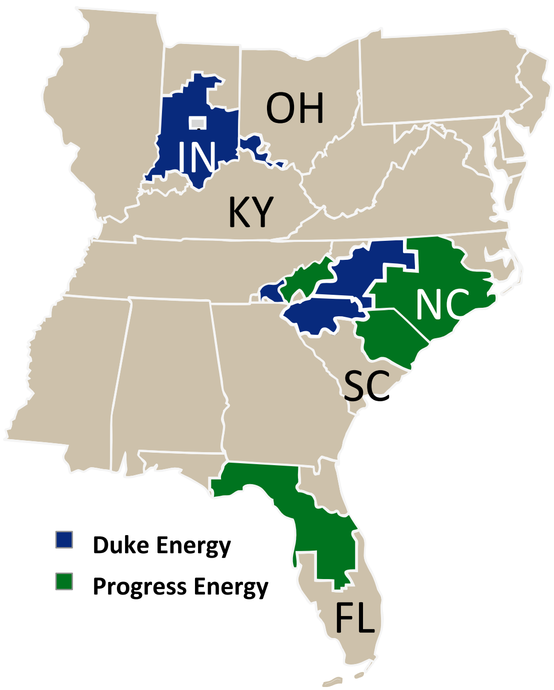
US-China Collaboration on Cleaner Coal Technology
中美清洁煤技术合作

David Mohler
大卫•墨勒
Vice President—Duke Energy
副总裁——杜克能源

Beijing, October 2012
北京，2012年10月

The Largest U.S. Utility with Unmatched Scale and Scope

Diverse Service Territories



Combined Statistics

	Duke Energy	Progress Energy	Combined	Rank
Enterprise Value	$40.2 B	$25.1 B	$65.3 B	#1
Market Cap.	$23.6 B	$12.8 B	$36.5 B	#1
Electric Customers	4.0 M	3.1 M	7.1 M	#1
Generation Capacity	35.4 GW[1]	21.8 GW	57.2 GW[1]	#1
Total Assets	$57.9 B	$32.7 B	$90.6 B[2]	#1
Rate Base	$23 B	$17 B	$40 B	#1
Total Generation	139.6 TWh	91.7 TWh	231.4 TWh	#1
Nuclear Generation	43.4 TWh	29.4 TWh	72.8 TWh	#3
Transmission Miles	16,341	10,966	27,307	#2
Regulated EBIT Mix[3]	77%	100%	85%	N/A

Source: FactSet as 12/31/2010; SNL Energy
Note: Customer data as of 12/31/2009; rate base data estimated as of 12/31/2010; total assets and generation capacity as of 09/30/2010; 2009A generation figures

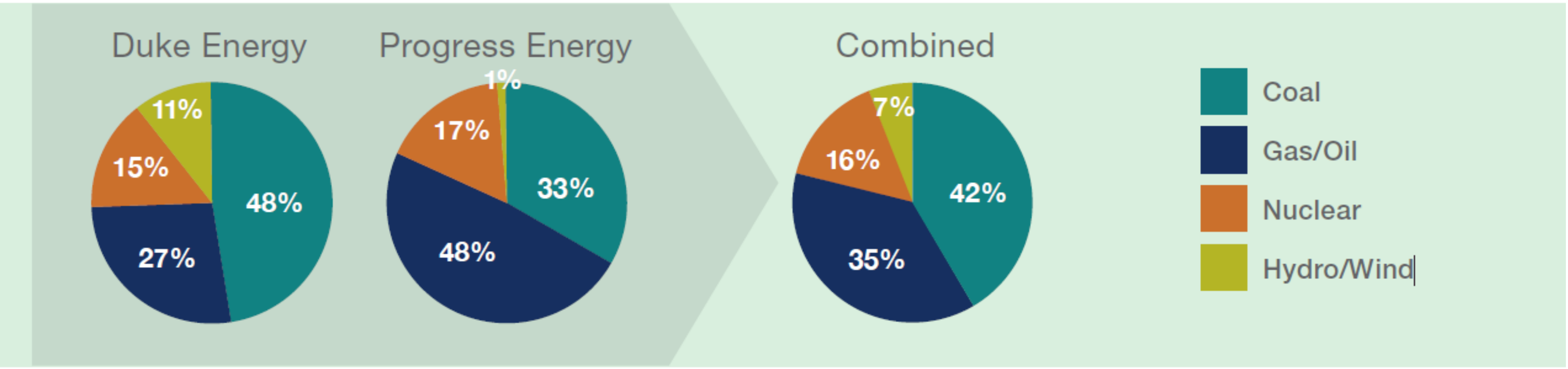
[1] Excludes purchased power and approximately 4 GW of Duke Energy International assets

[2] Total assets are a summation of the two stand-alone companies and do not include any purchase accounting adjustments from this transaction.

[3] Duke Energy's forecasted 2010 adjusted EBIT based upon midpoint of original 2010 adjusted diluted EPS range of $1.25 - $1.30; excludes operations labeled as 'Other'; Progress Energy's forecasted 2010 adjusted EBIT based upon midpoint of original 2010 ongoing EPS range of $2.85 - $3.05

Duke Energy Generation Overview

By Owned Capacity: 57 GW[1]



[1] Capacity owned as of 09/30/10 and excludes purchased power and 4.1 GW of Duke Energy International assets.

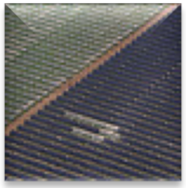
Duke Energy International At A Glance

International:
Duke Energy International principally operates and manages power generation facilities and engages in sales and marketing of electric power, natural gas, and natural gas liquids primarily in Latin America. It maintains almost 4,300 megawatts of owned capacity. Additionally, Duke Energy International owns a 25 percent interest in National Methanol Company, a large regional producer of methanol and MTBE located in Saudi Arabia. Duke Energy International's customers include retail distributors, electric utilities, independent power producers, marketers and industrial/ commercial companies.

Duke Renewable Portfolio

Wind Portfolio

- 10 commercial wind farms in six states
  - Colorado, Kansas, Pennsylvania, Texas, Wisconsin and Wyoming
    - >1,000 MW in commercial operation
    - 5 additional wind farms in construction that will be operational by end of 2012
- 5,500 MW in our U.S. pipeline of potential development projects



Solar Portfolio

- 11 commercial solar plants operate >50MW in Arizona, Florida, Texas and North Carolina
- Regulated portfolio focused in NC includes:
  - 8MW Distributed Solar Program
  - 16MW PPA
  - RECs from thermal solar

Bio-power

- >300MW of bio-power contracted across Duke Service territory
  - Wood waste plants in North Carolina provide close to 75MW
  - Solid waste plants in Florida and North Carolinas provide over 160MW
  - Poultry waste to bio-gas contract signed for 60MW

The Landscape Ahead for Duke

- Aging coal fleet—average age of existing units is 45 years
- Increasing and uncertain environmental regulation
- No clear direction on CO2
- US shale gas production and market dynamics fundamentally alters the competitive economics—our gas units have been dispatching ahead of our coal units

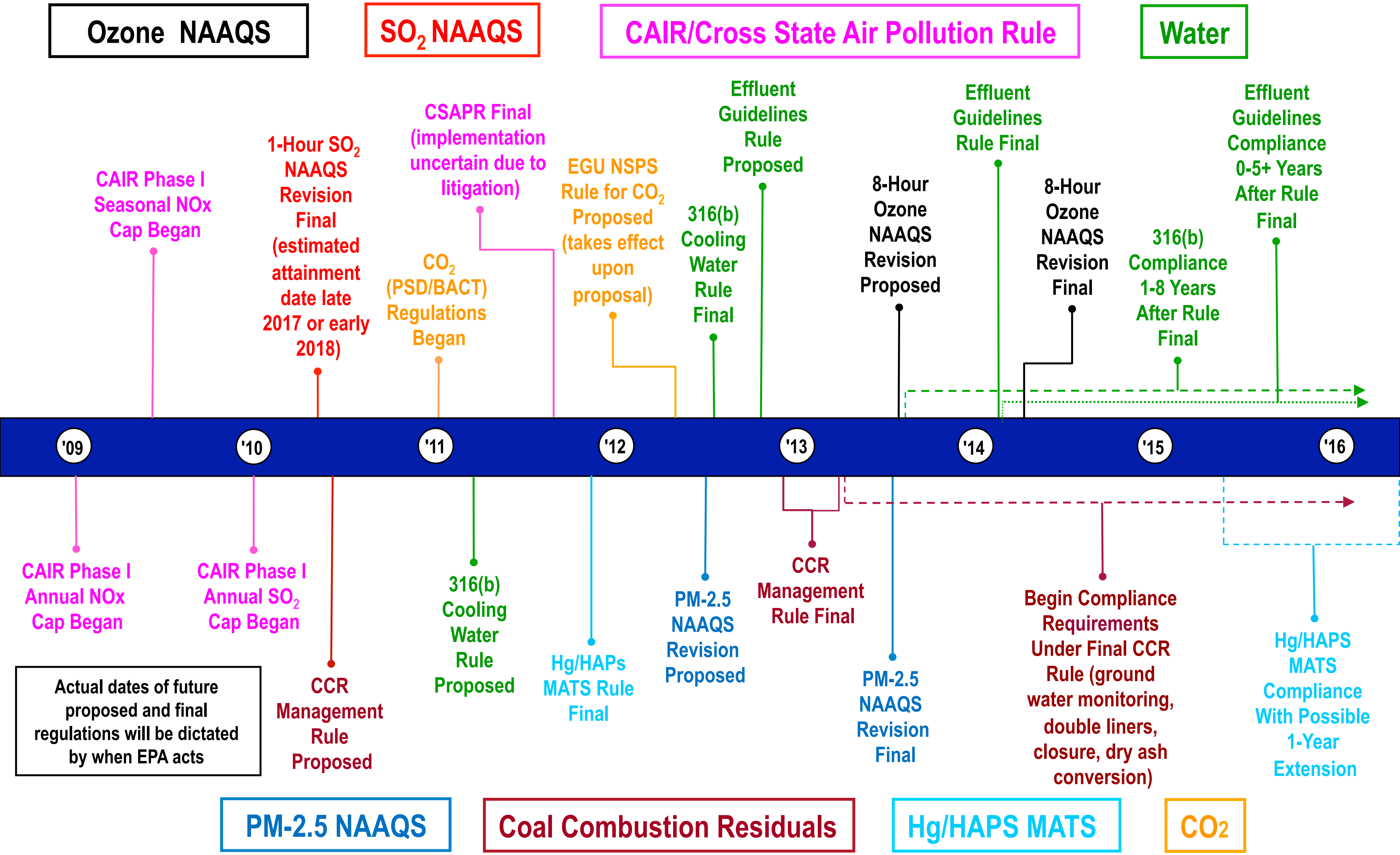
Duke Energy's Aging Coal Fleet

Duke Midwest	Oper. Year	MWs	Duke Carolinas	Oper. Year	MWs	Legacy Progress	Oper. Year	MWs
Cayuga	1970/72	1,005	Allen	1957/61	1127	Crystal River	1966/84	2340
Conesville	1973	312	Belews Creek	1974/75	2220	Asheville	1964/71	383
East Bend	1981	414	Buck	1953	256	Lee Steam	1951/1962	417
Gallagher	1958/61	280	Cliffside	1972	556	Mayo	1983	748
Gibson	1975/82	2,845	Lee	1951/59	370	Roxboro	1966/68	1038
Stuart	1970/74	927	Marshall	1965/70	2078	Weatherspoon	1949/52	117
Killen	1982	205	Riverbend	1952/54	454	H B Robinson	1960	179
Miami Fort	1949/78	883						
Wabash River	1953/68	668						
Beckjord	1952/69	862						
Zimmer	1991	605						

Average Coal Fleet Age = 45 years

Increasing and Uncertain Environmental Regulation "Environmental Train-Wreck"

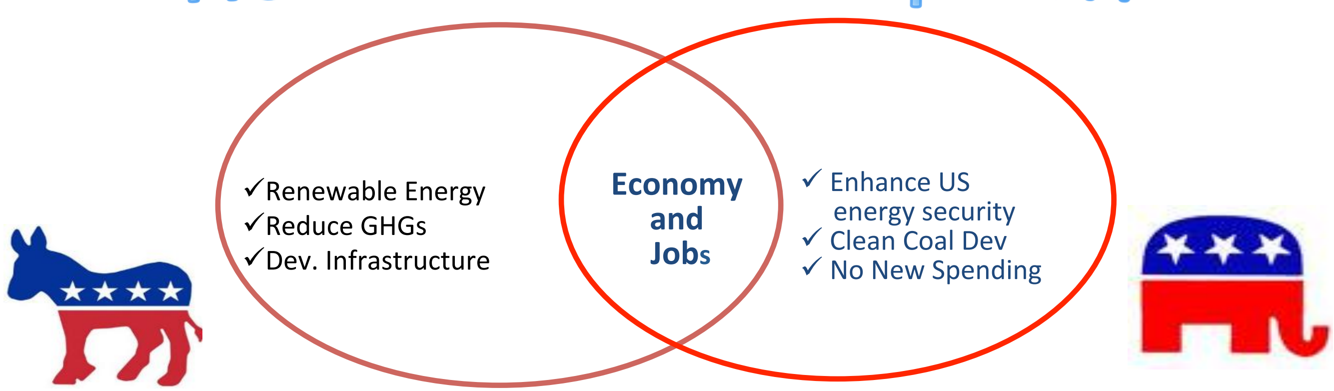
Duke Energy



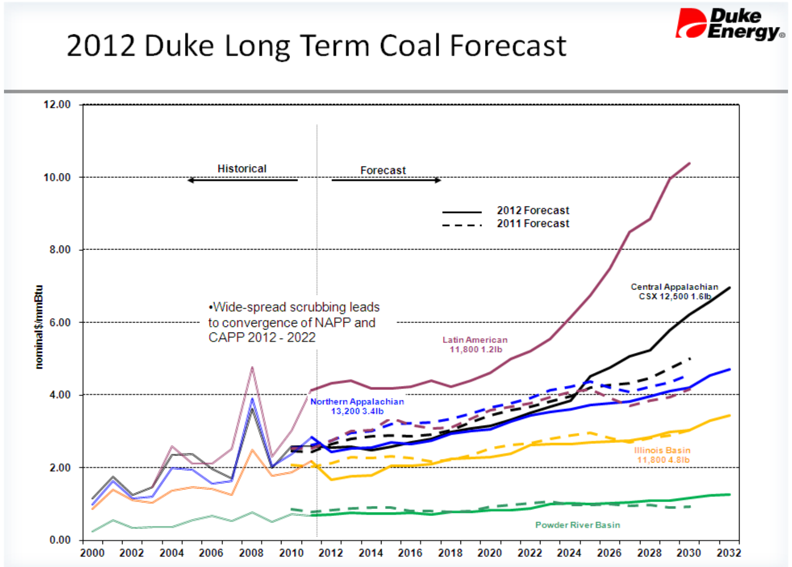
No Clear Direction on CO2

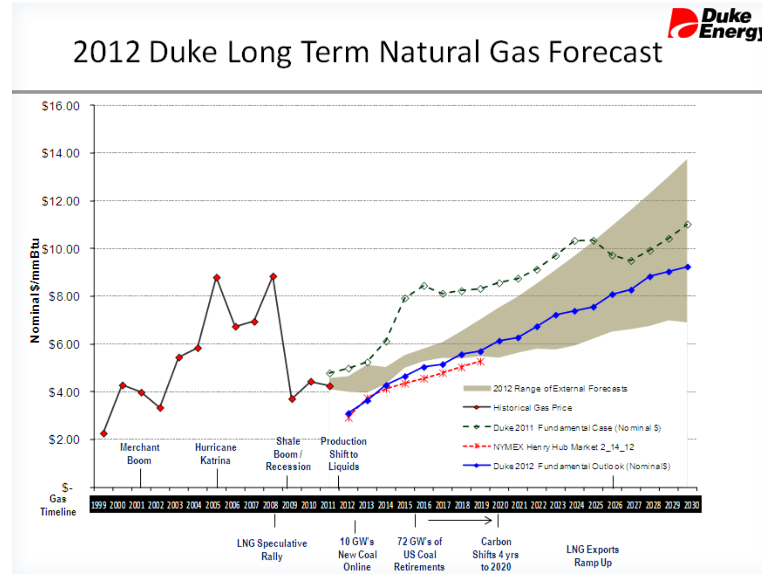
- No likelihood of significant action until 2013 or beyond
  - 2011 mid-term elections altered the balance of power
    - Republicans control over the House
    - Democrats reduced majority in the Senate, Moderate D's are key
  - Job creation and deficit reduction are of paramount importance
  - No political traction for GHG (CO_2) emissions controls in the US
  - Some Senate exploration of Clean Energy Standard & incremental CCS bill

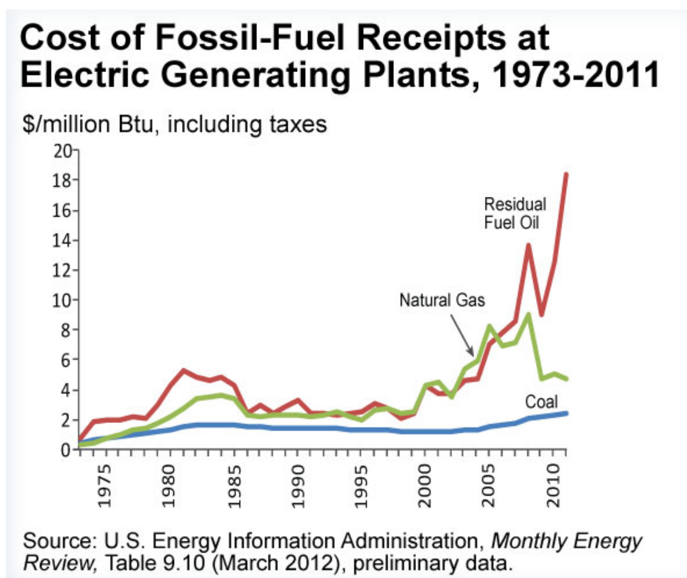
Presidential Election Impact???



Shale Gas Alters Competitive Economics







**Note: Actual pricing may be materially different from these estimates based on market impacts

Our Aspirations

- **De-carbonize our power generation**

- **Help make our communities the most energy efficient in the world**

*“We need to be ready to meet ever-higher environmental standards, to **embrace the latest technologies and to forge new partnerships—around the corner and around the globe**.”*

Jim Rogers

Chairman, President and CEO

Uncertainty Around CO2

LEGAL

Liability

- Identify and assess potential risks associated with long term storage of CO_2
- Define operations, pre-closure verification period, and post closure risk obligations and structure

Property Rights

- Identify how pore space will be addressed

PERMITTING

Regulatory questions

- A new Class VI permit was created by USEPA for CO_2 injection wells under the Underground Injection Well program (Safe Water Drinking Act)

Identify requirements

- Site selection and characterization
- Monitoring, measurement and verification
- Financial assurances

EDUCATION

Stakeholder education

- Customers
- Employees
- Media
- Public
- Regulators and other federal, state and local government officials
- Shareholders

Without a price on carbon, it is very difficult to justify large investments in CCSU technology development in the US

Beyond CCS—Potential CO_2 Uses

- **Integrated Circuits, or Chips -** CO_2 usage can eliminate million gallons of wastewater and thousands of gallons of corrosive hazardous materials.
- **Chemical processes:** CO_2 can be used to replace sulfuric acid in alkaline water to control pH levels.
- **Enhanced oil recovery**: CO_2 is pumped into an oil well, it is partially dissolved into the oil, rendering it less viscous. Considerably more oil can be extracted using this process.
- **Greenhouses:** Have shown that by using CO_2 production yields can increase by 20%.
- **Carbonation:** CO_2 gas is used to carbonate soft drinks, beers and wine and to prevent fungal and bacterial growth. CO_2 can also be used to displace air during canning.
- **Algae:** Value added products from CO2 recycling.
- **Working fluid:** Working fluid for energy storage or combustion turbines

Demonstration of Post-Combustion CO_2 Capture

Duke Energy®

Gibson Station

Feasibility study to remove 1M tons of CO_2 per year based on Huaneng's carbon capture technology

Storage Study

Studying the geologic storage potential for captured CO_2 from Gibson

Edwardsport IGCC

Edwardsport and Huaneng's GreenGen IGCC "lessons learned" proposal to share operational experience and best practices related to IGCC

CO_2 Utilization
East Bend Microalgae Development

Duke Energy

With University of Kentucky and ENN

APPENDIX

Central Plant Technology Strategy

Key Objectives

- Understand emerging trends and potential impacts.
- Identify and pursue portfolio of opportunities to reduce operational and environmental risk.
- Leverage and extend corporate central plant assets. Maintain balanced generation portfolio – Coal, Gas, Nuclear, Hydro, Renewables.
- Reduce environmental footprint of our generating fleet.

Key Focus Areas

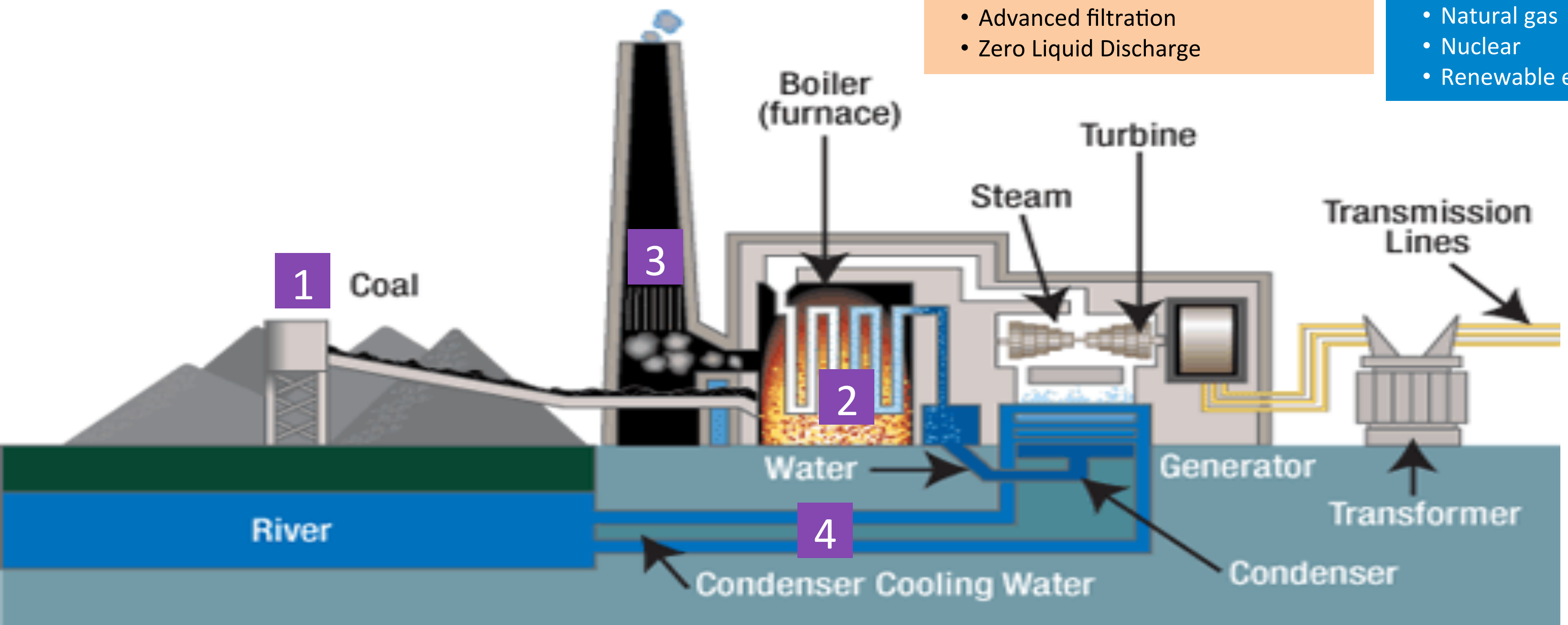
1. Pre-Combustion
- Environmental controls used to process and clean the fuel or air intake prior to entering the boiler for combustion
- Pre-combustion mercury control and coal cleaning to reduce metals from FGD effluent

2. Combustion
- Improved combustion processes that reduce CO_2, NOx, sulfur and particulate emissions

3. Post-Combustion
- Environmental controls used to remove pollutants from flue gas stream; CCS and algae technologies
- Environmental controls used to remove heavy metals from FGD effluent
  - Chemical / Biological / Physical treatment
  - Advanced filtration
  - Zero Liquid Discharge

4. Water Management
- Reduction and reuse of water throughout cooling water process
  - Waste water reuse
  - Cooling technologies

5. New Generation
- Maintain balanced portfolio
  - Coal
  - Natural gas
  - Nuclear
  - Renewable energy



Central Plant: Achievements

Technology Development & Testing

- Economic evaluation of potential Duke sites for compressed air storage
- Linked LP Amina with Duke SMEs for pulverizer modifications to reduce emissions and improve efficiency
- Evaluation of high-temp, gas-cooled, small modular reactors

Technology Transfer

- Business unit collaboration:
  - Air Products' Ion Transport Membrane Oxygen Program
  - Alstom's Chilled Ammonia CCS
- East Bend Algae Phase 1: Submitted case study for the Global Electricity Initiative in Durban climate talks.
- Supported nuclear job shadow program with Chinese partners

Industry Leadership

- Co-authored the User Design Basis Specification for IGCC with EPRI
- Advanced Research Projects Agency – Energy program participation
- Clean Energy Research Center (CERC) participation
  - East Bend Algae Project with ENN
  - Gibson Carbon Capture Study with Huaneng
  - Edwardsport IGCC Knowledge Transfer with Huaneng's IGCC

Central Plant: Achievements

Technology Development & Testing

- Execute East Bend Phase II algae project
- Participate in Water Research Center at Southern's Plant Bowen
- Continue to support business units to meet potential environmental requirements through monitoring of industry collaborations and technology developments
- Participate with Algal Biomass Organization (ABO) to advance commercial markets on algae by-products

Technology Transfer

- Review ETO's role with the generation organizations
  - Visiting generation facilities' management staffs to gain improved collaboration with our generation customers
  - Highlight opportunities that improve efficiency, availability, auxiliary power reductions, resource utilization, and EH&S
- New project process involvement for major projects

Industry Leadership

- Post-Combustion CO_2 Capture feasibility analysis at Gibson
- Engaging in DOE's Carbon Sequestration Regional Partnerships
- Monitor and shape CCS technology development through global partnerships

Environmental Regulation Will Drive Capital Allocation

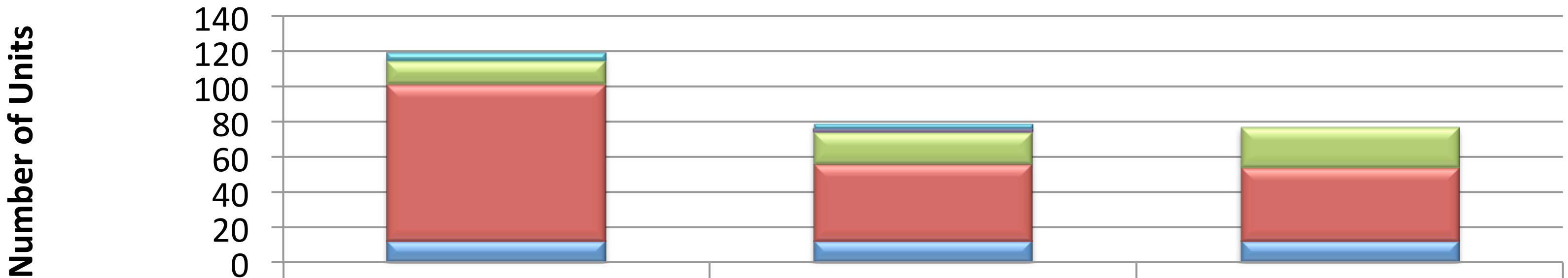
Project	Number	Time Frame
Major SCR Installations	3	2014-2016
Precipitator Upgrades	4	2014-2018
FGD Upgrade	1	2017
Natural Gas Conversion	2	2013

Latest Planning View 2012

**Note: Actual compliance costs incurred may be materially different from these estimates, based on market impacts and/or the requirements of the final EPA regulations

And Will Impact Asset Mix

Projected Duke Fleet Evolution 2011 – 2020



	2011	2016	2020
Oil	5	3	0
Converted Gas	0	2	0
CC	13	18	23
Coal	89	44	42
Nuclear	12	12	12

Retirements in association with new generation	~2,900 MW
Capacity anticipated to be uneconomical to retrofit	~2,800 MW
Capacity still under evaluation for controls	~900 MW
TOTAL	**~6,600 MW**

→ Vs. 4,700 MW of New Generation

**Note: Actual compliance costs incurred and MW to be retired may be materially different from these estimates based on market impacts and/or the requirements of the final EPA regulations