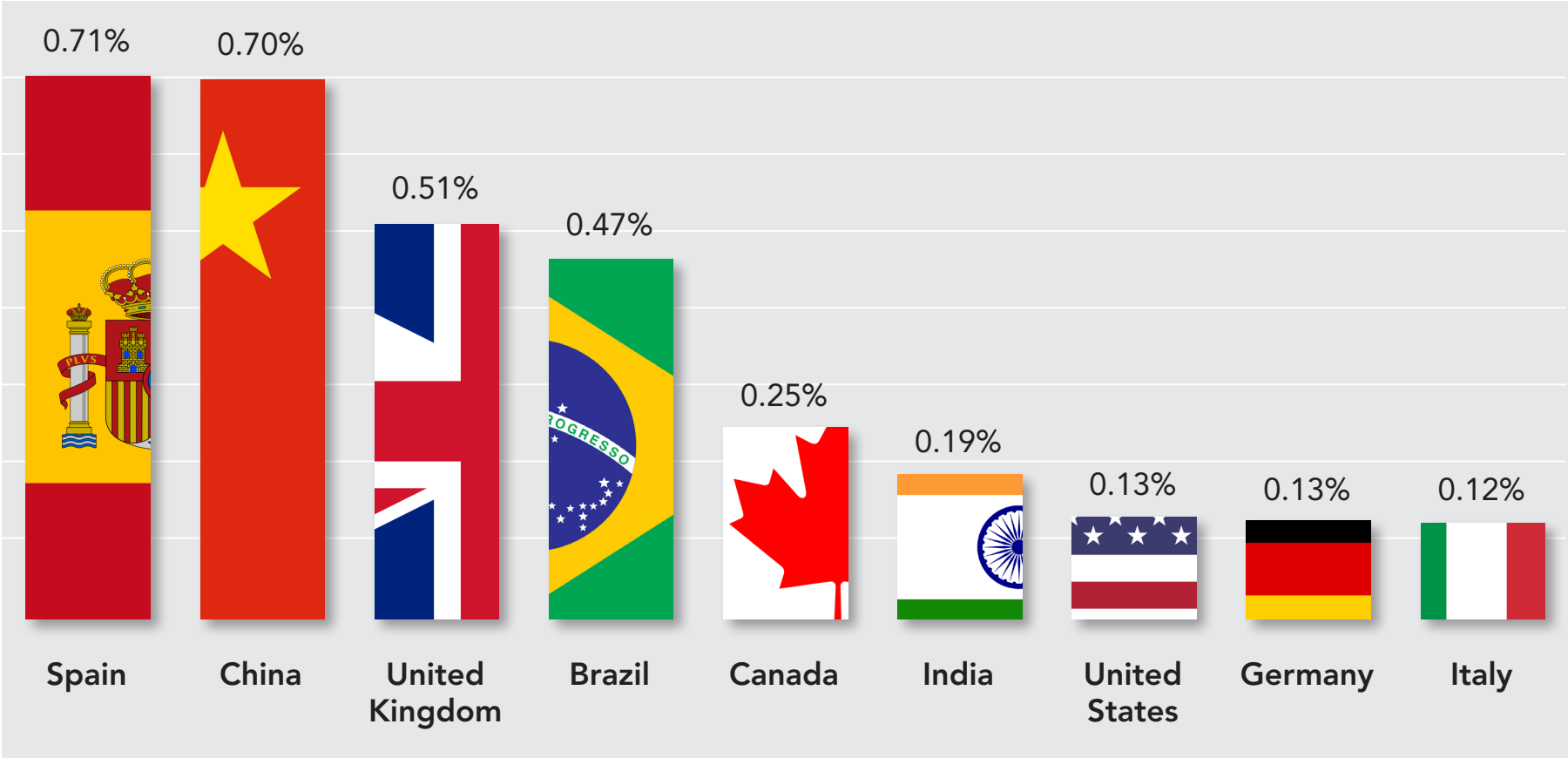
Top Countries in Clean Energy Investment

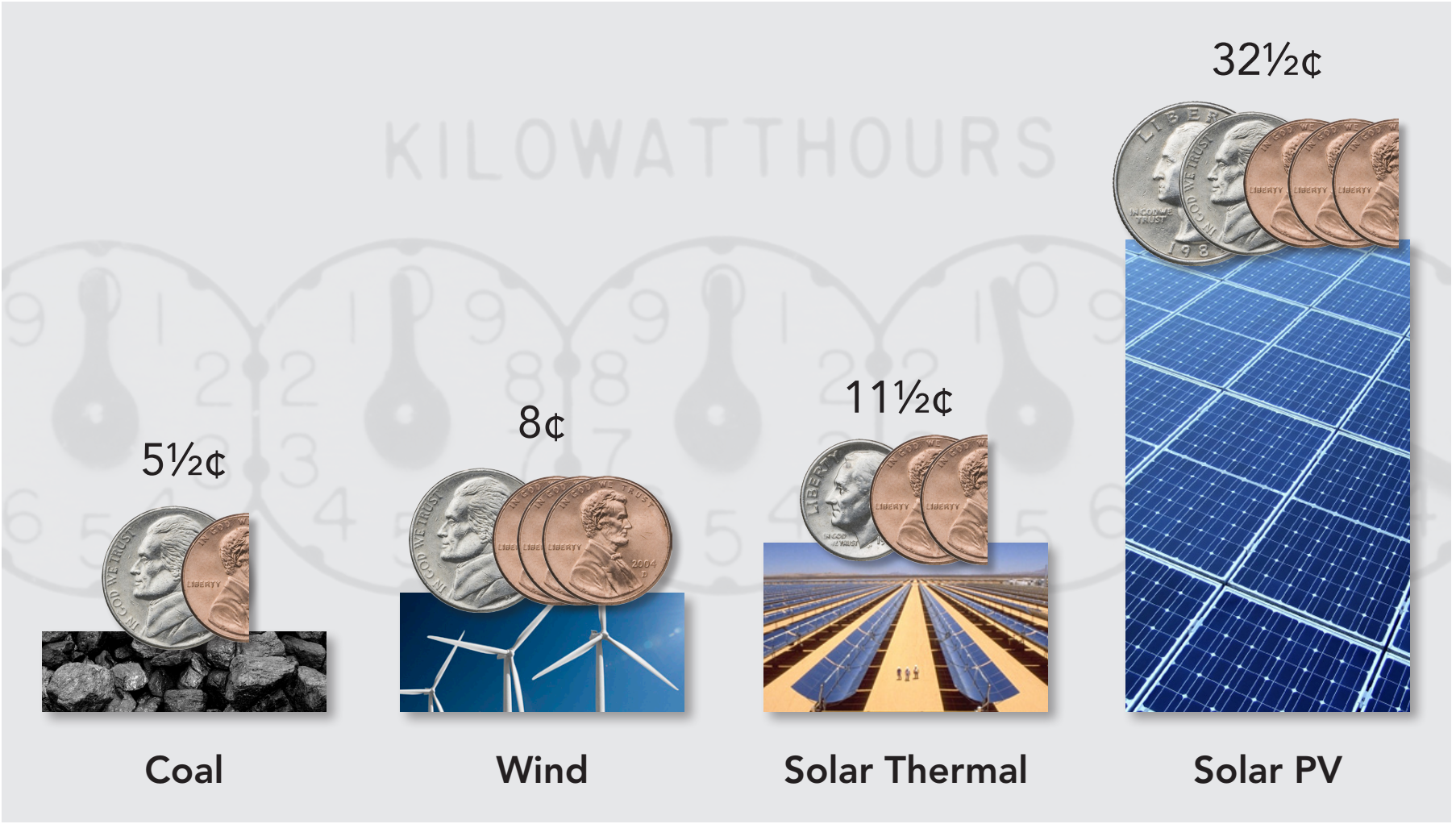
Clean Energy Investment as a Percentage of GDP



"Who's Winning the Clean Energy Race? Growth, Competition and Opportunity in the World's Largest Economies," Report, The Pew Charitable Trusts. To read the full "Creating a Clean Energy Century" report, visit http://www.thirdway.org/publications/351. Graphic design by Bill Rapp. For more information, visit www.thirdway.org.

Cost of Electricity by Fuel Source

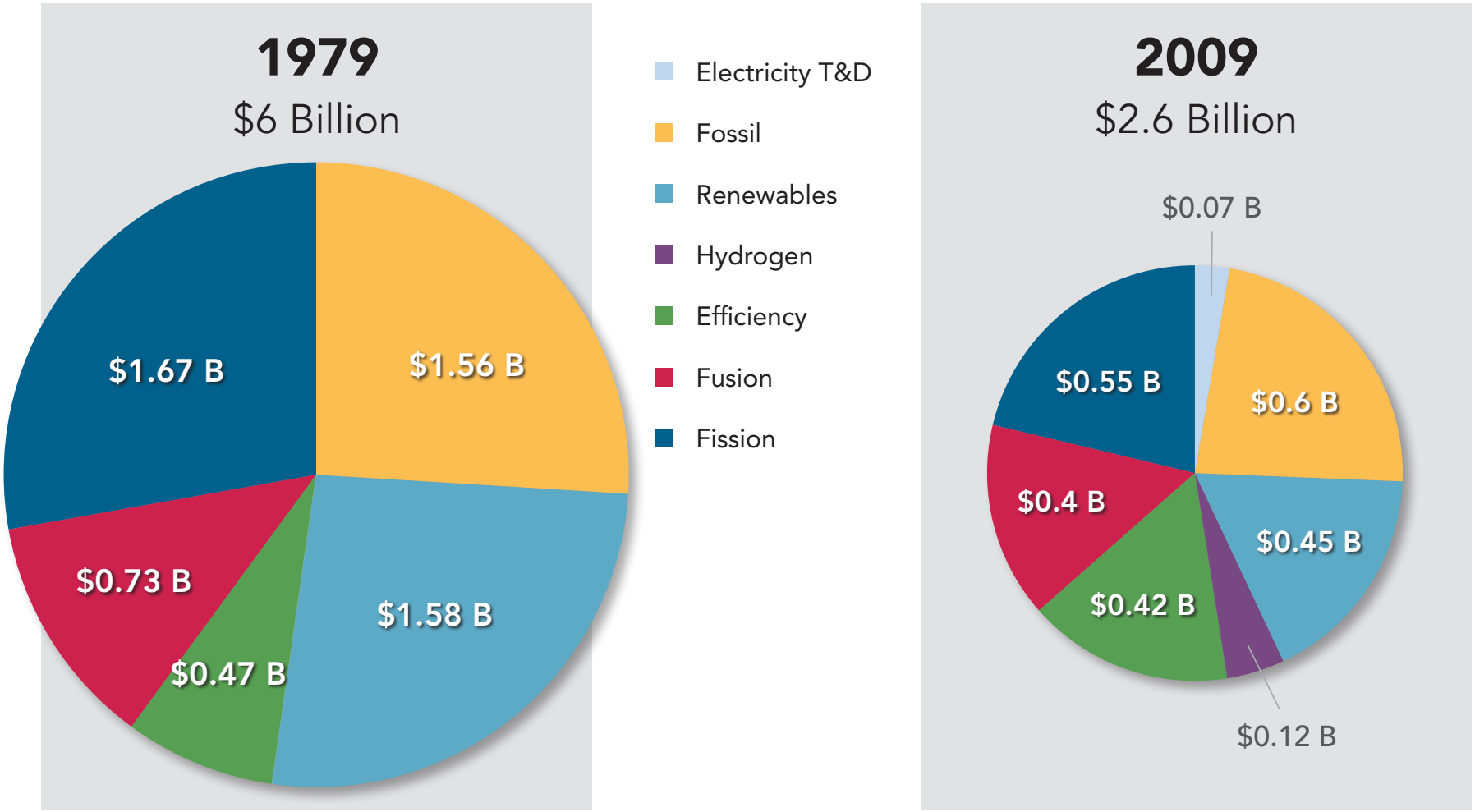
Cost in Cents per kW-h



Levelized cost of electricity calculations by The Breakthrough Institute based on United States Energy Information Administration's Annual Energy Outlook 2010 project cost estimates by technology. Calculations assume 8.8% effective cost of financing and a range of overnight capital costs +/- 15% from EIA published estimates. To read the full "Creating a Clean Energy Century" report, visit http://www.thirdway.org/publications/351.

U.S. DOE Energy R&D Spending

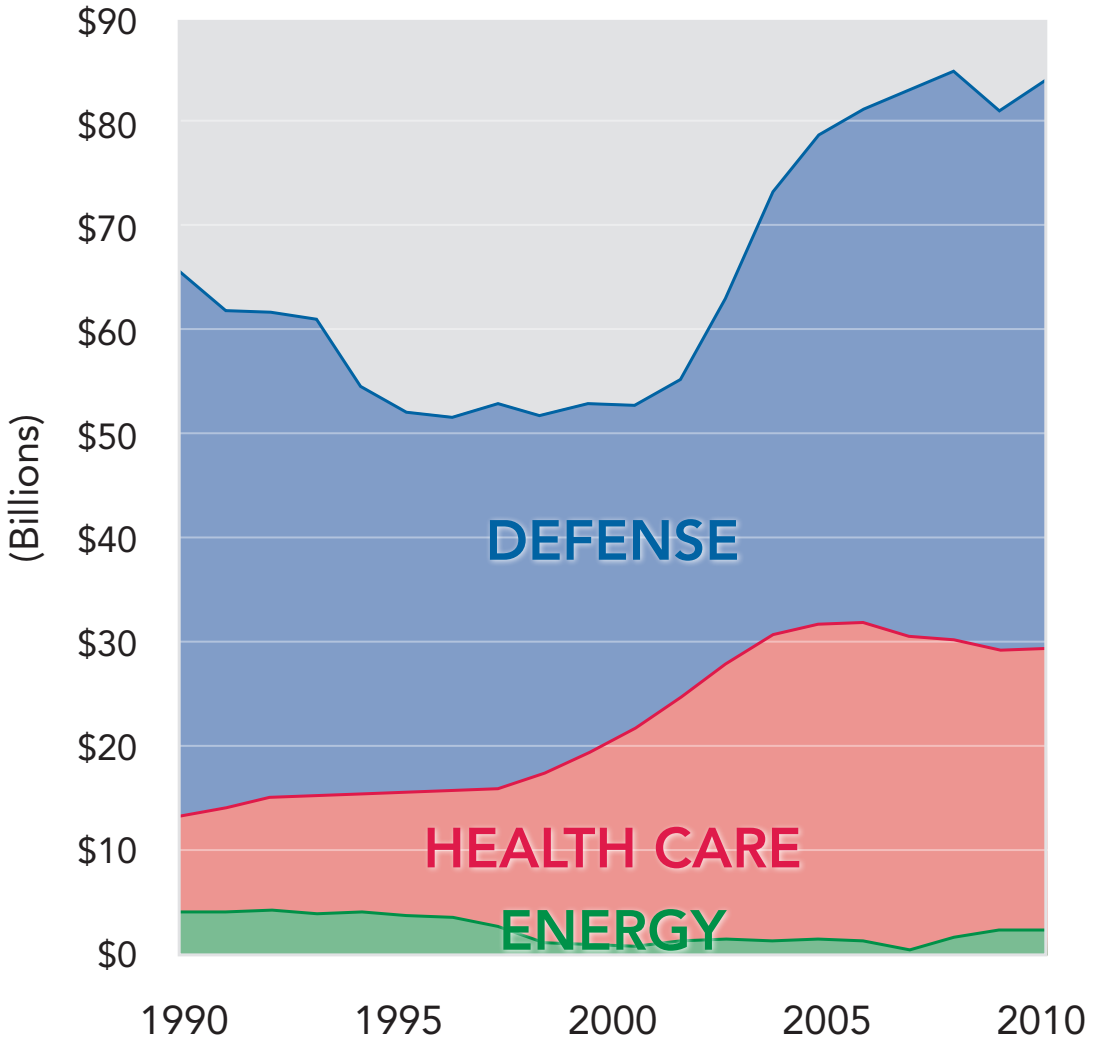
FY 1979 vs. FY 2009 Request in FY 2000 Dollars



Gallagher, K.S., "DOE Budget Authority for Energy Research, Development, and Demonstration Database," Energy Technology Innovation Policy, John F. Kennedy School of Government, Harvard University, June 2008. To read the full "Creating a Clean Energy Century" report, visit http://www.thirdway.org/publications/351. Graphic design by Bill Rapp. For more information, visit www.thirdway.org.

R&D Spending in Energy, Health, and Defense

1990–2009 Constant 2009 Dollars, Excluding Stimulus



Federal investment in health and defense innovation has never faced the rollercoaster of uncertainty faced by energy. Over the past two decades, the government has invested $52 billion in energy, compared to $452 billion in health research and $1.3 trillion for defense. Public energy innovation funding dipped, then flat-lined beginning in 1998 while investment in health and defense increased by an average of $167 million a year. This has correlated into a 4% growth in the defense sector and 5% in health care compared to only 2.3% in energy in the U.S.

"TABLE 36. Federal research and development obligations, budget authority, and budget authority for basic research, by budget function: FY 1955–2009," National Science Foundation, Accessed August 16, 2010. Available at: http://www.nsf.gov/statistics/nsf08315/pdf/tab36.pdf. To read the full "Creating a Clean Energy Century" report, visit http://www.thirdway.org/publications/351. Graphic design by Bill Rapp. For more information, visit www.thirdway.org.

The Clean Energy Maze

Clean Energy Funding Across Agencies/Programs

DEPARTMENT OF ENERGY

Fossil Energy

- Fossil Energy R&D
  - » Natural Gas Technologies
  - » Petroleum - Oil Technologies
  - » Unconventional Fossil Energy Technologies
  - » Cooperative R&D
  - » Coal Technology
    - Fuels and Power Systems

Energy Efficiency and Renewable Energy (EERE)

- Hydrogen Technology
- Fuel Cell Technologies Program
  - » Hydrogen and Fuel Cell Technologies
- Solar Energy
- Wind and Water Power Program
  - » Wind Energy
  - » Water Power
- Biomass Program
  - » Biomass and Biorefinery Systems R&D
- Geothermal Technologies Program
- Vehicle Technologies Program
  - » Alternate Fueled Vehicles
  - » Transportation Electrification
  - » Advanced Battery Manufacturing
- Building Technologies Program
- Industrial Technologies Program
- Weatherization and Intergovernmental Program
  - » Energy Efficiency and Conservation Block Grants
  - » State Energy Program Grants
- Federal Energy Management Program
- Conservation Weatherization Program (excluding training and technical assistance)
- RE-ENERGYSE (partnership with NSF)

Electricity Delivery and Energy Reliability (EDER)

- Research and Development
- Smart Grid Investment Program
- Smart Grid Regional and Energy Storage Demos

Office of Nuclear Energy

- Nuclear Energy
  - » Nuclear Energy Enabling Technologies
  - » Integrated University Program
  - » Reactor Concepts RD&D
  - » Generation IV Nuclear Energy Systems
  - » Nuclear Power 2010
  - » Fuel Cycle RD&D
  - » International Nuclear Power Programs
  - » RE-ENERGYSE (partnership with NSF)

Office of Science

- Science
  - » Basic Energy Sciences
  - » Fusion Energy Sciences Program
  - » Small Business Innovation Research Program

Title 17 - Innovation Technology Loan Guarantee Prog.

- Section 1705 Temporary Loan Guarantee Program

Advanced Technology Vehicles Manufacturing Loan Program

Energy Innovation Hubs

Energy Frontier Research Centers

Small Business Administration (EXTERNAL to DOE)

- Small Business Technology Transfer Program

DEPARTMENT OF DEFENSE

RESEARCH, DEVELOPMENT, TESTING & EVALUATION (RDT&E)

Department-wide

- Applied Research
  - » Plasma Fusion (Polywell) AR
- Advanced Technology Development
  - » Energy Modeling ATD
  - » Wind Lift Power Generator ATD
  - » HPCM Maui Energy Improvement Initiative ATD
  - » Algal Derived Biofuel Program ATD
  - » Fuel Cells ATD
  - » Fuel Efficient Ground Vehicle Demonstrator
  - » Materials - Ceramic Matrix Composites
  - » Mobile Waste to Energy
- Advanced Component Development and Prototypes
  - » Energy Enterprise Management ACDP
  - » Solid Waste Gasification ACDP
  - » Anaerobic Digester Technology ACDP
  - » Landfill Gas Energy Capture ACDP
  - » Tactical, Deployable Micro-Grid ACDP

Army

- Applied Research
  - » Develop smaller, lighter cogeneration and absorption environmental control style AR
  - » High Temperature Silicon Carbide (SiC) Power Semiconductors AR
  - » Lightweight, Flexible, Cost Effective Solar Energy Photovoltaics AR
  - » Environmental Quality Technology AR
- Advanced Technology Development
  - » Ultra Low Energy Community Systems ATD
  - » Energy Security Audit & Islanding Methodology ATD
  - » Advanced Power Electronics Ground Systems Testbed Equipment ATD
  - » High Temperature Silicon Carbide (SiC) Power Semiconductors ATD
  - » Micro-Grid Field Scaled Demonstration ATD
  - » Environmental Quality Technology Demonstrations ATD
- Advanced Component Development and Prototypes
  - » Environmental Quality Technology ACDP

Navy

- Applied Research
  - » Plasma Fusion (Polywell) AR
- Advanced Technology Development
  - » Power Projection Advanced Technology ATD
- Advanced Component Development and Prototypes
  - » Advanced High Energy HVAC System ACDP
  - » Advanced Nuclear Power Systems
  - » Aircraft Energy Conservation RDTE Program ACDP
  - » Alternate Test Fuel and Cert Protocol Acceleration ACDP
  - » F18 Engine Efficiency Improvements ACDP
  - » Hybrid Electric Drive System Development for Surface Combatants ACDP
  - » Navy Shipboard Energy Program ACDP
  - » Ocean and Wave Energy Utilization - OTEC ACDP
  - » Environmental Protection
  - » Navy Energy Program
- Operational Systems Development
  - » Improved Environmental Control Equipment OSD
  - » On-board Vehicle Power Operational Systems Development (OSD)
  - » Integrated Generator/Environmental Control OSD

Air Force

- Basic Research
  - » Nanoscale Additives for Novel Fuels Basic Research
- Applied Research
  - » Adaptive Versatile Engine Technology (ADVENT) AR
  - » Aft-Body Drag Reduction
  - » Energy Efficient Small Scale Propulsion and Power (ESSP) AR
  - » Highly Efficient Embedded Turbine Engine (HEETE)
  - » Hybrid Electric UAV High Endurance Renewable Propulsion and Power System AR
  - » Improved Transparent Conductors for Solar Cell Applications AR
  - » Ultra-High Efficiency Multijunction Solar Cells for Space and Terrestrial Concen AR
- Advanced Technology Development
  - » Materials for Green Propulsion ATD
  - » Global Solar Prediction Model for Airbase Renewable Energy Design and Simulation ATD
  - » Greenhouse Gas Lifecycle Analysis for 2nd and 3rd - Generation Biomass-Derived Aviation ATD
  - » Development and Demonstration of High Efficiency Portable Fuel Cells ATD
  - » Deployable Multi-Fuels Electric Generator ATD
  - » Toxicology Assessment of Biomass-Derived Aviation Fuels ATD
- Advanced Component Development and Prototypes
  - » Alternative Fuels
  - » Pollution Prevention
- Operational Systems Development
  - » High Concentration Anaerobic Bioreactor OSD
  - » Demonstration of Self Sustaining Energy Technology for Basic Expeditionary Airfi OSD

Small Business Administration (EXTERNAL to DOD)

- SBIR/STTR Management Support

NATIONAL SCIENCE FOUNDATION (NSF)

Integrative Activities

- Science and Technology Policy Institute

Cross-Cutting Programs

- Long-Term Research Sites (LTER)
- Science and Technology Centers

Research Infrastructure

- Cornell Electron Storage Ring

Programs to Broaden Participation

- Comprehensive Broadening Participation of Undergraduates in STEM

RE-ENERGYSE

Cross-agency sustrainability research effort focused on renwable energy technologies and complex environmental- and climate-system processes

NATIONAL INSTITUTE FOR STANDARDS AND TECHNOLOGY (NIST)

Industrial Technology Services

- Technology Innovation Program
- Hollings Manufacturing Extension Program

Small Business Innovation Research Program

Smart Grid Interoperability Standards Project

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

Operations, Research, and Facilities

ENVIRONMENTAL PROTECTION AGENCY (EPA)

Research and Development Initiatives

- Science to Achieve Results (STAR) Program
  - » Hydraulic Fracturing Research
  - » Green Infrastructure Research
- Climate Change Initiatives
  - » CAA GHG permitting
  - » Renewable Fuel Storage

DEPARTMENT OF AGRICULTURE (USDA)

Departmental Activities

- Executive Operations
  - » Office of the Chief Economist

Research, Education, and Economics

- National Institute of Food and Agriculture (NIFA)
  - » Biodiesel Fuel Education Program
  - » Agriculture and Food Research Initiative
    - AFRI global climate change research to develop mitigation capabilities and adaptive capacities for agricultural production
- Agricultural Research Service
  - » Environmental Stewardship

Rural Development

- Rural Business-Cooperative Service (RBS)
  - » Biorefinery Assistance Program
  - » Rural Energy for America Program (REAP)
    - Guaranteed Loans
    - Grants
  - » Biorefinery Assistance Guaranteed Loans
  - » Business and Industry Guaranteed Loans
  - » Bioenergy for Advanced Biofuels
- Rural Utilities Service (RUS)
  - » Electric Loan Program

Farm and Foreign Agricultural Services

- Commodity Credit Corporation
  - » Biomass Crop Assistance Program

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

Science

- Earth Science

Education

- Higher Education STEM Education
- K-12 STEM Education
- Informal STEM Education

Construction and Environmental Compliance and Restoration

Aeronautics Research

- Integrated Systems Research
  - » Green Aviation

DEPARTMENT OF TRANSPORTATION (DOT)

Federal Transit Administration

- Greenhouse Gas and Energy Reduction Total Clean Fuels and Environmental Research Greenhouse Gas and Energy Reduction
- Grants for Energy Efficiency and Greenhouse Gas Reduction
- Clean Fuels Grant Program (Section 5308)
- National Research and Technology
- Greenhouse Gas and Energy Reduction Deployment and Innovative Technology

National Highway Traffic Safety Administration

- Alternative Fuels Vehicle Safety (Hydrogen)

Research and Innovative Technology Administration

- Alternative Fuels R&D

Federal Railroad Administration

- High Speed Rail

Federal Aviation Administration

- Research, Engineering, and Development
  - » NextGen Initiative
    - Environmental Research
    - Alternative Fuels
  - » Improve Efficiency
  - » Reduce Environmental Impacts

National Infrastructure Innovation and Finance Fund

SMALL BUSINESS ADMINISTRATION (SBA)

Regional Cluster Initiative

- Regional Innovation Clusters

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD)

Energy Innovation Fund

Based on a Third Way review of federal FY2010 department budgets, the agencies involved in clean energy innovation include: Department of Defense (DOD), Department of Energy (DoE), National Science Foundation (NSF), National Oceanic and Atmospheric Administration (NOAA), National Aeronautics and Space Administration (NASA), United States Department of Agriculture (USDA), Environmental Protection Agency (EPA), National Institute of Standards and Technology (NIST), Department of Transportation (DOT).