



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

Bringing you a prosperous future where energy  
is clean, abundant, reliable, and affordable

# Recovery Act Implementation and Design/Build Lessons Learned

EFCOG Project Management Working Group

Jeffrey M. Baker

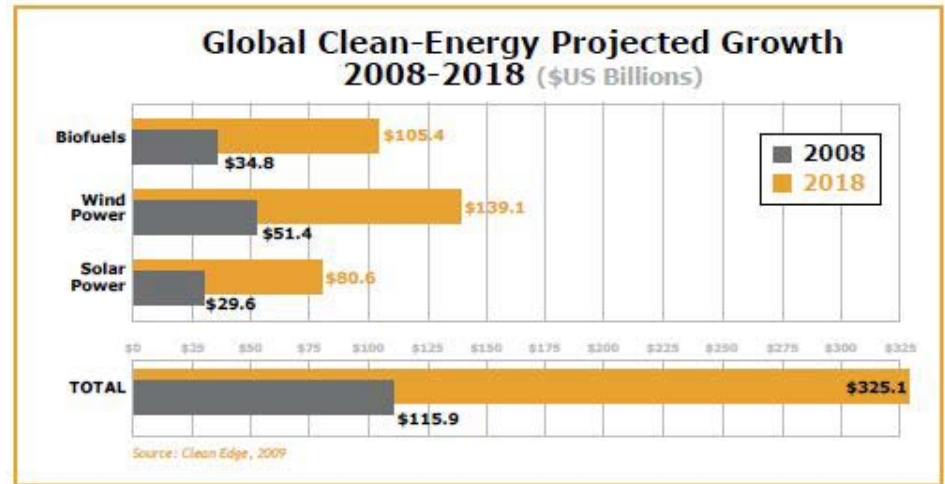
Office of Energy Efficiency and Renewable Energy

U.S. Department of Energy



# Renewable Energy: A Global Growth Industry

- **Biofuels**
  - 17B gallons of ethanol and 2.5B gallons of biodiesel
  - 50% of Brazil’s transportation fuel comes from bio-ethanol
- **Wind**
  - 27,000MW installed globally
  - 40% of all new U.S. electric capacity installed in 2008
  - U.S. eclipsed Germany as the world’s leading generator of wind
- **Solar Photovoltaics**
  - 4GW installed world wide
  - Increased availability of tax and other incentives
- 30% Annual Growth Rate for the Past Decade!



**Global Clean-Energy Jobs (Direct and Indirect): Solar and Wind**

	2008 (Current)	2018 (Projected)
Solar Photovoltaics	190,819	1,341,968
Wind Power	413,522	1,315,324
<b>TOTAL</b>	<b>604,341</b>	<b>2,657,292</b>

Source: Clean Edge, Inc., 2009



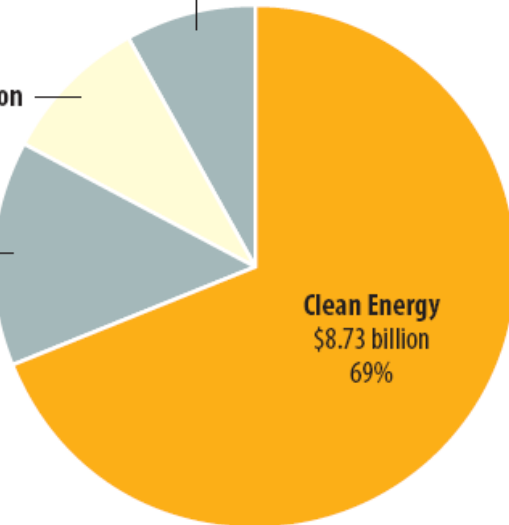
# Renewable Energy: Growing Venture Investment

## CLEAN VENTURE CAPITAL INVESTMENTS, 2006-2008

**Conservation and Pollution Mitigation**  
 \$1.08 billion, 9%

**Environmentally Friendly Production**  
 \$1.82 billion  
 14%

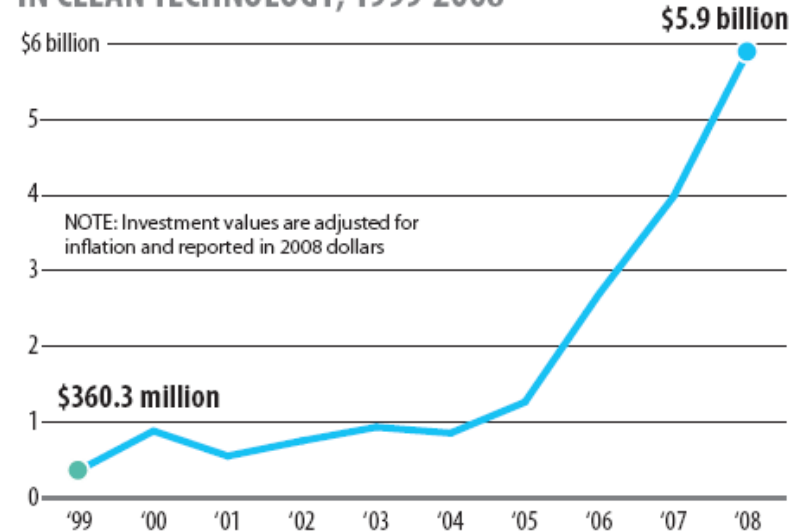
**Energy Efficiency**  
 \$943.1 million, 8%



SOURCE: Pew Charitable Trusts, 2009, based on data from The Cleantech Group™ LLC; analysis by Pew Center on the States and Collaborative Economics.

NOTE: Investment values are adjusted for inflation and reported in 2008 dollars. The category of Training and Support is not represented because it is not a category of investments tracked by The Cleantech Group LLC.

## VENTURE CAPITAL INVESTMENTS IN CLEAN TECHNOLOGY, 1999-2008



SOURCE: Pew Charitable Trusts, 2009, based on data from The Cleantech Group™ LLC; analysis by Pew Center on the States and Collaborative Economics.



# President's Energy Challenge

- Change the Way We Power Our Vehicles
- Develop Cost-Competitive, Reliable Renewable Electric Generation
- Transform the Way We Use Energy
- Grow the Green Economy



# Recovery Act Investments

## \$85B Investment in Clean Energy

AREA OF INVESTMENT	TOTAL INVESTMENT
Energy efficiency and conservation	\$16,470,000
Improving the grid	\$11,000,000
Energy research	\$7,900,000
Clean energy generation	\$6,000,000
Jobs training	\$500,000
Vehicle spending	\$2,600,000
Transportation spending	\$18,400,000
Climate science research	\$570,000
Tax credits for renewable energy and energy efficiency	\$19,668,000
Tax credits for alternative fuel pumps	\$54,000
Investment credits in energy generation and energy efficiency technologies	\$1,600,000
<b>Total</b>	<b>\$84,762,000</b>

SOURCE: Pew Center on Global Climate Change, Key Provisions: American Recovery and Reinvestment Act, March 2009 (updated April 16, 2009), <http://www.pewclimate.org/docUploads/Pew-Summary-ARRA-Key-Provisions.pdf> (accessed April 28, 2009).

## \$16.8B Managed by EERE

Recovery Act Funding	\$M
<b>EERE Discretionary RD&amp;D</b>	<b>\$2,500</b>
Technology RD&D (Solar, ITP, Buildings, Wind, etc.)	\$1,250
Biomass	\$800
Geothermal Technologies	\$400
Information and Communications Technology	\$50
<b>EERE Directed Funding</b>	<b>\$14,300</b>
Energy Efficiency & Conservation Block Grants	\$3,200
State Energy Program	\$3,100
Weatherization Assistance Program	\$5,000
Energy Star Rebates	\$300
Transportation Electrification	\$400
Clean Cities Alternative Fuels Pilot Program	\$300
Advanced Battery & Hybrid Manufacturing	\$2,000
<b>EERE Total</b>	<b>\$16,800</b>

*“This represents the largest commitment to scientific research and innovation in American history.” - President Obama, NAS, 4/09*

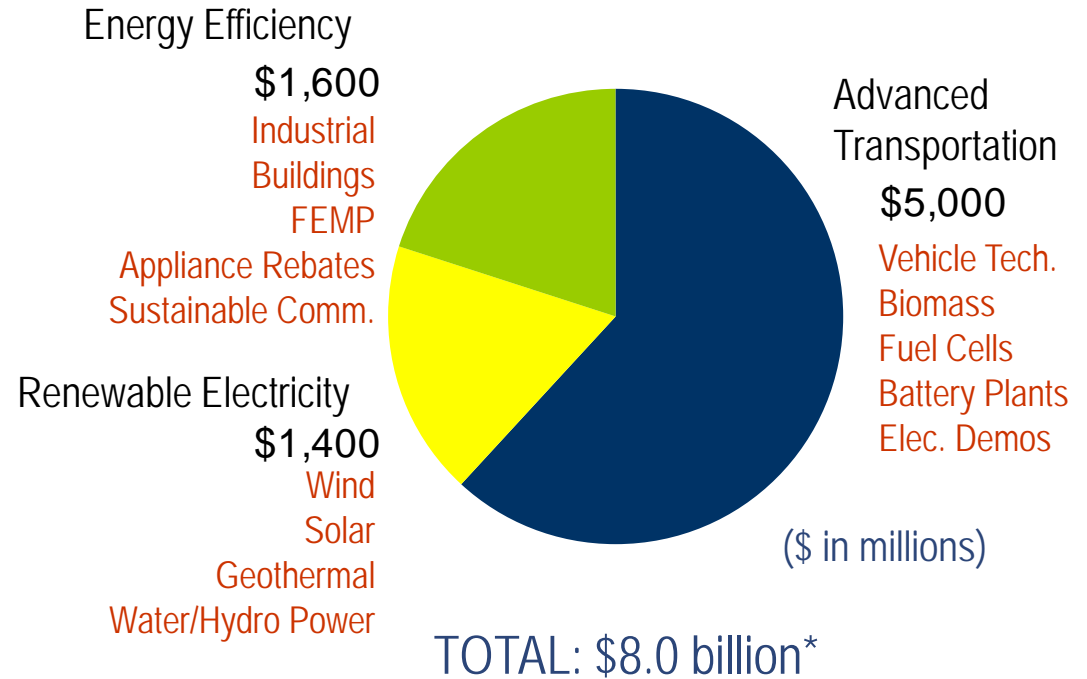


# Recovery Act/FY09/FY10 Request Combined Budget

## New Energy for America Plan

- Within 10 years save more oil than we import from the Mideast and Venezuela combined
- 1 million PHEVs on the road by 2015
- Require at least 36 billion gallons of biofuels by 2022 (RFS)
- Double renewable electricity generation in the next 3 years
- Deploy the cheapest, cleanest, fastest energy source—energy efficiency

## Recovery Act, FY09 and FY10 Request RD&D Budgets



Overall Objective

\* Budget figure excludes all funding for SEP, block grants, weatherization, facilities, program direction and support, and congressionally directed projects

Reduce greenhouse gas emissions 80% by 2050 and make the U.S. a leader on climate change



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

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- 218,000 Square Feet
- 750 Persons
- LEED Platinum
- 50% Lower Energy Use
- Comparable First Costs
- Redefines Commercial Building Design



**CONCEPTUAL VIEW – RESEARCH SUPPORT FACILITIES**



# Research Support Facilities

- Replaces Long-term Leased Space
- Congressionally-Directed Funding
  - \$9.9M (2006) + \$63M (2007)
- Two Primary Goals:
  - Complete to Cost, Scope, Schedule Baselines
  - Replicable Design Process Leading to Superior Energy Performance at Competitive First Costs



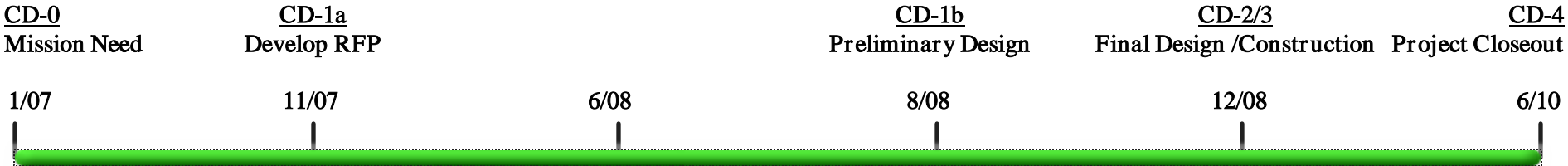
# Research Support Facilities

- Acquisition Strategy
  - National Conceptual Design Competition
  - Progressive Design/Build
  - 97% Firm-Fixed Price Subcontracts
- Advantages
  - Creativity and Innovation
  - Speed and Cost Savings
  - Risk Shift to Subcontractor



# Research Support Facilities

- Strategy Success Dependent Upon
  - System Performance Parameters vs. Design Specifications
  - Owner/Subcontractor Relationships
  - Planning, Planning, Planning!
- Must Be Willing to Invest Significant Executive and Technical Resources in Up-Front Planning



### Defining the Project and Strategy

Definition and Planning	RFP Development
<ul style="list-style-type: none"> <li>• National Design Charrette – 2000</li> <li>• Critical Decision 0 – 2004</li> <li>• Initial \$9.9M Appropriation – 2006</li> <li>• Initial Conceptual Design – 2006</li> <li>• Market Analysis and Project Planning</li> <li>• \$63M Appropriation – 2007</li> <li>• National Design Charrette – 2008</li> <li>• Site Visits to LANL &amp; LBNL</li> <li>• Design Build Institute of America Training and Certification of DOE &amp; NREL Staff</li> <li>• U.S. GBC on LEED Planning</li> <li>• National Design Charrette for Site Build-out -- 2008</li> </ul>	<ul style="list-style-type: none"> <li>• Owner’s Representative Selected for Design/Build Strategy</li> <li>• Key Performance Parameters</li> <li>• DOE Project Performance Goals</li> <li>• National Request for Qualifications               <ul style="list-style-type: none"> <li>• 10 Qualified Proposers</li> <li>• 3 Down-Selected</li> </ul> </li> <li>• Draft Request for Proposals Released               <ul style="list-style-type: none"> <li>• Proposer 1-on-1 Meetings</li> </ul> </li> <li>• DBIA-Certified Independent Team Reviews and Validates Feasibility of Project Performance Goals, Acquisition Strategy, and RFP</li> <li>• Final RFP for Conceptual Design Competition Released               <ul style="list-style-type: none"> <li>• Guaranteed Max Price</li> <li>• Preliminary Design Option</li> <li>• Final Design/Construction Option</li> </ul> </li> </ul>

### Market Innovation

#### Design Competition

- Owner’s Representative Selected for Project Execution
- Down-Selected Firms Prepare Conceptual Designs
- Progress-Check Meetings with Firms to Ensure Design Responsiveness
- Final Conceptual Designs Presented and Evaluate
- Selection of Most Responsive Design Solution
  - 12 Weeks After Final RFP Released
  - \$200K Stipend Paid to Non-Selected Firms
  - DOE Owns All Designs
- Prepare Preliminary Design

### Reducing Risk

#### Preliminary Design

- DOE/NREL/Design Team Charrette
- Parallel Design Packages to Accelerate Project Schedule
  - Site and Foundation (75%)
  - Structure (40%)
  - Interiors (40%)
- Preliminary Design (+40% Final Design) Completed
  - Reduces Risk to Proposer and DOE
  - Basis for Firm-Fixed Price Contract
- Multiple NREL/DOE Design Advisory Board and Integrated Project Team Reviews
- Owners Representative Conducts Independent Cost, Scope, and Schedule Validation
- EERE IPR Completed
  - IPR Conducted by OECM Subcontract Review Team

### Execution

#### Final Design/Constr

- Firm-Fixed Price Subcontract Approved
  - Virtually All Cost, Scope, and Schedule Risk Borne by Subcontractor
  - Cost-Loaded Schedule WBS 11
- Construction Starts
- Subcontract Payments Based on Field Validated Work and EVMS Data
  - Owner’s Rep Independently Validates Earned Value
- OECM EIR
- Parallel Design Packages Progress
  - Site and Foundation (100%)
  - Structure (100%)
  - Interiors (90%)
- Ongoing NREL Design Advisory Board and DOE/NREL Integrated Project Team Reviews



# Lessons Learned

- Design Charrettes Define the Possible – Use Them
- Design/Build is Really Different -- Get Trained!
  - Get Help Writing System Performance Parameters
  - Do Not Use Design/Build if:
    - Your Project is Complex or Risky
    - You are Unwilling to Dedicate the Planning Time to Define What You Want
    - You Cannot Shorten Funding Profile to Maintain DB Team
- Use the Draft RFP to Build Understanding and Reduce Risk
- Stage Decisions to Increase Knowledge and Reduce Risk to Owner and Subcontractor
  - Conceptual Design Competition
  - Preliminary Design with Option to Proceed
  - Final Design and Construction
- Firm-Fixed Price Contracts are Only as Good as the System Performance Parameters and Your Willingness to Manage



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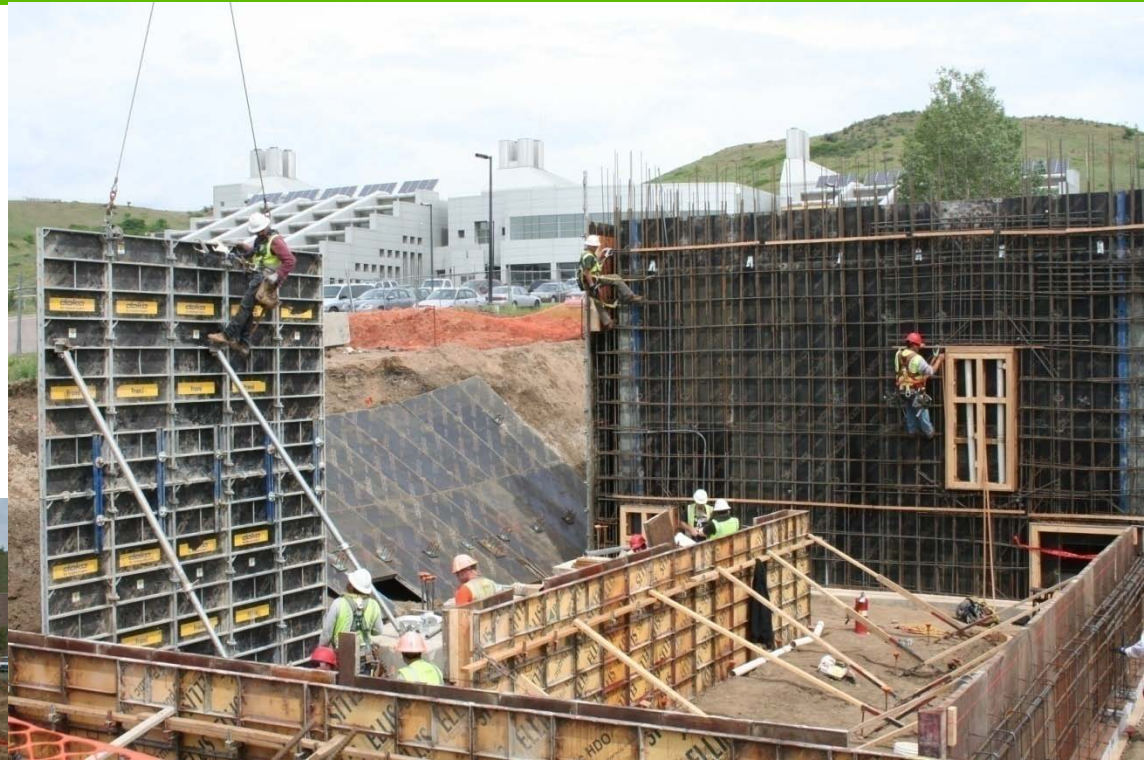


RSF Ariel View – JUNE 2009



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Forming Labyrinth / Stair Cores / Basement Walls – JUNE 2009



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**Finish Foundation Work / Backfill / Begin Structural Steel – JULY 2009**



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**Connector Wing Ready for Grade Beams – JULY 2009**



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## MONTHLY PROJECT PERFORMANCE REPORT Research Support Facilities STATUS REPORT THRU: Jun-09

<b>Project Description</b>	The proposed Research Support Facilities (RSF) project will provide Class A office space located on NREL's South Table Mountain (STM) site. The facility will provide approximately 218,500 sf for approximately 740 Alliance and DOE staff. The envisioned facility will: 1.) incorporate the concepts of safe design into the building planning, design, construction and operation; 2.) obtain a LEED™ Platinum certification; 3.) meet the needs of the work force of today and tomorrow; 4.) provide the lowest attainable energy use; and 5.) provide a facility that is architecturally consistent with the site and NREL's identity.								
<b>Project Baseline Information</b>	AT CD-2/3			<b>A&amp;E Key Personnel</b>	<b>Project Manager</b>		<b>DOE Key Personnel</b>	<b>Federal Project Director</b>	
	TPC	Start Date	Completion Date		Eric Telesmanich				Greg Collette
	\$80,000,000	7/2/2008 (Preliminary Design)	7/23/2011						
<b>Performance</b>		<b>Current Period</b>	<b>Cum To Date</b>	<b>Variance Calculations</b>	<b>Indices</b>			<b>Cum To Date Variance Key</b>	
	PV	\$3,660,957	\$18,139,713		Green	SPI	1.05		
	EV	\$4,163,936	\$19,099,900		Green	CPI	1.06		
	AC	\$3,668,370	\$17,999,728			SV%*	5.29%		
	SV	\$502,979	\$960,188			CV%*	5.76%		
	CV	\$495,566	\$1,100,173			*Variance Threshold = 5%			
							Green		
							Yellow		
							Red		

- Risk Retired
  - Excavation and Foundation (33% of Total Risk)
    - 75% as of June
    - 100% as of July
- One Improvement Change for \$91K to Enhance Future Data Infrastructure
- No Foreseeable Market Issues or Conditions to Threaten Baseline Performance

