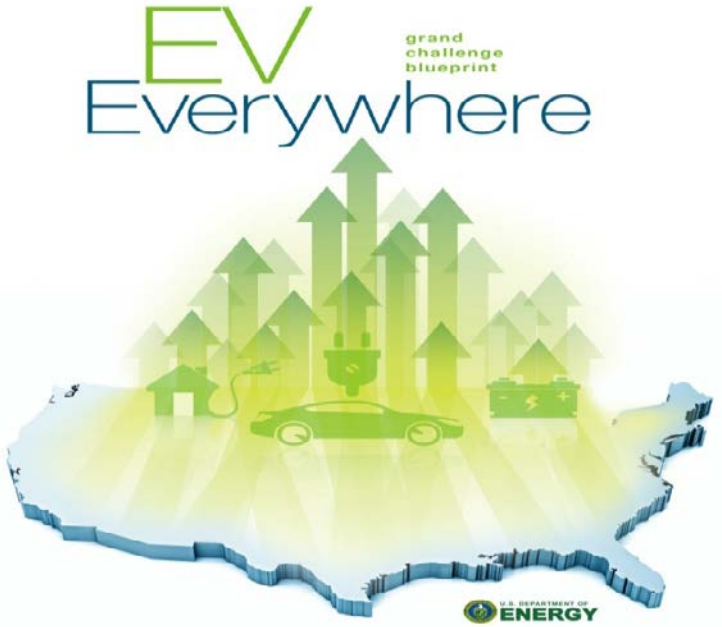
EV Everywhere Grand Challenge ($325.6M)

President Obama issued the *EV Everywhere* Grand Challenge in March 2012 with the bold goal for the U.S. to be the first nation in the world to produce plug-in electric vehicles (PEVs) that are as affordable and convenient for the average American family as today's gasoline-powered vehicles, within the next 10 years (2022).

***EV Everywhere* Grand Challenge** *EV Everywhere* focuses on technical targets to reduce PEV cost and directs attention to breaking down the most difficult PEV deployment barriers.

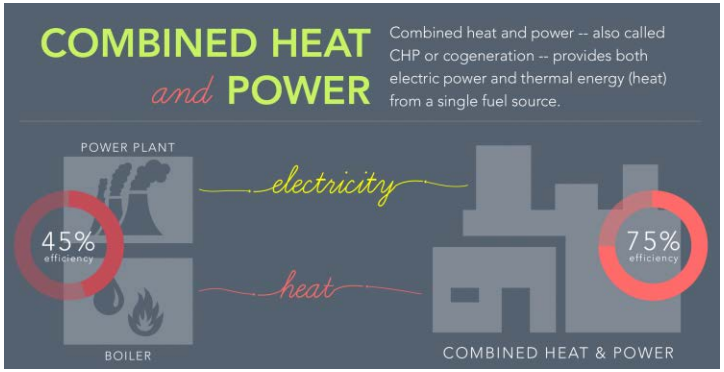
R&D *EV Everywhere* technology performance and cost targets will guide DOE investments to reduce the combined battery and electric drive system costs of a PEV by up to 75%. Includes $240.2M from Batteries and Electric Drive Technology, $32.9M from Vehicles and Systems Simulation and Testing, and $52.5M from Materials Technologies.

Workplace Charging Challenge Launched in 2013, the Challenge's goal is to achieve a tenfold increase in the number of U.S. employers offering workplace charging in the next 5 years. Leading U.S. employers in all economic sectors are taking the Challenge to help build our nation's PEV charging infrastructure by committing to install workplace charging.

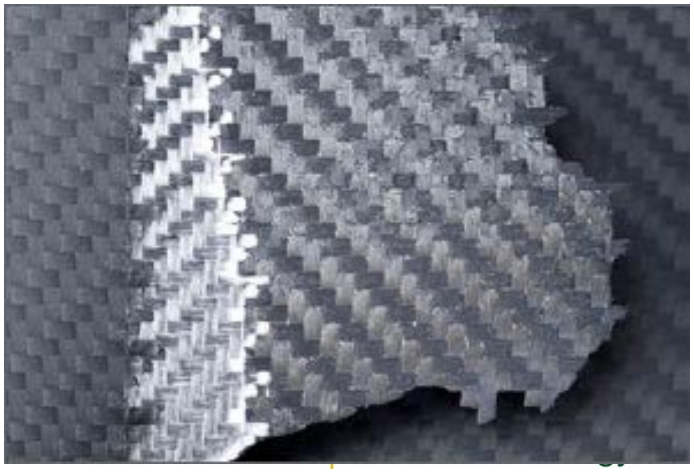


Clean Energy Manufacturing Initiative

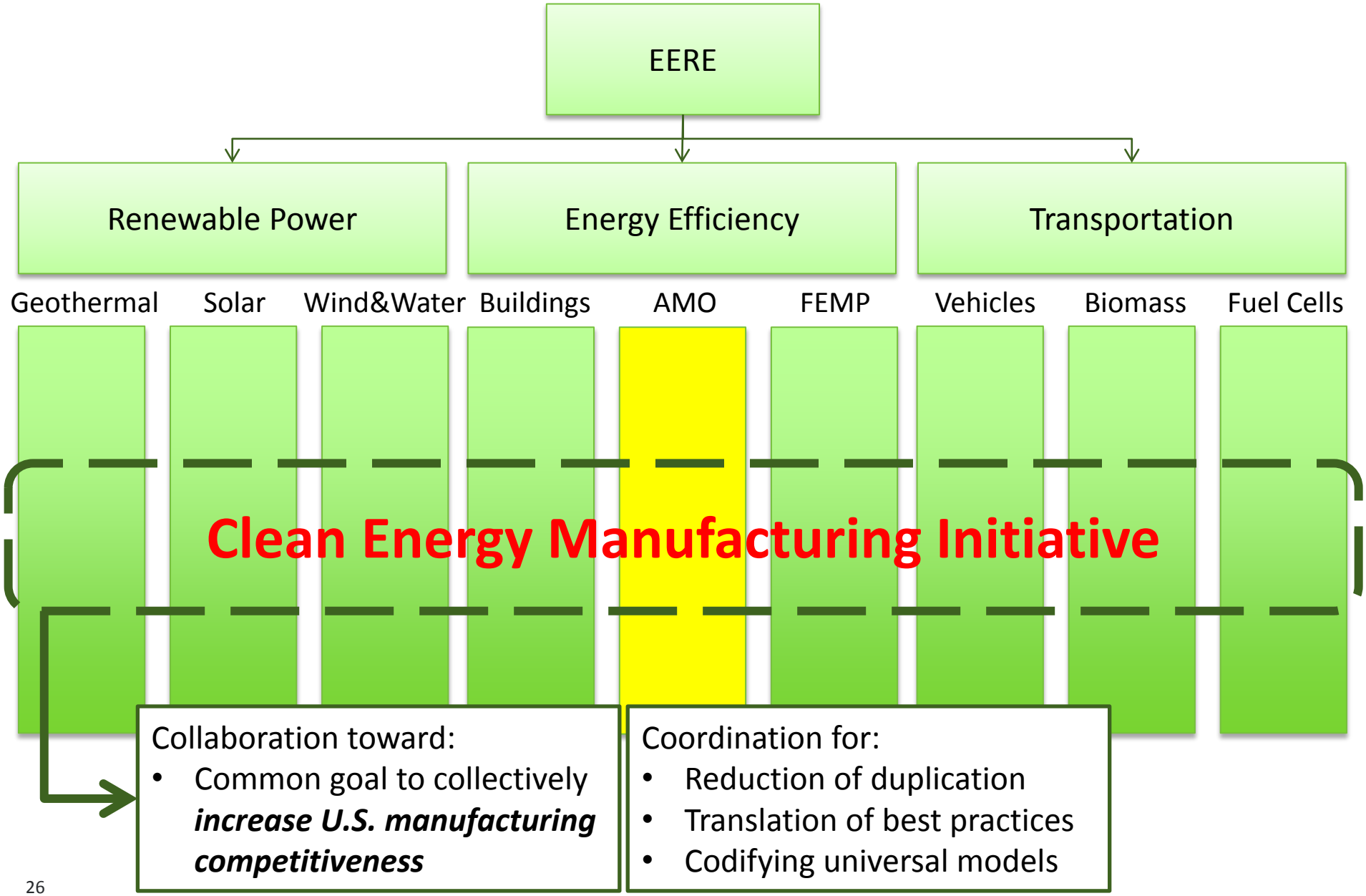
1. **Increase U.S. manufacturing competitiveness across the board by increasing energy productivity**
   - *Enhancing competitiveness of U.S. companies*



2. **Increase U.S. competiveness in the production of clean energy products**
   - *Invest in competitive advantages, overcome competitive disadvantages*



Internal Coordination on Clean Energy Manufacturing



EERE Incubators: High-Impact "Off-Roadmap" Technologies ($110M)

EERE Incubators:

- Pilot expansion of successful "Sunshot Incubator Program" in Solar Energy Technology Office to other EERE technology offices
- Enables ongoing on-ramp for "off-road-map" emerging technology approaches
- Small fraction of annual R&D budget
- SunShot Incubator program has leveraged $90M in competitively awarded government funds into more than $1.7B in private-sector follow-on funding

Program Offices	(Dollars in Thousands)
Vehicle Technologies	30,000
Bioenergy Technologies	20,000
Hydrogen and Fuel Cell Technologies	7,500
Wind Energy	4,500
Water Power	1,650
Advanced Manufacturing	20,000
Solar Energy	21,400
Building Technologies	5,000
Total Incubator Investments	**$110,050**

EERE Grid Integration Initiative: Goal & Vision ($80M)

Cross-cutting EERE Program to Address Grid Integration Barriers to High Penetration of EERE Technologies

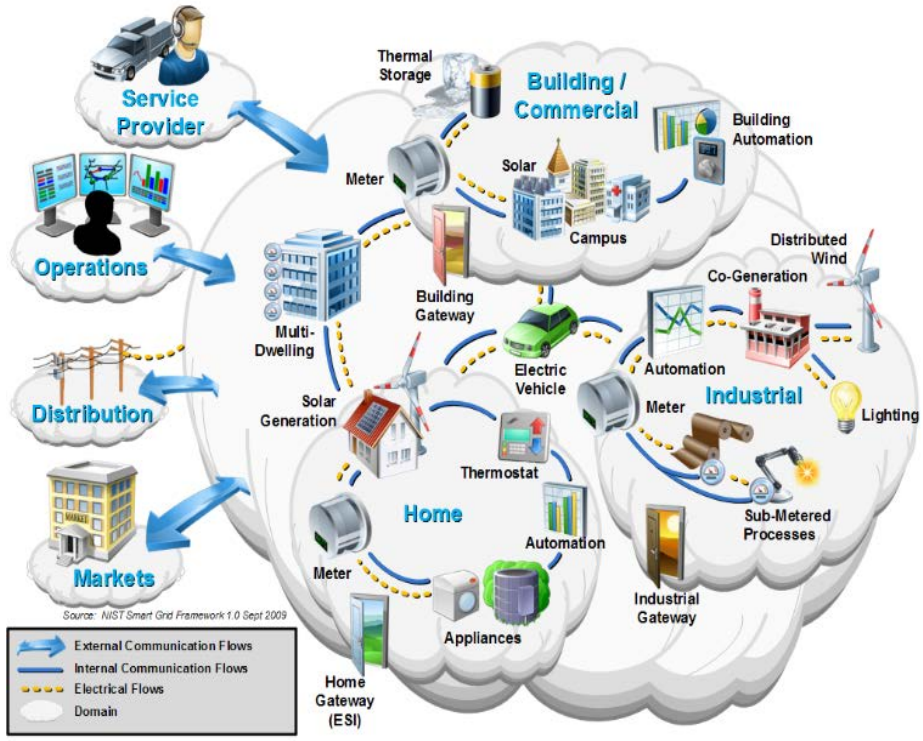
Importance of Integrating Clean Energy Technologies Into the Electricity Grid

Cost reduction alone will not enable large-scale deployment. As clean energy and energy efficient technologies become more prevalent on the customer side of the meter, the distribution system must evolve to accommodate these technologies. Distributed variable resources (e.g., solar, etc.), electric vehicles, and building energy technologies must be holistically integrated to be adopted by utilities or the marketplace at a scale necessary to achieve significant energy, economic, and environmental benefits.

Multi-Program (Solar, Buildings, and Vehicles) Initiative

Address grid integration barriers through joint funding opportunity announcements aimed at load serving utilities and supported by integrated national laboratory effort.

- Protection and restoration
- Systems optimization
- Data management and communications
- Interoperability and standards
- Sensors and data
- Distribution models and tools
- Owner economics



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For Further Information

Office of Energy Efficiency & Renewable Energy - http://www.eere.energy.gov/

Fiscal Year 2014 EERE Budget Request Information:
http://www1.eere.energy.gov/office_eere/bo_budget_fy14.html

State Summaries: A Snapshot of EERE's Work in States
http://apps1.eere.energy.gov/states/state_summaries.cfm

Cross-cutting EERE Initiatives

EV Everywhere: http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/index.html

Clean Energy Manufacturing Initiative: http://www1.eere.energy.gov/energymanufacturing/index.html

Renewable Electricity Generation – FY 2014 Technology Office Budget Requests

Bioenergy Technologies:
http://www1.eere.energy.gov/office_eere/pdfs/budget/bioenergy_ataglance_2014.pdf

Hydrogen and Fuel Cell Technologies:
http://www1.eere.energy.gov/office_eere/pdfs/budget/fuelcells_ataglance_2014.pdf

Vehicle Technologies:
http://www1.eere.energy.gov/office_eere/pdfs/budget/vehicles_ataglance_2014.pdf

For more information, please contact EERE Stakeholder Engagement at
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