

Federal Programs for Clean Coal Technology Development

Energy & Mineral Law Foundation Winter Workshops on Energy Law

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CURC

Focus of the Discussion

- 1. CURC and the CURC technology program**
- 2. Role of technology**
- 3. U.S. government support of CCS development**
- 4. Outlook for Obama Administration and 111th Congress**

What is CURC?

- **Coal Utilization Research Council**
- **Based in Washington D.C.**
- **60+ members & membership includes...**
- **Focused upon coal related technology development and use**

Coal Utilization Research Council

2009 Membership

Air Products and Chemicals
Alliant Energy
Alstom Power, Inc.
American Coal Council
American Coalition for Clean Coal
Electricity (ACCCE)
Murray Energy Corporation
American Electric Power*
American Public Power Association
Arch Coal, Inc.
The Babcock & Wilcox Company
Battelle
ConocoPhillips
CONSOL Energy, Inc.
Duke Energy Services
Eastman Gasification Services
Company
Edison Electric Institute (EEI)
Electric Power Research Institute
(EPRI)
Energy Industries of Ohio
E. On US
First Energy
Foster Wheeler
Foundation Coal

FutureGen Industrial Alliance
General Electric Company
Illinois Department of Commerce &
Community Affairs
Jamestown BPU
Kentucky Office of Energy Policy
Lehigh University
National Mining Association
National Rural Electric Cooperative
Association
New York Power Authority
NRG Energy
Ohio University
Peabody Energy
PNM Resources
Praxair, Inc.
Purdue University
Rio Tinto Energy America Services
RW Beck
Salt River Project
Schlumberger Carbon Services
Shell US Gas & Power
Siemens Power Generation
Southern Company
Southern Illinois University

State of Colorado
State of Ohio, Air Quality Development
Authority
Tenaska, Inc.
Tennessee Valley Authority (TVA)
Tri-State Generation & Transmission
Association
United Mine Workers of America
University of Kentucky
University of Tennessee Space Institute
University of Utah
University of Wyoming
West Virginia Coal Association
West Virginia University
Western Research Institute
We Energies Corporation

Companies in red are Steering
Committee members

* Designates co-chairs of CURC

Operating Presumptions

- **Coal will remain a key energy resource for the generation of electricity**
- **Mitigating climate change will succeed only if CCS is successful**
- **To succeed - CCS will require “public support” through every phase of technology development from basic R&D, demonstration and pioneer plants, early deployment (i.e. “early adopters”), and long(er)-term commercial utilization**

CURC Program to Develop & Use Technology to Address CO₂ Capture & Storage

- What needs to be done?**
- How long will it take?**
- How much will it cost?**
- How will it be paid for?**

What needs to be done?

- Develop, demonstrate & deploy CCS technology
 - What is CCS technology?
 - CO₂ capture } ~ 80% of total CCS costs
 - CO₂ transportation
 - CO₂ injection & long-term storage
 - CO₂ monitoring & verification } ~ 20% of total CCS costs
- Increase the efficiency of coal-based power plants
 - The greater the efficiency in converting coal to useful energy the less CO₂ emitted
 - Each 1% increase in efficiency = ~2.5% decrease in CO₂
 - Increasing efficiency reduces costs for CCS because less coal used
 - Increased efficiency = more energy/unit of coal

What Needs to be Done?

- 1. Research & Development (RD&D) program**
 - New, more efficient, less costly technology in the R&D pipeline
- 2. Undertake Demonstration and “First Mover” projects (“Pioneer Projects”)** of currently available technology to capture and sequester CO₂ now
 - Integration of electricity generation & CCS has not been done in power plants at utility scale
- 3. Early Adoption** of technologies to support use of CCS
 - CO₂ capture credit, like wind PTC, to overcome financial risk
- 4. Widespread Commercialization** of CCS No financial assistance needed; technology commercially mature

Typical Development Cycle of Large Scale, Capital Intensive Coal Systems

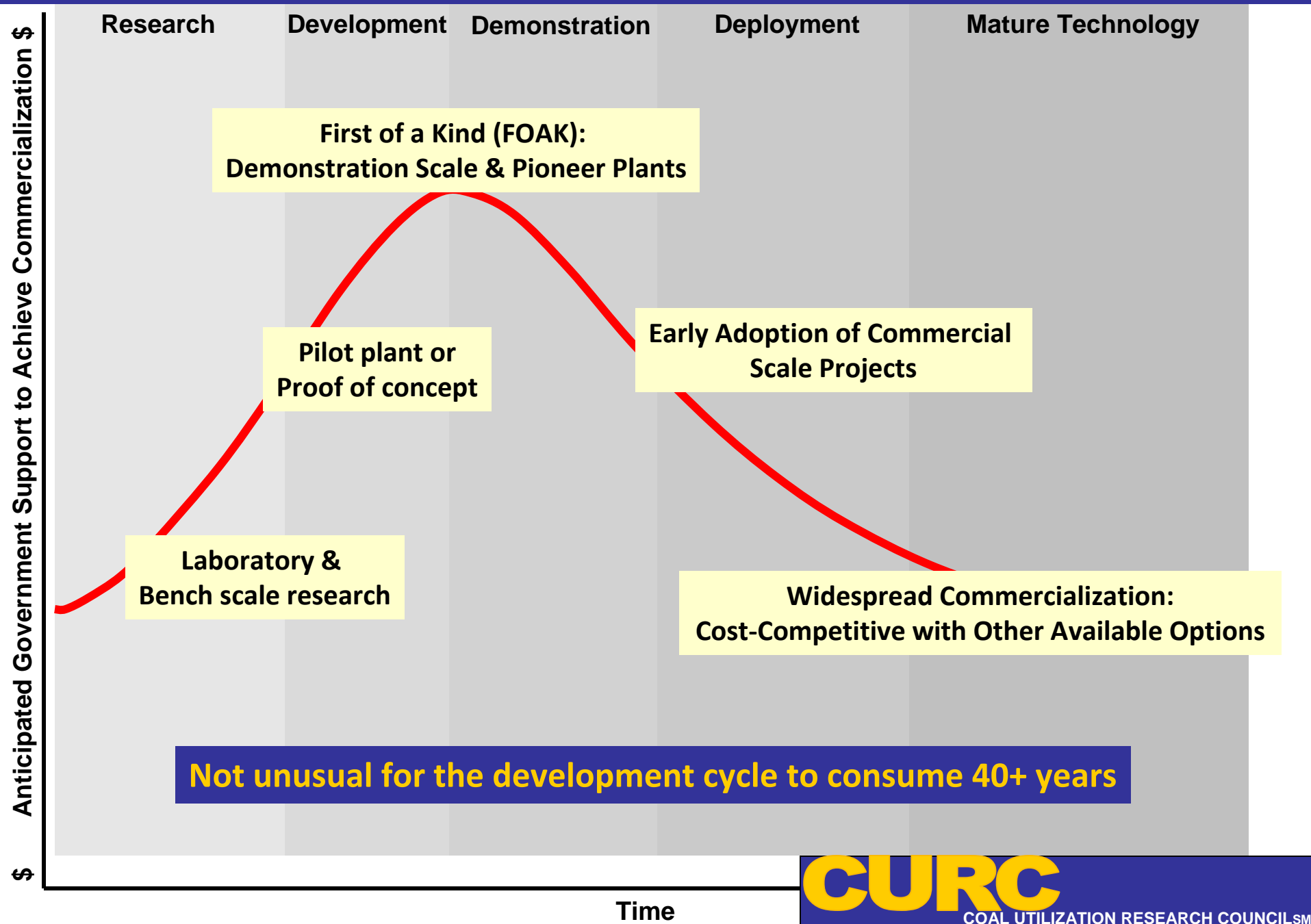
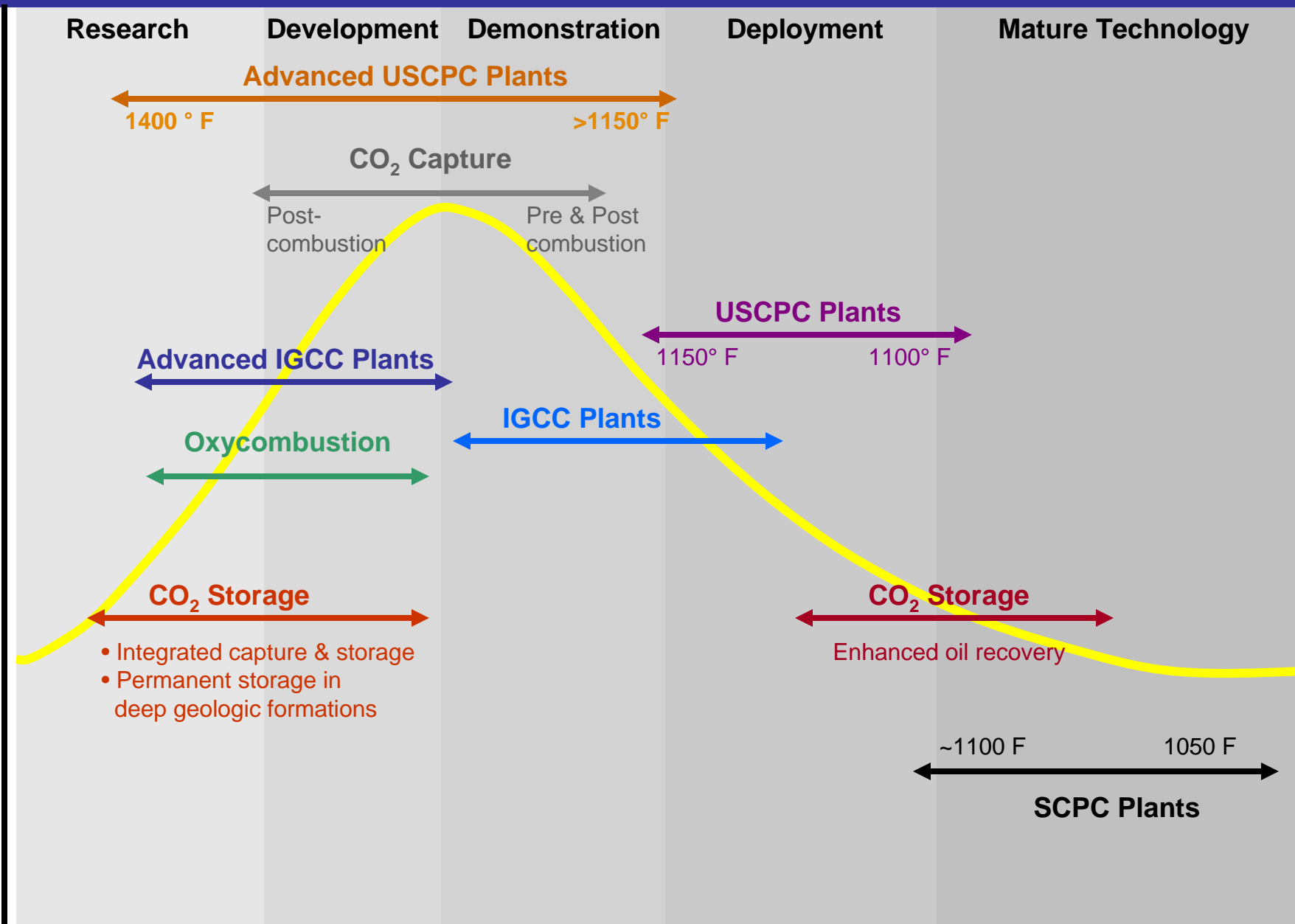


Chart Depicts Approximate Level of Maturity of Various Technologies in 2008



CURC Proposed Program Responds to Entire Technology Development Cycle

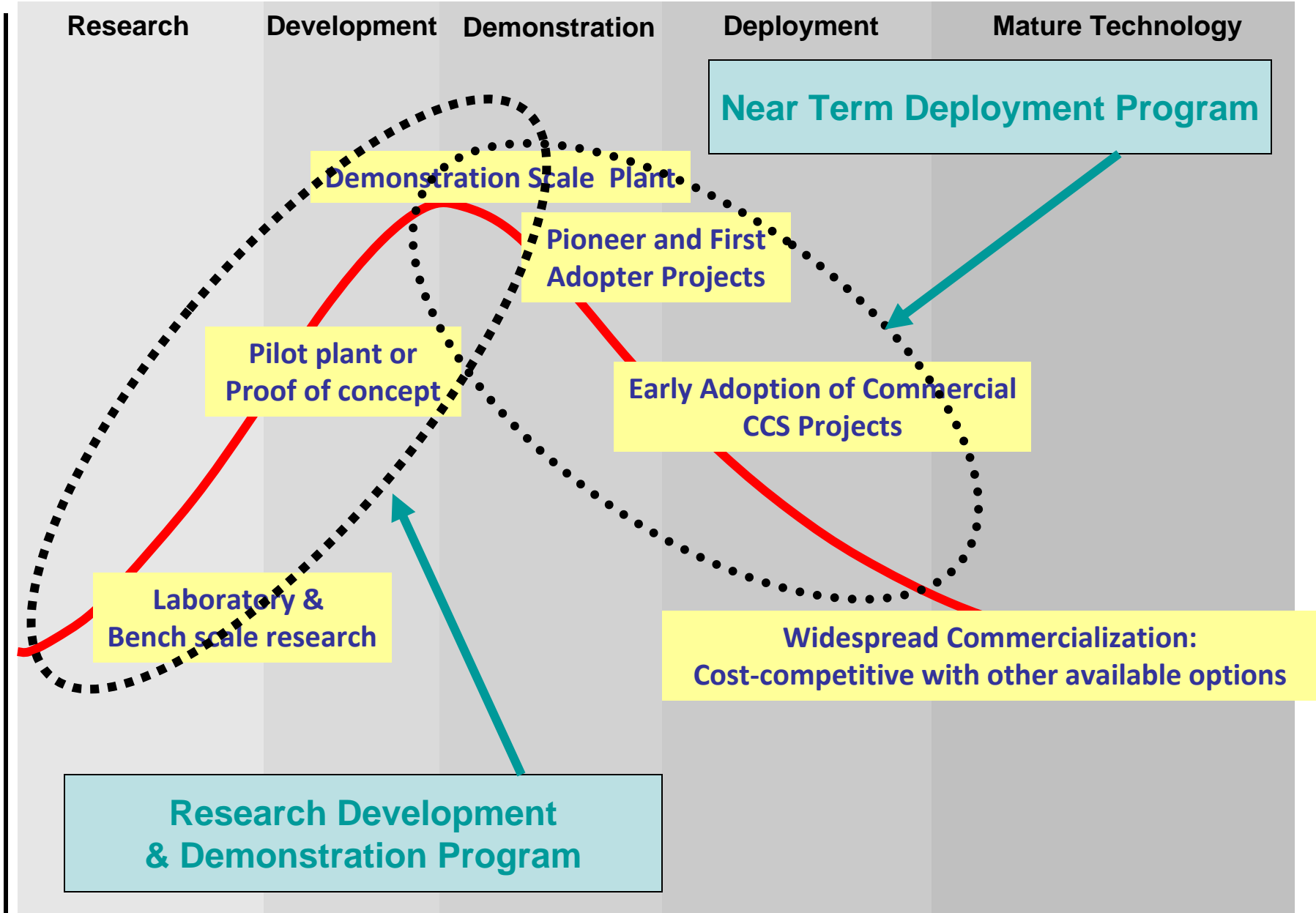


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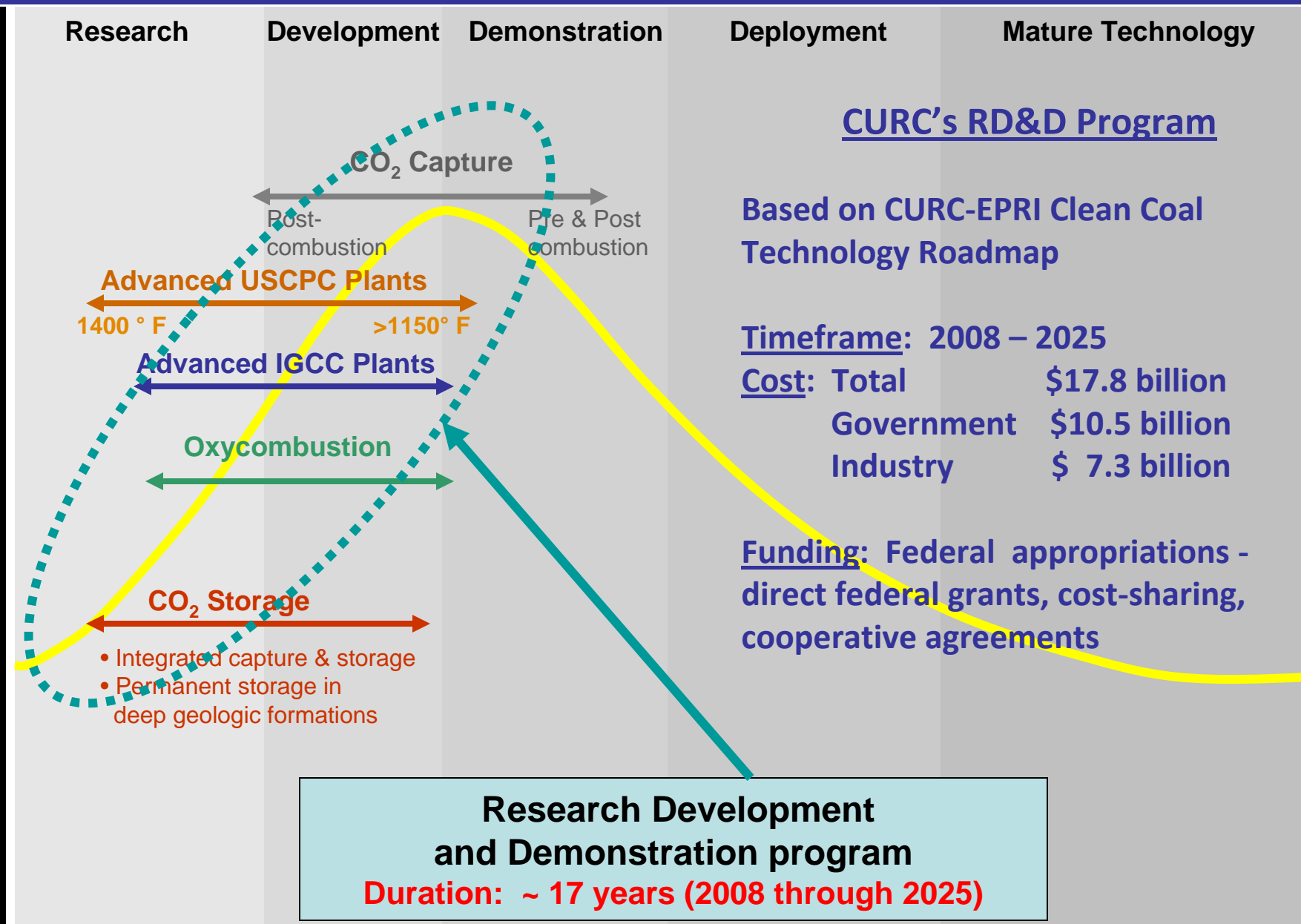
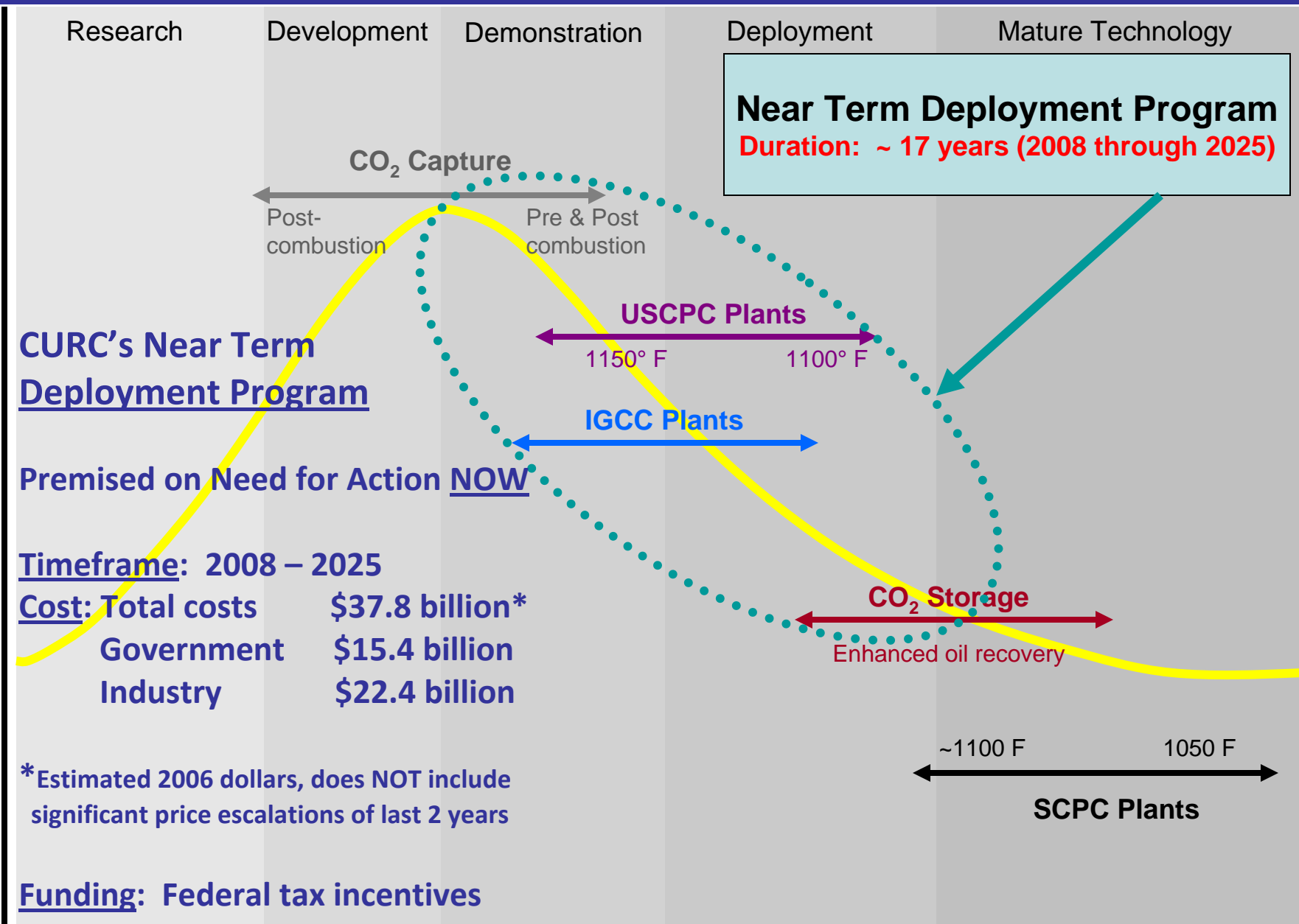


Chart Depicts Approximate Level of Maturity of Various Technologies in 2008



Current Federal Programs Designed to Support CCS and Advanced Coal Systems

- R&D: Annual federal R&D budget of ~ \$400 million
 - includes ~ \$100 - \$150 million annually for carbon sequestration
- Clean coal power initiative (CCPI):
 - Cost-shared demonstrations focused upon advanced coal power generation and CCS
 - \$460 million solicitation underway
- FutureGen & Restructured FutureGen
- Federal loan guarantee program
 - \$8 billion solicitation underway
- Federal tax incentives for CCS
 - \$2.5 billion currently available

Range of Legislative Approaches to Support CCS and Coal

- **Climate Change Policy**
 - CCS bonus allowances
 - CCS funding from allowance auction revenues
 - Other – regulatory framework, early action credits
- **Near-Term CCS Incentive Legislation**
 - Tax incentives
 - Investment tax credits for CCS
 - Sequestration tax credits
 - CCS demonstration project funding generated through utility fees
 - Debt securitization to reduce advanced energy technology financing costs
- **Federal Appropriations Measures**
 - Clean Coal Power Initiative
 - DOE Restructured FutureGen program
 - R&D programs

Evolution of Support for Coal and CCS

- Driver: Climate Change
- Growing recognition that “technology is the solution”
 - Bipartisan agreement on need for CCS in Congress and in Obama Administration
 - Controversy over level and type of support
 - Continuing coal build moratorium
 - Growing environmental, NGO and international recognition that climate mitigation not possible without CCS
- Federal and industry efforts not adequate to ensure early development of CCS technology application

Near Term CCS Legislation in Play in 110th Congress

- **S. 3038 (Conrad/Hatch) and H.R. 6756 (Pomeroy/Lewis)**
 - 10-30% ITC for new plants with CCS and for CCS retrofits
 - Establishes Carbon Sequestration Credits beginning at \$30/ton of CO₂
 - Total program ~ \$15 billion in federal tax credits
- **H.R. 6258 (Boucher)**
 - Imposes fee on retail sales of fossil-generated electricity if approved by utility sector
 - Fees set to collect \$1 billion/year for 10 years
 - Funds provided for large-scale CCS demonstrations; no technical project criteria specified
 - No Senate companion although advocates building support
- **S. 3233 (Bingaman) – Fannie Mae for Energy Technology Finance**
 - Held hearing in Senate in July, no further action
- **H.R. 1424 - Economic Stimulus Bill – PASSED INTO LAW October 2008**
 - Includes extension of Section 48A ITC (additional \$1.25 B) for new plants with new eligibility requirement of 65% CO₂ capture
 - Establishes new, 10 year “Carbon Dioxide Sequestration Credit” capped at 75 million tons with requirement to store a minimum of 500,000 tons of CO₂ annually
 - \$20/ton for saline storage; or
 - \$10/ton for EOR

CCS Proposals in the 111th Congress

- **House Stimulus**

- \$2.4 B for near zero emission power plant demonstrations
- 40% R&D tax credit for CCS

- **Senate Stimulus**

- \$4.6 B for near zero emission power plant demonstrations
 - Includes additional \$1.0 Billion for CCPI
- 40% R&D tax credit for CCS
- 30% Advanced Energy Investment Credit
- \$50 billion in loan guarantee authority

- **Senate Energy Committee drafting an Energy Bill**

- Includes Title on CCS Regulatory Framework and Interim Liability Program

Outlook for Federal Climate Legislation in the 111th

- **Senate**

- Senate considered a cap and trade proposal that failed a Floor vote in the Senate in the summer of 2008
- “Group of 10” Democrats considering principles, including CCS technology development, as elements of a bill for next Congress
 - “want to include proposals to provide funding for carbon capture and storage ... in advance of resources being available through the auction of emission allowances.”
- Chairman of the U.S. Senate Energy & Natural Resources Committee “10 principles for climate legislation”
 - “[W]e need an upfront commitment to technology even before cap and trade legislation could take effect ... so we can figure out right away if our caps are based on technically viable options and whether coal can continue to play [a] major role”
- Chairman of the U.S. Senate Environment & Public Works Committee drafting bill

- **House**

- Long-time Chairman of the House Energy and Commerce Committee voted out of chairmanship – ramifications for climate legislation
- House considering Dingell-Boucher discussion draft and holding oversight hearings

Senator Dorgan (D-ND) CCS Initiative

- Bringing key parties to the table to better define and narrow diverging views on CCS:
 - Industry, Technology Interests, Labor, Academia, Environmental and NGOs, States, Think Tanks
 - Director of NETL facilitating process
- Goal to answer key technology questions, such as:
 - Needed Funding Levels and Timelines – CURC co-chairing
 - Effective Financial Mechanisms – CURC co-chairing
 - Overcoming the CCS Penalty
 - Domestic and International Deployment

Outlook for Obama Administration

- Already moving forward on GHG policy:
 - Ordered EPA to re-consider a waiver request from California—denied by the Bush administration—for federal exemption authority for a program to regulate GHGs from new cars sold in the state
 - Directed DOT to establish more stringent fuel economy standards beginning with the 2011 model year as required by EISA 2007
 - Secretary of State Clinton named a new “Climate Change Envoy” to the State Department
- Proposed Coal and CCS Policy:
 - Energy Plan:
 - Supports five large-scale commercial CCS demonstration projects to be cost-shared by DOE
 - Supports incentives to accelerate private sector investment in CCS facilities
 - Developing “low emission coal plants” as part of \$150 billion (\$15 B/yr for 10 yrs) “Clean Energy Economy and Create 5 Million Green Jobs” plan
- Next Steps?
 - Advisor has stated if Congress doesn’t enact legislation within 18 months, Obama Administration will push EPA to regulate GHG emissions through CAA

For Additional Information

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Additional Slides

**Details of the CCS Provisions in
the House and Senate Climate
Bills of the 110th Congress**

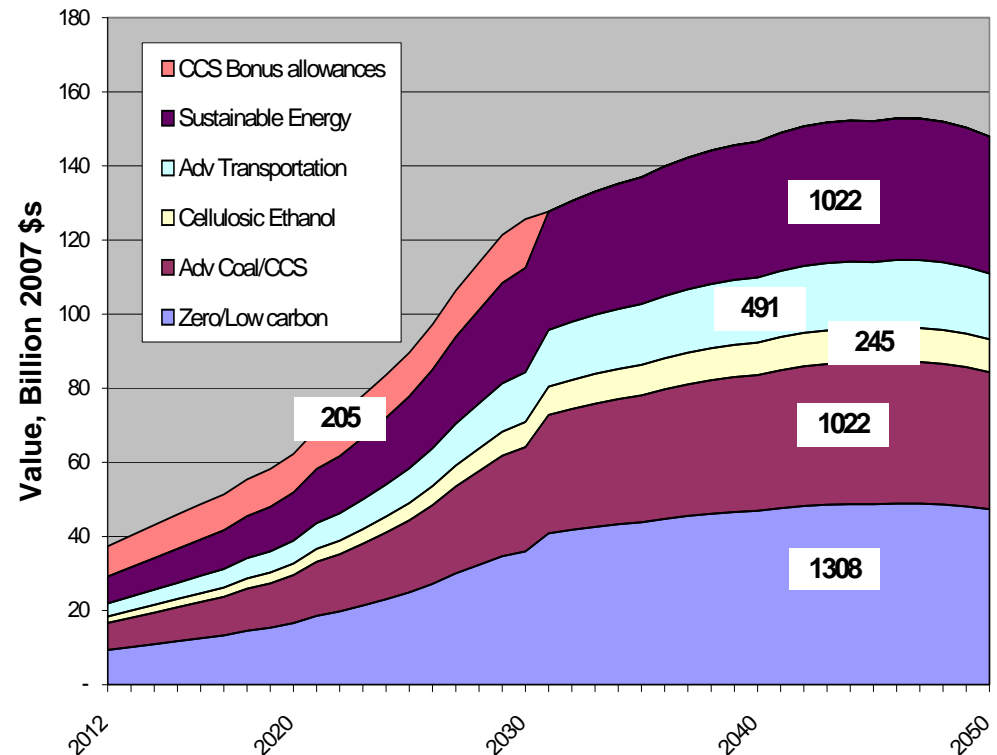
Senate Climate Bills

- **S. 2191 – Lieberman-Warner (as reported by EPW)**
 - Allowance auction proceeds for CCS –
 - ~ \$740 billion for demonstration and deployment programs, mostly available in later years
 - CCS bonus allowances
 - 4% of allowances through 2030
 - Bonus allowance rate begins at 4.5 and declines over time
 - Eligibility for both funding and bonus allowances subject to strict emission rate preconditions

S. 2191 - Sufficient Resources to Fund Advanced Technology

- Bonus allowances and Advanced Coal incentives under §4403 total as much as \$1.2 trillion, using EPA allowance values.
- Timing for bonus allowances & auction funds & maturity of CCS technologies are critical issues

S.2191 Technology Subsidies
(Total = \$4.3 Trillion)



Senate Climate Bills (Cont'd)

- **S.A. 4825 to S. 3036 – Boxer Substitute**
 - “Kick-Start” program –
 - ~ \$17 billion for CCS demonstrations in early years of program
 - CCS bonus allowances
 - Slightly fewer allowances than S. 2191 (3.5 billion vs. 3.66 in S. 2191)
 - 80% of allowances for electric power sources – must meet varying CO2 capture eligibility requirements
 - 20% of allowances for non-electric generation projects must meet 85% CO2 capture eligibility requirement
 - Bonus allowance rate starts at 2.0 and declines over time
 - Non-electric generation project rate reduced - not to exceed incremental capital and operating costs of sequestration
 - Bonus allowance rate for EOR reduced to reflect lower costs
 - Early Action program specifically includes eligible CCS projects

House Climate Bills

- **Dingell-Boucher Discussion Draft**
 - CCS bonus allowances: 2 – 5% of annual allowances
 - 75% allocated to electric power plants
 - Varying levels of CO₂ capture to qualify
 - 10 year bonus allowance
 - Starts at \$90/ton of CO₂ for saline storage
 - EOR storage receives a reduced bonus allowance value
 - Remaining 25% allocated to industrial facilities
 - 85% CO₂ capture to qualify
 - 5 year bonus allowance
 - Bonus allowance not to exceed incremental capital and operating costs and will reflect reduced cost for CO₂
 - Establishes CO₂ capture performance standard for new coal plants
 - Directs EPA to develop certification program for geologic storage sites and establish a task force to examine the existing regulatory framework for CCS
 - Definition of “emissions” excludes carbon that is captured and sequestered

House Climate Bills (Cont'd)

- H.R. 6186 – Markey
 - Virtually all allowances auctioned; no CCS bonus allowances
 - 2.5% of auction revenue (~ \$50 billion) allocated for CCS demonstration and deployment program in first decade of program
 - Requires 85% CO₂ capture rate to qualify
 - Calls for a CCS regulatory framework
- H.R. 6316 – Doggett
 - Program administered by Treasury Department (bill referred to Ways & Means)
 - 85% of allowances auctioned
 - No funding specifically allocated for CCS; no CCS bonus allowances