



# Climate Policy under the Obama Administration





# **The Climate Change Problem**



A NOAA (*National Oceanic and Atmospheric Administration*) study found [permanent Dust Bowls in Southwest and around the globe](#) on our current emissions trajectory (and irreversibly so for 1000 years). Future droughts will be fundamentally different from all previous droughts that humanity has experienced because they will be **very hot weather droughts**.



“Probabilistic Forecast for 21st Century Climate Based on Uncertainties in Emissions (without Policy) and Climate Parameters,” (MIT, Feb. 2009)

There is now a nine percent chance (about one in 11 odds) that the global average surface temperature will increase by more than 7°C (12.6°F) by the end of this century, compared with only a less than one percent chance (one in 100 odds) that warming would be limited to below 3°C (5.4°F).

[“Kinematic Constraints on Glacier Contributions to 21st-Century Sea-Level Rise”](#) (*Nature and Science*, Sept 2008)

Sea level rise: .8 to 2 meters.

The first meter of SLR create more than 100 million environmental refugees and inundate over 13,000 square miles in the USA. Southern Louisiana and South Florida would inevitably be abandoned, especially in the face of a steadily increasing number of killer super-hurricanes.



Where are we going now ...

# Real Leadership

*"The danger posed by climate change cannot be denied. Our responsibility to meet it must not be deferred."*





## But what does this mean?

In his first 8 months in office, President Barack Obama has:



- Appointed the first scientist to lead to DOE in nearly a decade (Nobel prize winner, Dr. Steven Chu).
- Passed ARRA which funds more than 80 billion USD in clean energy investment.
- Increased the average fuel efficiency standard to 35.5 mpg by 2016
- Is leading the fight for passage of the American Clean Energy Act which will mandate 84% reduction in GHG by 2050



# Looking Ahead — New National Priorities

- Invest \$150B in alternative energy over 10 years
- Create green jobs with clean, efficient American energy
- Double production of alternative energy in three years – enough to power 6 million homes
- Upgrade the efficiency of more than 75% of federal buildings and two million private homes
- Put one million PHEVs on U.S. roads by 2015
- Reduce CO<sub>2</sub> emissions by 80% below 1990 levels by 2050
- Transform our economy with science, technology and efficiency

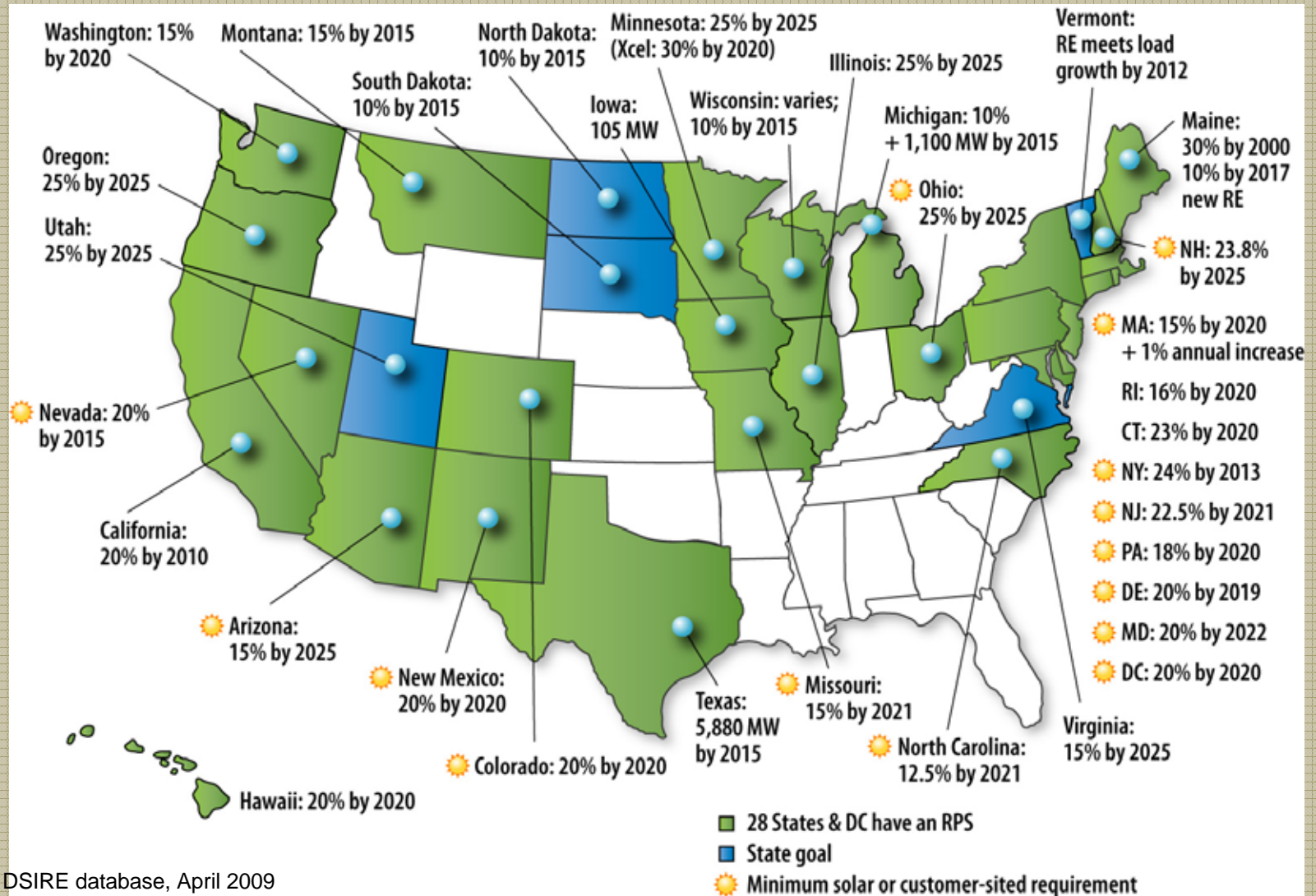




**WHAT IS  
HAPPENNING  
AT THE STATE  
AND LOCAL LEVEL?**



# State Policy Framework



Source: DSIRE database, April 2009

# City of Olympia, Washington

- Reduced GHG emissions 30% since 2005
- Public works officials then asked the City Council to set new GHG targets:
  - 50% reduction from 2005 levels by 2020 and 80% by 2050

“If we do it right, we’ll be saving money and reducing our carbon footprint,”

- Jack Zeiger of Olympia Climate Action

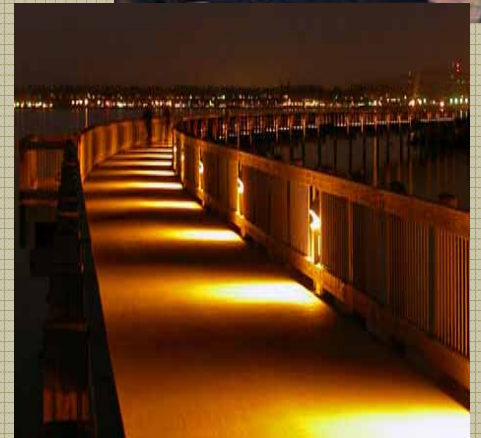




# City of Bellingham, Washington

## Climate Reduction Goals:

- Reduce City government GHG emissions 64% by 2012 and 70% by 2020, from 2000 levels.
- Reduce Community GHG emissions 7% by 2012 and 28% by 2020, from 2000 levels.



# King County, WA

- Goal to reduce annual GHG emissions 80% below 2007 levels by 2050
- Reduced GHG from county operations 6% in 2007 from energy efficiency measures.
- Exceeded the 1.5% reduction target for 2007 set as part of the County's membership in the Chicago Climate Exchange





# Boulder, Colorado

- Enacted the first carbon tax in the USA  
And just doubled that tax rate this year.



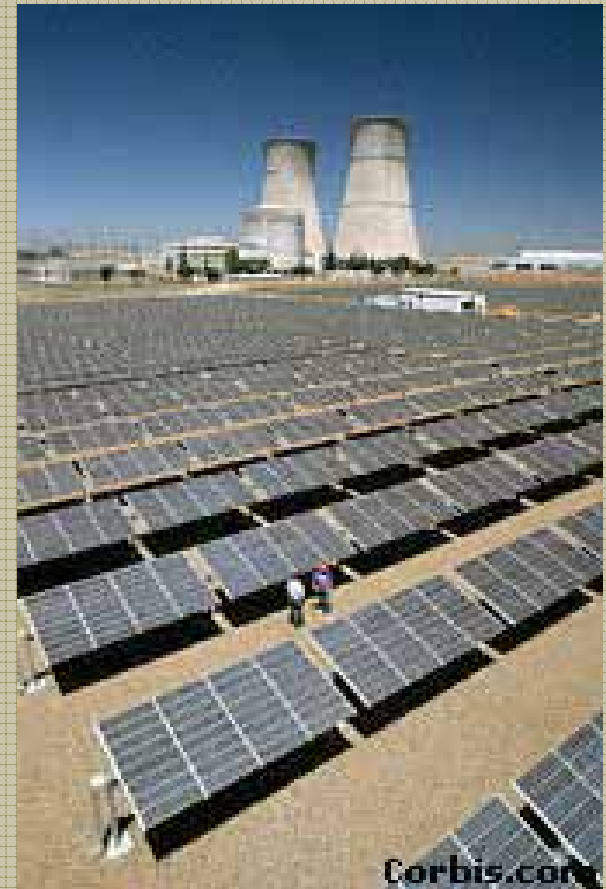


# Combine energy efficiency and renewable energy

## **Sacramento California –**

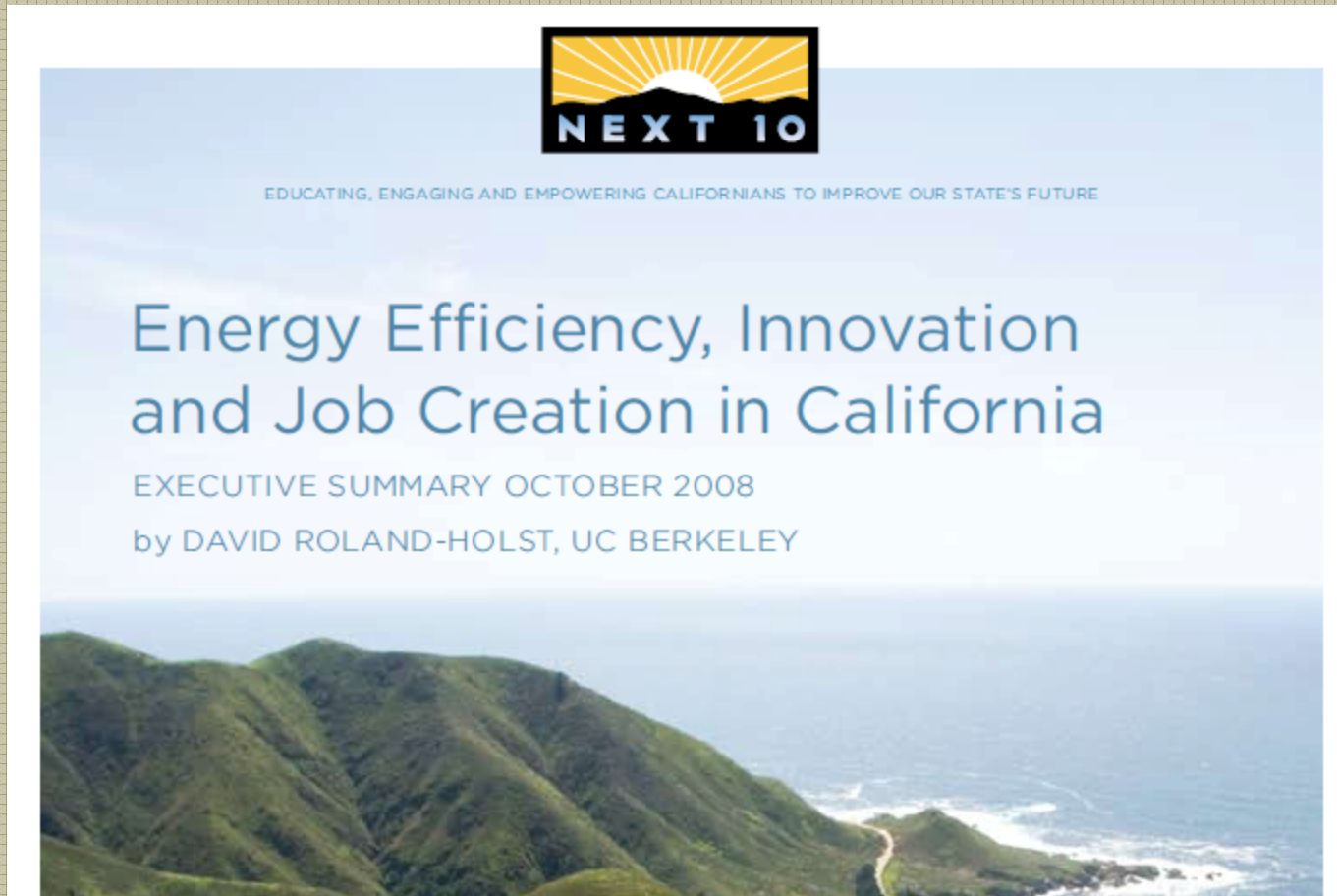
Shut down 1,000 MW power plant, invested instead in efficiency, wind, solar, co-generation. This Increased regional income by \$130 million.

Had the plant kept running, rates would have increased 80%. Instead, they have kept rates same for decade, retained over 2,000 jobs, created 880 new jobs and the program eliminated the utility's debt





# California's example



# California Climate Plan Results

Implementing AB 32 fully will increase the Gross State Product (GSP) by about \$76 billion

Increase real household incomes by up to \$48 billion and create as many as 403,000 new efficiency and climate action driven jobs.



# The Mayors Climate Protection Agreement



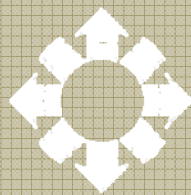
A typical U.S. community spends more than 20 percent of its gross income on energy—and 80 percent of those dollars immediately leave the local area.





# SCIENCE *AND* ECONOMICS

# Science

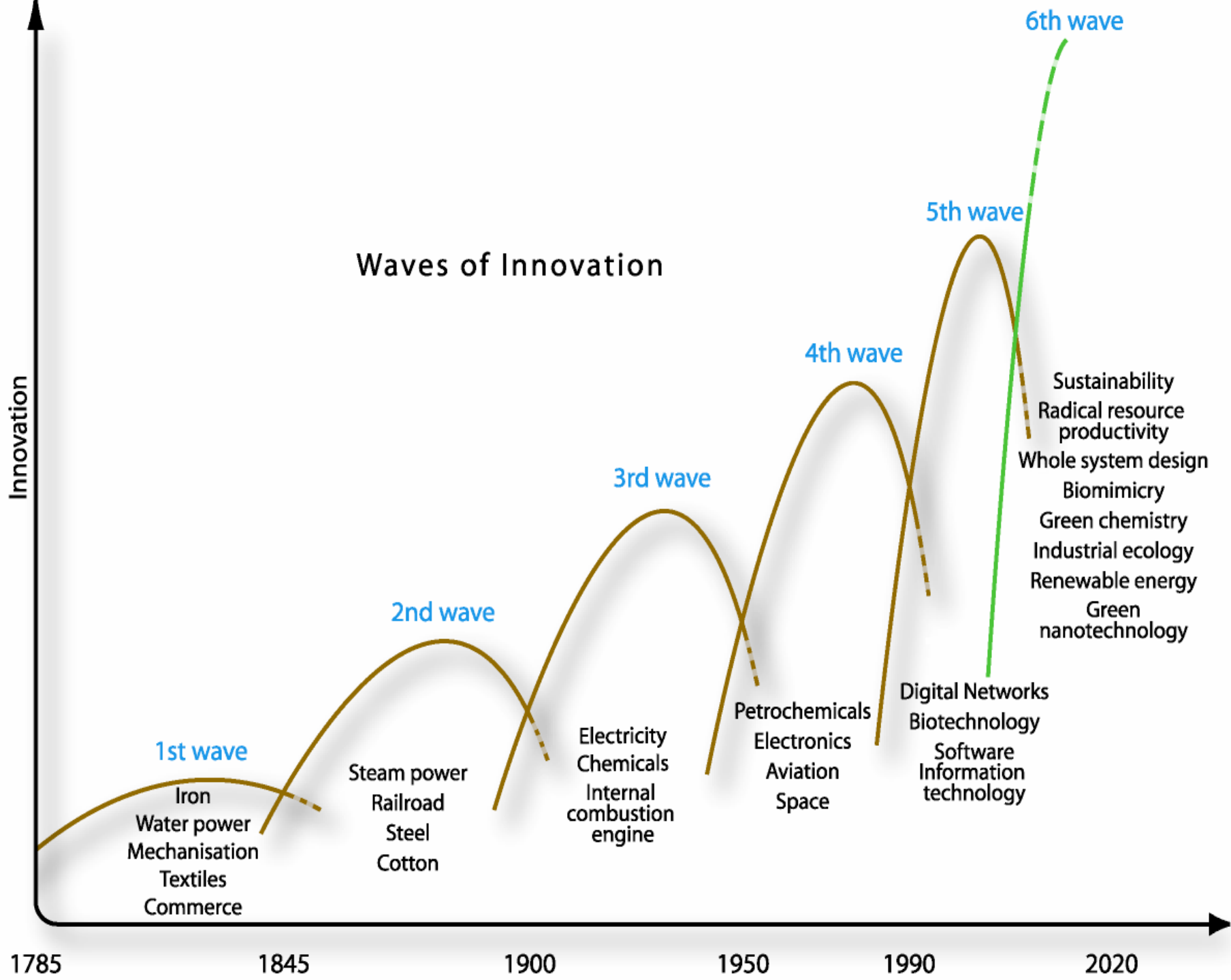


**NREL**

**National Renewable Energy Laboratory**

*Innovation for Our Energy Future*





# U.S. Energy System

100 Quads

## Supply & Conversion



Oil 40%

Coal 23%

Natural Gas 23%



Nuclear 8%



Hydro  
Wind  
Solar 6%  
Biomass  
Geothermal

## Transmission & Distribution



61%



39%

## Utilization



27%



40%



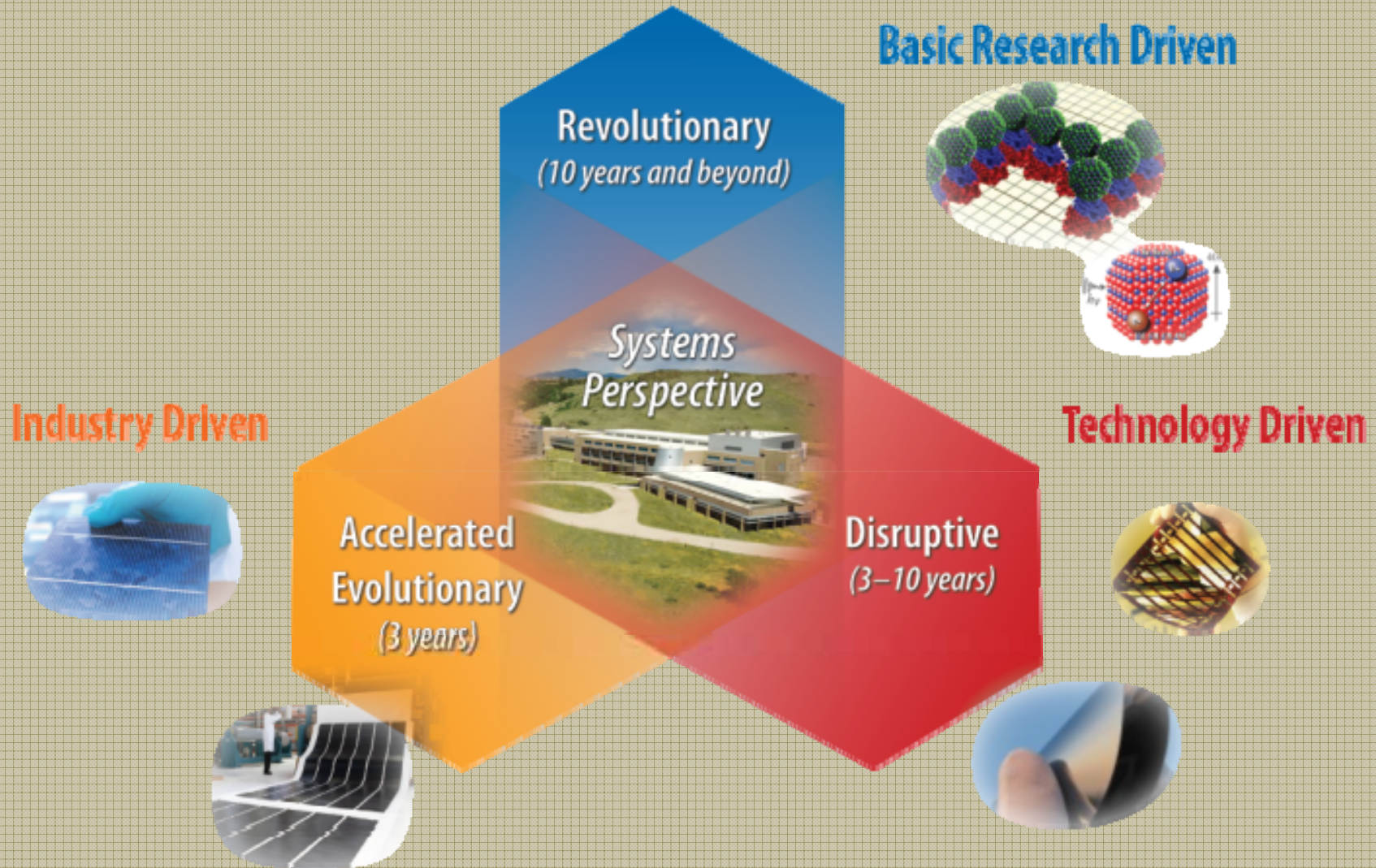
33%

Lost energy as inefficiencies – 62%



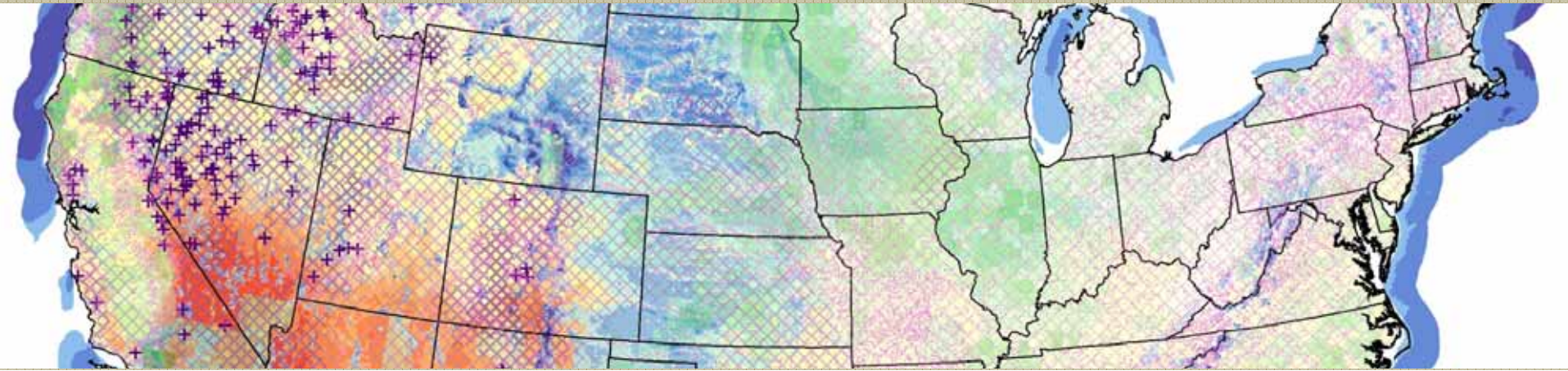


# Achieving the Potential Requires A Balanced Portfolio



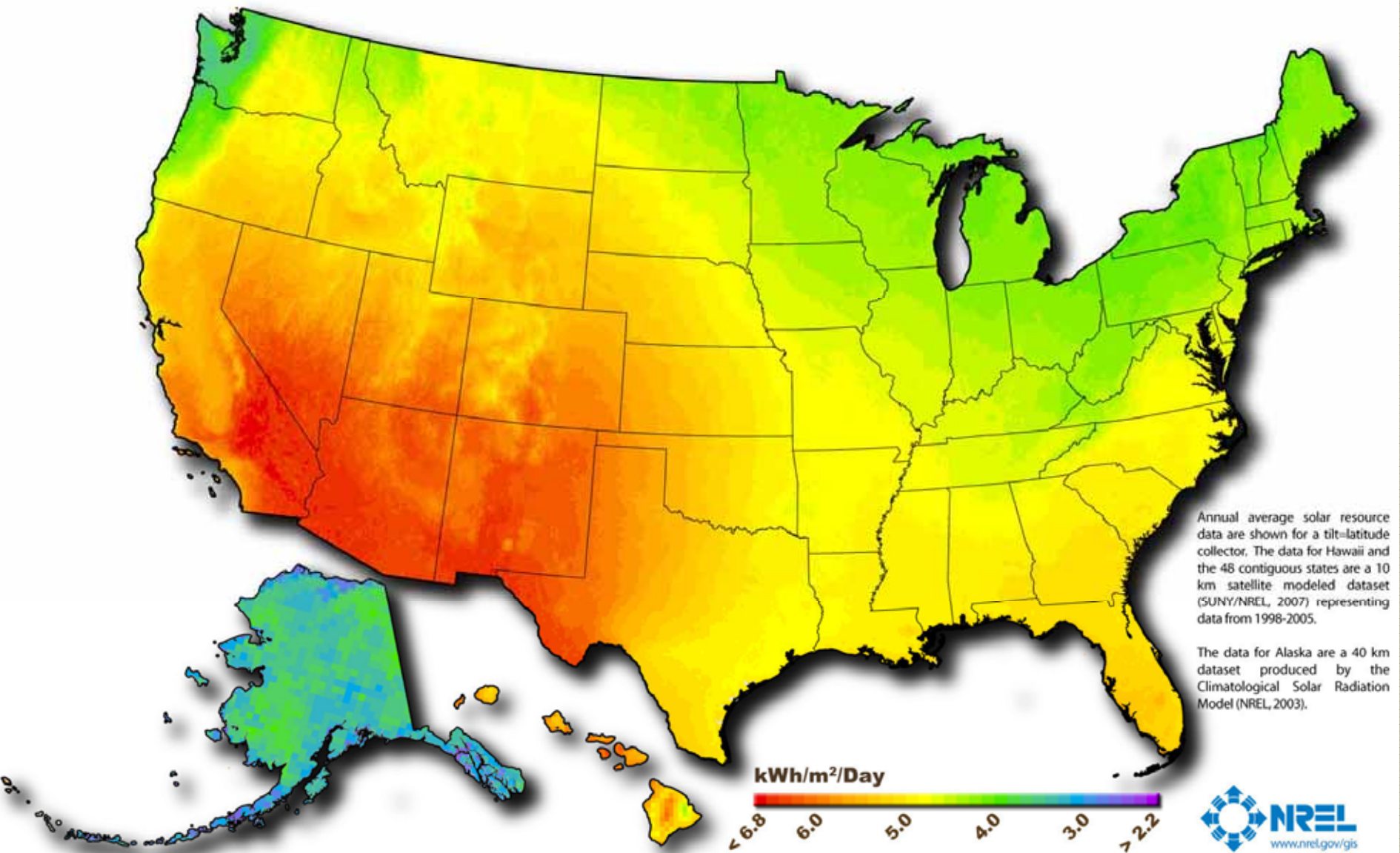


# Resource Potential

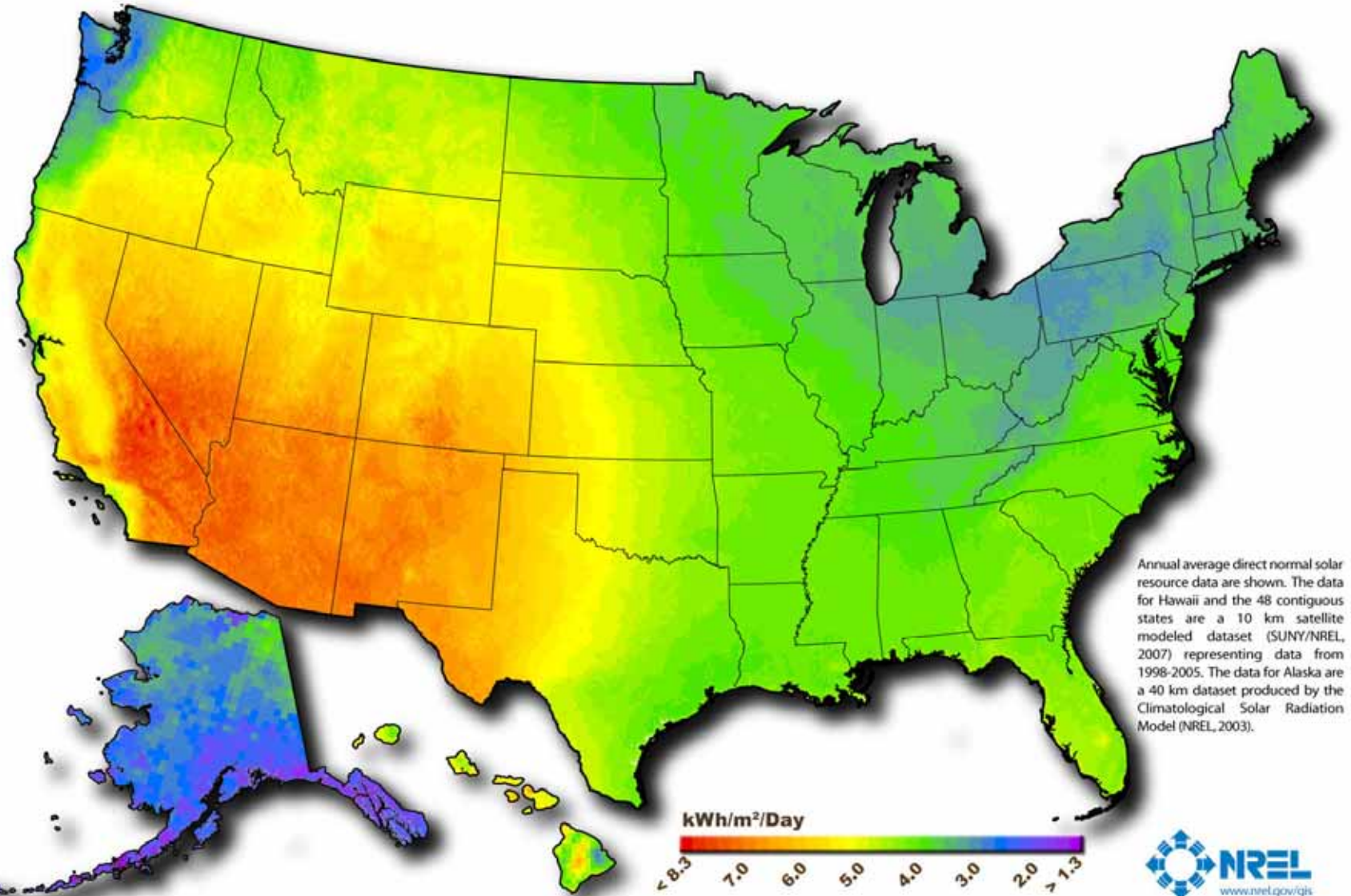




# U.S. Photovoltaic Solar Resource

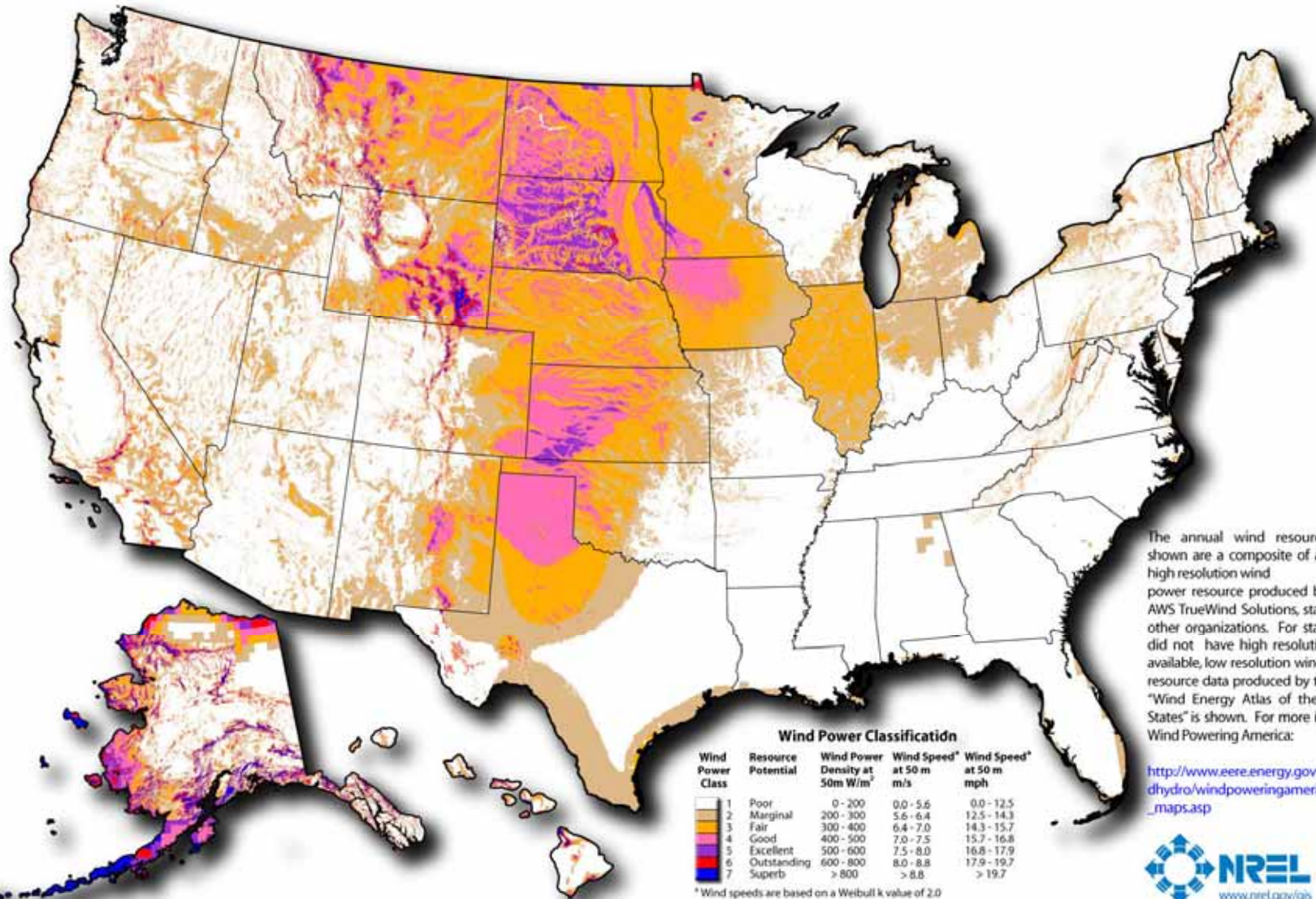


# U.S. Concentrating Solar Resource





# U.S. Wind Resource (50m)



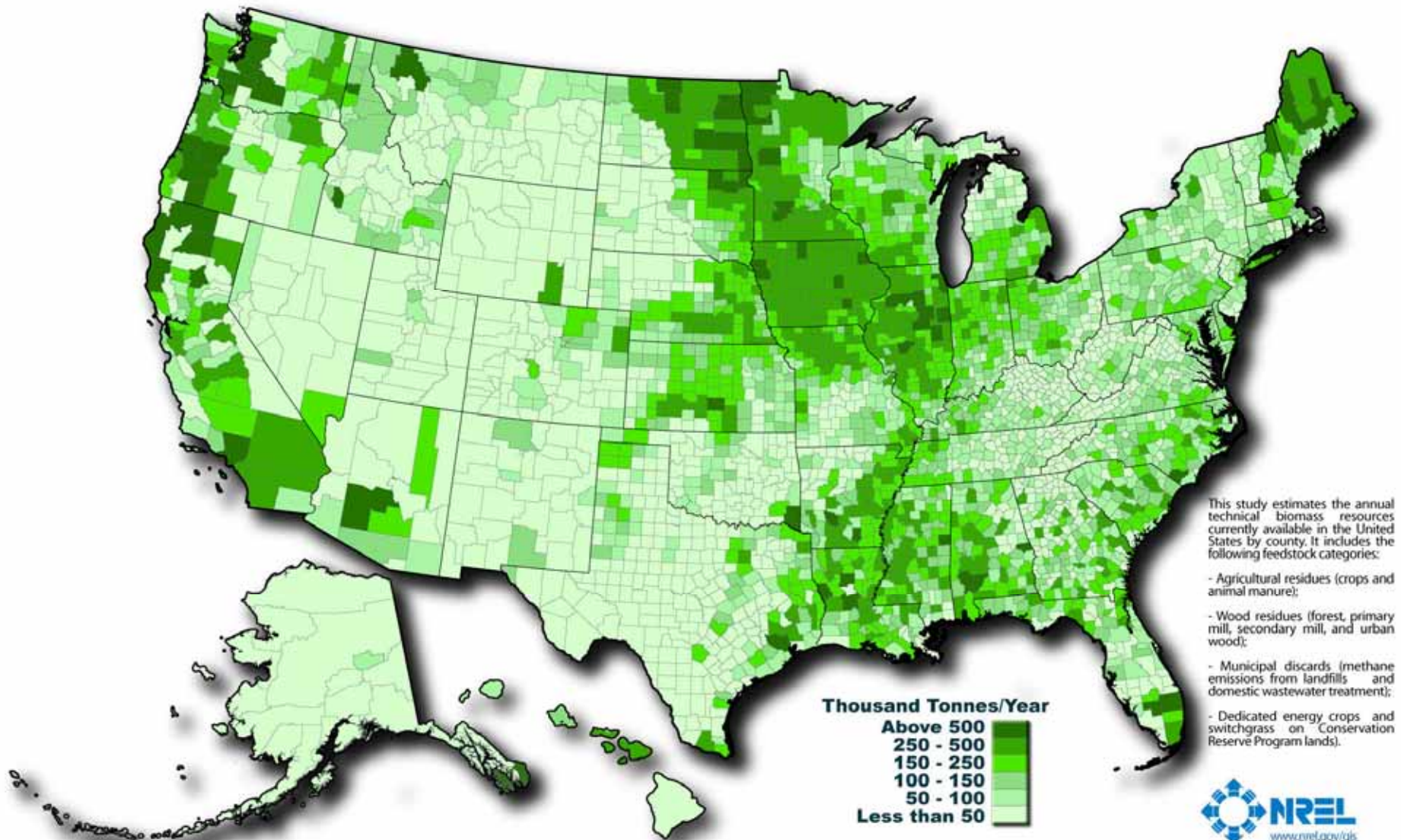
The annual wind resource data shown are a composite of available high resolution wind power resource produced by NREL, AWS TrueWind Solutions, states, and other organizations. For states that did not have high resolution data available, low resolution wind power resource data produced by the 1987 "Wind Energy Atlas of the United States" is shown. For more info, visit Wind Powering America:

[http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind\\_maps.asp](http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp)



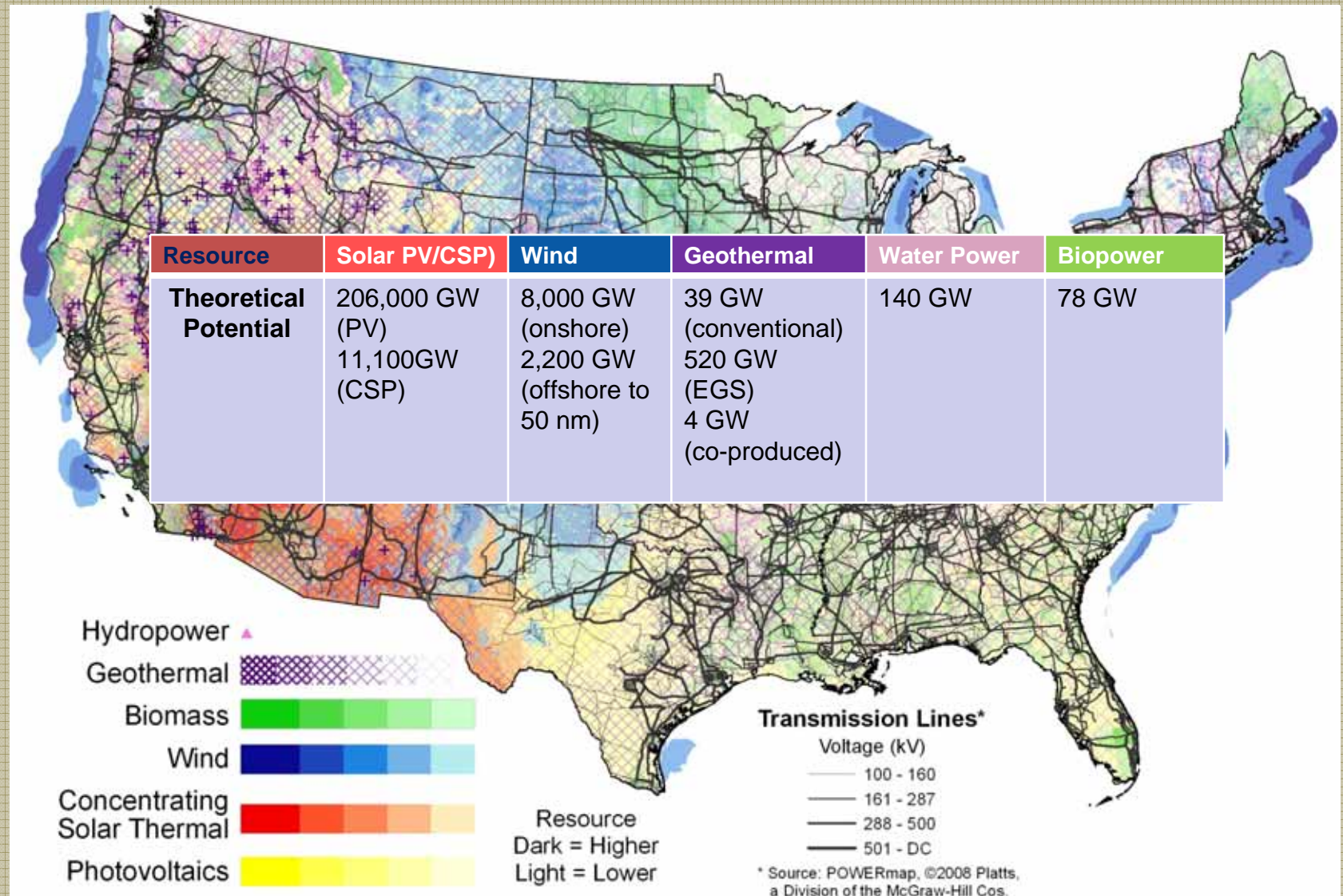


# U.S. Biomass Resource





# U.S. Renewable Resources



# Energy Efficiency





# Buildings

## Status U.S. Buildings:

- 39% of primary energy
- 71% of electricity
- 38% of carbon emissions

## DOE Goal:

- Cost effective, marketable zero energy buildings by 2025
- Value of energy savings exceeds cost of energy features on a cash flow basis

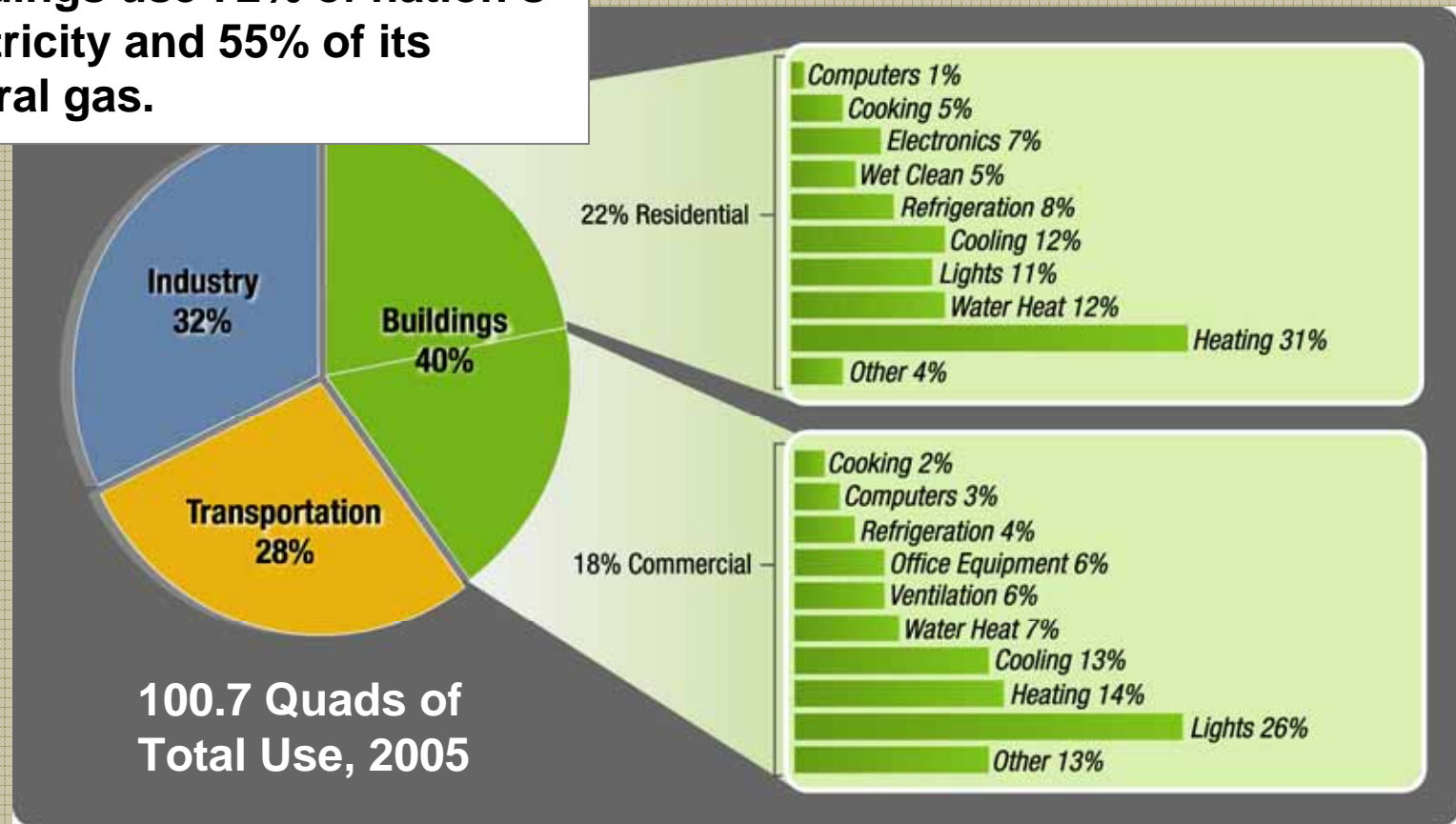
## NREL Research Thrusts

- Whole building systems integration of efficiency and renewable features
- Computerized building energy optimization tools
- Building integrated PV



# Energy Used in Buildings

**Buildings use 72% of nation's electricity and 55% of its natural gas.**



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Source: *Buildings Energy Data Book 2007*



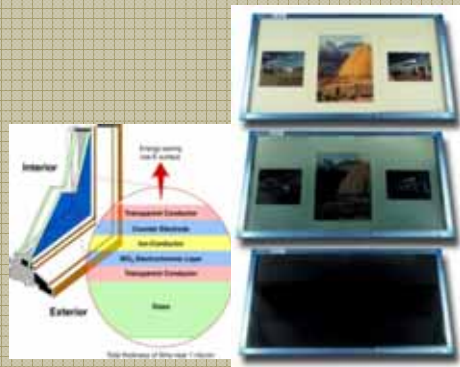
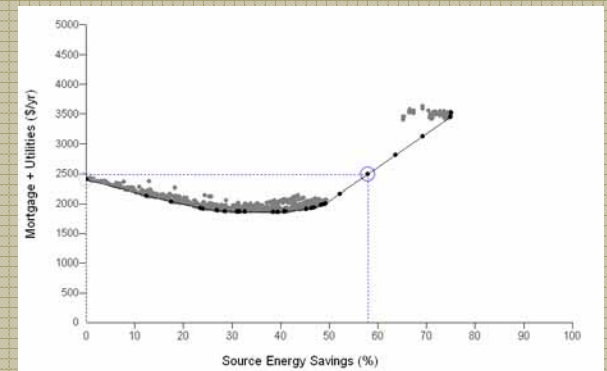
# Technology for Cost Effective Zero Energy Buildings

## NREL Zero Energy Habitat House

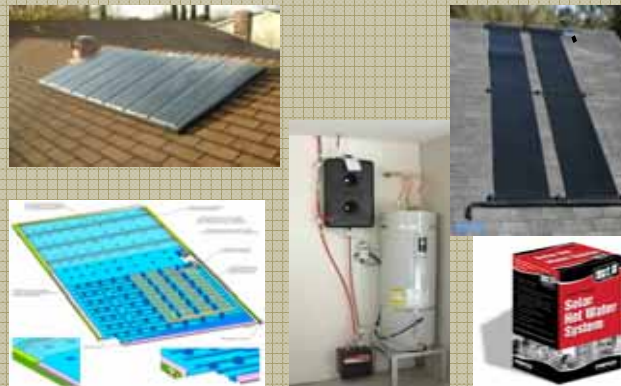


## BIPV Products & PV-T Array

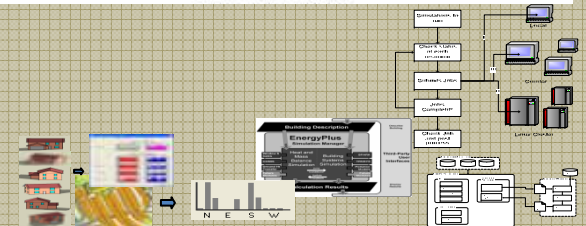
## Compressorless Cooling



## Electrochromic Windows



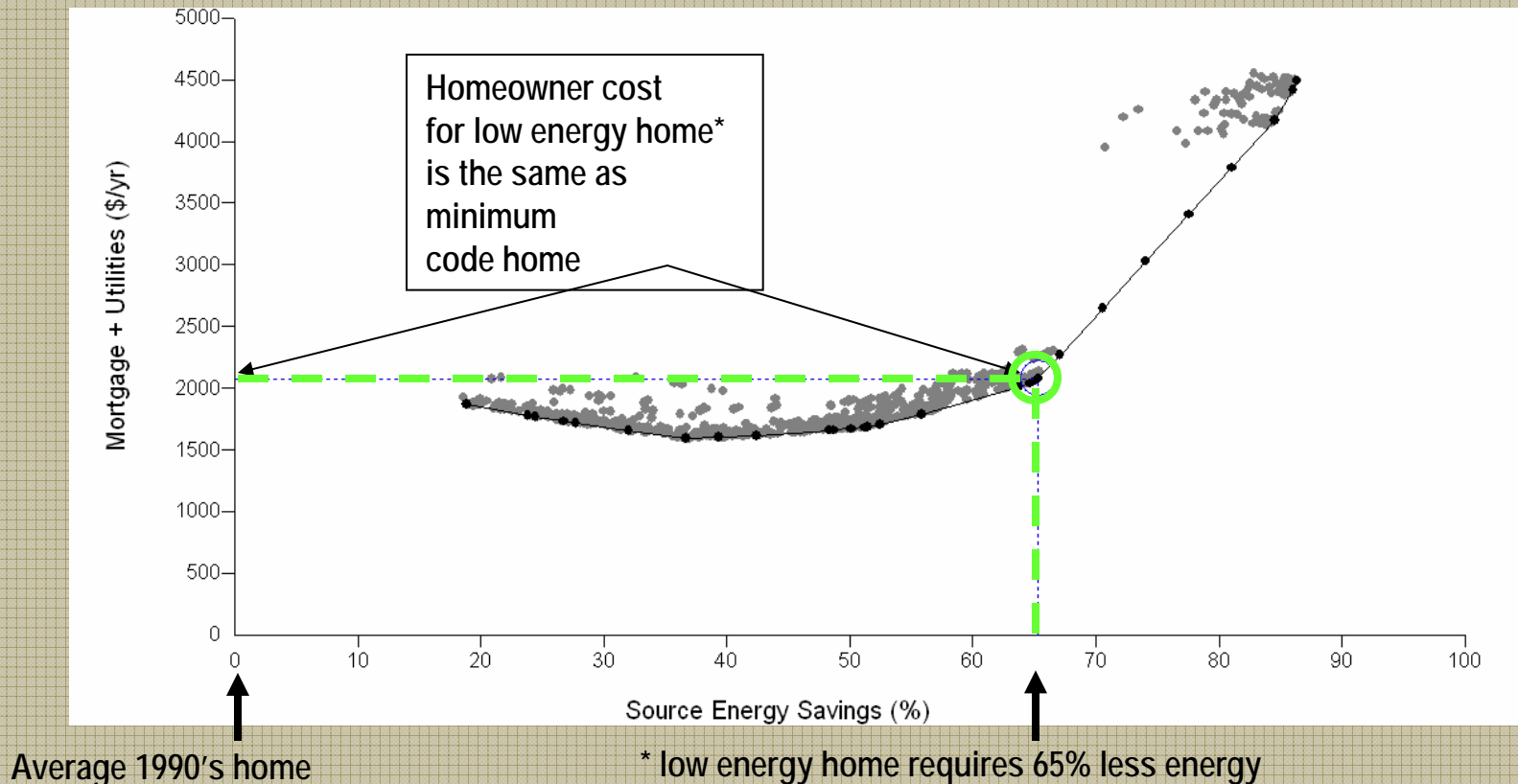
## Polymer Solar Water Heaters



## Computerized optimization & simulation Tools

# Net-Zero Energy Homes That Are Cash-flow Neutral

- NREL Analysis using BEOpt software for Boulder, CO climate



*Example taken from the "GEOS" Neighborhood. Courtesy of Wonderland Hills Development, Boulder Colorado*





# Renewable Electricity Supply





# Wind

- **Today's Status in U.S.**
  - 25,300 MW installed capacity
  - Cost 6-9¢/kWh at good wind sites\*
- **DOE Cost Goals**
  - 3.6¢/kWh, onshore at low wind sites by 2012
  - 7¢/kWh, offshore in shallow water by 2014
- **Long Term Potential**
  - 20% of the nation's electricity supply



\* With no Production Tax Credit

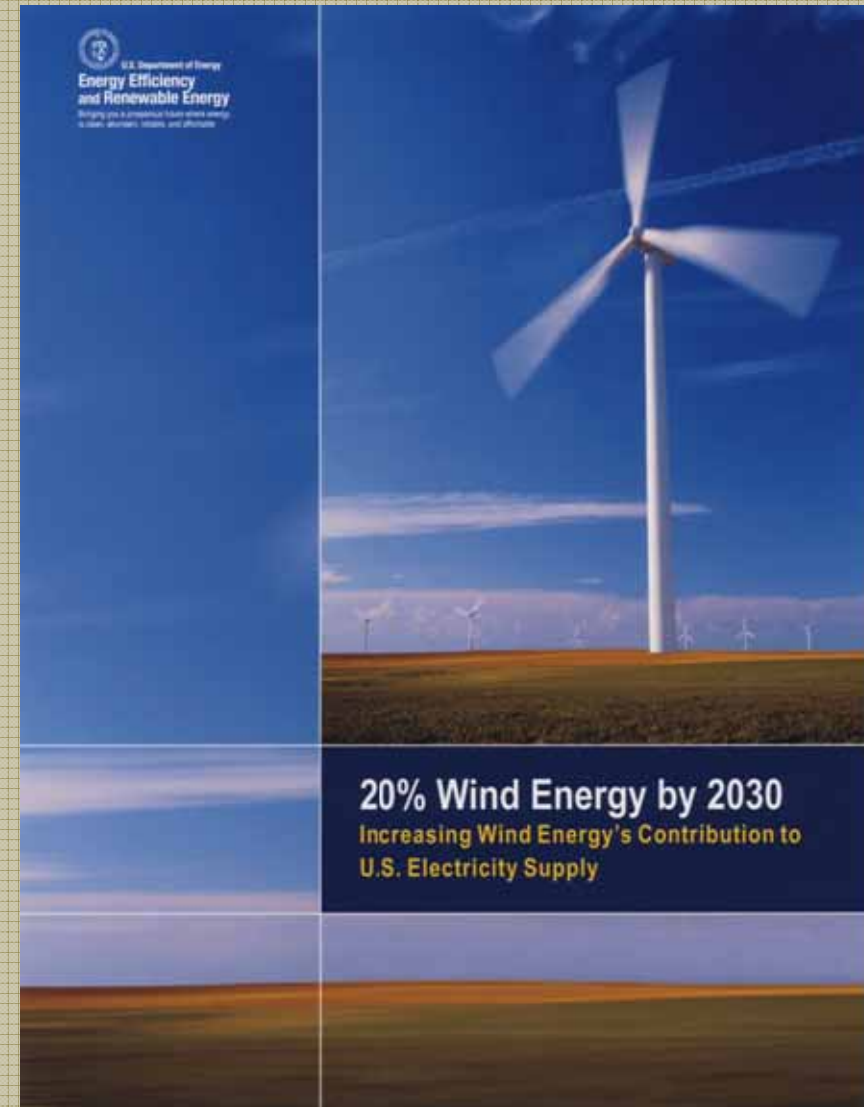
Updated May 8, 2009

Source: U.S. Department of Energy, American Wind Energy Association

# The “20% Wind Report” Informs Our RD&D

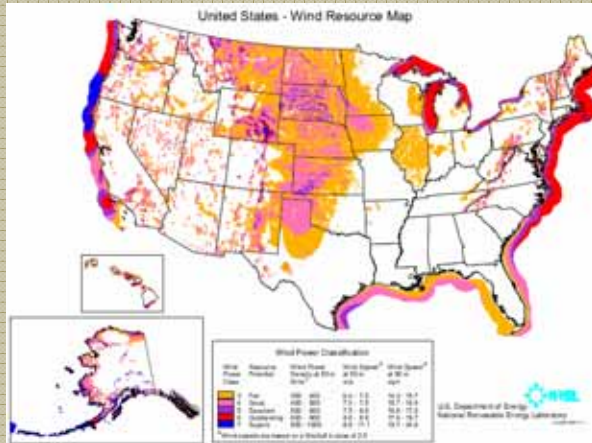
## The 20% Wind Energy by 2030 Scenario

- **How it began:**
  - 2006 State of the Union and Advanced Energy Initiative
  - Collaborative effort of government and industry (DOE, NREL, and AWEA) to explore a modeled energy scenario in which wind provides 20% of U.S. electricity by 2030
- **Primary Assumptions:**
  - U.S. electricity consumption grows 39% from 2005 to 2030—to 5.8 billion MWh (Source: EIA)
  - Wind turbine energy production (capacity factor) increases about 15% by 2030
  - Wind turbine costs decrease about 10% by 2030
  - No major breakthroughs in wind technology
- **Primary Findings:**
  - 20% wind electricity would require about 300 GW (300,000 MW) of wind generation
  - Affordable, accessible wind resources available across the nation
  - Cost to integrate wind modest
  - Emissions reductions and water savings
  - Transmission a challenge

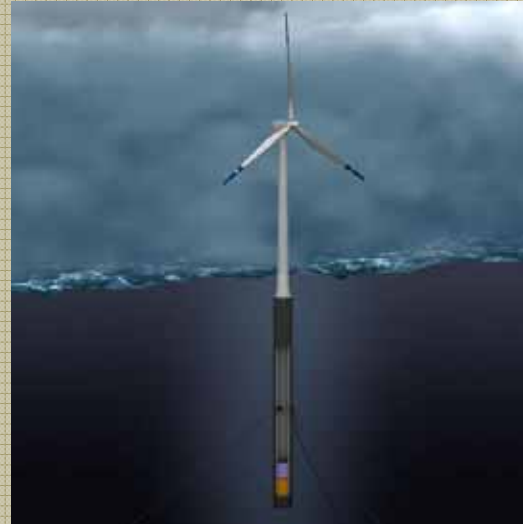




# Wind Energy Technology



**US Wind Resource Exceeds  
Total Electrical Demand**



**Offshore Wind**



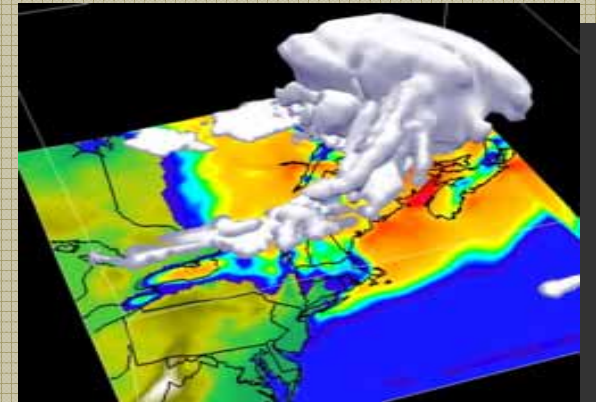
**Advanced  
Blades**



**Innovative Tall  
Towers**



**Giant Multi-megawatt Turbines**



Courtesy: WindLogics, Inc. St. Paul, MN

**Wind Forecasting**

# NREL Research Thrusts

- Improved performance and reliability
- Advanced rotor development
- Utility grid integration





# Applications of Solar Heat and Electricity

## Solar Thermal

Passive solar



Hot water



**Distributed  
Generation,  
on-site or  
near point of  
use**



## Photovoltaics (PV)



**Centralized  
Generation,  
large users  
or utilities**



## Concentrating Solar Power (CSP)



Transportation

Residential &  
Commercial  
Buildings

Industrial



# Solar – Photovoltaics and CSP

## Status in U.S.

### PV

- 1,000 MW installed capacity
- Cost 18-23¢/kWh

### CSP

- 419 MW installed capacity
- Cost 12¢/kWh

### Potential:

### PV

- 11-18¢/kWh by 2010
- 5-10 ¢/kWh by 2015

### CSP

- 8.5 ¢/kWh by 2010
- 6 ¢/kWh by 2015





# Solar Research Thrusts

## Photovoltaics

- Higher performance cells/modules
- New nanomaterials applications
- Advanced manufacturing techniques

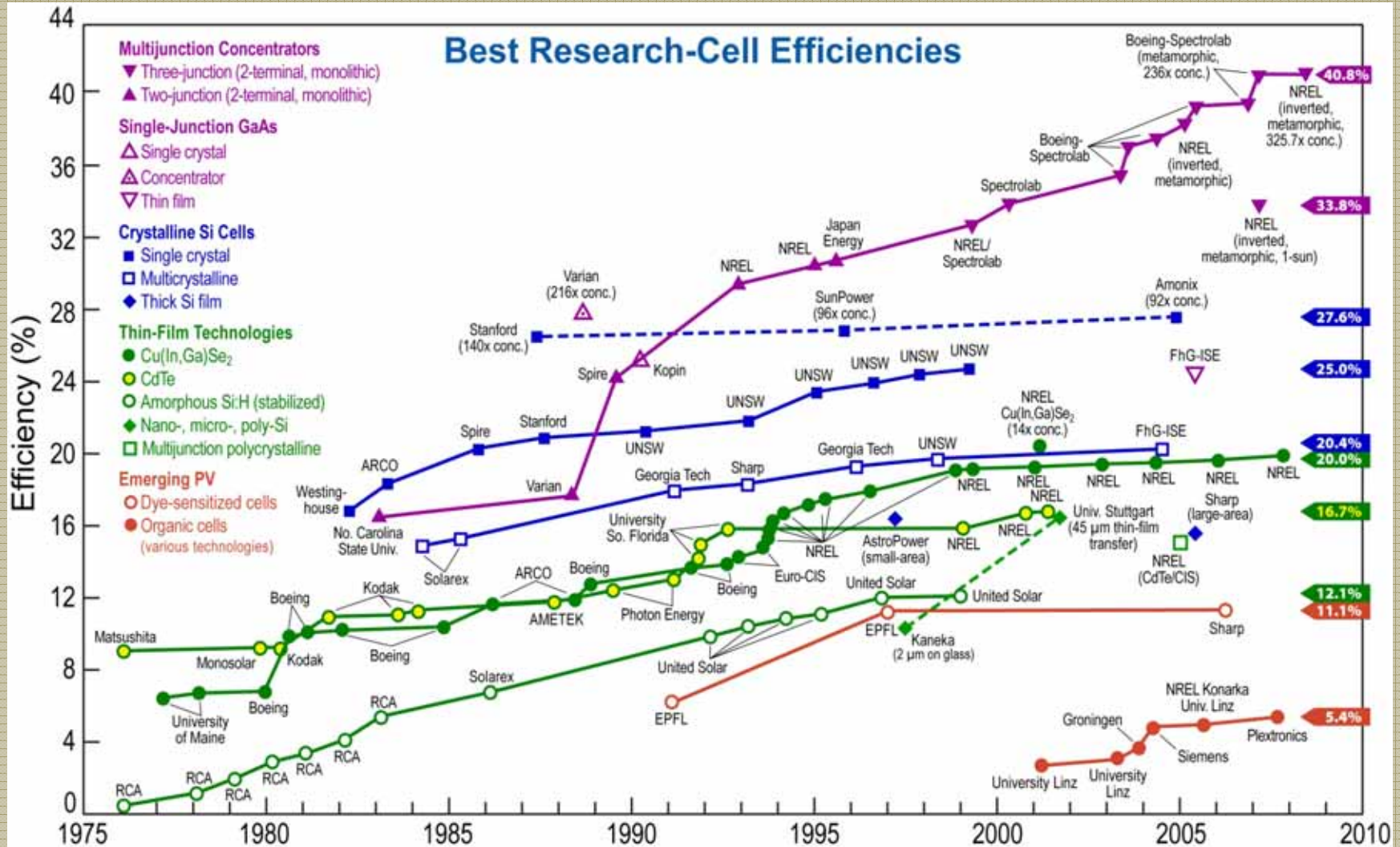
## Concentrating Solar Power

- Low cost high performance storage for baseload markets
- Advanced absorbers, reflectors, and heat transfer fluids
- Next generation solar concentrators



8.22-megawatt Alamosa, Colo.,

# PV Conversion Technologies— Decades of NREL Leadership



Rev. 11-08



# PV Conversion Technology Portfolio

## Market-Competitive Targets

| Market Sector | Current U.S. Market Price Range (¢/kWh) | Cost (¢/kWh) Benchmark 2005 | Cost (¢/kWh) Target 2010 | Cost (¢/kWh) Target 2015 |
|---------------|---|-----------------------------|--------------------------|--------------------------|
| Residential   | 5.8-16.7                                | 23-32                       | 13-18                    | 8-10                     |
| Commercial    | 5.4-15.0                                | 16-22                       | 9-12                     | 6-8                      |
| Utility       | 4.0-7.6                                 | 13-22                       | 10-15                    | 5-7                      |



### Thin Films (aSi)

Advancing amorphous and wafer replacement crystal silicon film solar cells on low-cost substrates



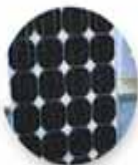
### Organic PV

Customizing molecules, substrates, and deposition techniques to yield ultra low-cost modules



### Next Generation

Investigating advanced concepts aimed at delivering revolutionary performance improvements



### Crystalline Silicon

Developing higher efficiency devices and lower cost processing methods for traditional silicon cells

### Crosscut

Synergistic technologies, evaluation approaches, and process engineering approaches applicable across multiple absorber materials and processes

### Concentrating PV

Combining new, lower cost multijunction cells and innovative optical packages



### Thin Films (CIGS)

Supporting the manufacture of non-vacuum processes and transferring record efficiency device performance into large area commercial modules



### Dye-Sensitized Cells

Advancing the efficiency and stability of inexpensive dye-based solar cells with novel nanostructures

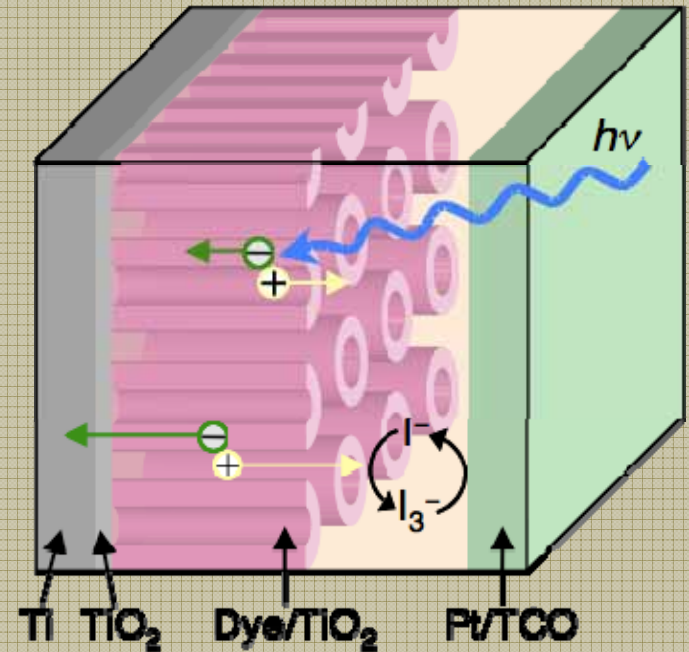
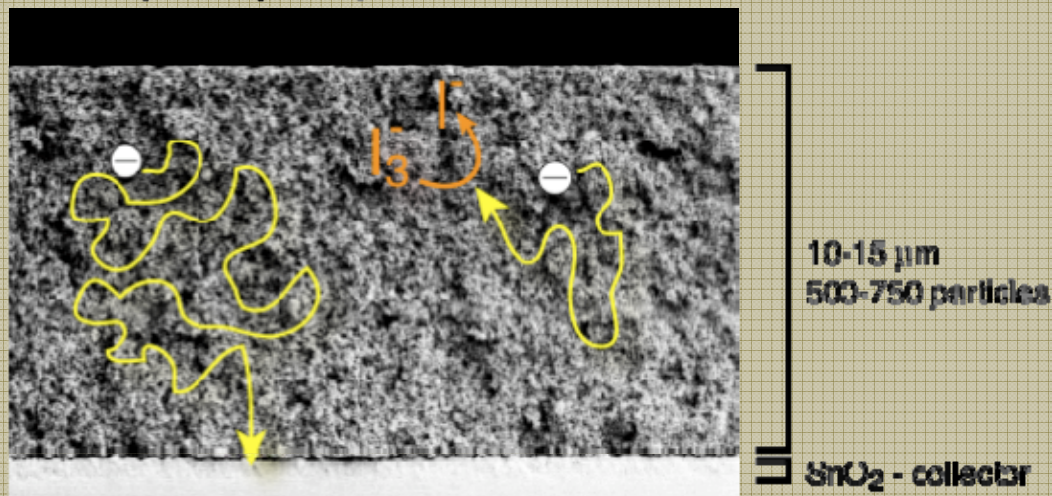
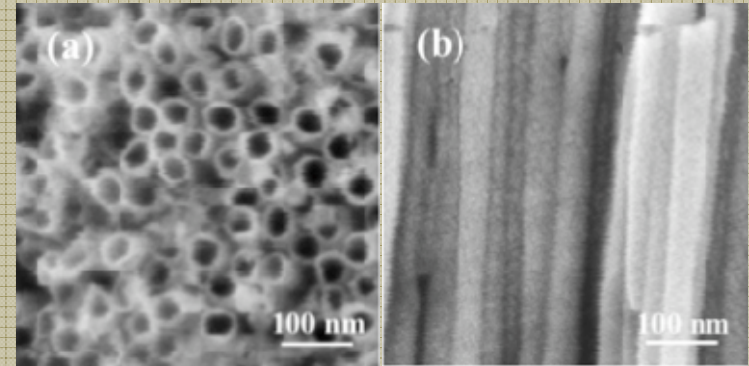
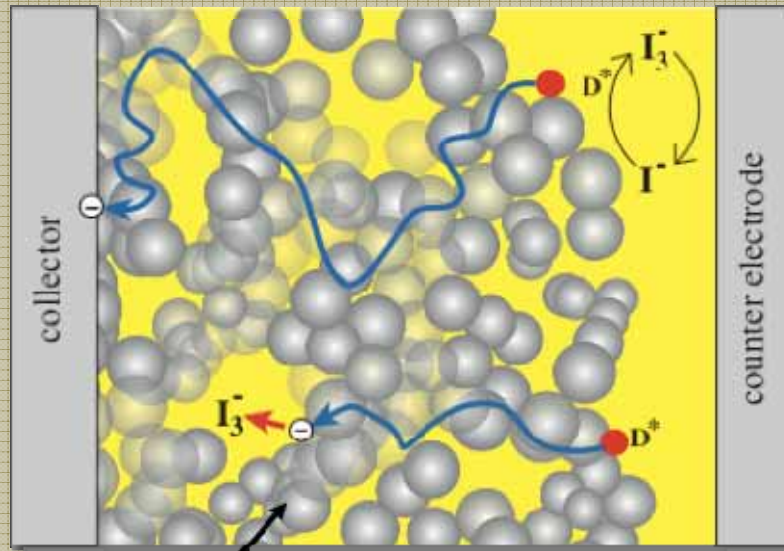


### Building Integrated PV

Creating module form factors aimed at dramatically reducing or eliminating solar installation costs



# Current Research Moves from Nanoparticles to Nanotubes to Improve Electron Transport



Credits: Art Frank



# Geothermal

## Today's Status in U.S.

- 2,800 MWe installed, 500 MWe new contracts, 3000 MWe under development
- Cost 5-8¢/kWh with no PTC
- Capacity factor typically > 90%, base load power

## DOE Cost Goals:

- <5¢/kWh, for typical hydrothermal sites
- 5¢/kWh, for enhanced geothermal systems with mature technology

## Long Term Potential:

- Recent MIT Analysis shows potential for 100,000 MW installed Enhanced Geothermal Power systems by 2050, cost-competitive with coal-powered generation



## NREL Research Thrusts:

- Analysis to define pathways to commercialization of enhanced geothermal systems (EGS)  
Systems engineering/integration to enable fast track development of EGS and other Program goals  
Geothermal energy conversion RD&D  
Low temperature geothermal, direct use, and ground source heat pump RD&D



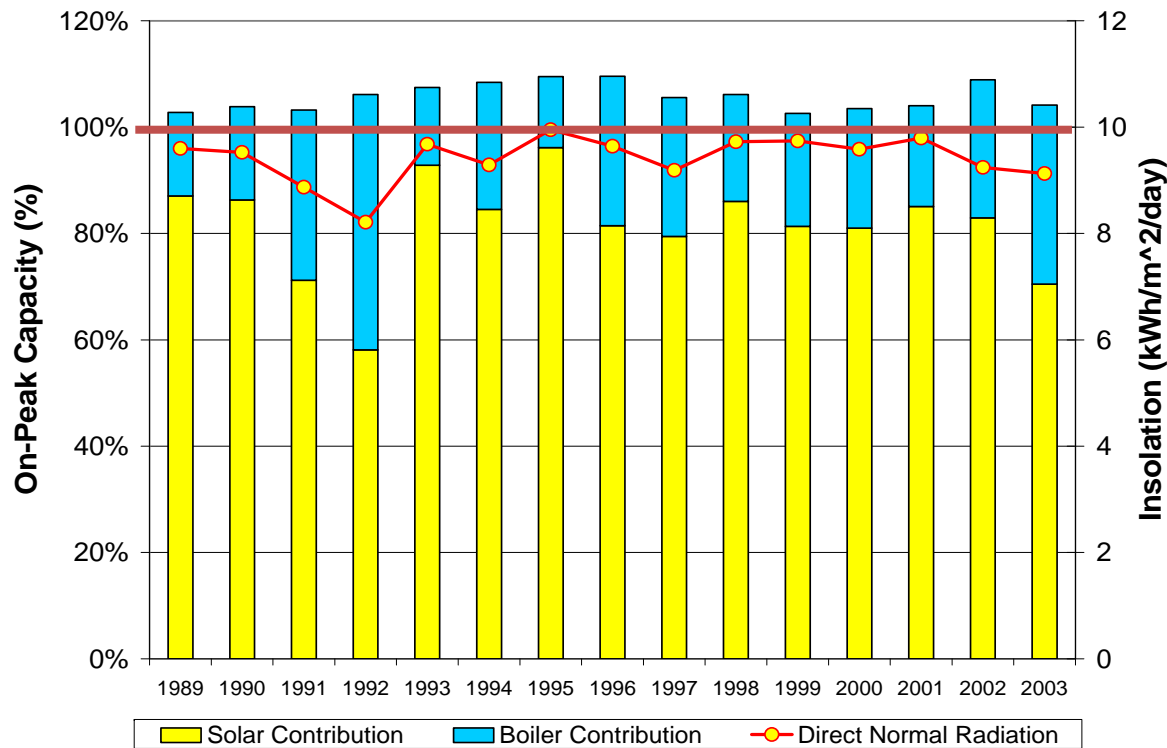
# 354 MW Solar Electric Generating Systems (SEGS)





# SEGS Historic Plant Capacity Value

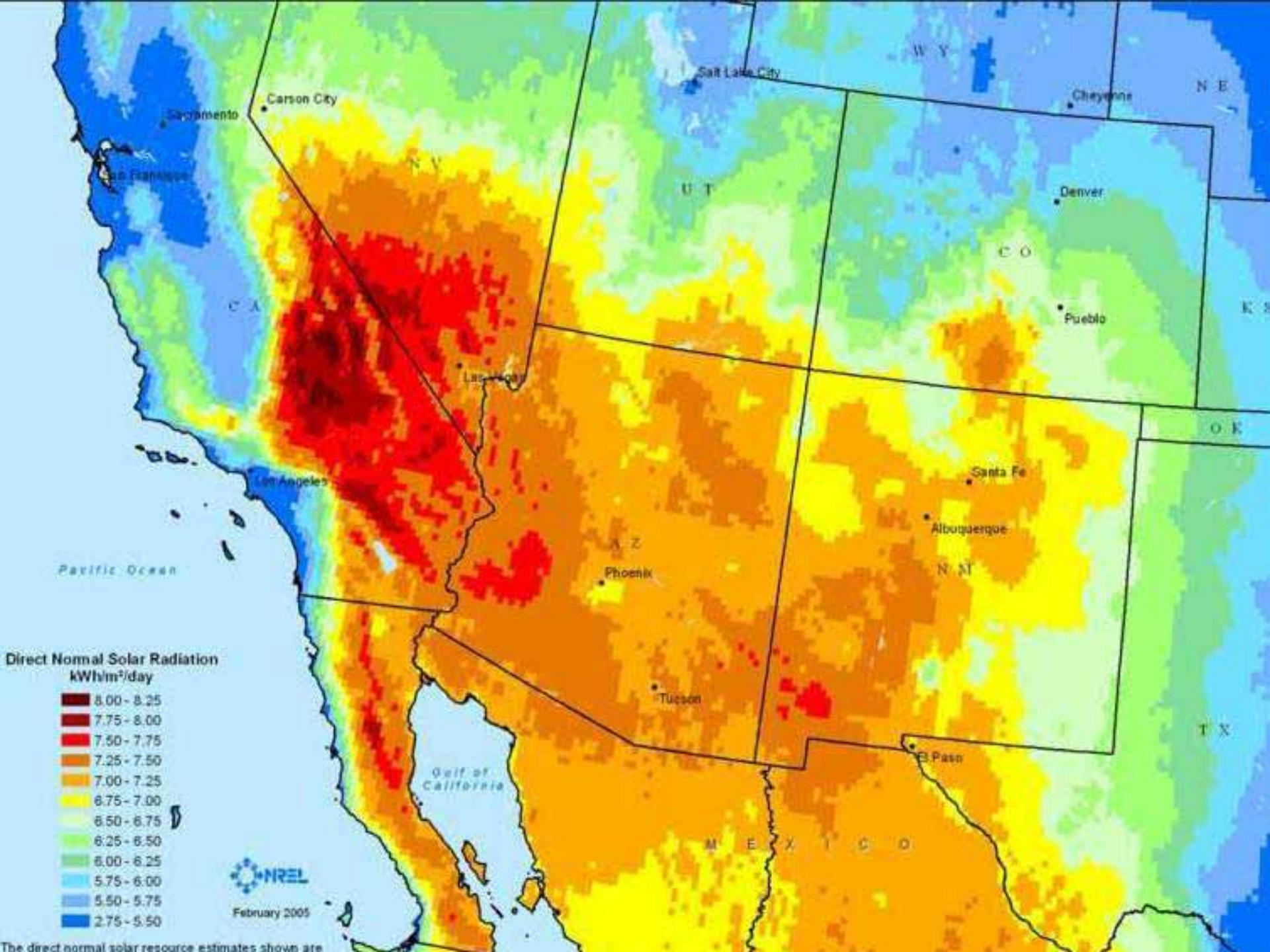
## On-Peak Performance For 5 Parabolic Trough Plants



- Over 100% capacity with fossil backup
- Averaged 80% on-peak capacity factor from solar

**SCE Summer On-Peak**  
Weekdays: Jun - Sep  
12 noon - 6 pm

Source: KJC Operating Company



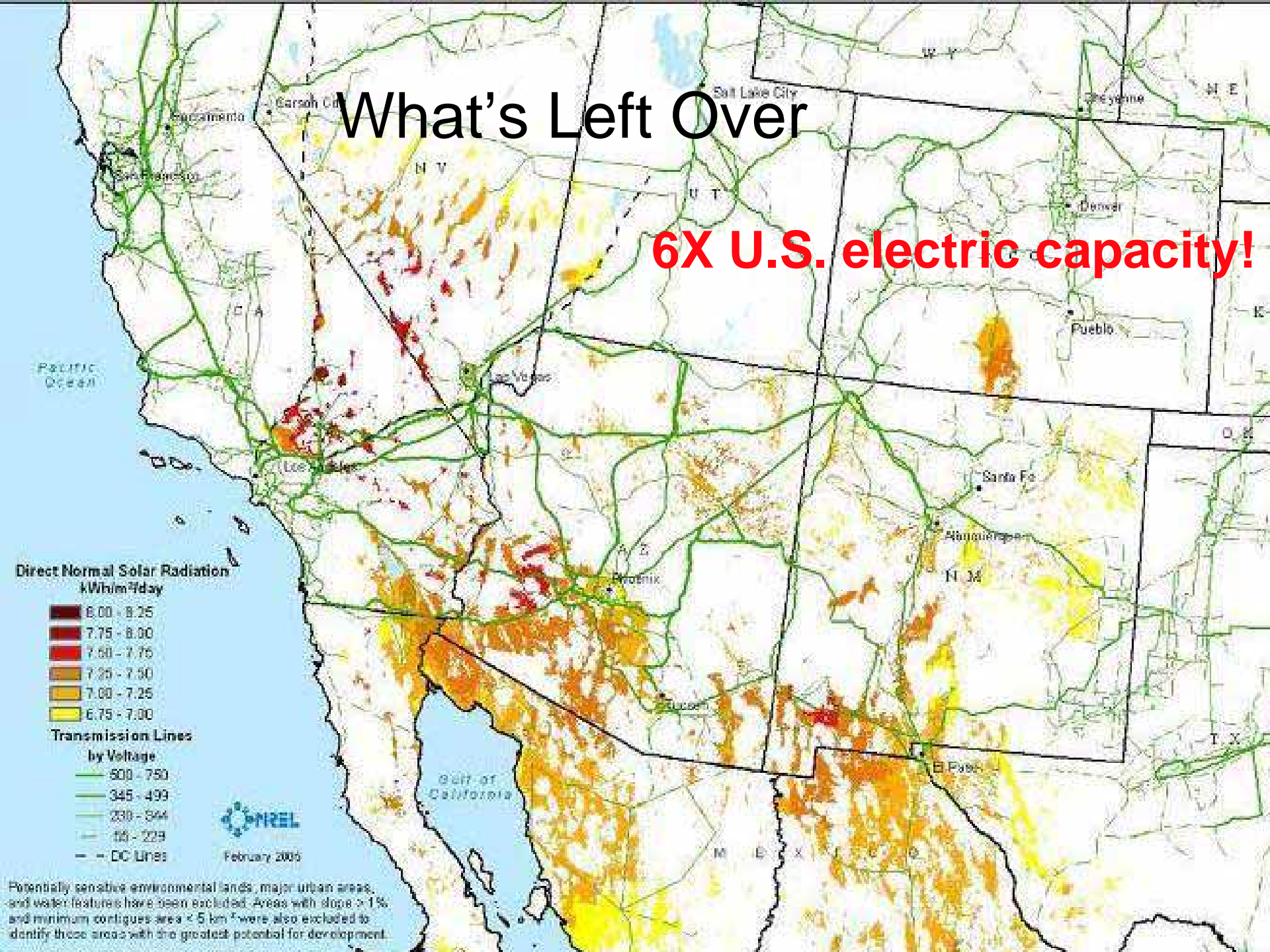


# Exclude:

- Used and sensitive land
- Solar < 6.75 kWh/m<sup>2</sup> per day
- Ground slope > 1%

# What's Left Over

# 6X U.S. electric capacity!





# Biofuels





# Biofuels

## Current Biofuels Status in U.S.

- Biodiesel – 171 companies; 2.2 billion gallons/yr capacity<sup>1</sup>
- Corn ethanol
  - 174 commercial plants<sup>2</sup>
  - 10.8 billion gal/yr. capacity<sup>2</sup>
  - Additional 2.4 billion gal/yr planned or under construction
- Cellulosic ethanol (current technology)
  - Projected commercial cost ~\$3.50/gge

## Key DOE Goals

- 2012 goal: cellulosic ethanol \$1.33/ETOH gallon or ~\$1.99/gge
- 2022 goal: 36B gal Renewable Fuel; 21B gal “Advanced Renewable Fuel” – 2007 Energy Independence and Security Act
- 2030 goal: 60 billion gal ethanol (30% of 2004 gasoline)

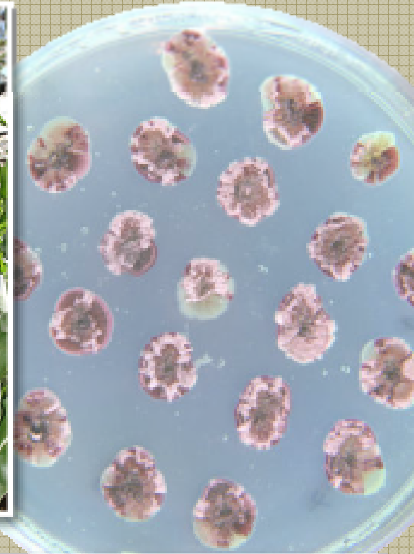
## NREL Research Thrusts

- The biorefinery and cellulosic ethanol
- Solutions to under-utilized waste residues
- Energy crops
- New biofuels

Updated February 2009

Sources: 1- National Biodiesel Board

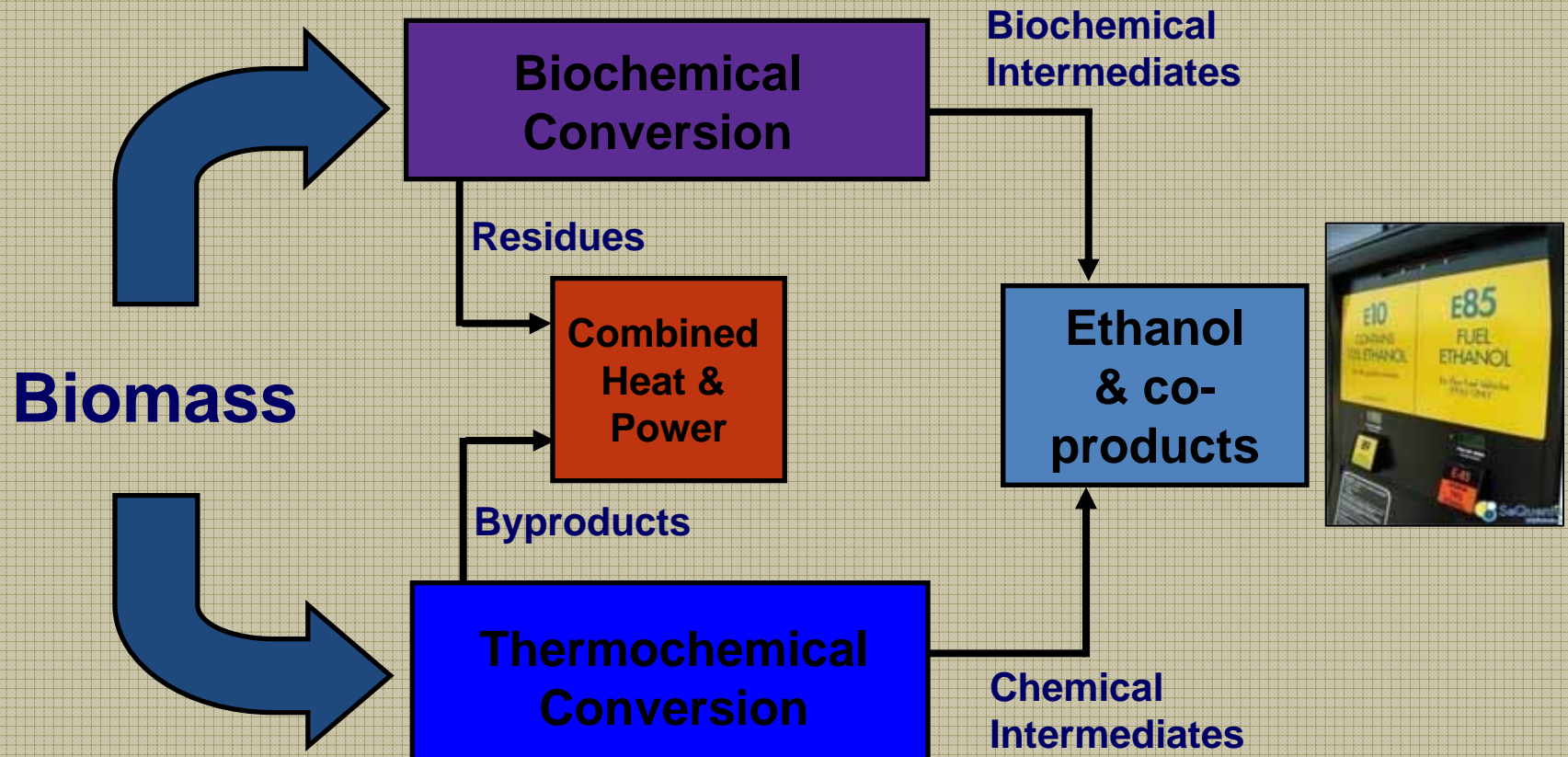
2 - Renewable Fuels Association, all other information based on DOE and USDA sources





# Generation 2 (Cellulosic Ethanol)

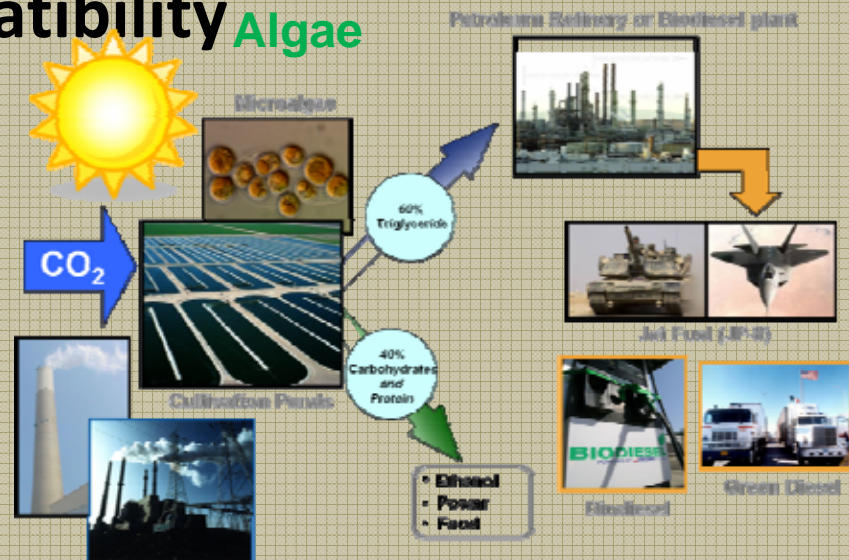
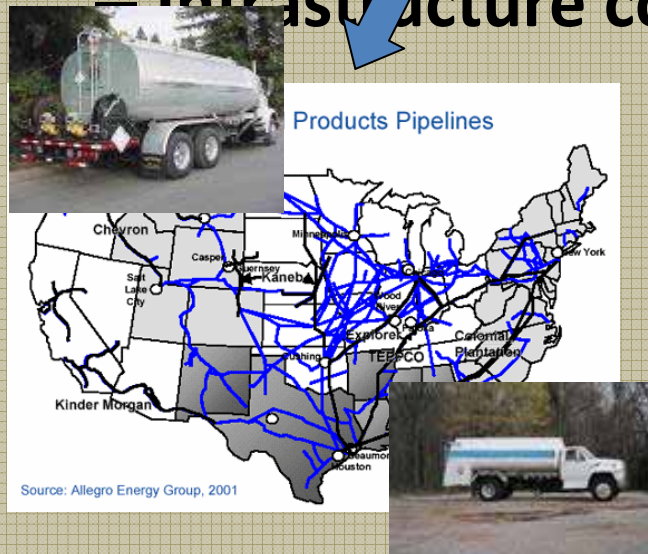
- **2nd generation**—from lignocellulosic biomass materials, primarily producing ethanol via biochemical or thermochemical conversion



# Why Follow-On Generations?

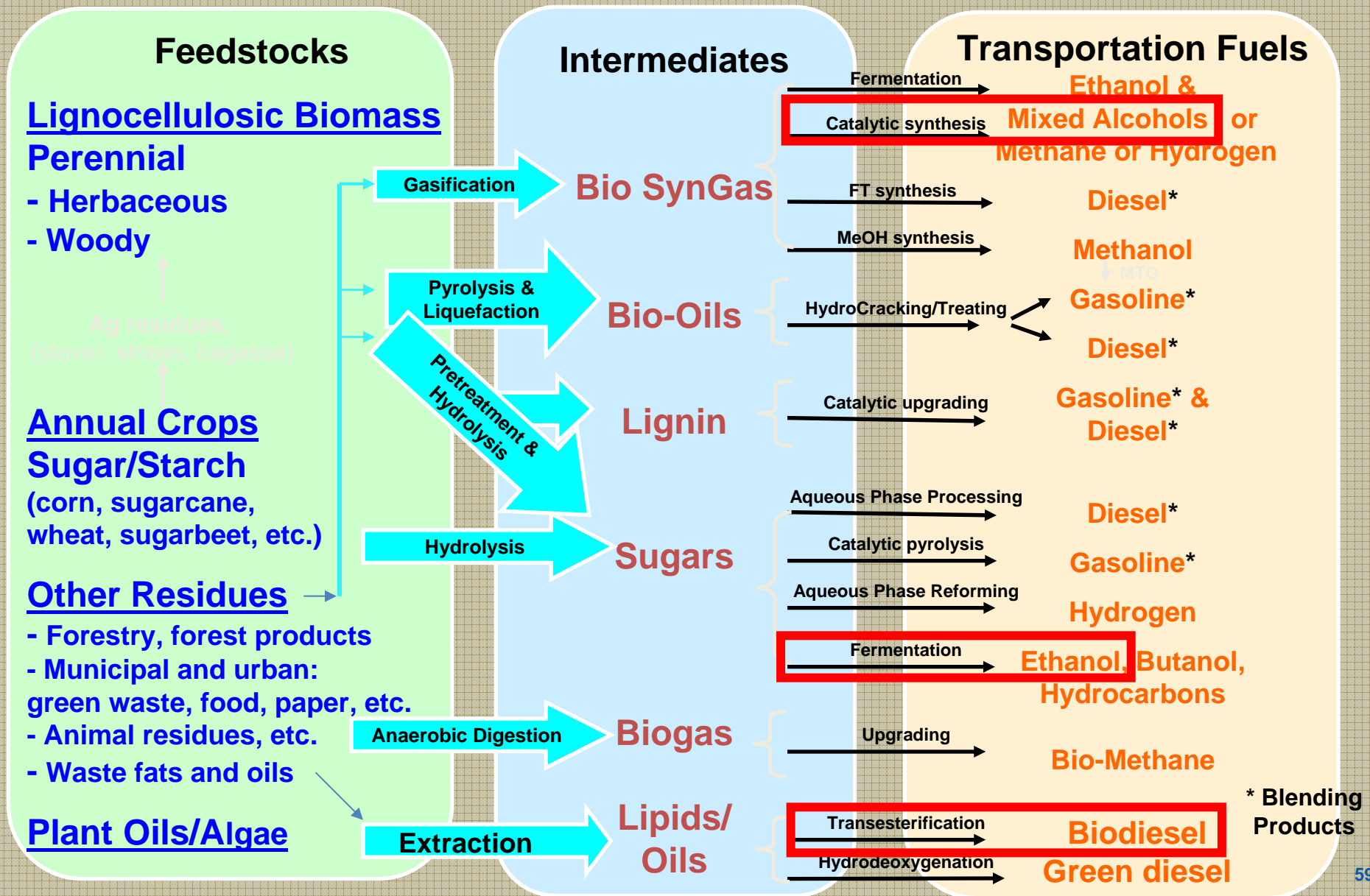
## • 3<sup>rd</sup> & 4<sup>th</sup> Generations – “beyond ethanol”

- Higher energy density/suitability
- Better temp and cold start ability
- Energy and tailored feedstocks
- Infrastructure compatibility





# Wide Range of Biofuel Technologies



# Sustainable Transportation





# Plug-In Hybrid Electric Vehicles (PHEV)

## Status:

- PHEV-only conversion vehicles available
- OEMs building prototypes
- NREL PHEV Test Bed

## NREL Research Thrusts

- Energy storage
- Advanced power electronics
- Vehicle ancillary loads reduction
- Vehicle thermal management
- Utility interconnection
- Vehicle-to-grid

## Key Challenges

- Energy storage – life and cost
- Utility impacts
- Vehicle cost
- Recharging locations
- Tailpipe emissions/cold starts
- Cabin heating/cooling
- ~33% put cars in garage



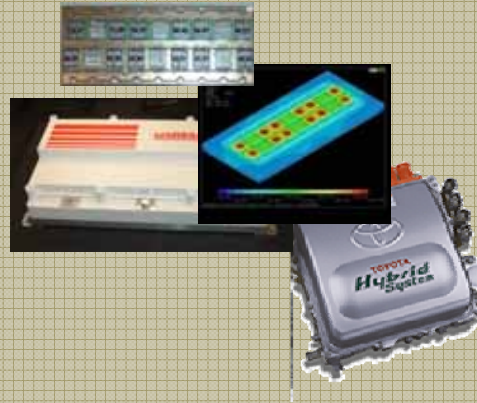


# Advanced Vehicle Technologies

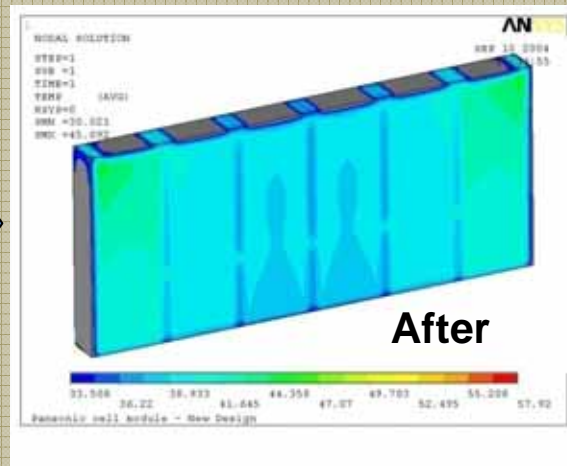
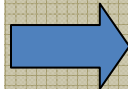
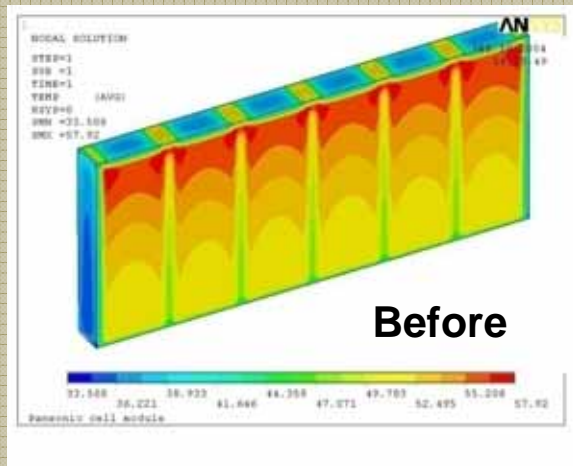
## Energy Storage



## Advanced Power Electronics



## Vehicle Ancillary Loads Reduction





# Fuels Performance

## Coordinating Research Council

- FACE
- Biodiesel Stability
- E10/E20/E85



## Fuel Surveys

- Biodiesel
- E85



## NBB CRADA - Biodiesel

- Quality/Stability
- Compatibility with Emission Controls
- Real-World Evaluation



## Fuels Chemistry Lab



- Test Methods
- Impurities
- Chemical analysis

## ASTM

- Specs & Test Method Development
- Biodiesel
- E85



## IQT Projects

- Fundamental Ignition Studies
- Pollutant formation
- FACE Fuels Testing



# Hydrogen and Fuel Cells





# Hydrogen and Fuel Cells

## U.S. Status

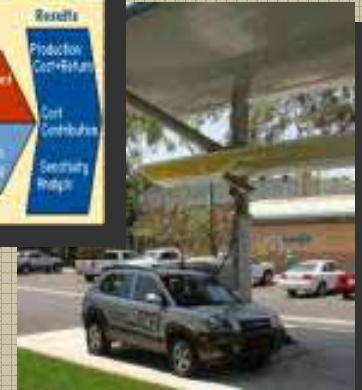
- 400+ fuel cell vehicles on the road
- 58 hydrogen fueling stations

## Goals

- Hydrogen Production
  - \$2-3/Kg for all pathways
  - Renewables in \$5-10/Kg range
- Fuel Cells
  - \$30/kW by 2015
  - 5,000 hour stack life

## NREL Research Thrusts

- Renewable H<sub>2</sub> production
- Safety/codes/standards
- Early market introduction



# Energy Storage

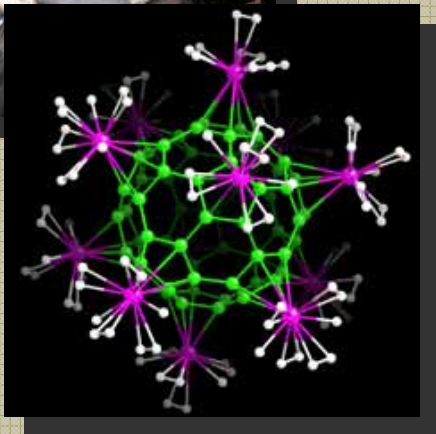




# Designer Nanostructured Materials are Critical to Enabling Energy Storage Systems for Renewables



Organometallic  
Buckyballs for Hydrogen  
Storage



## State-of-the-art processing to create novel nanomaterials for energy storage:

- Hydrogen storage: porous carbons, boro-carbons, metcars, macromolecules
- Batteries: novel electrolytes and metal oxides for cathodes and anodes
- Ultracapacitors: nanotubes and high dielectric materials
- Dynamic smart windows

## NREL leads DOE's hydrogen sorption Center of Excellence

- Develops high surface area, low-weight and low-cost materials
- 15 projects: 4 national labs, 10 universities, and one industrial partner

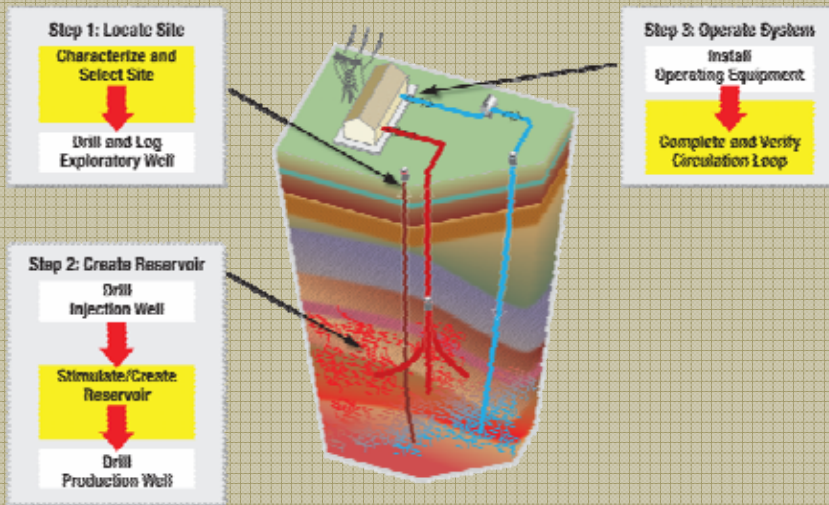
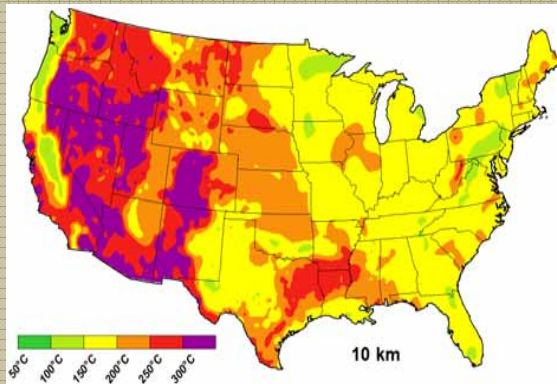
# New Directions





# Evaluating Potential New Directions

## Enhanced Geothermal Systems



## Ocean Kinetic Energy



Wave

Tidal



Pelamis—Ocean Power Delivery

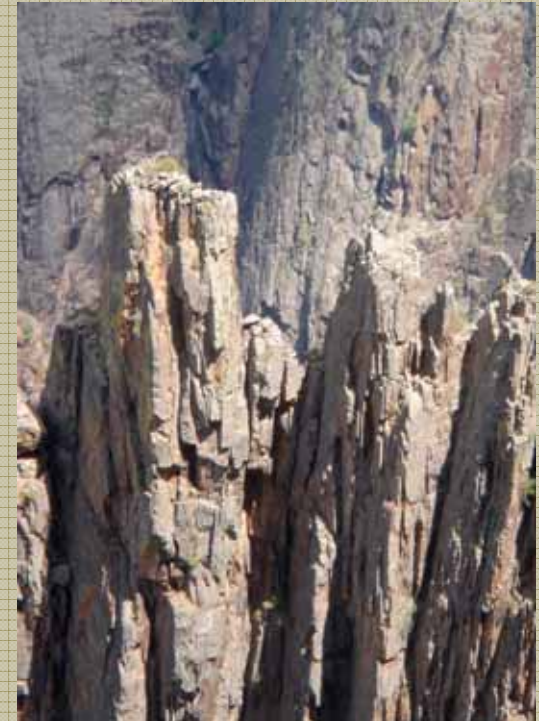
Verdant—Power RITE Turbine



# Enhanced Geothermal Systems Challenges

## Technical

- Site selection - exploration techniques for EGS
  - EGS paradigm shift from hydrothermal
- Creating EGS in variety of geologic environments
  - Create a subsurface fracture system to enable extraction of heat
    - Sufficient flow rates (80 kg/sec)
    - Heat exchange volume (recoverable energy) and surface area (recovery rate)
    - Minimal loss of injected fluid
- Few EGS field experiments yet conducted worldwide
  - Experimental evidence of EGS well productivity, heat exchange volume, and longevity is lacking



***Geologic variability and uncertainty create technical challenges***



# FY09 NREL Water Program

## Market Development and Transformation

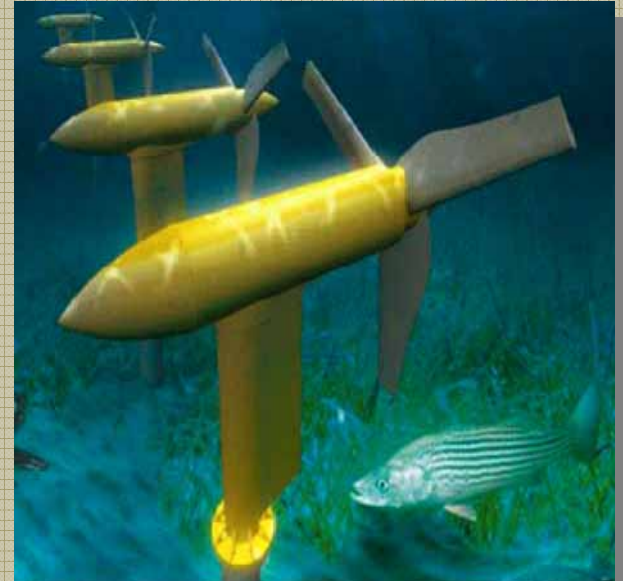
- International Collaborations and Standards
- Technical Support
- Industry Technology Support

## Industry Status

- New industry extracting power from natural Ocean and River Currents, Tidal, Wave, and Thermal energy

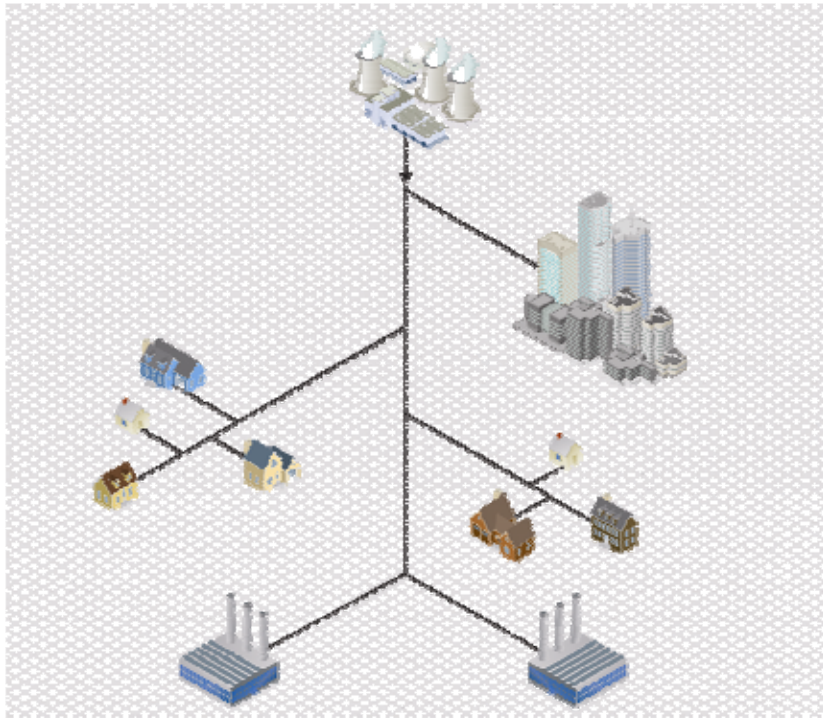
## Water Power Mission

- Assess the potential of extractable energy from water resources and facilitate the development and deployment of renewable, environmentally-friendly, and cost-effective energy systems from domestic rivers, estuaries and coastal waters
- Include R&D for economic and environmental improvements to existing hydroelectric facilities and dams

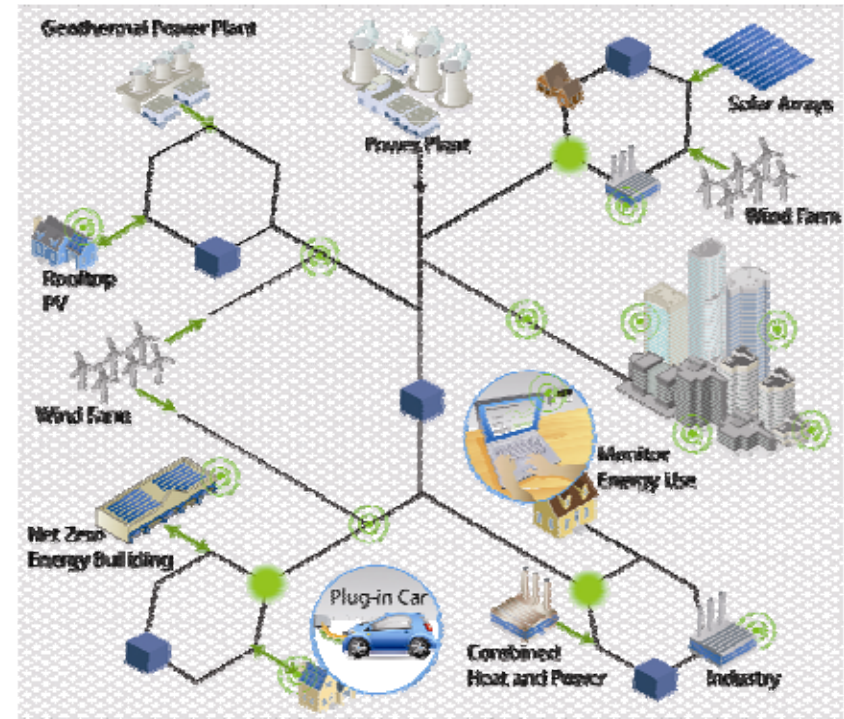


# Smart Grid – Renewable Energy Integration in Systems at All Scales

## Today



## Future



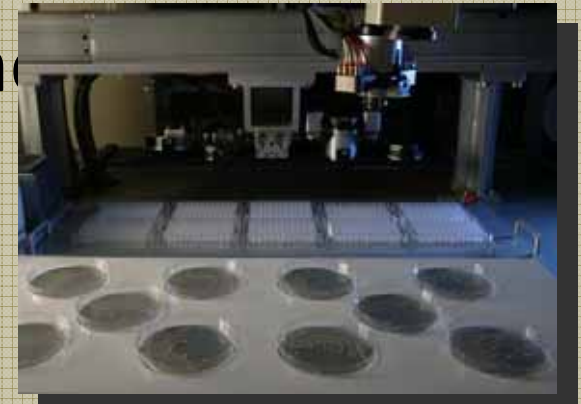
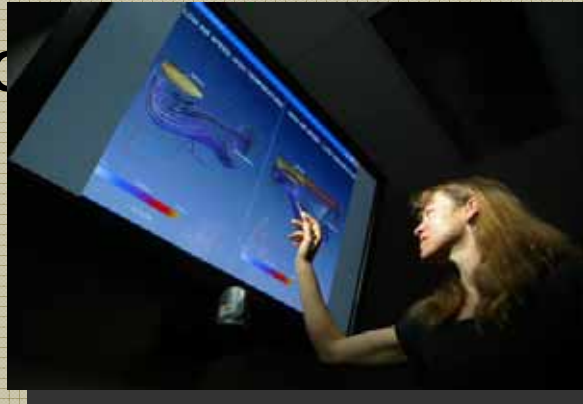
Smart Grid Energy Sensors  
Energy Pulled From or Added to the Grid

Smart Substation  
Energy Storage



# Energy Solutions Require a New Approach

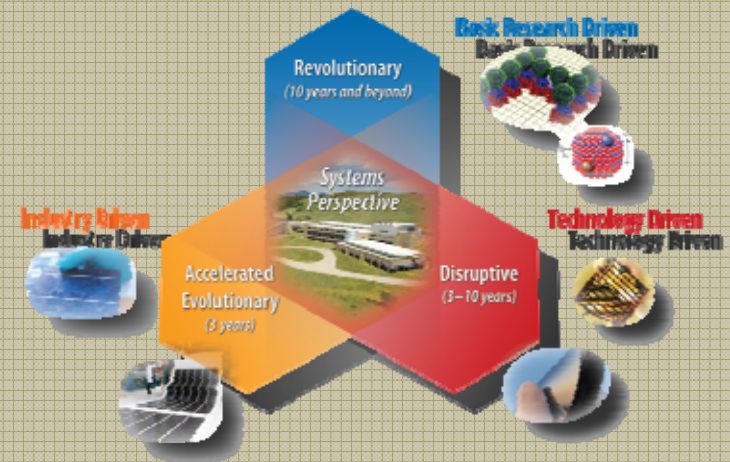
- Multi-disciplinary/multi-institutional collaboration
  - Chemistry, materials science
  - Computational modeling
  - Biology
- Translational science—bridge basic to applied





# Breakthrough/Translational Science

- Bioscience Centers
- Energy Frontiers
- Energy Innovation Hubs
- ARPA-E





# Economics

(the 800 pound Gorilla)

**China has replaced the U.S. as the world's leading consumer of basic commodities: oil, grain, coal, steel.**

**And producer of carbon**



**If China's economy grows at its prior rate and uses resources as inefficiently as the U.S.**

**By 2030 China will need 99 million barrels of oil/ day.**

**The world now produces 85 million bbl/ day.**



**Where are oil prices headed?**



# Renewing a Sustainable Energy Economy

*Requires a National Energy Grand Challenge\**

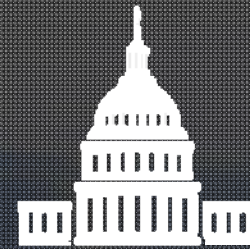


Lead Coordinated R  
Strategy in Sustainable  
Energy

**Building a Sustainable  
Energy Future:**  
U.S. Actions for an Effective  
Energy Economy Transformation

Soon to be released.

National Science Board



Construct Essential  
Policies & Market  
Conditions



Support Education  
Workforce Developm

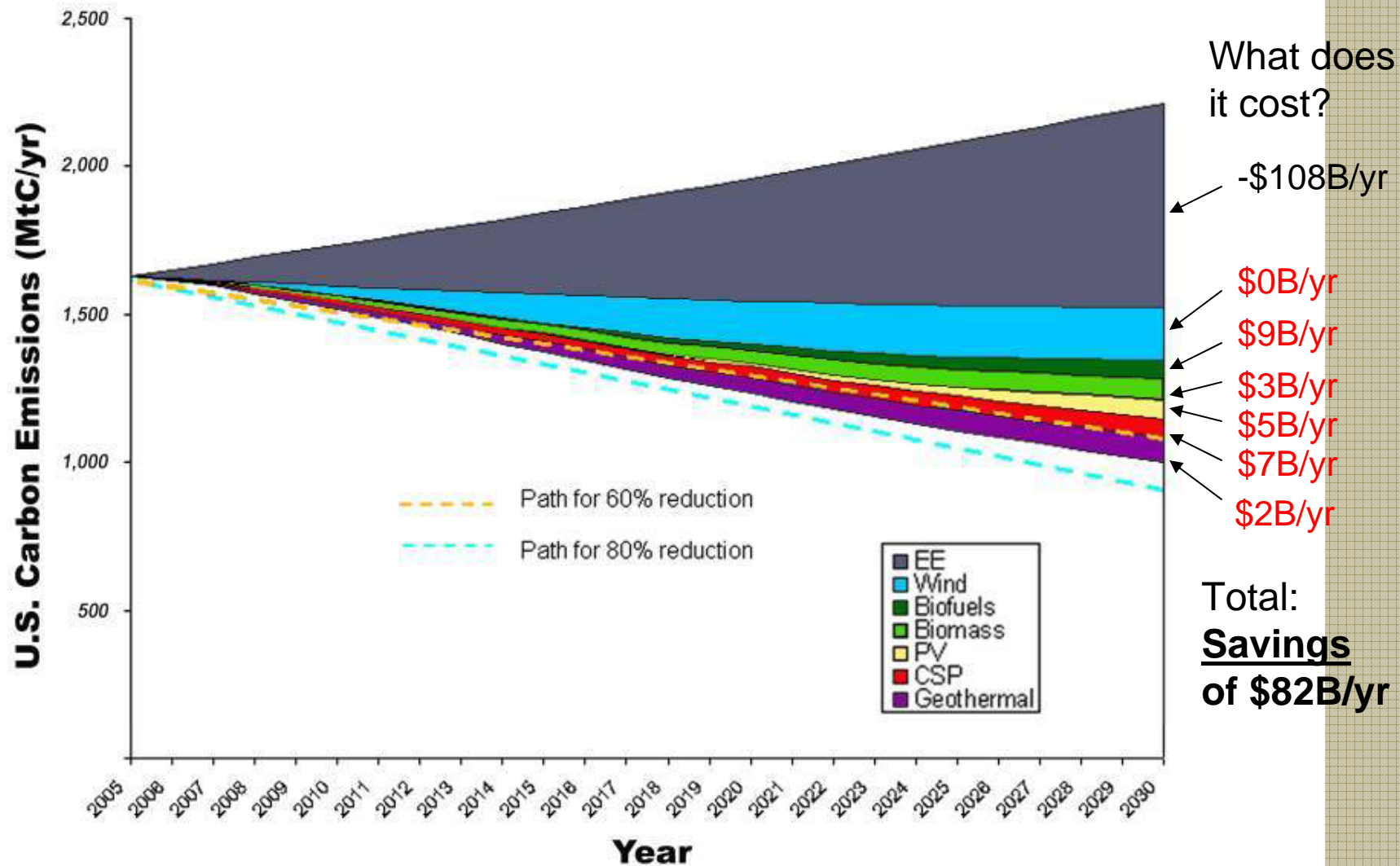


Promote Public  
Awareness & Action

\* Recommendations of the National Science Board Task Force on Sustainable Energy



# Potential U.S. Carbon Reductions



57% Energy Efficiency, 43% Renewables

# *“The Integrated Bottom Line”*

## *The Business Case for Sustainability*

### *Enhancing Shareholder Value:*

- Financial performance
- Reduced cost, enhanced profitability
- Ability to drive innovation
- Reduction of risk
- Franchise to operate, legal liabilities
- Attraction and retention of best talent
- Labor productivity - increased worker health
- Market share - enhanced brand equity
- Product differentiation
- Supply chain and stakeholder management
- Reducing cost of distrust
- “First to the future” = the billionaires of the future



# ***Companies in the Dow Jones sustainability Index outperform the general market***

- **New report from Goldman Sachs July 5-6: Companies considered leaders in environmental, social and governance (ESG) policies are leading the pack in stock performance—by an average of 25%.**
- **72% of the companies on the list outperformed industry peers.**

**Companies with the highest share price growth over the past three years paid more attention to sustainability issues... those with the worst performance tended to do less....**

**The link appears clear: companies that rated their efforts most highly over this time period saw annual profit increases of 16% and share price growth of 45%,**

**Those that ranked themselves worst reported growth of 7% and 12% respectively. High-performing companies put a much greater emphasis on social and environmental considerations at board level, while**

***the poorly-performing firms are far more likely to have nobody in charge of sustainability issues.***



## GOALS:

Cut greenhouse gas emissions  
65% 1990–2010



Raise revenues 6%/y 2000–10  
with no increase in energy use

By 2010, 10% of energy & 25%  
of feedstock from renewables

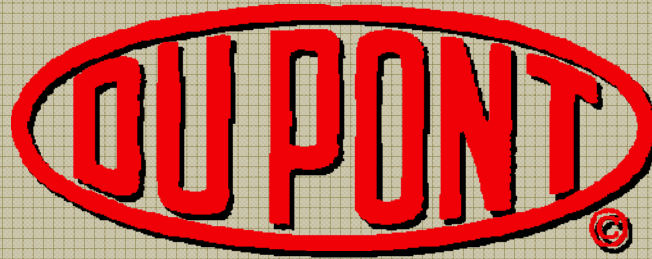
Since 1990 have kept energy use the same and increased production 30%

GHGs from global operations are down 80%

Global energy use 9% below 1990 levels

Savings of \$3 billion 2000 – 2005

On track with renewables



## **Commitment**

- **Waste reduction**
- **Held energy use flat**

## **Annual Savings**

- **\$1.8 Billion**
- **\$0.4 Billion**

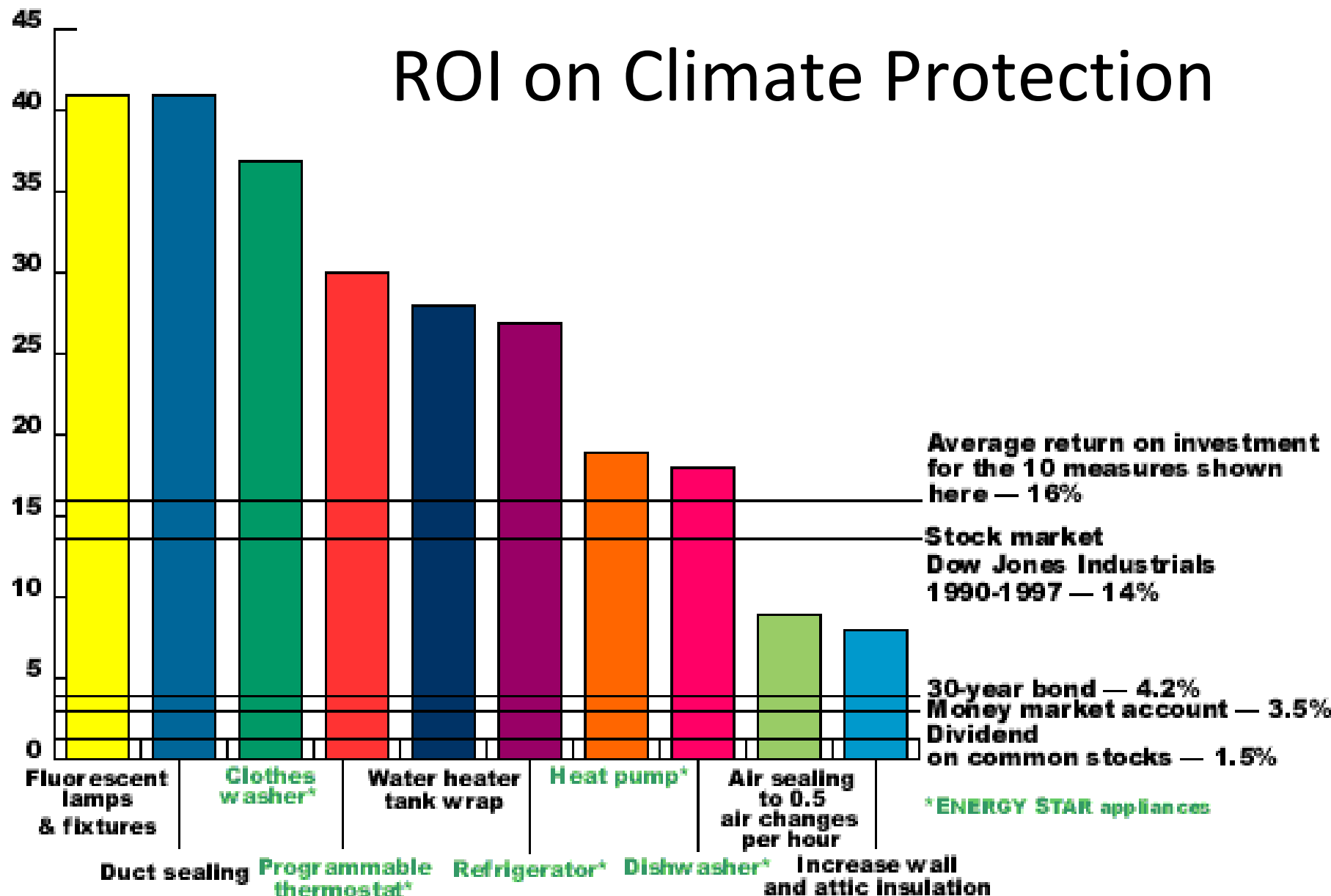
**Eco-Efficiency = \$2.2 Billion saved each year**

**Average Net Income (2003-2007) = \$2.2 Billion**



Annual return  
on investment (%)  
after-tax

# ROI on Climate Protection



# Energy Efficiency

- **Businesses such as energy efficiency rose by 75 percent in 2008 to \$530 billion and could exceed \$2 trillion by 2020, HSBC Global Research estimated last Friday.**
- **In the 2006 Stern Review on the economics of climate change, climate-related revenues were forecast to climb to \$500 billion by 2050.**





Increase vehicle fleet efficiency 25% in 3 yrs –  
Double it in 10 yrs.

Invest \$50 million in sustainability projects

Become the world's leading organic retailer

100% renewable energy

Zero waste

Carbon neutral

Sell only sustainable products







# The Walmart Sustainability Index is organized around the following impact areas and goals

|                             | Across the lifecycle of its products, Walmart seeks...                               | Sample topics included   |
|-----------------------------|--|--|
| <b>Energy and Climate</b>   | To maximize the use of renewable energy and minimize greenhouse gas emissions.       | <ul style="list-style-type: none"> <li>• Energy use / efficiency</li> <li>• GHG emissions</li> <li>• Renewable energy</li> </ul>   |
| <b>Material Efficiency</b>  | To maximize efficient use of all materials, close material loops and minimize waste. | <ul style="list-style-type: none"> <li>• Use / efficiency of all resources other than energy (water, minerals, chemicals, etc.)</li> <li>• Waste, re-use and recycling</li> </ul>          |
| <b>Natural Resources</b>    | To promote the integrity of nature and a safe, reliable supply of natural resources. | <ul style="list-style-type: none"> <li>• Pollution (except GHG emissions) and hazardous waste</li> <li>• Biodiversity</li> <li>• Natural abundance (supply of fish, wood, etc.)</li> </ul> |
| <b>People and Community</b> | To promote quality of life and safeguard human health.                               | <ul style="list-style-type: none"> <li>• Toxicity to humans</li> <li>• Nutrition</li> <li>• Livelihoods</li> <li>• Community development</li> </ul>  |



# October meeting in Beijing

1,000 suppliers, government, NGOs

Set aggressive goals and expectations to build more environmentally and socially responsible global supply chain phased in for suppliers in China in Jan. 2009, expanded to suppliers around the world by 2011.

Top 200 factories to achieve a 20 percent improvement in energy efficiency by 2012.

Source 95 percent of production from factories with the highest ratings in audits for environmental and social practices by 2012.

Wal-Mart China will design and open a new store prototype that uses 40 percent less energy and will reduce energy use by 30 percent in existing stores by 2010.



# America Is Making Transformational Change



Renewable energy and sustainable business practices are the greatest opportunities of this century.