

***Clean Tech Innovation:  
Patent Trends & The Federal Stimulus In New York State  
July 9, 2009***

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INTELLECTUAL PROPERTY LAW

<http://www.CleanEnergyPatentGrowthIndex.com>

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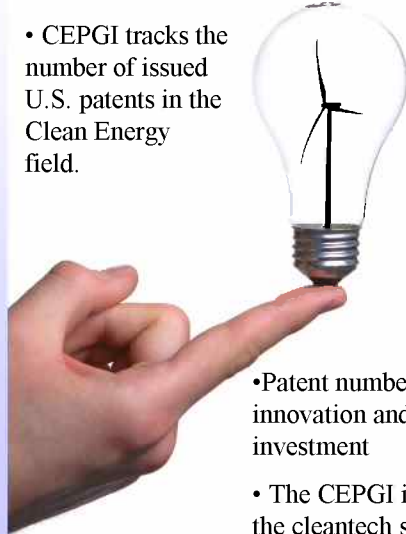
***Agenda***

- Discuss the Clean Energy Patent Growth Index (CEPGI) as a tool for measuring Clean Tech Innovation
- Look at CEPGI and Venture Capital investment trends for several key Clean Energy technologies
- Focus on Clean Tech Innovation in NY State with comments on technology and investment trends
- Review government funding opportunities for Clean Tech researchers and businesses as a result of the Federal Stimulus Package

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## *Clean Energy Patent Growth Index (CEPGI)*

- CEPGI tracks the number of issued U.S. patents in the Clean Energy field.



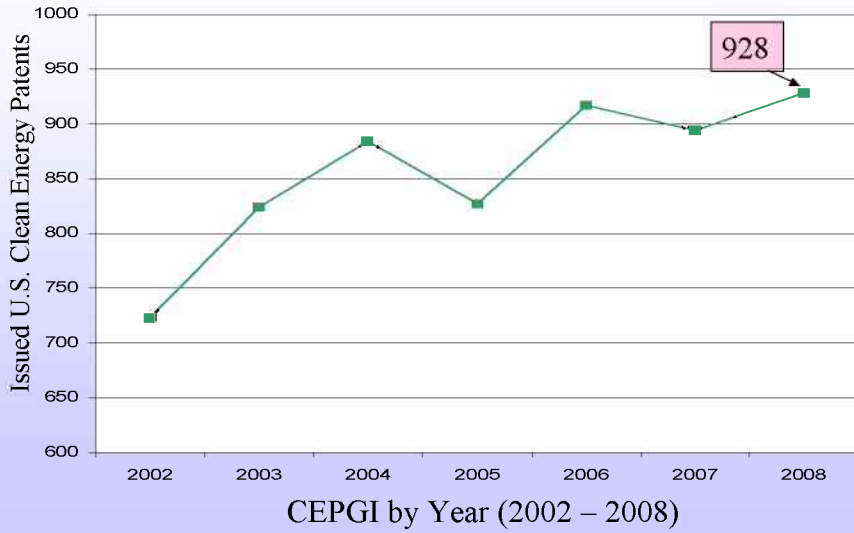
- Patent numbers are often cited as a measure of innovation and the effectiveness of R&D investment

- The CEPGI is one way to keep a "pulse" on the cleantech sector and determine relative trends

## *Technologies Tracked in the CEPGI*

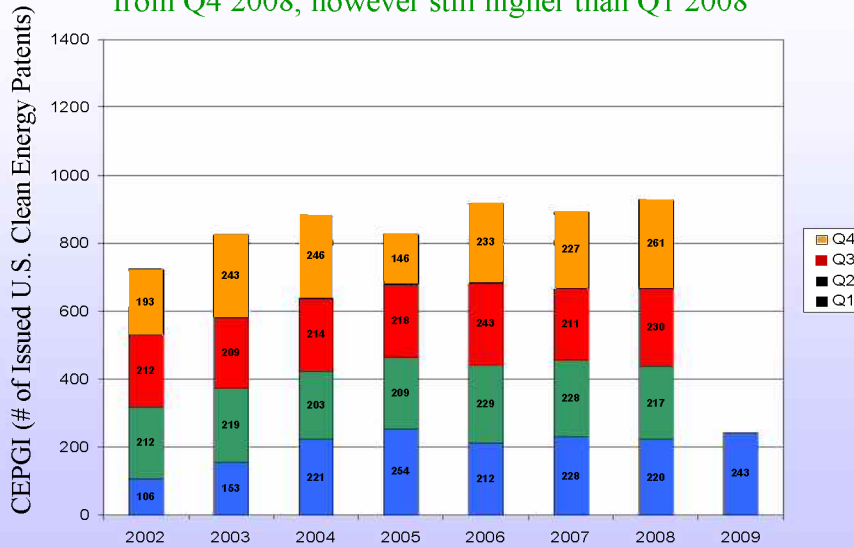
- Fuel Cells
- Wind Power
- Solar Power
- Hybrid/Electric Vehicles
- Tidal/Ocean Wave Power
- Biofuels / Biomass Power
- Hydroelectric Power
- Geothermal Power
- Other Clean Energy Technologies
  - (Alternative Energy and Renewable Power)

### Issued clean energy patents set new record in 2008



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### CEPGI for the First Quarter 2009 shows decrease from Q4 2008, however still higher than Q1 2008



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1Q09: down 41% from 4Q08, 60% from 3Q08



Data from the Cleantech Group, LLC (VC)

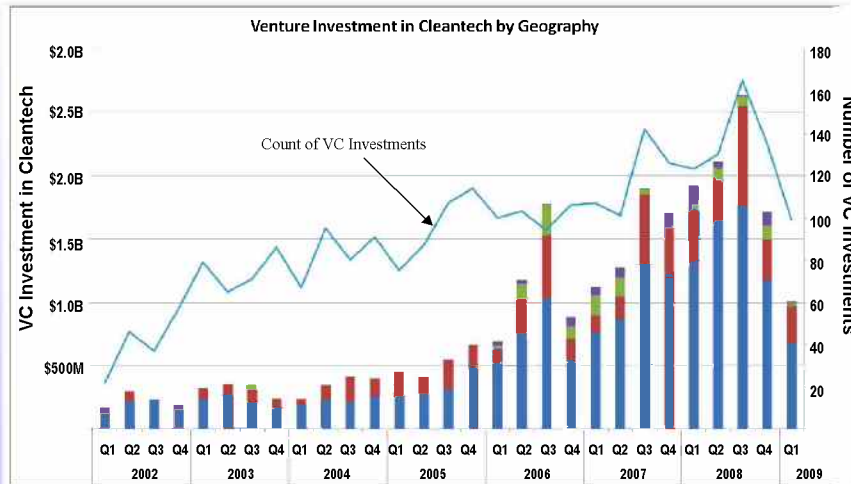
www.cleantech.com

Deloitte clean tech

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Q3 2008 through Q1 2009:

First major down cycle in cleantech VC



North America Europe China India

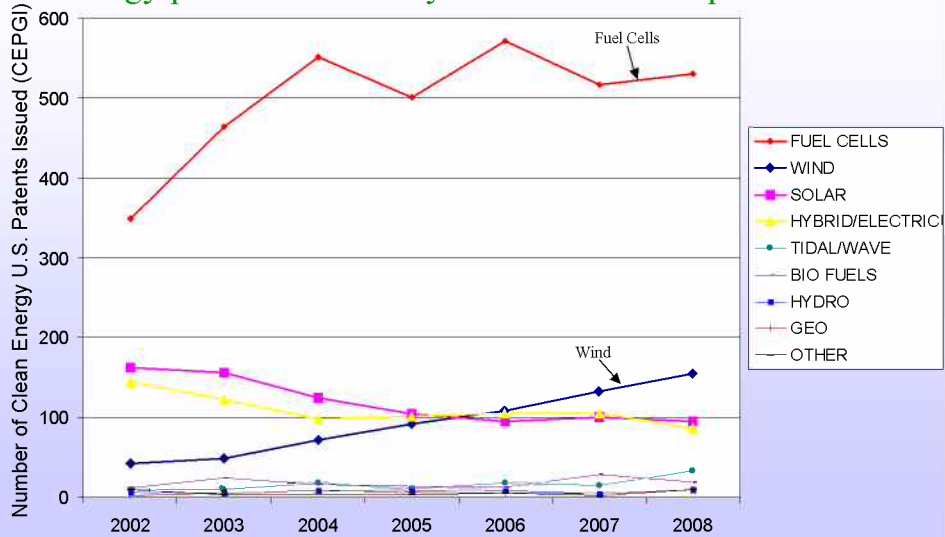
Update: Q2 2009 shows VC investment up near \$1.25B

Data from the Cleantech Group, LLC (VC)

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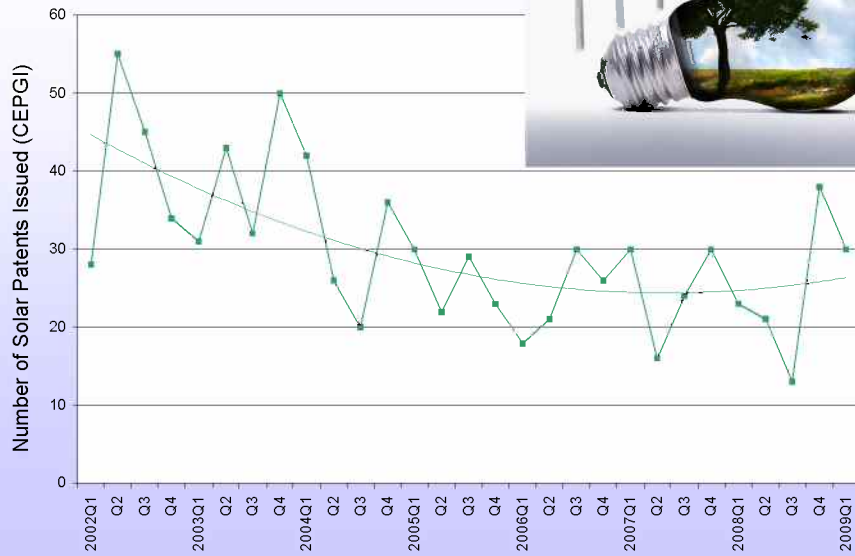
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## 2008 showed fuel cells still dominating issued clean energy patents and steady increase in wind patents



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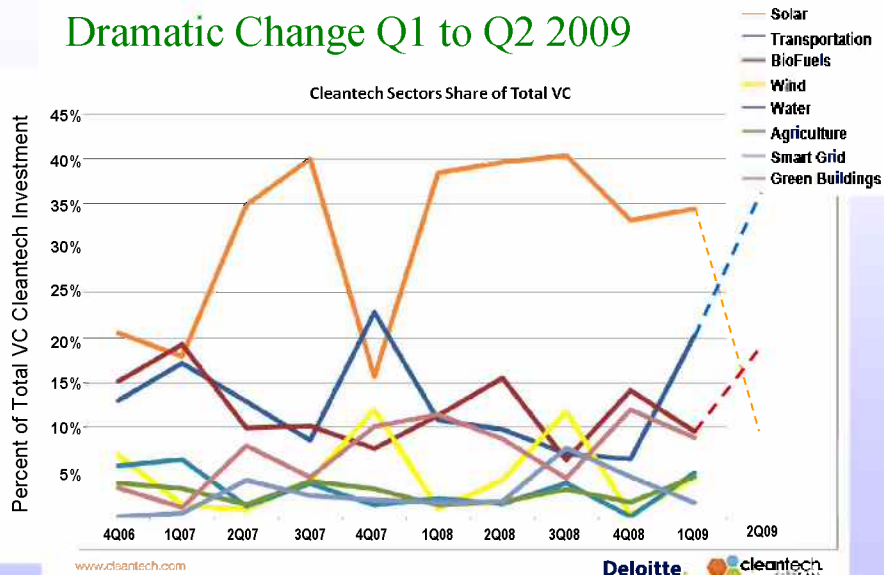
## Solar IP Trends



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## Solar VC Trends: Dramatic Change Q1 to Q2 2009



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## Wind

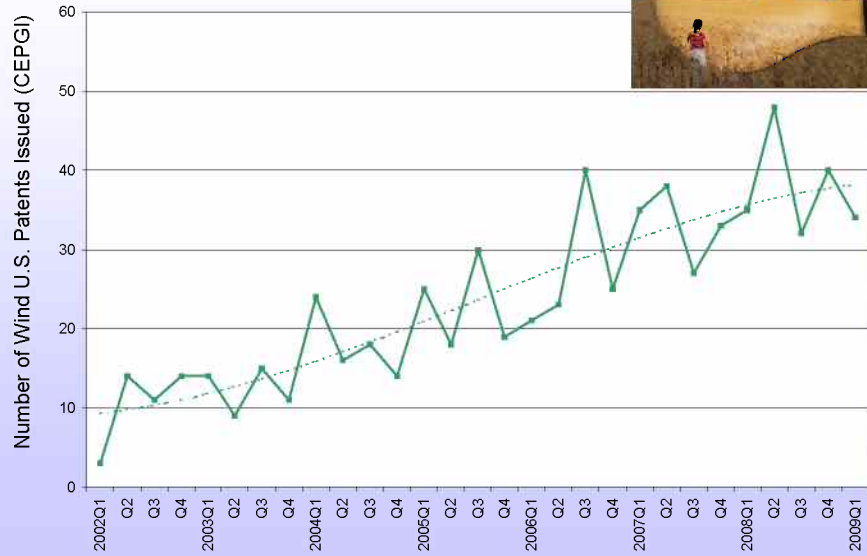
- According to the DOE, wind energy is among the fastest growing energy technologies in the U.S.
- U.S. leads the world in wind energy generation and has led the globe in new wind energy capacity installations for the past four years
- In 2008, wind energy accounted for 42% of all new energy generation capacity in the United States



U.S. Department of Energy, Office of Public Affairs, Washington, D.C. (April 29, 2009)

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## Wind IP Trends

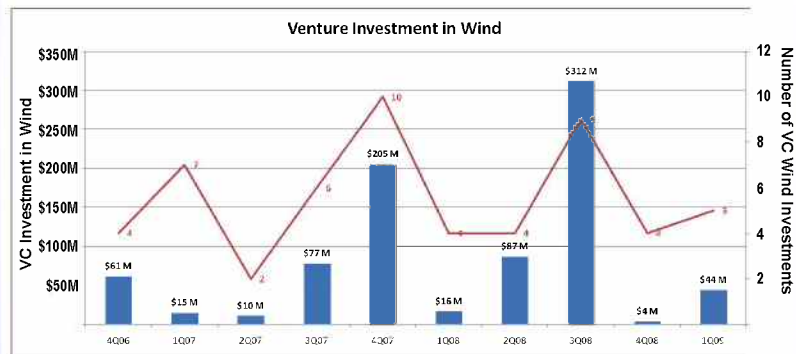


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## Wind VC Trends

Wind – still down after extraordinary 3Q08



Update: Wind VC investment was down to about \$8M for Q2 2009

[www.cleanitech.com](http://www.cleanitech.com)

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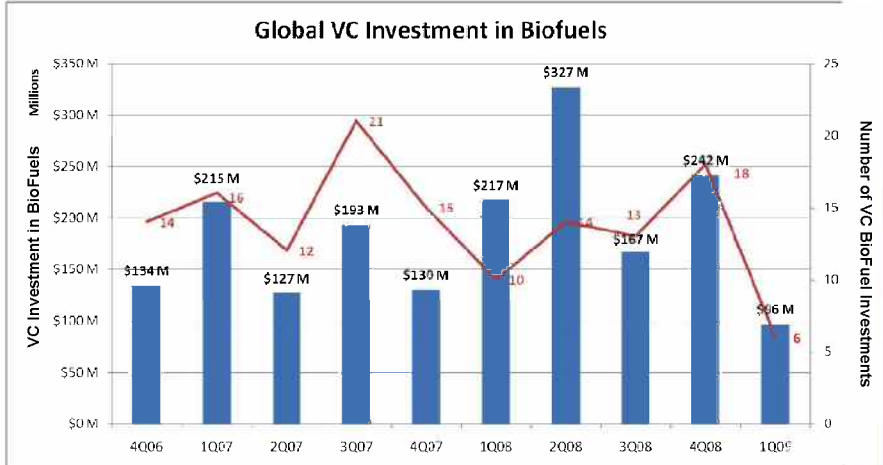


# BioFuel IP Trends



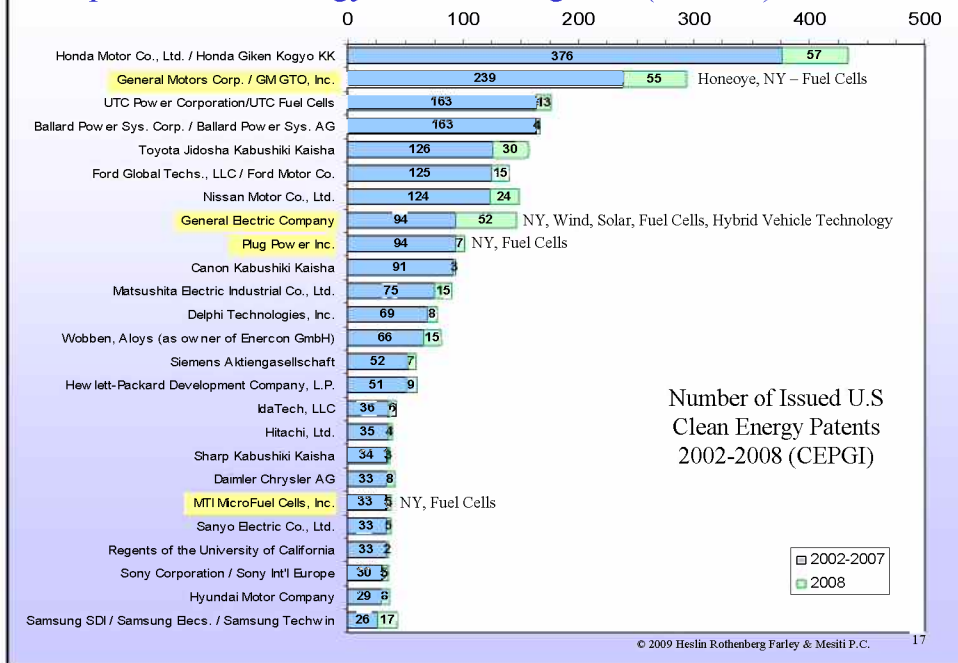
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In Q1 2009,  
**Biofuels investment at lowest level since 2005**

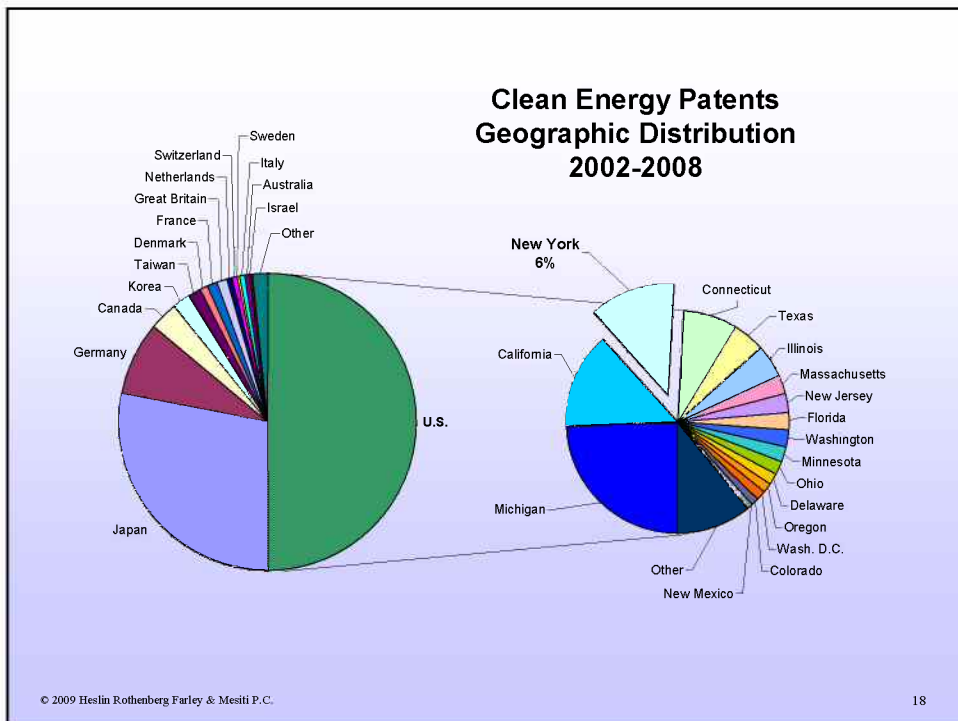


Update: Biofuel investment was up over \$200M in Q2 2009  
[www.cleantech.com](http://www.cleantech.com) Deloitte cleantech

## Top 25 Clean Energy Patent Assignees (CEPGI)



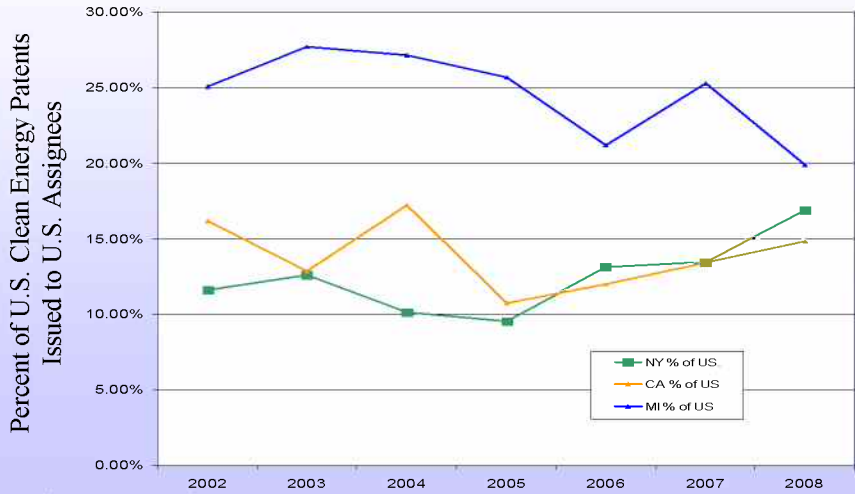
## Clean Energy Patents Geographic Distribution 2002-2008



# How is NYS Doing ?

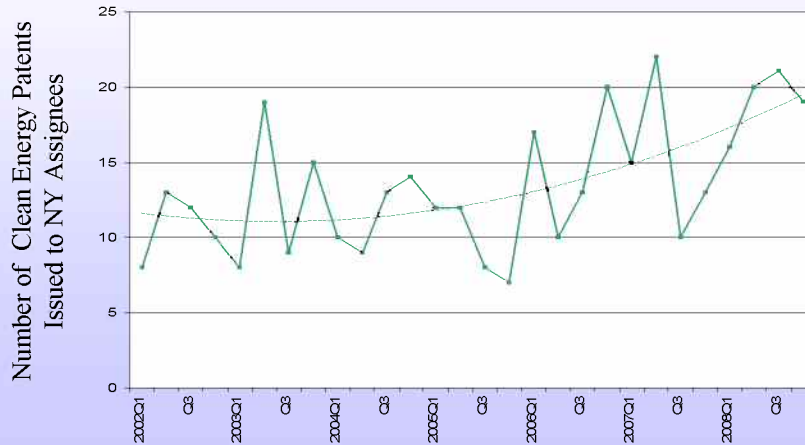


NY sees increase in percentage of issued patents in clean energy as compared to other leading states





### New York Clean Energy Patents See Slight Decline Overall in 4<sup>th</sup> Quarter 2008

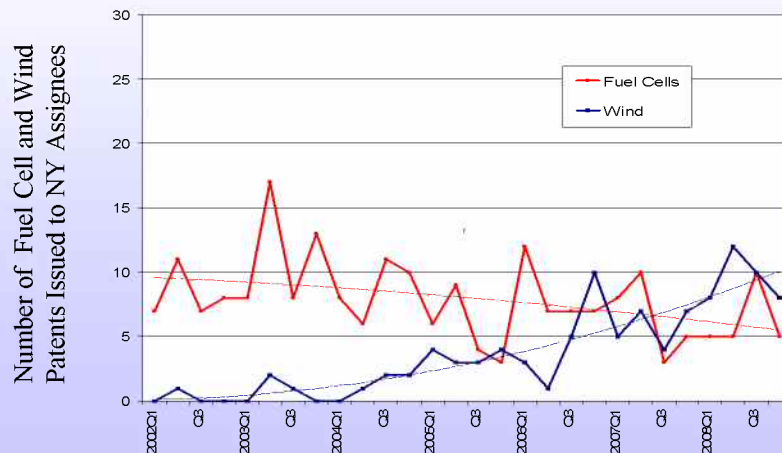


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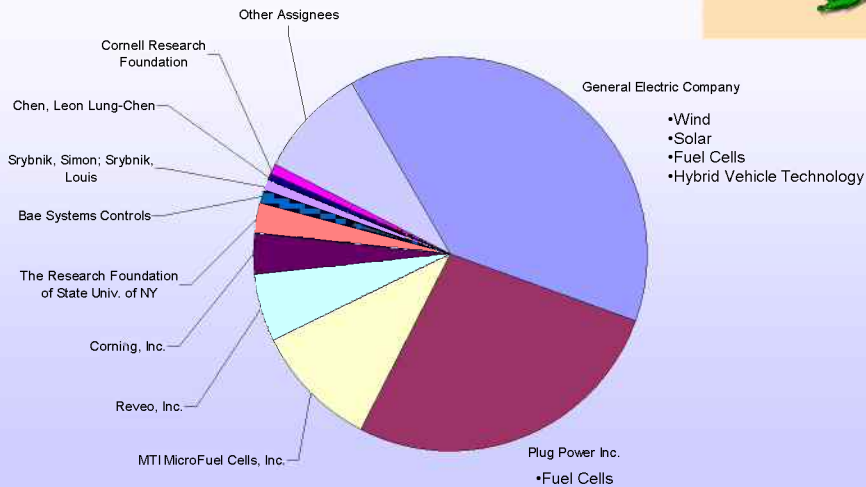
### NY Fuel Cell Patents have shown a general declining trend while NY Wind Patents have been on a rising trend



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## NYS Clean Energy Patent Assignees (2002-2008)



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•The CEPGI data shows us that NY State is a key participant in the growing Clean Energy field.

•Available data also suggests that VC investment in Cleantech was under a dramatic decline Q3 2008 through Q1 2009, but may have bottomed-out with a slight increase in Q2 2009.

•Where is the \$\$ for innovation, investment and IP coming from?

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## American Recovery and Reinvestment Act 2009

One of the Goals:  
To provide federal  
stimulus for clean energy  
innovation and  
intellectual property



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## Federal Stimulus - ARRA

- Approximately \$92 billion planned spending on clean technology, including
  - \$32.8 billion in clean energy
  - \$26.86 billion in energy efficiency
  - \$18.95 billion in green transportation
- Investment tax credits and loan programs for clean technologies
- May lead to opportunities for innovators and investors to pursue projects in clean energy and clean transportation, and continued growth in the clean energy field.

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## Additional Cleantech Spending Identified as part of the Stimulus

- **Hybrid Technology** - \$2 billion in new grants for manufacture and development of advanced battery systems and components for hybrid vehicles
- **Energy storage & delivery technology** - \$4.5 billion for the Smart Grid Investment Program modernizing the nations energy delivery.
- **Public Transportation** - \$8 billion for investment into new high-speed passenger rail projects; \$8.4 billion in additional funding for U.S. public transportation infrastructure projects
- **Biomass/Biofuels** - \$800 million to support the DOE's research, development and deployment of biomass technologies and \$50 million for wood-to-energy grants promoting increased utilization of biomass.
- **Geothermal** - \$400 million to support the DOE's research, development and deployment of geothermal technologies
- **Energy efficiency** - \$3.1 billion to the DOE's State Energy Program, which provides grants to states for energy efficiency and renewable energy programs.
- **Green Buildings** - \$4.5 billion to convert federal facilities into High-Performance Green Buildings; \$3.6 billion for DOD energy efficiency and modernization of facilities

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## Recent Cleantech Developments U.S. Government Investment – Fuel Cells



**April 15<sup>th</sup>** – Energy Secretary Chu Announces \$41.9 Million to Spur Growth of Fuel Cell Markets

- \$2.4 million to **MTI MicroFuel Cells** (Albany, NY)
- \$3.4 million to **Plug Power, Inc.** (Latham, NY) for 5-kW stationary combined heat and power fuel cell system
- \$2.7 million to **Plug Power Inc.** (Latham, NY) for GenCore® rack-mounted fuel cell product

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## Recent Cleantech Developments

### U.S. Government Investment – Wind Energy



**April 29<sup>th</sup>** - U.S. Secretary of Energy Steven Chu announced plans to provide \$93 million to support wind energy development

- \$45 million for wind turbine drivetrain R&D and testing
- \$14 million for technology development
- \$24 million for wind power research and development
- \$10 million for National Wind Technology Center

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## Recent Cleantech Developments

### NYSERDA Investment – Clean Energy Incubator Program



**July 2<sup>nd</sup>** – NYSERDA (NY State Energy Research and Development Authority) awards \$1.5 million to Syracuse-based Clean Tech Center to establish a Clean Energy Business Incubator Program.

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## What can we take away ?

- Sharply declining VC investment in cleantech may have bottomed-out in 2<sup>nd</sup> Quarter 2009
- 1<sup>st</sup> Quarter 2009 shows a slight decline in issued clean energy patents from last quarter, but increase from 1<sup>st</sup> Q 2008

**In VC investment:** Solar no longer dominates VC investment. Transportation cleantech investment is the new leader, but it will be interesting to see what effect further stimulus spending has, since fuel cell stimulus spending seems to have taken place before solar spending.

**In IP:** Fuel cells continue to dominate, with wind seeing a steady increase

- 2009 will be driven by government stimulus and policies, rather than investment capital, although investors appear to be responding to the stimulus

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## Government Funding Opportunities in CleanTech



- NYSERDA compiles a list of federal and state energy-related economic recovery programs
  - Go to [www.nysERDA.org](http://www.nysERDA.org) and click the “recovery” link to find up-to-date information and sign up for email updates as new programs become available.

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# Federal Stimulus Funding for NYS

State Energy Program: \$ ARRA - \$3.1 Billion  
 \$ NYS Share - \$123 Million

Status	Potential Uses
<ul style="list-style-type: none"> <li>• Program Guidance issued by DOE on 3/12/2009</li> <li>• NYSERDA submitted Plan to DOE on 5/12/2009</li> <li>• <a href="http://www.nysERDA.org/Economicrecovery/documents/NYS%20SEP%20ARRA%20Grant%20Application.pdf">http://www.nysERDA.org/Economicrecovery/documents/NYS%20SEP%20ARRA%20Grant%20Application.pdf</a></li> <li>• DOE approved the NYS Plan on 7/2/09</li> <li>• The first competitive solicitation for projects will be issued in July, with applications due in late August</li> </ul>	<ul style="list-style-type: none"> <li>• Energy efficiency (EE) and renewable energy capital projects</li> <li>• Building and facility energy audits</li> <li>• Energy Code support</li> <li>• Transportation EE and alternative fuels</li> </ul>

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# Federal Stimulus Funding for NYS

Energy Efficiency & Conservation Block Grants:  
 \$ ARRA - \$3.2 Billion  
 \$ NYS Share - \$175 Million to Cities/Towns  
 plus amount for competitive grants TBD

Status	Potential Uses
<ul style="list-style-type: none"> <li>• Program Guidance issued by DOE on 3/26/2009</li> <li>• Due date for large city, county, and tribal organization applications extended from 6/25/2009 to 8/10/2009</li> <li>• NYSERDA submitted its EECBG plan on 6/25/2009</li> <li>• <a href="http://www.nysERDA.org/pdfs/NYS%20EECBG%20Plan-%206-09-rev2.pdf">http://www.nysERDA.org/pdfs/NYS%20EECBG%20Plan-%206-09-rev2.pdf</a></li> <li>• NYSERDA will solicit applications for projects from small municipalities following DOE approval of Plan</li> </ul>	<ul style="list-style-type: none"> <li>• Building energy audits</li> <li>• Financial incentives for EE retrofits</li> <li>• Transportation EE programs</li> <li>• Building code services</li> <li>• Energy distribution technologies</li> <li>• Material conservation programs</li> <li>• Technologies to reduce or capture greenhouse gases from landfills</li> <li>• Replacement of traffic signals and street lighting with EE technologies</li> <li>• On-site renewable energy technology that generates electricity for government buildings</li> </ul>

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## Federal Stimulus Funding for NYS

### Advanced Battery Manufacturing Grants:

\$ ARRA - \$2.0 Billion

\$ NYS Share – money from competitive grants TBD

Status	Potential Use
<ul style="list-style-type: none"><li>FOA for Electric Drive Vehicle Battery and Component Manufacturing Initiative issued by DOE on 3/19/2009; <u>Proposals were due 5/19/2009</u></li><li>NYSERDA and ESD provided letters of support for companies that submitted applications to DOE</li></ul>	<ul style="list-style-type: none"><li>Manufacturing of advanced batteries and components</li></ul>

\*\*Although the dates on this grant are past, it is important to note that it may be helpful to work with NYSERDA for letters of support.

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## Federal Stimulus Funding for NYS

### Applied Research, Development, Demonstration, and Deployment

\$ ARRA - \$2.5 Billion

\$ NYS Share – money from competitive grants TBD

#### ➤ \$800 million for biomass projects:

- FOA for Recovery Act - Demonstration of Integrated Biorefinery Operations issued by DOE on 5/7/2009; Notice of Intent to Apply due 5/29/2009; Applications due 6/30/2009; NYSERDA provided several applicants letters of support
- Special Notice for Recovery Act, Office of the Biomass Program, FOAs for two R&D related opportunities (1. intermediate ethanol blends, and 2. algal and advanced biofuels) issued by DOE on 5/05/2009; Anticipated FOA release date Summer 2009:

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# Federal Stimulus Funding for NYS

## Applied Research, Development, Demonstration, and Deployment

### ➤ \$350 million for geothermal projects:

- **FOA for Enhanced Geothermal Systems Component Research and Development Analysis** issued by DOE; DOE has modified this FOA to replace prior funding with \$56,000,000 in ARRA funds and to expand Topic Areas; New proposal due date, extended to 7/17/2009; NYSERDA is considering letters of support
- **FOA for Enhanced Geothermal Systems Demonstration** issued by DOE; DOE modified this FOA to replace prior funding with \$90,000,000 in ARRA funds; New proposal due date, extended to 7/30/2009; NYSERDA is considering letters of support
- **FOA for Recovery Act – Geothermal Technologies Program** issued by DOE on 5/27/2009; Applications due 7/22/2009
- **FOA for Recovery Act – Geothermal Technologies Program: Ground Source Heat Pumps** issued by DOE on 6/02/2009; Application due 8/06/2009

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# Federal Stimulus Funding for NYS

## Applied Research, Development, Demonstration, and Deployment

### ➤ \$256 million for the Industrial Technologies Program:

- **FOA for Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste Energy Recovery Systems, and Efficient Industrial Equipment** issued by DOE on 6/1/2009; Proposals due 7/14/2009
- **FOA for Recovery Act - Systems Level Technology Development, Integration, and Demonstration for Efficient Class 8 Trucks (SuperTruck) and Advanced Technology Powertrains For Light-Duty Vehicles (ATP-LD)** issued by DOE on 6/09/2009; Applications due 9/09/2009

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# Federal Stimulus Funding for NYS

## Applied Research, Development, Demonstration, and Deployment

### ➤ \$117 million for the Solar Technologies Program:

- FOA for Recovery Act: High Penetration Solar Deployment issued by DOE on 5/27/2009; Applications due 7/30/2009
- FOA for Recovery Act: Solar Market Transformation issued by DOE on 5/27/2009; Applications due 7/30/2009
- FOA for Recovery Act: National Laboratory Call for Foundational Photovoltaics and Concentrating Solar Power Research and Development issued by DOE on 5/27/2009; Applications due 7/15/2009

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# Federal Stimulus Funding for NYS

## Applied Research, Development, Demonstration, and Deployment

### ➤ \$93 million for Wind Energy Projects:

- FOA for Recovery Act: Wind Energy Consortia between Institutions of Higher Learning and Industry issued by DOE on 5/29/2009; Letter of Intent due date extended to 6/29/2009; Applications due 7/22/2009
- FOA for Recovery Act: Large Wind Turbine Drivetrain Testing Facility issued by DOE on 6/23/2009; Letter of Intent required, due 7/15/2009; Application due 8/06/2009

### ➤ \$25 million for the Massachusetts Wind Technology Testing Center

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## Federal Stimulus Funding for NYS

### Applied Research, Development, Demonstration, and Deployment

- \$50 Million for Information and Communications Technology:

- FOA for Recovery Act: Energy Efficient Information and Communication Technology issued by DOE on 6/03/2009; Letter of Intent due 6/30/2009; [Applications due 7/21/2009](#)

- \$41.9 Million to spur growth of fuel cell markets.

- no grants currently listed, but much of this money appears to have been given out in April 2009 (in NY, MTI Micro Fuel Cells \$2.4 Million; Plug Power \$3.4 and \$2.7 Million)

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## Federal Stimulus Funding for NYS

### Applied Research, Development, Demonstration, and Deployment

- \$41.5 Million for Solid State Lighting

- FOA for Recovery Act - Solid State Lighting U.S. Manufacturing - Round 1 issued by DOE on 6/29/2009; [Applications due 8/24/2009](#)
- FOA for Recovery Act - Solid-State Lighting Product Development Funding Opportunity - Round VI issued by DOE on 6/29/2009; [Applications due 8/17/2009](#)
- FOA for Recovery Act - Solid-State Lighting Core Technologies - Round VI issued by DOE on 6/29/2009; [Applications due 8/10/2009](#)

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# Federal Stimulus Funding for NYS

## Applied Research, Development, Demonstration, and Deployment

### ➤ \$107.5 Million for Building Efficiency

- FOA for Recovery Act: **Advanced Energy Efficient Building Technologies** issued by DOE on 6/29/2009; Applications due 8/18/2009
- FOA for Recovery Act - **Building America Energy Efficient Housing Partnerships** issued by DOE on 6/29/2009; Applications due 8/24/2009

### ➤ \$32 Million for Hydropower

- FOA for Recovery Act: **Hydroelectric Facility Modernization** issued by DOE on 6/30/2009; Letter of Intent due 7/20/2009; Applications due 8/20/2009

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# Federal Stimulus Funding for NYS

## Electricity Delivery and Energy Reliability:

\$ ARRA - \$4.5 Billion

\$ NYS Share – competitive grant \$ TBD

### Status

- FOA for **Synchrophasor Research** issued by DOE on 3/27/2009; Applications due 5/27/2009
- FOA for **Smart Grid Investment Grant Program** issued by DOE on 6/25/2009; Letters of Intent due 7/16/2009, 10/23/2009, and 2/10/2010; Applications due 8/06/2009, 11/04/2009, and 3/03/2010
- FOA for Recovery Act – **Smart Grid Demonstrations** issued by DOE on 6/25/2009; Applications due 8/26/2009
- FOA for Recovery Act - **Enhancing State Government Energy Assurance Capabilities and Planning for Smart Grid Resiliency** issued by DOE on 6/15/2009; Applications due 7/30/2009
- FOA for Recovery Act-**Resource Assessment and Interconnection-Level Transmission Analysis and Planning** issued by DOE on 6/15/2009; Applications due 8/14/2009
- FOA for Recovery Act – **State Electricity Regulators Assistance** issued by DOE on 6/15/2009; Applications due 8/31/2009

### Potential Uses

- Smart Grid – Regional Demonstrations and Grid-Scale Energy Storage (including advanced battery systems (including flow batteries), ultra-capacitors, flywheels, and compressed air energy systems, wind and photovoltaic (PV) integration with the grid, upgrade deferral of transmission and distribution assets, congestion relief, and system regulation).
- Accelerate the modernization of the nation's electric transmission and distribution systems and promote investments in smart grid technologies, tools, and techniques that increase flexibility, functionality, interoperability, cyber-security, situational awareness, and operational efficiency.
- Eligibility varies among FOAs.

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# Federal Stimulus Funding for NYS

## Fossil Energy Research and Development:

\$ ARRA - \$3.4 Billion

\$ NYS Share – competitive grant \$ TBD

Status	Potential Uses
<ul style="list-style-type: none"> <li>Pending issuance of additional Funding Opportunity Announcements by DOE</li> <li>FOA for <b>Recovery Act: Clean Coal Power Initiative - Round 3</b> issued by DOE on 5/09/2009; <u>Letter of Intent Due 7/24/2009</u>; Applications due 8/24/2009</li> <li>FOA for <b>Recovery Act: Site Characterization of Promising Geologic Formations for CO2 Storage</b> issued by DOE on 6/02/2009; <u>Applications due 8/03/2009</u>; NYSERDA is considering letters of support</li> <li>FOA for <b>Recovery Act: Regional Sequestration Technology Training</b> issued by DOE on 6/02/2009; <u>Applications due 7/22/2009</u></li> <li>NOI to Issue FOA DE-FOA-0000032 entitled <b>Recovery Act: Geologic Sequestration Training and Research</b> issued by DOE on 5/20/2009</li> <li>FOA for <b>Recovery Act: Carbon Capture and Sequestration (CCS) from Industrial Sources and Innovative Concepts for Beneficial CO2 Use</b> issued by DOE on 6/08/2009; <u>Applications due 8/07/2009</u>; NYSERDA is considering letters of support</li> <li>FOA for <b>Recovery Act: Geologic Sequestration Training and Research</b> issued by DOE on 6/29/2009; <u>Applications due 8/11/2009</u></li> </ul>	<ul style="list-style-type: none"> <li>Fossil energy research and development projects, including carbon capture and sequestration projects and geological characterization Clean Coal Power Projects- specifically targeting advanced coal-based systems and subsystems that capture and sequester, or put to beneficial use, CO<sub>2</sub> emissions. The announcement is also open to any coal-based, advanced carbon capture technologies that result in co-benefits with respect to efficiency, environmental, or economic improvements potentially capable of achieving CCPI coal technology performance levels specified in the EPACT 2005, Title IV, Subtitle A, Section 402 (Table 1).</li> </ul>

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# Federal Stimulus Funding for NYS

## Science – Advanced Research Projects

\$ ARRA - \$1.6 Billion

\$ NYS Share – competitive grant \$ TBD

Status	Potential Uses
<ul style="list-style-type: none"> <li>DOE announced on 4/27/2009 awards for 46 new Energy Frontier Research Centers (EFRCs), to be funded, in part, with ARRA funds. Five EFRCs to be located in NYS.</li> <li>Pending issuance of additional FOAs by DOE</li> </ul>	<ul style="list-style-type: none"> <li>Research and development of energy technologies</li> <li>Research to reduce energy imports; energy-related GHG emissions; and improve energy efficiency in all sectors</li> </ul>

### 5 Energy Frontier Research Centers to be located in NYS:

- Brookhaven National Laboratory – Center for Emergent Superconductivity (Upton, NY)
- Columbia University – Re: Defining Photovoltaic Efficiency Through Molecule Scale Control (NY, NY)
- Cornell University – Nanostructured Interfaces for Energy Generation, Conversion, and Storage ( Ithaca, NY)
- General Electric Global Research – Center for Electrocatalysis, Transport Phenomena and Materials for Innovative Energy Storage (Niskayuna, NY)
- SUNY Stony Brook – Northeastern Chemical Energy Storage Center (Stony Brook, NY)

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# Federal Stimulus Funding for NYS

Dept. of Commerce – National Institute of Standards & Technology

\$ ARRA - \$610 Million

Status	Potential Uses
<ul style="list-style-type: none"> <li>• "Major Communication, May 8, 2009" issued by NIST on 5/8/2009</li> <li>• FCOA for Recovery Act NIST Construction Grant Program issued by NIST on 5/26/2009; Letter of Intent due 6/25/2009; <u>Proposals due 8/10/2009</u></li> <li>• FCOA for Recovery Act Measurement Science and Engineering Research Grants Program issued by NIST on 6/01/2009; <u>Applications due 7/13/2009</u></li> </ul>	<ul style="list-style-type: none"> <li>• Supports collaborative efforts with industry and federal agencies to develop a comprehensive framework for a nationwide, fully interoperable smart grid for the U.S. electric power system</li> <li>• Construction Grant Program for construction of research science buildings</li> <li>• Grants Program for financial assistance to support measurement science and engineering research proposals in: <u>energy, environment and climate change, information technology/ cybersecurity, biosciences/healthcare, manufacturing, and physical infrastructure</u> as part of NIST's ARRA activities.</li> </ul>

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# Federal Stimulus Funding for NYS

Innovative Technology Loan Guarantee Program

\$ ARRA - \$6.0 Billion

\$ NYS Share – competitive grant \$ TBD

Status	Potential Uses
<ul style="list-style-type: none"> <li>• Pending issuance of FOA by DOE</li> </ul>	<ul style="list-style-type: none"> <li>• Technology Development and Demonstration</li> </ul>

A principal purpose of the loan guarantee program is to encourage early commercial use in the United States of new or significantly improved technologies in energy projects. DOE's loan guarantee program is not intended for technologies in research and development. The DOE must receive either an appropriation for the Subsidy Cost or payment of that cost by the borrower. The Subsidy Cost is the expected long-term liability to the Federal government in issuing the loan guarantee. No funds have been appropriated for the Subsidy Cost of loan guarantees. Therefore, DOE anticipates that the borrower (the sponsors) of a project approved to receive loan guarantee pursuant to the first solicitation will pay this cost.

In the first round, the Department evaluated loan guarantee pre-applications for projects that employed technologies in the following areas:

1. Biomass
2. Hydrogen
3. Solar
4. Wind and Hydropower
5. Advanced Fossil Energy Coal
6. Carbon Sequestration practices and technologies
7. Electricity Delivery and Energy Reliability
8. Alternative Fuel Vehicles
9. Industry Energy Efficiency Projects
10. Pollution Control Equipment

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# THANK YOU

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