

REINHOLD ENVIRONMENTAL Ltd.



2010 APC Round Table & Expo Presentation

July 18-20, 2010, in Concord, NC / Hosted by Duke Energy

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Cliffside Modernization Project: Permitting and Air Quality Control



Artistic Rendering – Cliffside Modernization

Presented to Air Pollution Control Conference
By Harry Lancaster

7/19/10

Main Points of Presentation

- Duke's plans for meeting customers' energy needs
- Siting Cliffside Unit 6
- Permitting issues
- Unique design of Unit 6 air quality control system.

Duke Energy

- Fortune 500 Company
- Operates in NC, SC, Indiana, Ohio, Kentucky
- 4 million customers; 36,000 megawatts
- ~18,000 employees
- 2.3 million customers in Carolinas; 19,200 megawatts
- Diverse energy mix: nuclear, coal, gas/oil fired, hydro

Duke's Plans for Meeting Customers' Energy Needs

- Clean up existing generation
- New lower carbon generation, including efficient coal, gas, nuclear and renewables
- Energy efficiency

Coal Plants in the Carolinas

- Eight – Allen, Belews Creek, Buck, Cliffside, Dan River, Lee, Marshall, Riverbend
- Generate about half of the electricity used by our customers in the region
- One of the nation's most efficient fossil generating systems which means lower operating costs for Duke Energy and lower electric rates for our customers
- Manage system air emissions by using a diverse mix of fuels to generate electricity, operating efficiently and employing emission reduction technologies
- As a result, our emission levels of nitrogen oxide, sulfur dioxide and carbon dioxide from the Duke Carolinas system are below the latest industry averages

Clean Smokestacks Act

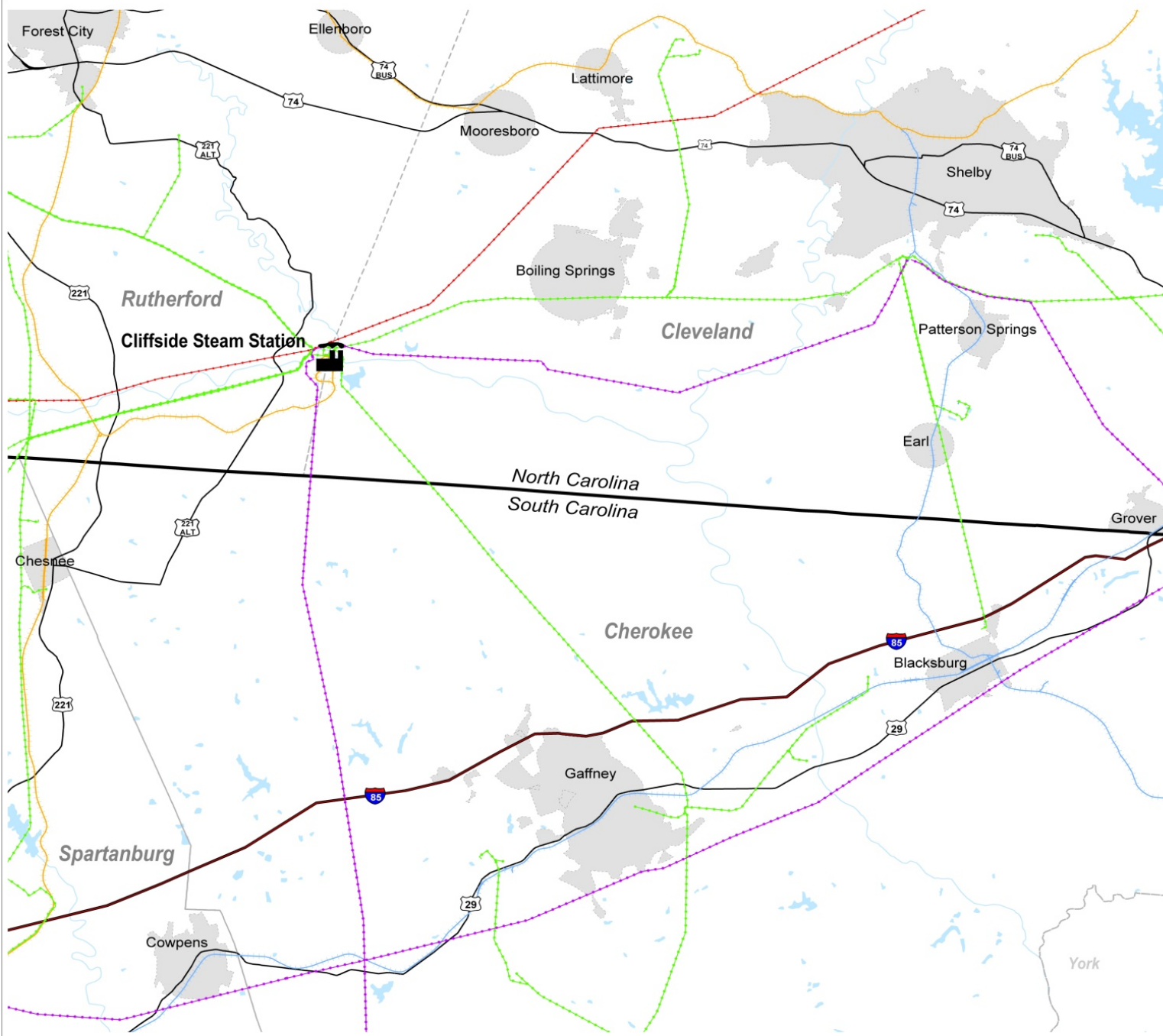
- Duke Energy completed installation of scrubbers and air emission control systems on eleven of twelve largest Carolinas generating units.
- Clean air total estimated cost = \$1.8 billion investment for SO₂ and NO_x controls
- Wet scrubbers removes approximately 95 percent of sulfur dioxide emissions:
 - Marshall – 2007
 - Belews Creek – 2008
 - Allen – 2009
 - Cliffside Unit 5 – 2010 (99% removal)

New Generation Plans

- New Natural Gas Combined Cycle Plants at Buck and Dan River Steam Stations in NC (620 MW each)
- William States Lee III Nuclear Power Plant, Cherokee County, SC (2,234 MW)
- Cliffside Modernization Project, Cleveland/Rutherford Counties, NC (800 MW)

Energy Efficiency

- Energy efficiency is the “fifth fuel” at Duke Energy.
- The save-a-watt model creates the appropriate incentive to pursue energy efficiency in a more robust manner way.
- Customers will use less electricity and Duke Energy will be compensated only for achieving energy efficiency savings.
- Energy efficiency programs are currently being rolled out in the Carolinas.



Legend

- Cliffside Steam Station
- Duke 100 kV Transmission Lines
- Duke 230 kV Transmission Lines
- Duke 525 kV Transmission Lines
- CSX Railroad
- Norfolk Southern Railroad (NS)
- US Highways
- Interstate Highways
- Incorporated Areas
- County Boundary
- State Boundary
- Lakes & Streams



Data Acquired from Various Sources: Duke Energy, USGS, CSX Railroad, and Norfolk Southern Railroad

**Proposed Expansion at
 Cliffside Generation Plant**
 Cleveland and Rutherford Counties, North Carolina



Cliffside Steam Station

- Capacity: 760 megawatts
- Location: Cleveland and Rutherford counties, NC
- Units 1-4 on line in 1940s (200 MW total)
 - Electrostatic precipitator (particulate)
- Unit 5 on line in 1972 (560 MW)
 - Electrostatic precipitator (particulate)
 - 2002 – Selective Catalytic Reduction (80% removal of nitrogen oxides)
 - 2010 – Wet flue gas desulfurization (99% removal of sulfur dioxide) and coincident removal of mercury



Cliffside Modernization Project Economic Impact

- Retire Units 1-4 (200 MW), add scrubber to Unit 5, construct Unit 6 (825 MW supercritical pulverized coal)
- \$1.8 billion estimated cost for Unit 6 project
- 2,100 jobs at peak of construction (currently 2,000)
- \$100 million annual payroll
- Unit 6 construction began 1/30/08; expected on line 2012
- 20-30 permanent jobs once the unit comes online
- Shaw Group is the engineering, procurement and construction contractor

Permitting/Environmental

- NC Utilities Commission issued Certificate of Public Convenience and Necessity 3/21/07
- NC Department of Environment and Natural Resources (DENR) issued water discharge permit 8/13/07
- DENR issued air permit 1/29/08 – stringent limits on SO₂, NO_x, PM, Hg
- DENR issued permit to construct ash/gypsum landfill 6/4/09
- Compared to the existing plant, the modernized plant will emit 80% less SO₂, 50% less NO_x and 50% less mercury while generating more than twice the electricity

Air Permit Highlights

- Avoided PSD for SO₂ and NO_x:
 - Retired Units 1-4, added Scrubber and SCR on Unit 5
 - NC PSD Rule required design for 99% SO₂ control to qualify for netting.
- Agree to state “BACT” limits:
 - 0.12 lb/MMBtu SO₂, 30-day average
 - 0.07 lb/MMBtu NO_x, 30-day average
- BACT Limit for Mercury: 0.019 lb/GWH all fuels
 - May be adjusted based on data from other units
- CO₂ Mitigation Plan:
 - Retire 800 MW additional older units from 2015-2018
 - Mitigate balance of CO₂ emissions through efficiency, renewables, nuclear power, or purchased offsets

Unit 6 Air Permit Limits

Sulfur Dioxide	0.12 lb/MMBtu 30-day avg.
Nitrogen Oxides	0.07 lb/MMBtu 30-day avg.
PM	0.015 lb/MMBtu
PM10 (Filterable)	0.012 lb/MMBtu
PM10 (Total)	0.018 lb/MMBtu
Mercury	0.019 lb/GWH (NC BACT)
Carbon Monoxide	0.12 lb/MMBtu
VOCs	0.003 lb/MMBtu
Sulfuric Acid	0.005 lb/MMBtu
Lead	0.000022 lb/MMBtu

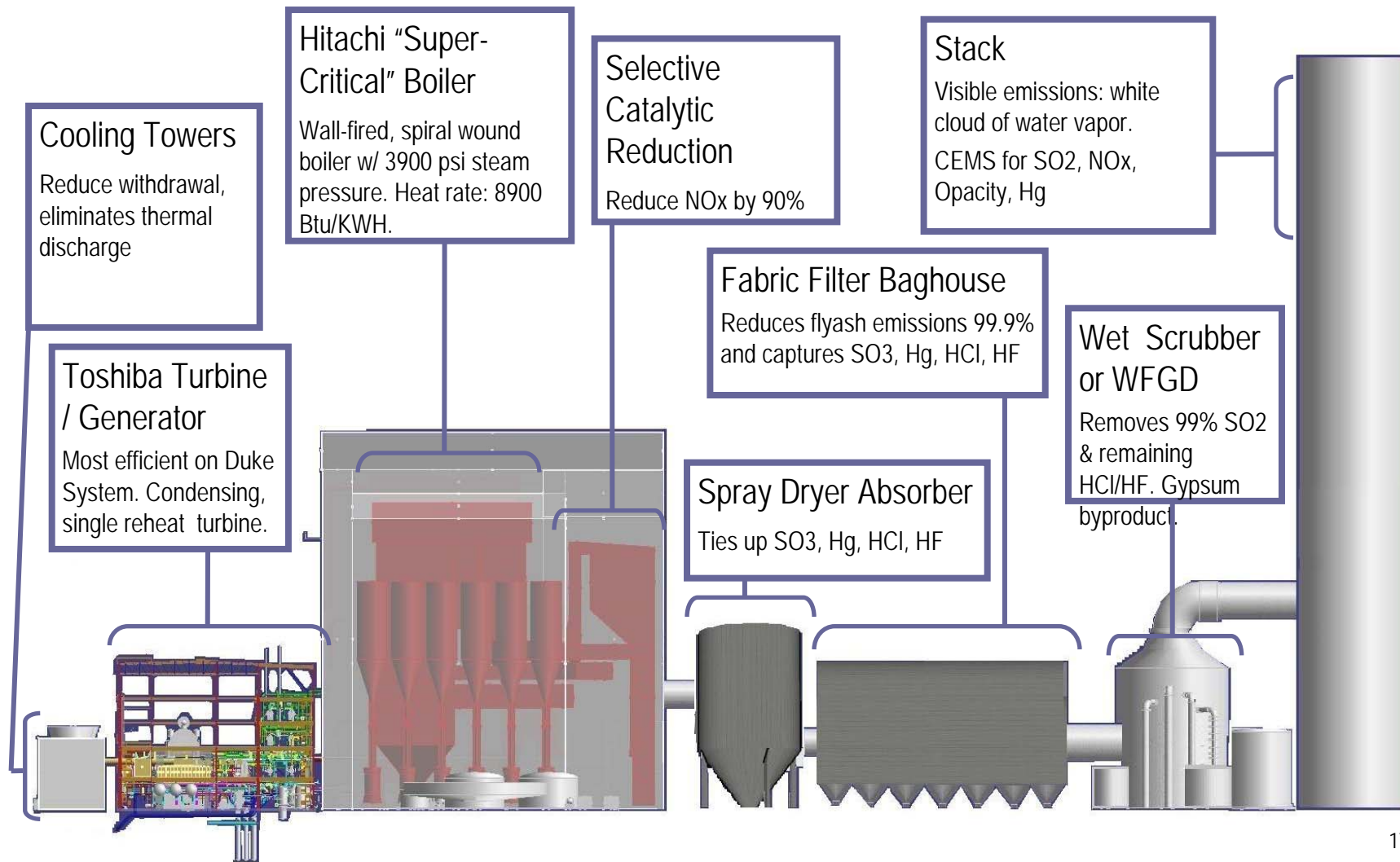
Permitting/Environmental (cont.)

- Federal mercury regulations (CAMR) overturned after permit issued
- At DENR request, Duke prepared and submitted voluntary MACT assessment for Hazardous Air Pollutants (HAPS)
- Environmental groups sued in federal court to require mandatory MACT assessment and permit reopening.
- Based on data from Marshall scrubber and enhanced technology at Cliffside, Duke Energy demonstrated to DENR that Cliffside 6 would be a “minor” new source of HAPS who issued “minor source” permit March 13, 2009 following public hearing.
- Judge Thornburg ruled that the “minor source” permit eliminated the requirement for “case-by-case MACT standards.”

The Latest Update on Permitting

- Appeal of air permit before NC Office of Administrative Hearings
 - Issues include PSD analysis and permit limits, and “minor source” determination under MACT.
 - Motions for Summary Judgment heard 7/7/10, hearing on merits of case not expected until Fall 2010 or later
- Title V permit renewed June 30, 2010 following public hearings held in January.
- Appeal of Judge Thornburg’s ruling (Remaining issue is Attorney Fees)

Overview of Unit 6



SCR

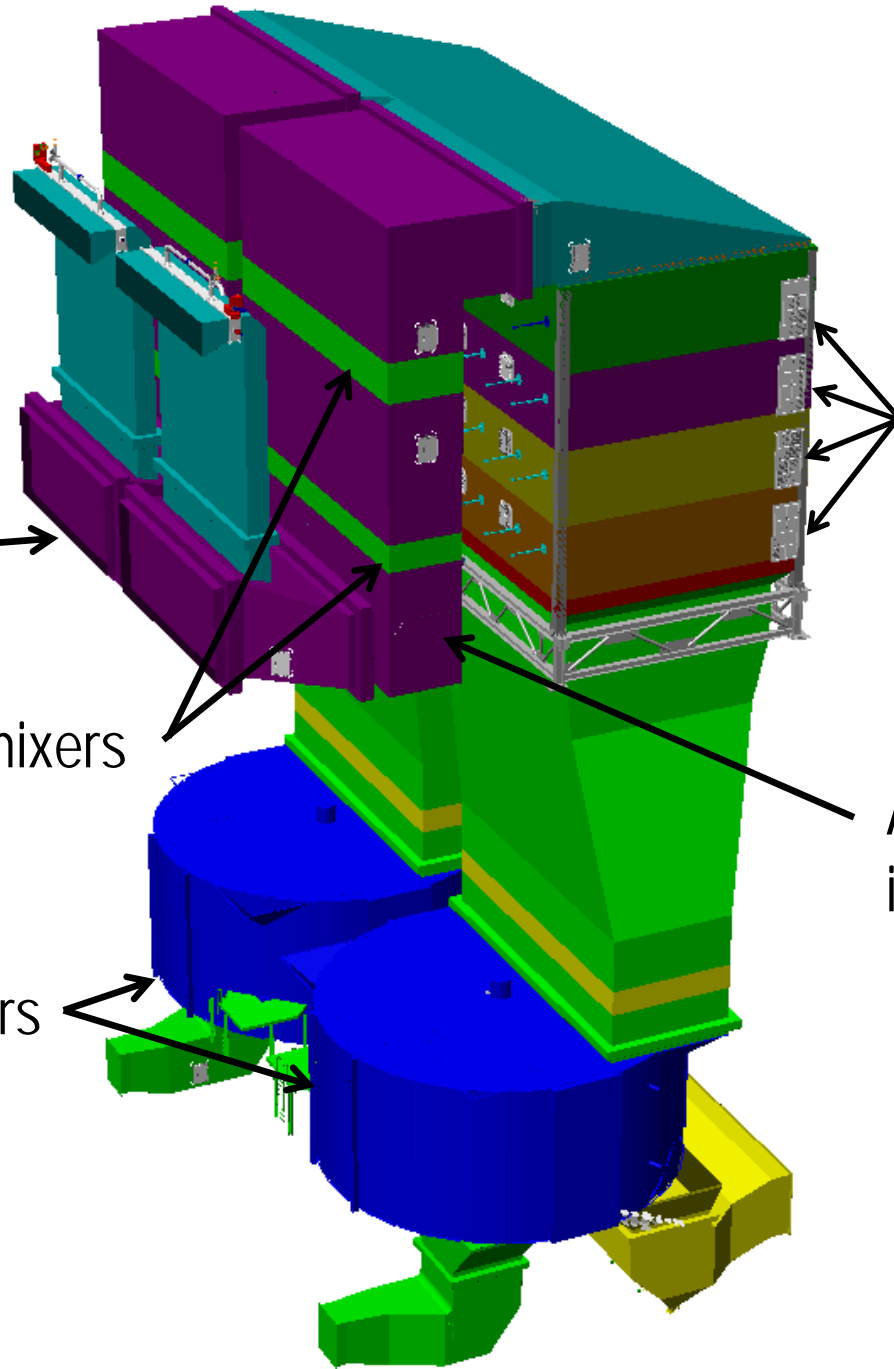
SCR Inlet

Static mixers

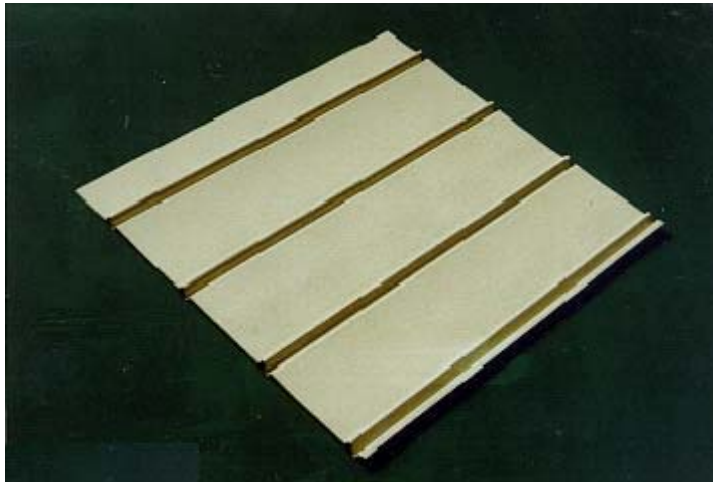
Air Heaters

Three catalyst layers and one spare

Ammonia injection grid

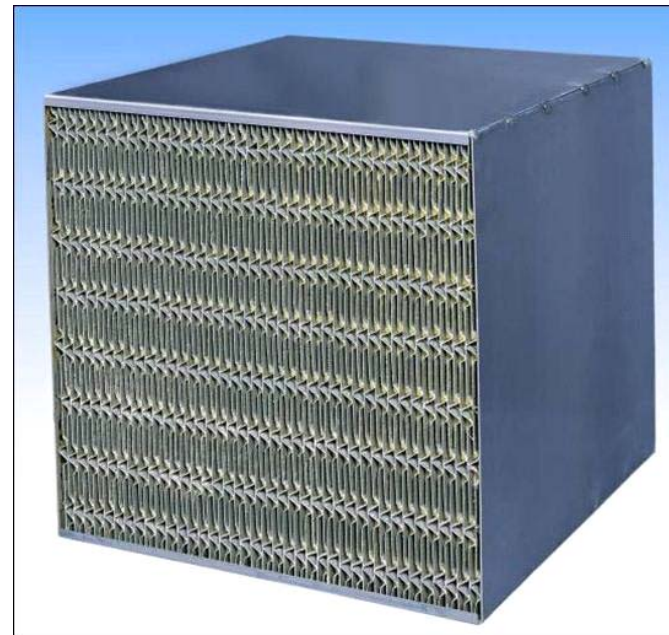


SCR Catalyst



Catalyst Element

Catalyst Unit



NORTH
(PROJECT)

Wet
Scrubber

WFGD ABSORBER
(REF 24011-GA-20105-027)

Dry Scrubbers

Baghouses

FABRIC FILTER 764"

PLATE
FRAMING
WIND
BRACE

GENERAL NOTES:

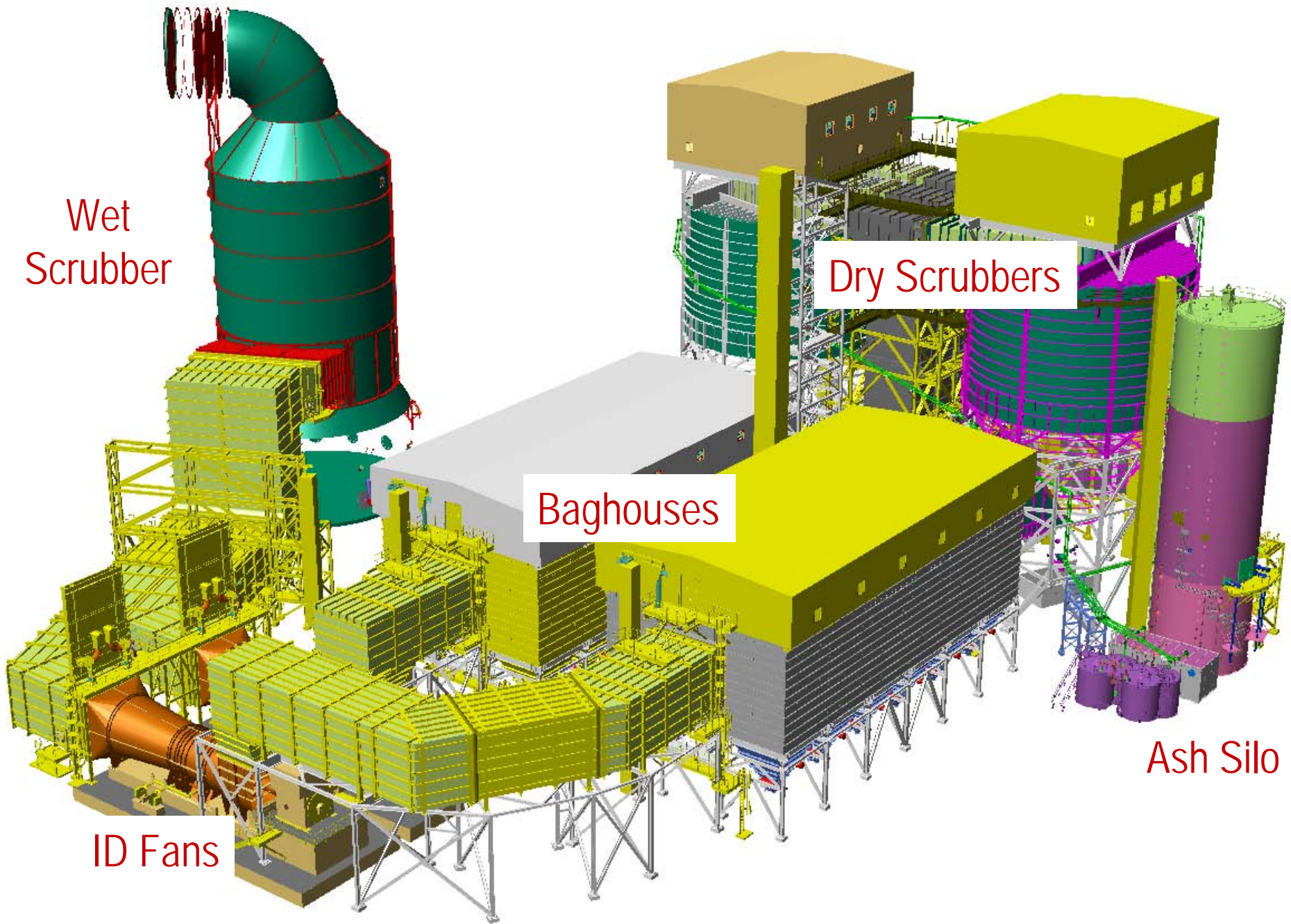
- EQUIPMENT SHOWN IS SPRAY DRYER ABSORBERS AND FABRIC FILTERS FOR FOR CLIFFSIDE UNIT 6.
- WFGD ABSORBER FOR UNIT 6 SHOWN ON THE CLIFFSIDE UNIT 6 GENERAL ARRANGEMENT DRAWINGS UNDER CONTRACT 24011.
- SITE UNIT 6 DRAWING 24011-GA-20105-002 FOR SITE PLAN.
- DIMENSIONS FOR VESSELS AND DUCTS ARE INSIDE OF PLATE, UNLESS NOTED.
- FLOOR AND PLATFORM ELEVATIONS SHOWN ARE TOP OF FINISHED FLOOR, UNLESS NOTED.

REFERENCE DRAWINGS:

- 24012-GA-20105-002 THRU -011
- 24012-PA-20110-001 & -002
- 24011-GA-20105-001 THRU -027

GENERAL ARRANGEMENTS UNIT 6 SDA & FABRIC FILTER
PROJECT REQUIREMENTS
GENERAL ARRANGEMENTS WFGD SYSTEM UNITS 5 & 6

DESCRIPTION		DATE	ALSTOM Power Inc. An ISO 9001:2000 Certified Firm 3/2021-11-01 20105 24012 2/2008 2/2008 2/2008	DUNE ENERGY CLIFFSIDE STATION UNIT 6 CLIFFSIDE, NORTH CAROLINA WFGD SYSTEM GA - SDA & FABRIC FILTER SOUTHWEST ISOMETRIC VIEW DWG NO. 24012-GA-20105-001
REV	DESCRIPTION	DATE		
01	GENERAL UPDATE PER FINAL DESIGN	1/28/2010		



Wet Scrubber

Dry Scrubbers

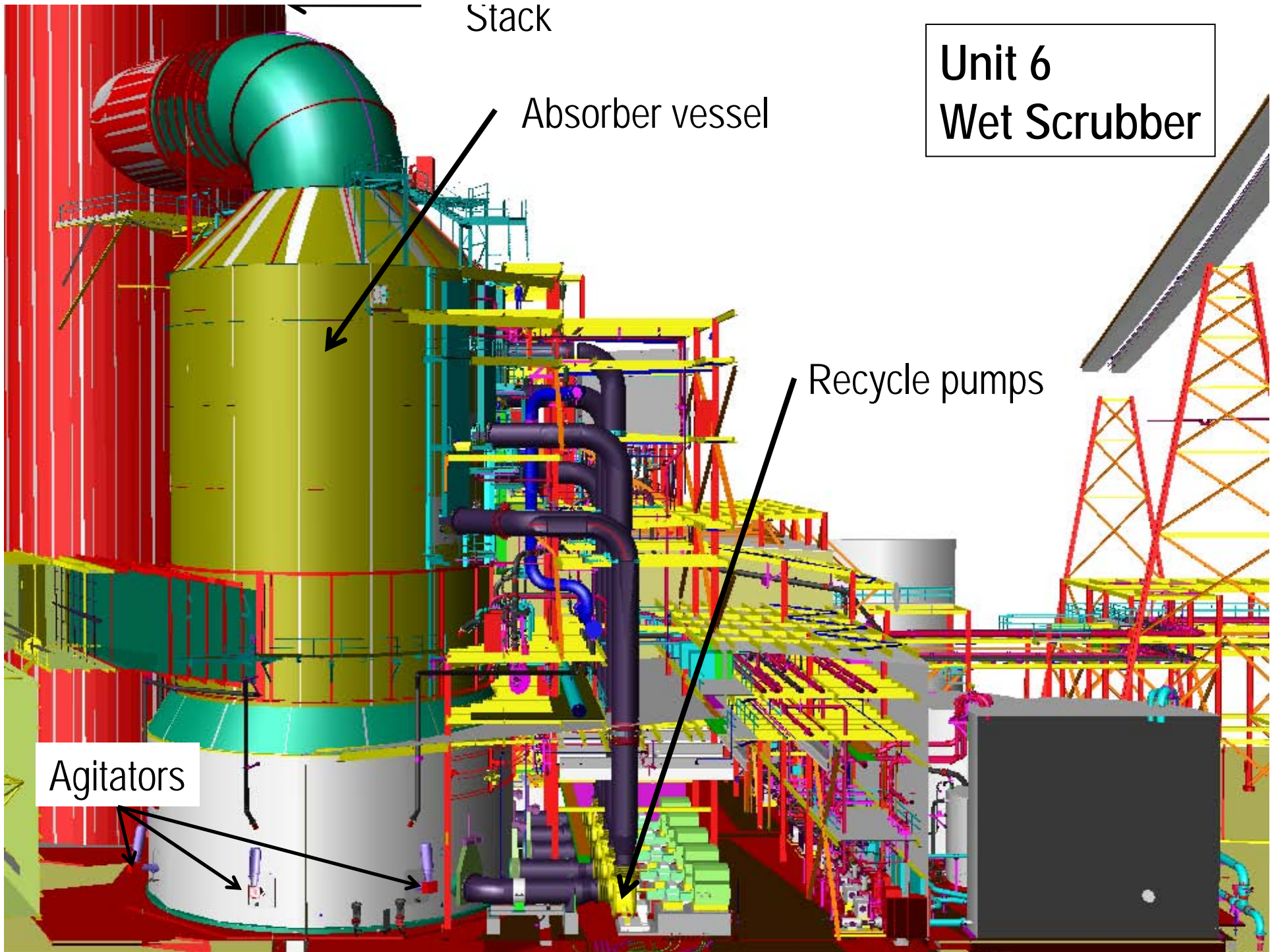
Baghouses

ID Fans

Ash Silo

Dry scrubber and bag house

- Two dry scrubber/baghouse trains
- Three atomizers in each dry scrubber, flue gas temperature lowered to 220°, acid gases condense
- Dry scrubber makeup water is purge stream from U6/U5 (reuse and recycle)
- Twelve compartments in each baghouse train
- 22,000 bags, 26' long, 5 1/4" diameter
- Pulse jet cleaning of PPS/P84 blend bags



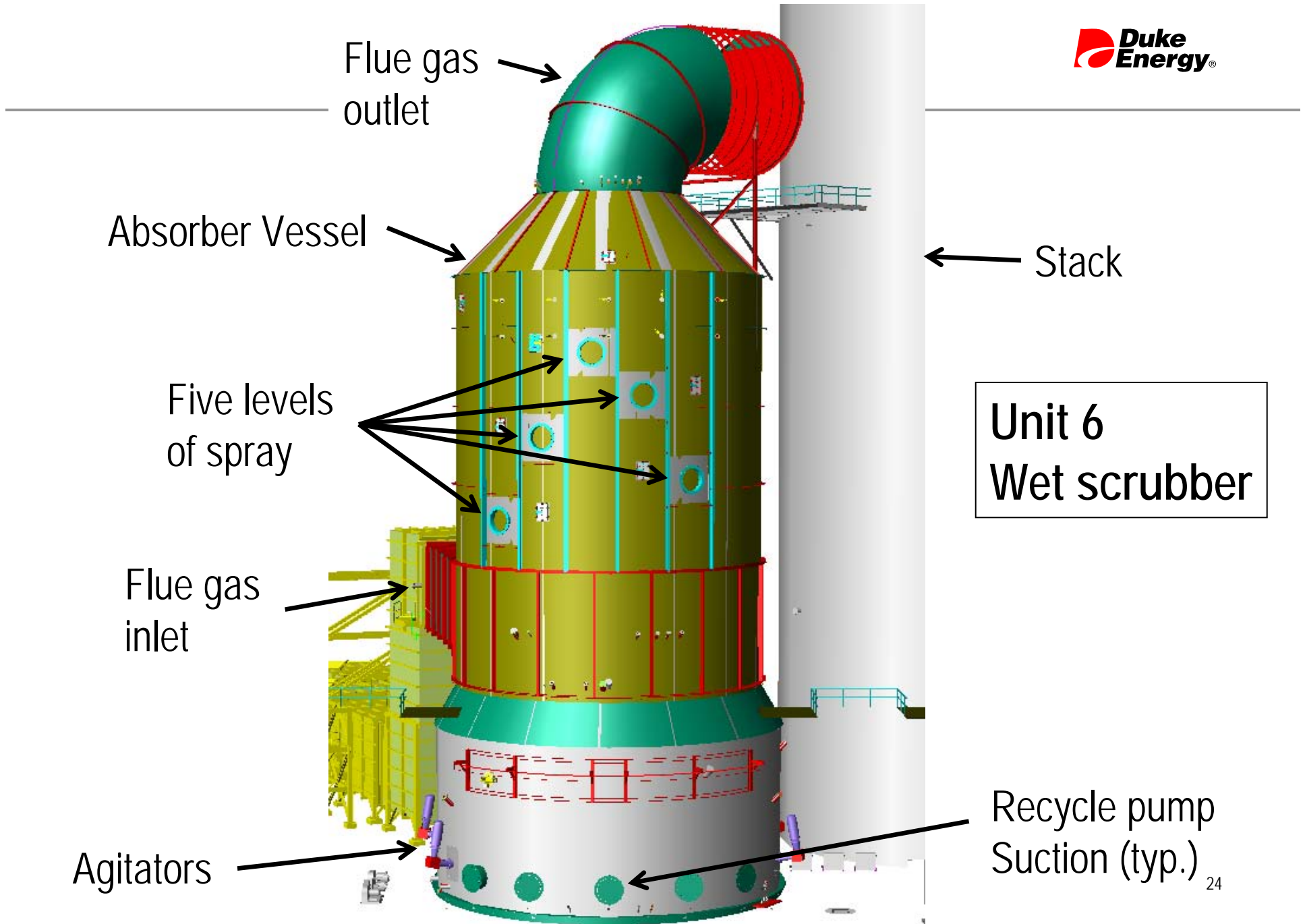
Stack

**Unit 6
Wet Scrubber**

Absorber vessel

Recycle pumps

Agitators



One of five WFGD
U6 recycle pumps



25



Unit 5 Recycle Pump Configuration

Update of project work

- Stack, cooling tower, limestone unloader complete
- Continue to weld boiler water wall panels, superheat pendants and high energy piping; air heater under construction
- Generator set and continue to set turbine casings
- Unit 5 WFGD duct tie-in scheduled for September (stack, absorber vessel, ball mills, dewatering, wastewater treatment complete or nearly complete)
- McCraw Road Bridge accepted by DOT; passing track completed
- Project approximately 68% complete

Passing Track

McCraw Road Bridge

Ash/Gypsum Landfill

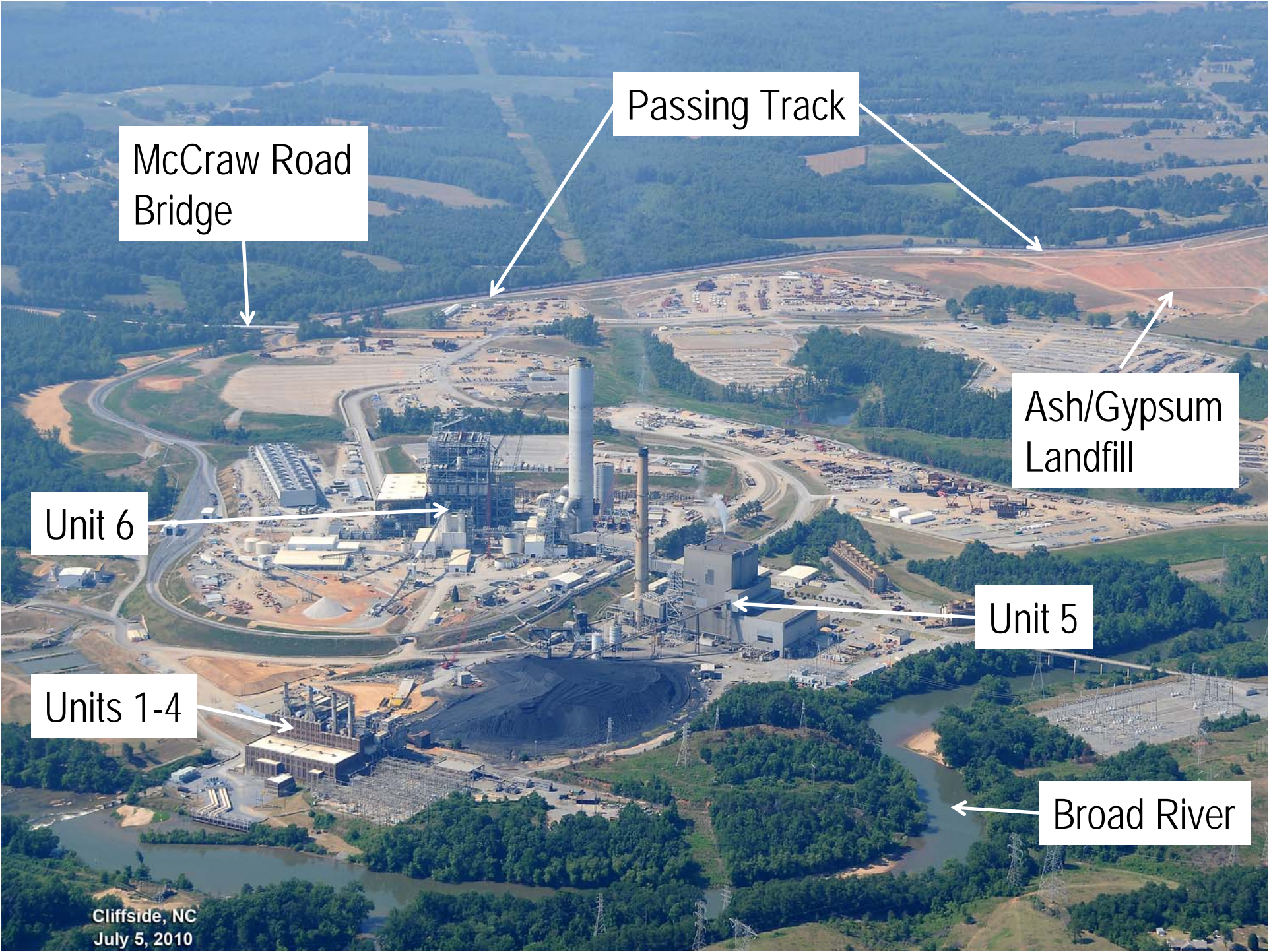
Unit 6

Unit 5

Units 1-4

Broad River

Cliffside, NC
July 5, 2010



Site Overview – July 5, 2010

Unit 5

Units 1-4

Unit 6

Rutherford
County

Cleveland
County

Cliffside, NC
July 5, 2010

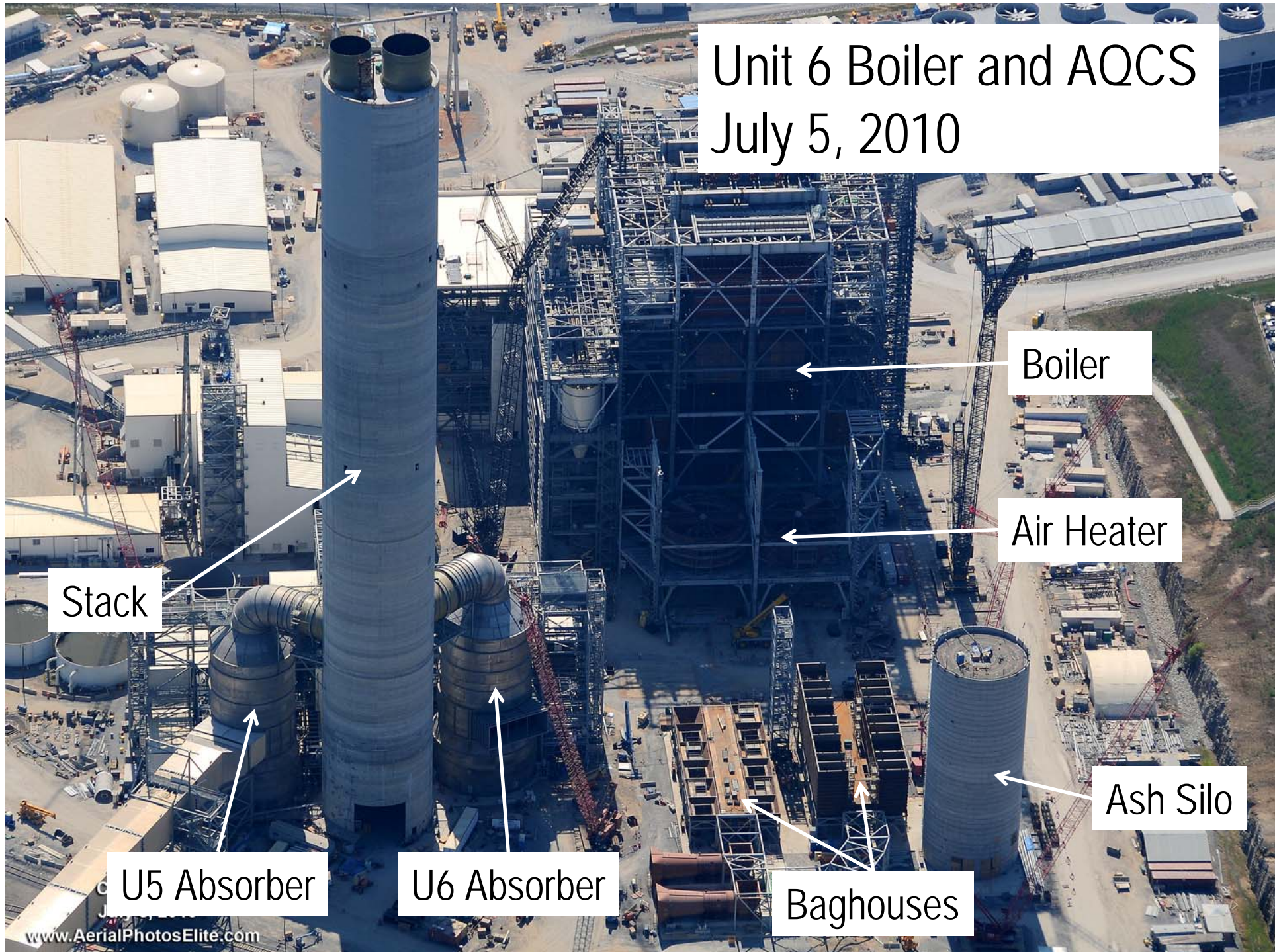




Site Overview – July 5, 2010

Cliffside, NC
July 5, 2010

Unit 6 Boiler and AQCS July 5, 2010



Stack

Boiler

Air Heater

U5 Absorber

U6 Absorber

Baghouses

Ash Silo

Cliffside Unit 6 “Noteworthyies”

- First unit to be constructed designated as a minor source of HAPs
- Unit 6 awarded U.S. Department of Energy advanced clean coal tax credit of \$125 million
- First US coal unit to include carbon mitigation plan in air permit – requires Duke to retire additional 800 MW by 2018 and take other measures as needed
- Compared to the existing plant, the modernized plant will emit 80% less SO₂, 50% less NO_x and 50% less mercury while generating more than twice the electricity

Cliffside Modernization Bottom Line

- Modernizing our fleet allows us:
 - To generate more electricity more efficiently
 - With fewer emissions
 - And, to retire older, less efficient coal-fired generation
 - Good for customers, the environment and the economy

Questions?

Passing Track

McCraw Road Bridge

Ash/Gypsum Landfill

Unit 6

Unit 5

Units 1-4

Broad River

Cliffside, NC
July 5, 2010

