

### NATIONAL ENERGY TECHNOLOGY LABORATORY



# **Tracking New Coal-Fired Power Plants**

## **National Energy Technology Laboratory**

Office of Systems Analyses and Planning Erik Shuster



January 8, 2010

# **Tracking New Coal-Fired Power Plants**

This report is intended to provide an overview of proposed new coal-fired power plants that are under development. This report may not represent all possible plants under consideration but is intended to illustrate the potential that exists for installation of new coal-fired power plants.

Recent experience has shown that public announcements of new coal-fired power plant development do not provide an accurate representation of actual new operating power plants. Actual plant capacity commissioned has historically been significantly less then new capacity announced.

The report focuses on those power plant projects that have achieved significant progress toward completion, to provide a more accurate assessment of the ability of this segment of the power generation industry to support demand for new electricity capacity in various regions of the United States.

The Department of Energy does not warrant the accuracy or suitability of this information.



# **Tracking New Coal-Fired Power Plants**

- This report provides a perspective of coal-fired power plants that are currently under development, with a focus on those having made significant progress toward achieving commercial operation
- The status of projects in development varies from project announcements to those under construction
- Announced projects that are canceled before or during the permitting phase are not unusual; announced projects are not necessarily strong indicators of capacity additions
- Plants that are permitted or under construction reflect a developer's significant financial commitment to completion and offer a better perspective of the new generation capacity that may be forthcoming



## Past Capacity Announcements vs. Actual Figure 1



Historically, actual capacity has been shown to be significantly less than proposed capacity. For example, the 2002 report listed 11,455 MW of proposed capacity for the year 2005 when actually only 329 MW were constructed.

■ Actual ■ 2002 Report ■ 2005 Report ■ 2007 Report ■ 2010 Report

#### NATIONAL ENERGY TECHNOLOGY LABORATORY

Source: 2007 & 2010 data Ventyx – Velocity Suite

4

2002 – 2005 data – Previous NETL Tracking New Coal-Fired Power Plants Reports

# Historic Capacity Additions by Years Refer to Figure 1

- Actual plant capacity, commissioned since 2000, has been far less than new capacity announced; the year 2002 report of announcements reflected a schedule of over 36,000 MW to be installed by 2007, whereas ≈ 4,500 MW (12%) were achieved
- The trend over several years has reflected the bulk of power plant developments shifting out in time due to project delays
- Delays and cancelations have been attributed to regulatory uncertainty (regarding climate change) or strained project economics due to escalating costs in the industry
- Cancellations become more prevalent as prospects of fulfilling all projects in the queue become impractical



# Current Coal-Fired Capacity Projects (Annual Change)

I adie 1		Nu	Number of Plants			Capacity (MW)			
	General Status	5	Jan 2009	January 2010	Net Change	Jan 2009	January 2010	Net Change	
	Under Construction Near Construction		28	22	-6	16,319	13,755	-2,564	
Progressing			7	1	-6	2,812	320	-2,492	
Projects	Permitted		13	8	-5	7,000	3,280	-3,720	
	SUB TOTAL		48	31	-17	26,131	17,355	-8,776 (-34%)	
Uncertain Potential and Timing	Announced (early stages of development)		47	46	-1	31,869	26,233	-5,636 (-18%)	
	TOTAL		95	77	-18	58,000	43,588	-14,412 (-25%)	
	Operational this Period		-	8	+8	-	3,218	+3,218	
	TOTAL (with Operational)				-10			-11,194 (-20%)	
	Status Listing			Description					
Under Construction			n	Project is under construction.					
Near Construction				Project has been approved; majority or all permits are obtained. Sponsor is contracting vendors and Engineering, Procurement and Construction (EPC) contractors. Site preparation has begun.					
Permitted				In the permitting phase. Two or more permits approved or fuel or power contracts have been negotiated.					
6 Source: Ve	entvy – Velocity Suite		Early stages of development to filing for permits. May include a feasibility study.						

Data collected 1/5/2009 and 1/8/2010

# Current Capacity Additions by Years Refer to Table 1

- Table 1 reflects the current status of coal-fired plant development activity as of January 4, 2010 and the entire year (*January 5, 2009 through January 4, 2010*)
- "Progressing" plants are projects with status indicating permitted, near construction, or under construction
- "Progressing" plants have attained a higher likelihood of advancing toward commercial operation; however, regulatory uncertainty and industry cost increases are impacting development decisions for all projects
- 3,218 MW (8 plants) have become operation during 2009
- There has been a net decrease of 8,776 MW (-34%) of "Progressing" projects for the year

### Breakdown of Removed and Added Capacity (year 2009)

### **Refer to Table 1**

#### **Removed Projects**

Previous Unit Status before being removed or now operational	Number of Units	Total Capacity (MW)
Announced	15	9,652
Progressing	12	5,263
Operational	8	3,218

Latest StatusNumberToof UnitsOf Units	
	(MW)
Announced 10	4,605

#### NATIONAL ENERGY TECHNOLOGY LABORATORY

**(**8)

## Current Capacity Additions by Years Figure 2



Operational Dates Proposed
NATIONAL ENERGY TECHNOLOGY LABORATORY

(9)

Actual

# Net Capacity Changes (Removed and Added Opportunities)

### Figure 3

40

53% of MWs removed represent "Announced" projects 18% of MWs removed due to Now Operating plants



# **Canceled Plant Implications**

- The projects removed from the list are predominately due to today's economic environment and regulatory uncertainty
- Announced projects that are canceled before or during the permitting phase are not unusual
  - announced projects are not necessarily strong indicators of capacity additions
- Delayed or abandoned projects still represent future opportunities
  - Land, fuel, transportation, and water availability still exists
  - Specifically: Mine mouth opportunities and waste coal piles are still there

## **Proposed Capacity by U.S. NERC Regions** *Table 2*



		Progressing Projects						
NERC Region		Under Construction	Near Construction	Permitted	Sub Total	Announced	Grand Total (less Operational)	Operational
ASCC	Capacity (MW)	0	0	0	0	100	100	
	Plants	0	0	0	0	1	1	
ERCOT	Capacity (MW)	2,767	0	800	3,567	6,795	10,362	1,479
	Plants	4	0	1	5	7	12	2
FRCC	Capacity (MW)	0	0	0	0	0	0	
	Plants	0	0	0	0	0	0	
MRO US	Capacity (MW)	99	0	0	99	2,000	2,099	180
	Plants	1	0	0	1	4	5	1
NPCC	Capacity (MW)	0	0	125	125	50	175	
	Plants	0	0	1	1	1	2	
RFC	Capacity (MW)	3,140	0	1,375	4,515	4,130	8,645	
	Plants	4	0	3	7	10	17	
SERC	Capacity (MW)	3,815	0	600	4,415	6,698	11,113	478
	Plants	4	0	1	5	12	17	2
SPP	Capacity (MW)	2,652	0	0	2,652	895	3,547	663
	Plants	6	0	0	6	1	7	1
WECC	Capacity (MW)	1,282	320	380	1,982	5,565	7,547	418
	Plants	3	1	2	6	10	16	2
N/A	Capacity (MW)	0	0	0	0	0	0	
	Plants	0	0	0	0	0	0	
Total Sum Ca	pacity (MW)	13,755	320	3,280	17,355	26,233	43,588	3,218
Total Count of Plants		22	1	8	31	46	77	8

#### NATIONAL ENERGY TECHNOLOGY LABORATORY

# Proposed Technologies of New Plants

(with Annual change)

Figure 4  $g_{\text{pc}}^{30}$   $g_{\text{pc}}^{3$ 

#### Table 3

(13)

Technology Listings	Operational	<b>Progressing</b> (Permitted, Near-, and Under Construction)		Anno	unced	Total Proposed	
	(Since 2000)	Jan 2009	Jan 2010 (Change)	Jan 2009	Jan 2010 (Change)	Jan 2009	Jan 2010 (Change)
PC Subcritical	23	18	11 (-7)	16	13 (-3)	34	24 (-10)
CFB	10	14	6 (-8)	10	11 (1)	24	17 (-7)
PC Supercritical	2	10	8 (-2)	8	7 (-1)	18	<b>15</b> (-3)
IGCC	1	6	6 (0)	13	15* (2)	19	21 (2)

Source: Ventyx – Velocity Suite

Data collected (1/5/2009); Current Report data collected (1/8/2010)

\* Includes one underground gasification plant

# **Proposed Technologies of New Plants** *Refer to Figure 4 and Table 3*

- Opportunities involving conventional technologies, such as subcritical PC and CFB, are more plentiful and tend to be more advanced due to earlier start in development
- Advanced technologies proposed, such as supercritical PC and IGCC, reflect more recent trends in development activity, thus fewer have achieved permitted status
- Regulatory uncertainty for GHG legislation is a key issue impacting technology selection and reliability of economic forecasts
- Returns on investment for conventional plants, including supercritical, can be severely compromised by the need to subsequently address CO<sub>2</sub> mitigation
- Higher capital costs incurred for IGCC may make such new plants less competitive unless their advantage in CO<sub>2</sub> mitigation is assured

## **Geographical Map by State: Coal-Fired Plants** (*Permitted, Near Construction, and Under Construction*)



#### NATIONAL ENERGY TECHNOLOGY LABORATORY

## **Geographical Map by NERC Regions: Coal-Fired Plants** (Permitted, Near Construction, and Under Construction)



NATIONAL ENERGY TECHNOLOGY LABORATORY

# Specified Coal Ranks All Proposed Plants

Figure 7



#### NATIONAL ENERGY TECHNOLOGY LABORATORY

Source: Ventyx – Velocity Suite (1/8/2010)

- 17

# Coal-Fired Build Rate China and U.S.



**Online Year** 

China:■ OperationalU.S.:■ Operational

Under Construction
Under Construction

Planned

NATIONAL ENERGY TECHNOLOGY LABORATORY

Source: Platts - UDI Database - December 2008 Ventyx - Velocity Suite 1/8/2010

## Proposed U.S. New Capacity Coal, Natural Gas, and Wind



#### NATIONAL ENERGY TECHNOLOGY LABORATORY



- Eight plants totaling 3,218 MW have become <u>operational</u>.
   2009 has had the largest new coal capacity additions in one year since 1991
- "Progressing" projects have decreased by 18 plant (8 which are now operational with a decrease in total MW involved (from 26,131 MW to 17,355 MW)
- 4,605 MW of new capacity have been proposed and 14,915 MW have been canceled
  - Out of the 14,915 MW of canceled plants, 65% were in the early announced phase and 35% were in an advanced progressing phase
- Compared to previous year, few "announced" projects are being proposed