

Clean Carbon Policy Summit & Project Expo

Federal Clean Coal & CO₂ Reduction Initiatives

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Ben Yamagata
Executive Director
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, early deployment (i.e. “first adopters”), and long(er)-term commercial utilization

Focus of the Presentation --

Two Parts:

- 1. Federal programs & proposals to promote CCS power plants**
- 2. Description of CURC program of technology development**

Range of CCS Programs and Proposals

- **Enacted Federal Measures addressing CCS**

- Clean Coal Power Initiative
- DOE Restructured FutureGen program
- Federal Loan Guarantee program
- R&D programs

- **Climate Bills**

- 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

Current DOE CCS-related Activities

- **CCPI Program**
 - 3rd solicitation -- focus on CCS
 - ~ \$340 million available
 - Applications due January 15, 2009, awards expected July, 2009
- **DOE Restructured FutureGen Program**
 - DOE expected ~ \$290 million available for open solicitation; based on CR, ~\$165 million available for initial awards
 - Qualifying criteria – 81% CO₂ capture and 1 MMT of CO₂ sequestered in saline formations
 - Applications due October 8, 2008 but future of program unclear
- **Federal Loan Guarantee Program**
 - \$8.0 billion of federally guaranteed loans
 - Solicitation issued & applications due December 22, 2008
- **DOE Regional Partnerships**

Financial Rescue Package

- **Extension of federal investment tax credits for advanced clean coal projects (electricity) and industrial gasification projects**
 - \$1.25 billion for IGCC and advanced PC systems
 - Must include 65% CO₂ capture and sequestration
 - \$250 million for industrial gasification, must include 75% CO₂ capture and sequestration
- **Authorizes new carbon sequestration credit**
 - \$10/metric ton for CO₂ used in EOR applications
 - \$20/metric ton for CO₂ stored in geologic formations
 - Limited to first 75 million metric tons
 - Estimated \$1.1 billion

Energy & Water Appropriations: FY 2009 Coal Program Budget

Technology Program (All figures in \$Millions)	FY 2008 Omnibus	President's Request	CURC-EPRI Roadmap	House Committee	Senate Committee
IGCC/Gasification	53.5	69.0	80.0	60.0	63.0
Advanced Combustion		0.0	45.0		
Advanced Turbines	23.8	28.0	45.0	24.0	30.0
Existing Plants	36.0	40.0	32.0	40.0	50.0
Carbon Sequestration R&D Program ¹	119.0	149.1	50.0	220.0	149.1
Carbon Sequestration Injection Tests			110.0		
Advanced Research	37.2	26.6	-	26.6	30.0
Coal Fuels & Liquids	24.7	10.0	-	10.0	30.0
Fuel Cells	55.5	60.0	78.0	60.0	60.0
TOTAL R&D	349.8	382.7	440.0	440.6	412.1
CCPI (Demonstrations) ²	69.4	85.0	325.0	241.0	232.3
FutureGen	74.3	156.0	215.0		-
PROGRAM TOTAL	493.5	623.7	980.0	681.6	644.4

¹ The House Appropriations Committee recommends combining funding for the Clean Coal Power Initiative (CCPI) and FutureGen programs to establish a new Carbon Capture Demonstration Initiative (CCDI) which would be a new CCS demonstration program for FY 2009. The Senate does not support the DOE restructured FutureGen program and has put funding for the original program on hold until a new Administration comes into office, and instead recommends increased funding for a 3rd CCPI solicitation in FY 2009.

Status of Climate Legislation in Congress

- 1. Senate failed to shut off Senate filibuster**
- 2. 10 Democrats would have “opposed”**
- 3. Senator Bingaman’s principles including CCS**
- 4. House Energy & Commerce Committee leaders may float an climate change “discussion draft”**
- 5. CONCLUSION: The economic crisis will postpone climate legislation**

Related legislation addressing clean coal and climate

1. **Boucher fossil fuel fee**
2. **Bingaman debt securitization**
3. **Conrad/Hatch tax credits for CCS**
4. **CONCLUSION: Tax extenders bill added to the financial rescue bill**

Highlights: Federal Activities supporting Clean Coal and CCS

- CCPI III solicitation is on the street (~\$340 million)
- Coal project loan guarantee solicitation on the street (\$8.0 billion)
- Realization in Congress that addressing climate change “successfully” cannot be accomplished unless CCS succeeds
- Financial industry recovery bill (\$700 B) includes more than \$2B in tax incentives for Clean Coal with CCS (includes investment tax credits and carbon capture credits)
- FutureGen is “alive” and R&D appropriation levels are “robust” but Restructured FutureGen is problematic

Focus of the Presentation --

Two Parts:

1. Pending legislation affecting clean coal technology development and CCS
2. **Status of proposed CURC program of technology development**

IF CCS is the path forward to insure the continued use of coal then --

- 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 } ~ 20% of total CCS costs
 - CO₂ monitoring & verification
- 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 and demonstration (RD&D) program**
 - New, more efficient, less costly technology in the R&D pipeline
2. **Deployment** of currently available technology to capture & sequester CO₂ now
 - Integration of electricity generation & CCS has not been done in power plants at utility scale
3. **Widespread commercialization** to support use of CCS (CO₂ capture credit, like wind PTC)

Typical development cycle of large scale, capital intensive coal systems

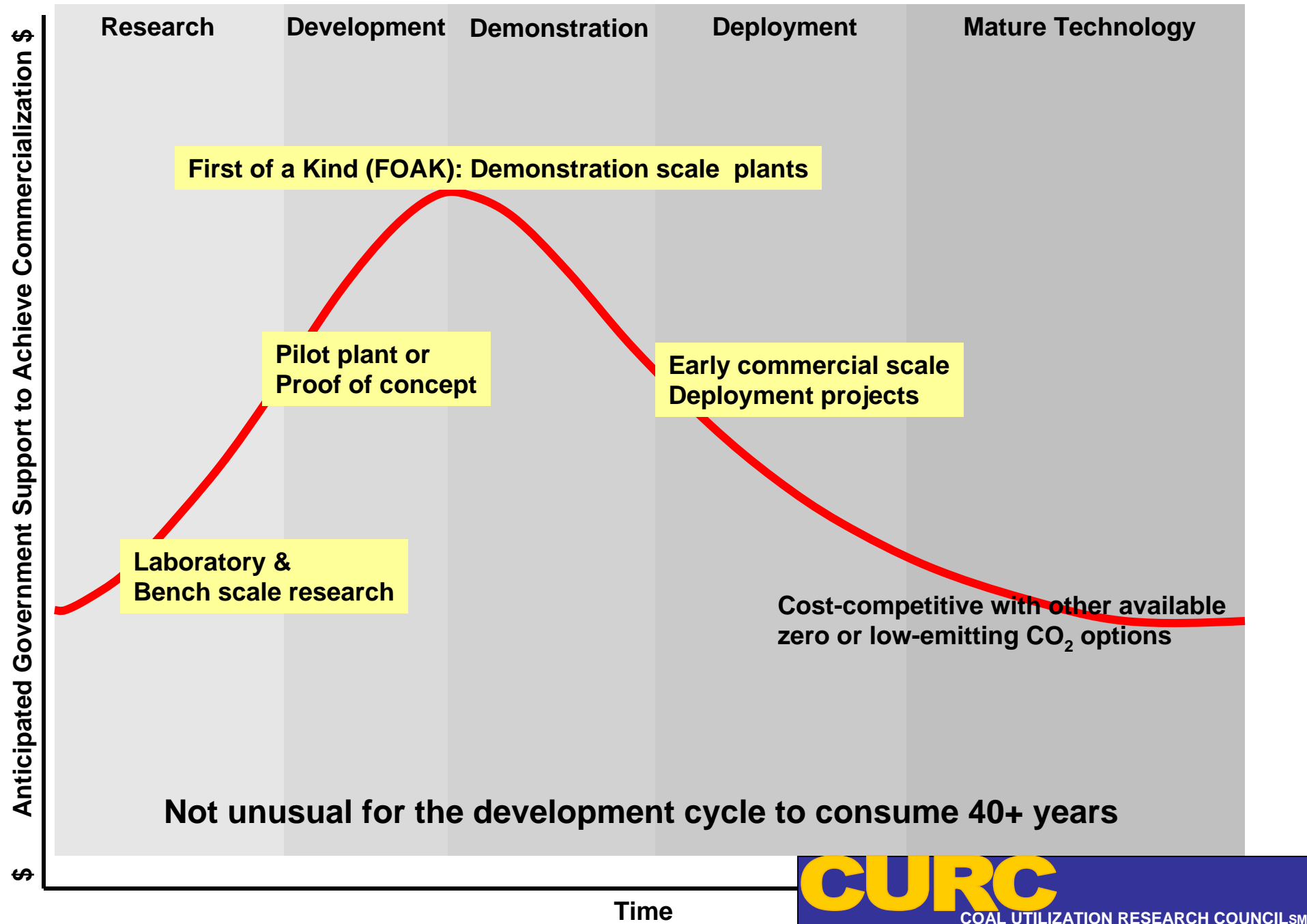
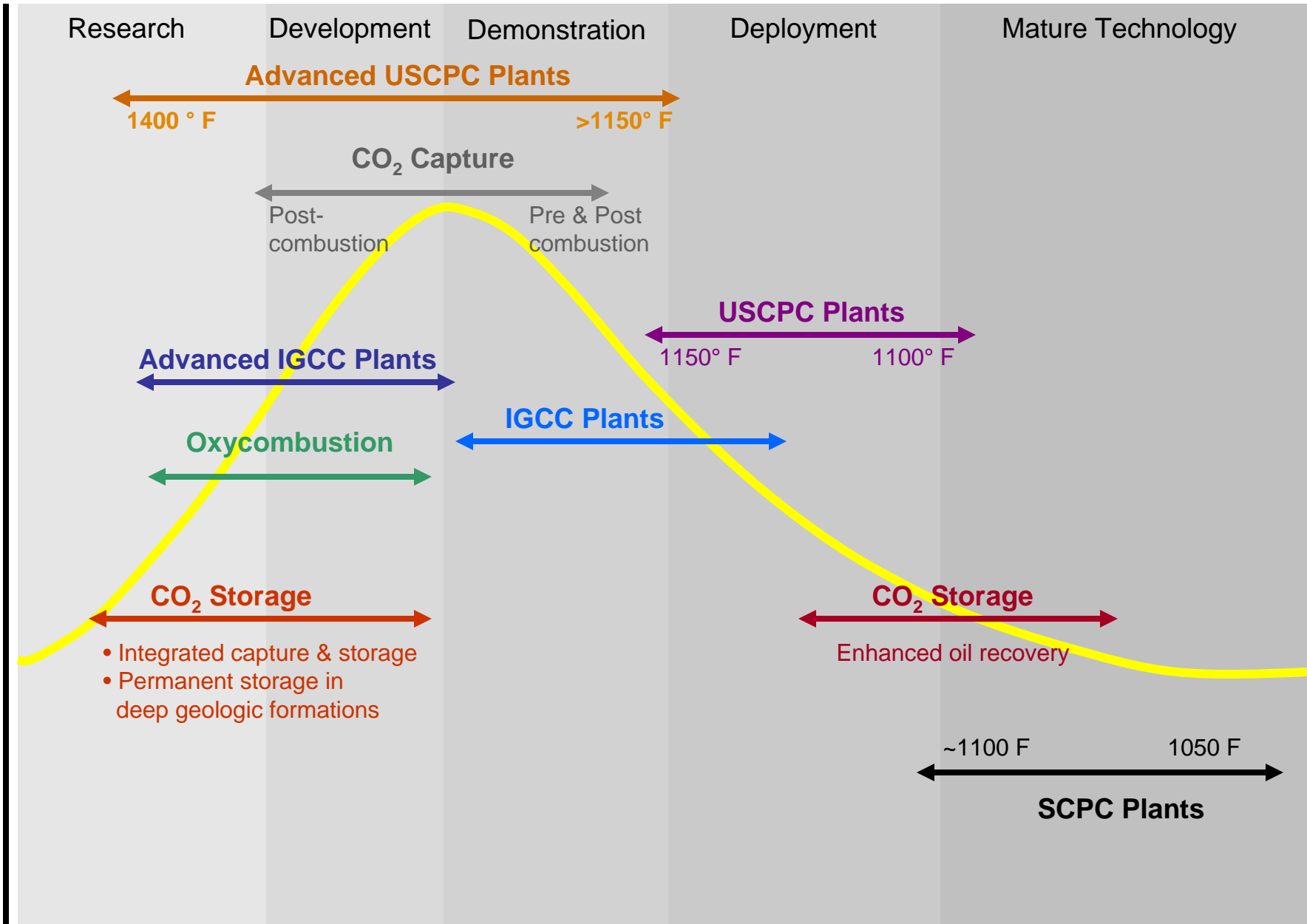
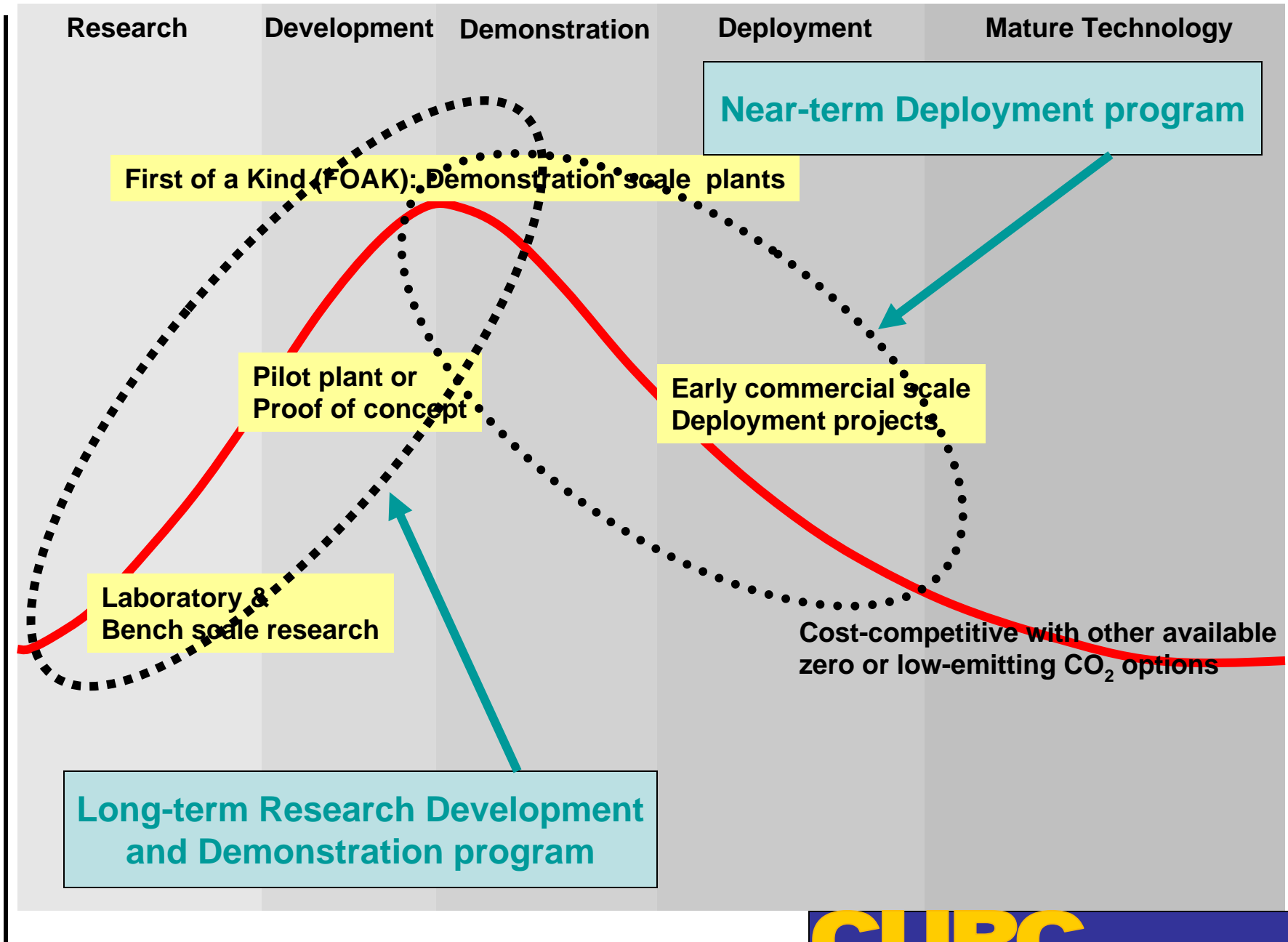


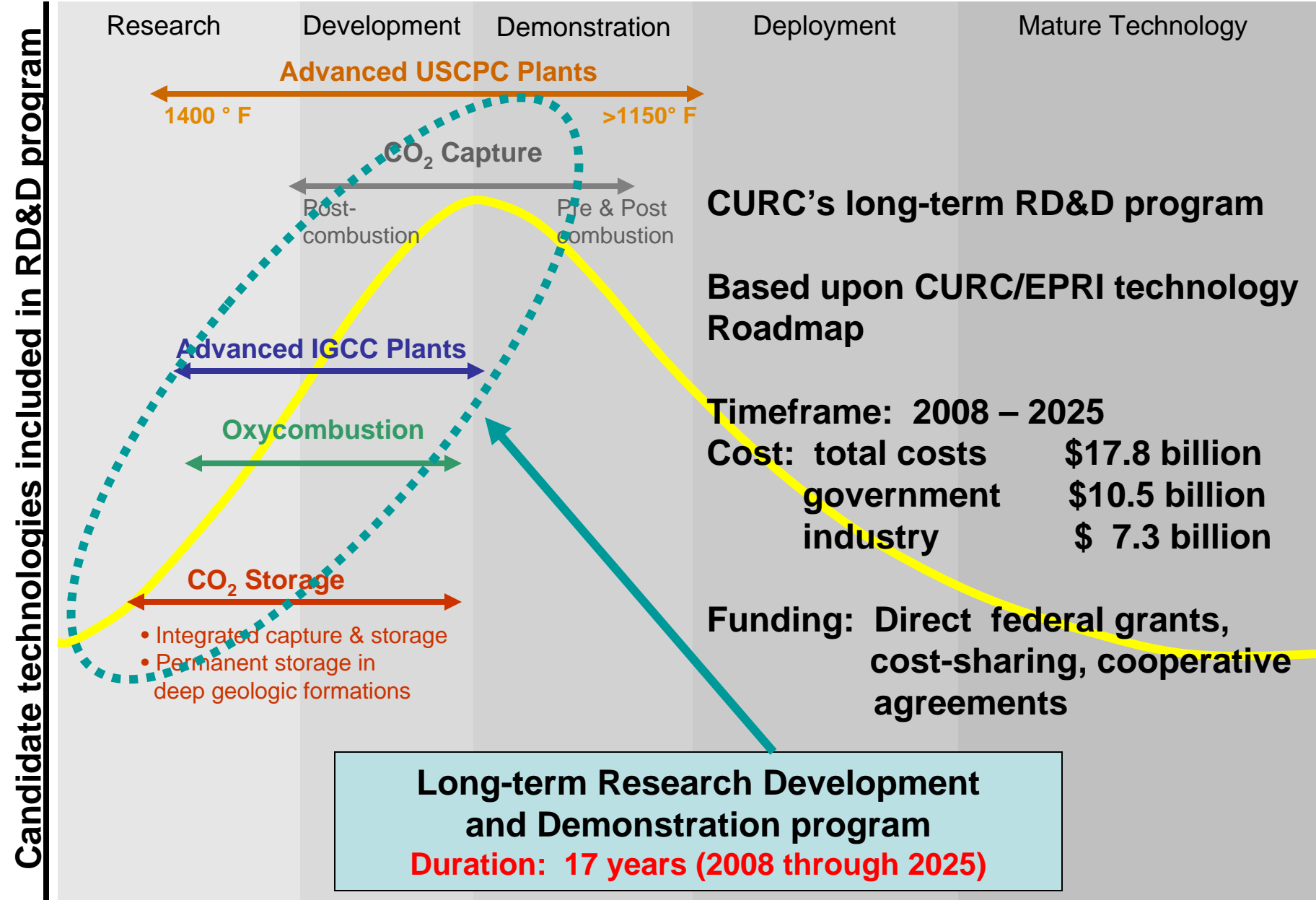
Chart depicts approximate level of maturity of various technologies in 2008



Typical development cycle of large scale, capital intensive coal systems



Various advanced coal & CO₂ capture and storage technologies that would be focus of RD&D Program



Approximate level of development of various advanced coal technologies & CO₂ capture and storage

Technology projects included in Deployment program

Research Development Demonstration Deployment Mature Technology

Advanced USCPC Plants
 1400 ° F >1150° F

Near-term Deployment program
 Duration: 17 years (2008 through 2025)

CO₂ Capture
 Post-combustion Pre & Post combustion

USCPC Plants
 1150° F 1100° F

CURC's Near term Deployment Program

IGCC Plants

Premised on need to take Action NOW

Timeframe: 2008 – 2025

Cost: total costs	\$37.8 billion*
government	\$15.4 billion
industry	\$22.4 billion

*Estimated 2006 dollars, does NOT include significant price escalations of last 2 years

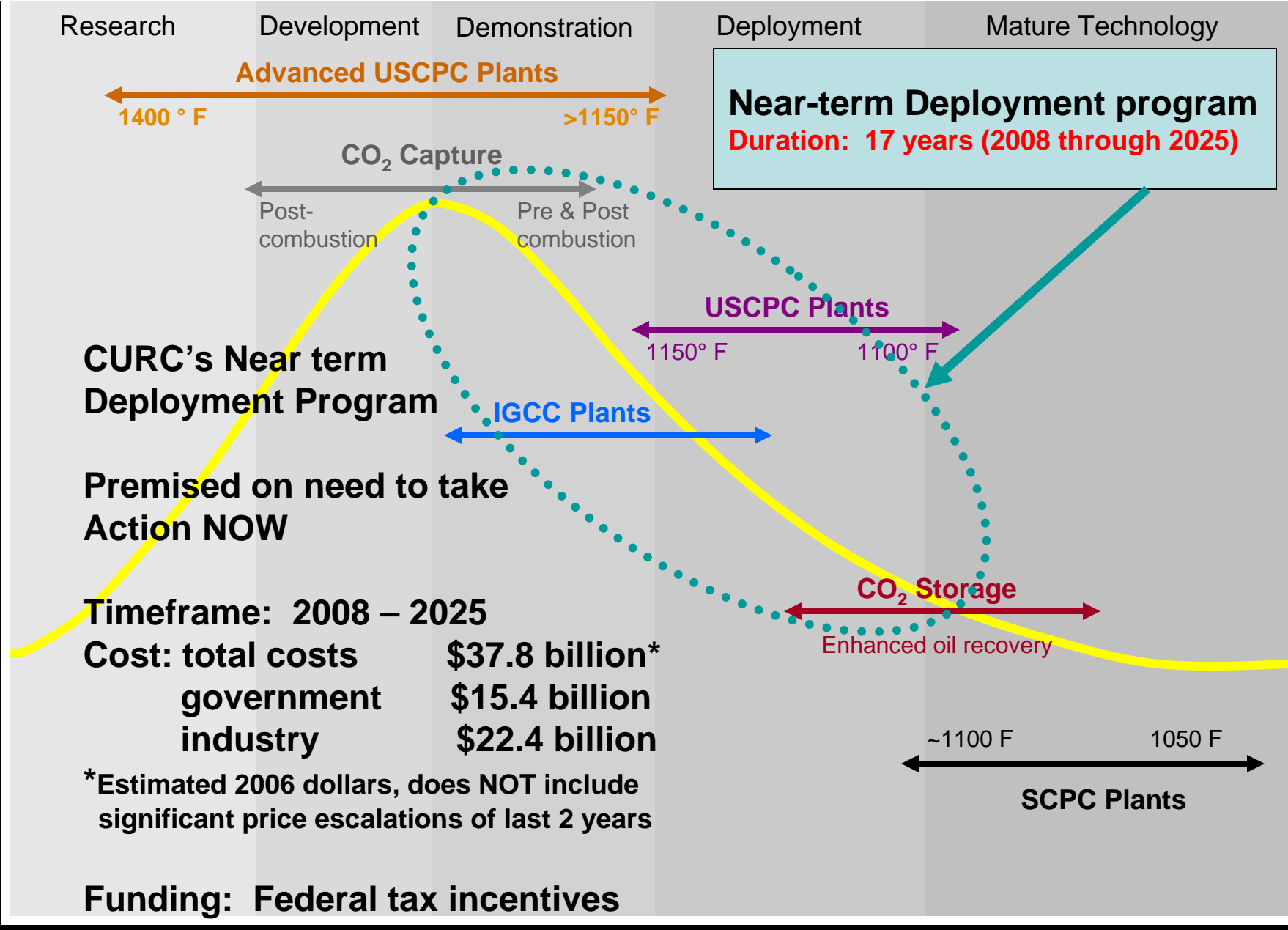
CO₂ Storage
 Enhanced oil recovery

~1100 F 1050 F
SCPC Plants

Funding: Federal tax incentives

2008

2025



Summary of the CURC program

1. Fund an aggressive R,D&D program that shares the costs of --
 - a. Demonstration projects (i.e. first -of-a-kind (FOAK) technology demonstrations)
 - b. Improving the ways we currently use coal to produce electricity and other valuable products (e.g. advanced combustion and gasification systems)
 - c. Developing new technologies to reduce costs, increase efficiency & reliability of CCS at existing or new power plants

Summary of the CURC program (cont.)

2. Immediately initiate a CCS deployment program

- a. “deployment” = construction/operation of the 2nd, 3rd, nth project employing the same, or similar CCS technology; designed to replicate technology application that will then reduce risks and costs, increase reliability and familiarize industry with the technology
- b. Focus upon both *efficiency* improvements at new or existing plants and applications of CCS technology
- c. Before a long-term regulatory regime to govern the disposition of CO₂, enact a limited, interim program that addresses long-term liability of CO₂ that is permanently stored

For additional information

www.coal.org

Ben Yamagata at:

bnym@vnf.com

202-298-1857