How Natural Gas-Fired Generation Can Meet America's Evolving Power Needs

Gregory C. Staple
Chief Executive Officer
American Clean Skies Foundation
750 First Street, N.E. – Suite 1100
Washington, D.C. 20002
Tel: 202.682.6294 – gstaple@cleanskies.org

Washington Energy Summit – Powering Cities of the Future
Ronald Reagan Building, Washington, D.C. – September 28, 2011

American Clean Skies Foundation

ACSF: Founded in 2007; Washington, D.C. 501(c)(3)

Mission: Promote energy independence and a cleaner environment through expanded use of natural gas, renewables and conservation

Activities:

- Media Sponsor – energyNOW! – a weekly 30 minute TV news magazine on America's energy challenges. On Bloomberg TV (Sat. and Sun.) and WJLA (ABC-Ch.7) in Washington. Online at: www.energynow.com
- Policy Program – A "Think" and "Do" Tank:

  Active in EPA and FERC proceedings. Sponsor of conferences and reports.

Outline of Presentation

- Power generation at a cross roads
- The opportunity for natural gas
  - Substituting gas for coal
  - Pairing gas and renewables
- Repurposing legacy power plant sites

Power Generation At A Crossroads

- New EPA clean air and water rules
- Carbon limits
- A post-Fukushima world
- Renewable mandates
- Efficiency and uncertain demand

What Should Power Companies Do?

"[N]ature and technology have generously coincided to provide a great blessing – a clean, competitive, and inexpensive windfall – natural gas. [It] allows the energy market to work and technologies to compete without introducing new market distinctions."

John Rowe, Chairman and CEO Exelon Corporation –
CERAWeek, Houston – March 9, 2011

Yes, Gas is Hot

Source: General Electric

The Opportunity For Natural Gas

- Substituting base load (CCGT plants) for non-compliant coal plants
- Complementing renewable electricity generation
- Providing ancillary services – enhancing grid flexibility, storage

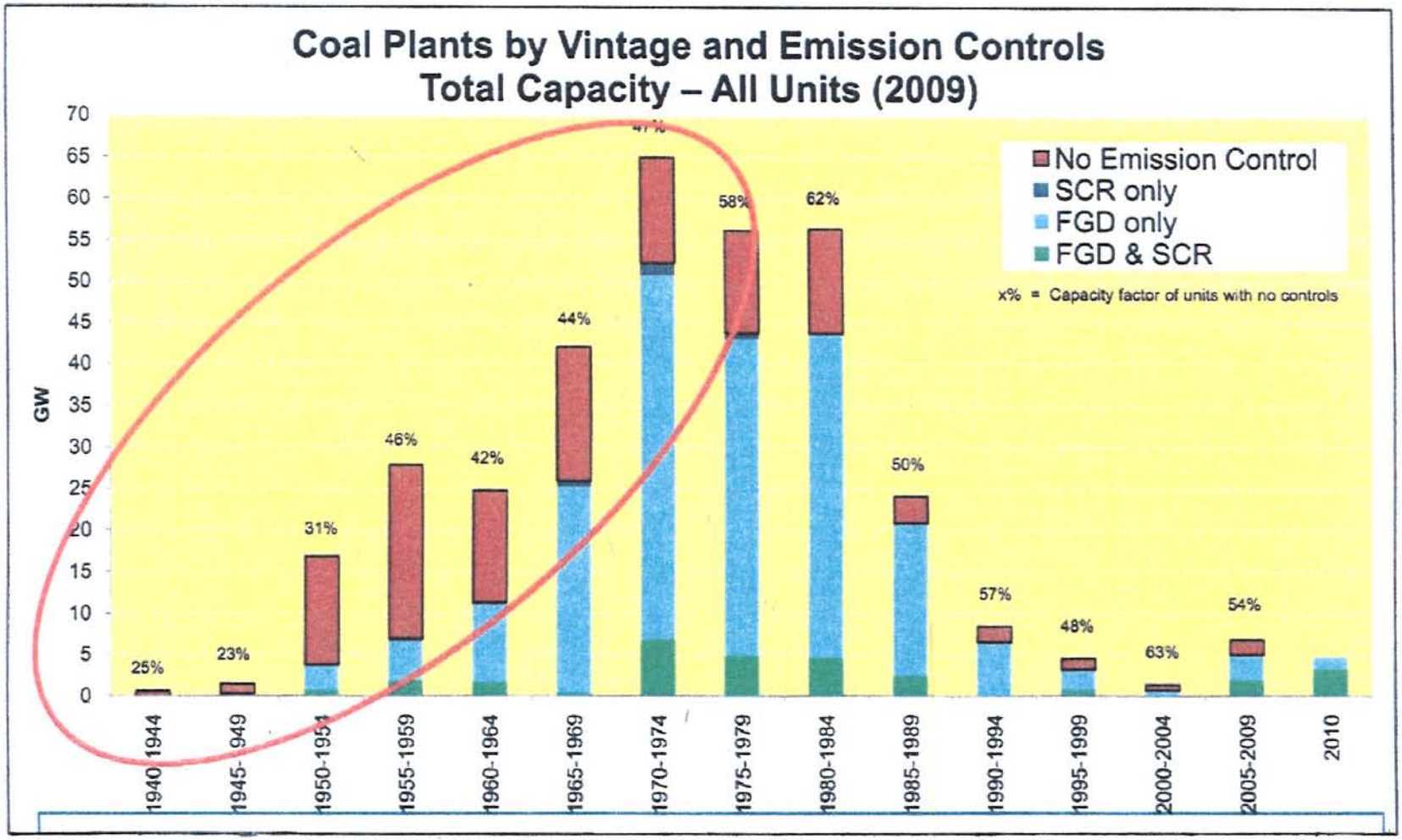
Coal Plant Retirement Estimates

Study	Low Estimate (GW)	Moderate Estimate (GW)	High Estimate (GW)
Bernstein Research		65	
Battle Group	40	66	
Charles River Associates	35		
Credit Suisse	35	60	103
Deutsche Bank		60	
MJ Bradley & Associates	30	60	
NERC	33	67	104

Note: Total U.S.-Coal Capacity is 314 GW (net Summer)

Source: ACSF Compilation

Older Plants Have Fewer Controls; Operate Less



Source: Analysis Group

Replacing Gas With Coal: How Much?

"There is sufficient surplus NGCC capacity to displace roughly one-third of U.S. coal fired generation reducing CO2 emissions for the power sector by 20% …. This will require an incremental 4 TcF per year of natural gas …"

The Future of Natural Gas (MIT, June 2011)

Coal Plant Retrofit Costs vs. Fuel Switching

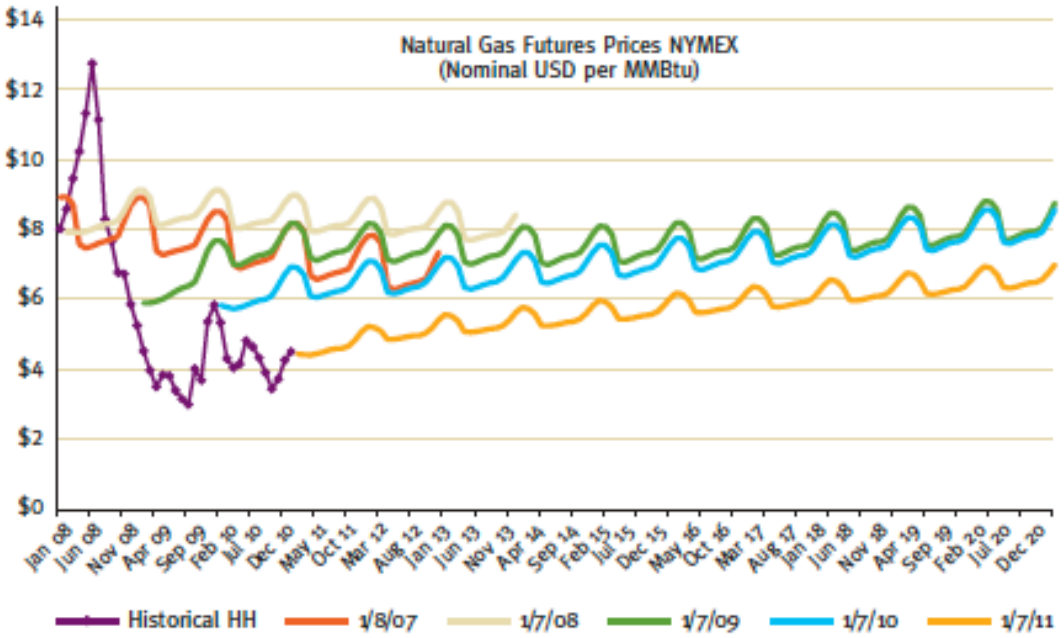
Retrofit Assumptions	Fuel Switching Breakeven Gas Price
Inexpensive – Dry Sorbent Injections (DSI) + selective non-catalytic reduction (SNCR)	$5/MM Btu (or less)
Baseline – Scrubbers + Selective Catalytic Reduction (SCR)	$6 MM Btu (or less)
Expensive – Scrubbers + SCR + ash control + cooling towers	$7 MM Btu (or less)

Assumes average heat rate for non-compliant coal units is 11,750 Btu/kWh and heat Rate for substituted gas-fired CCGT units is 7,500 Btu/kWh

Source: Joel N. Swisher, "The Business Case For Integrating Clean Energy Resources to Replace Coal," (ACSF, June 2011)

Substituting Gas: Fuel Supply & Price

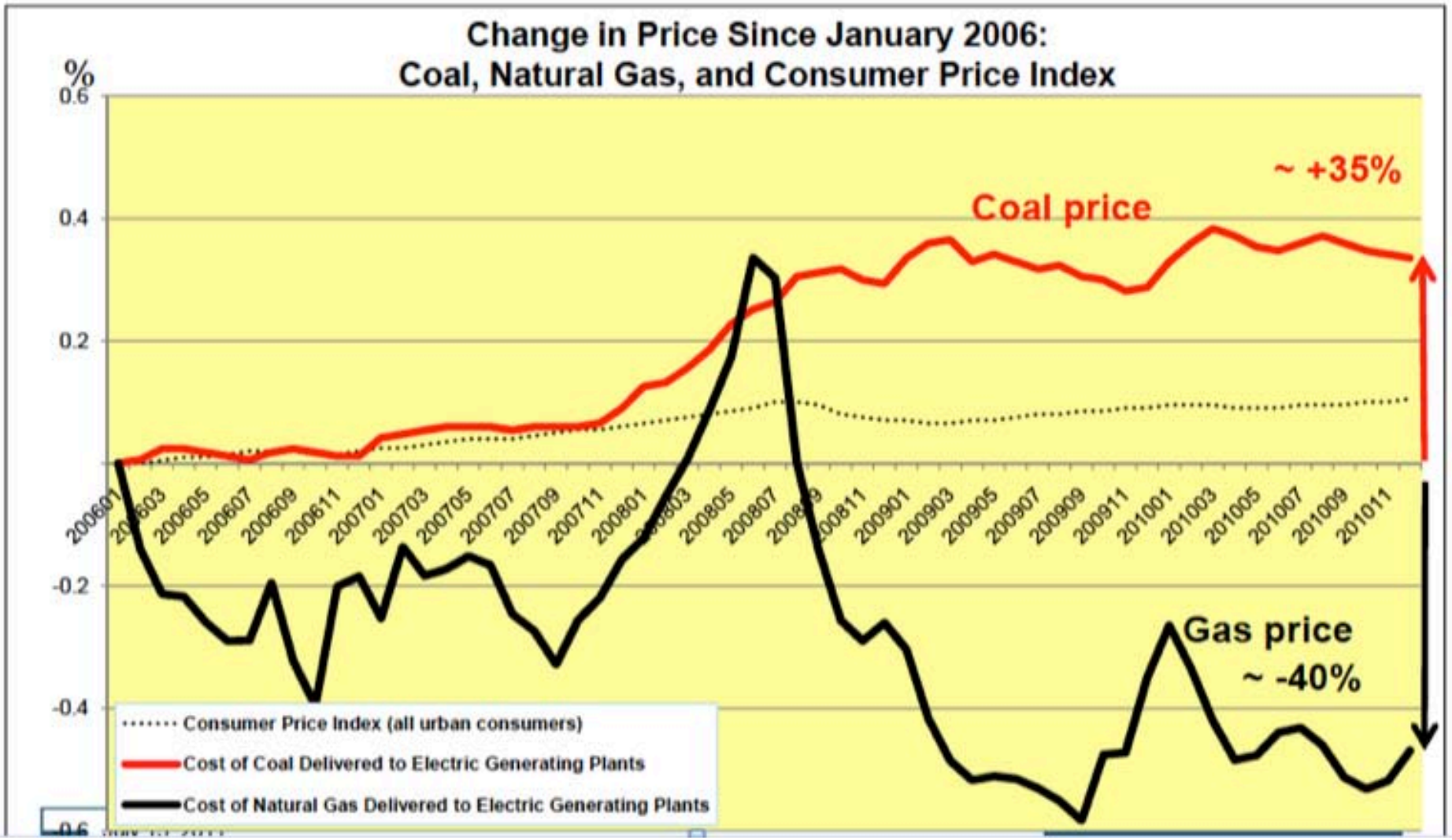
Figure 1. Natural Gas Futures Prices - 2008 to 2010



Note: Henry Hub (HH), Louisiana, is a major production area delivery point in the gas industry. The NYMEX Natural Gas Futures contract uses the Henry Hub price as the reference price.

Source: New York Mercantile Exchange.

Gas and Coal Prices Are Diverging



Source: EIA Data and Analysis Group

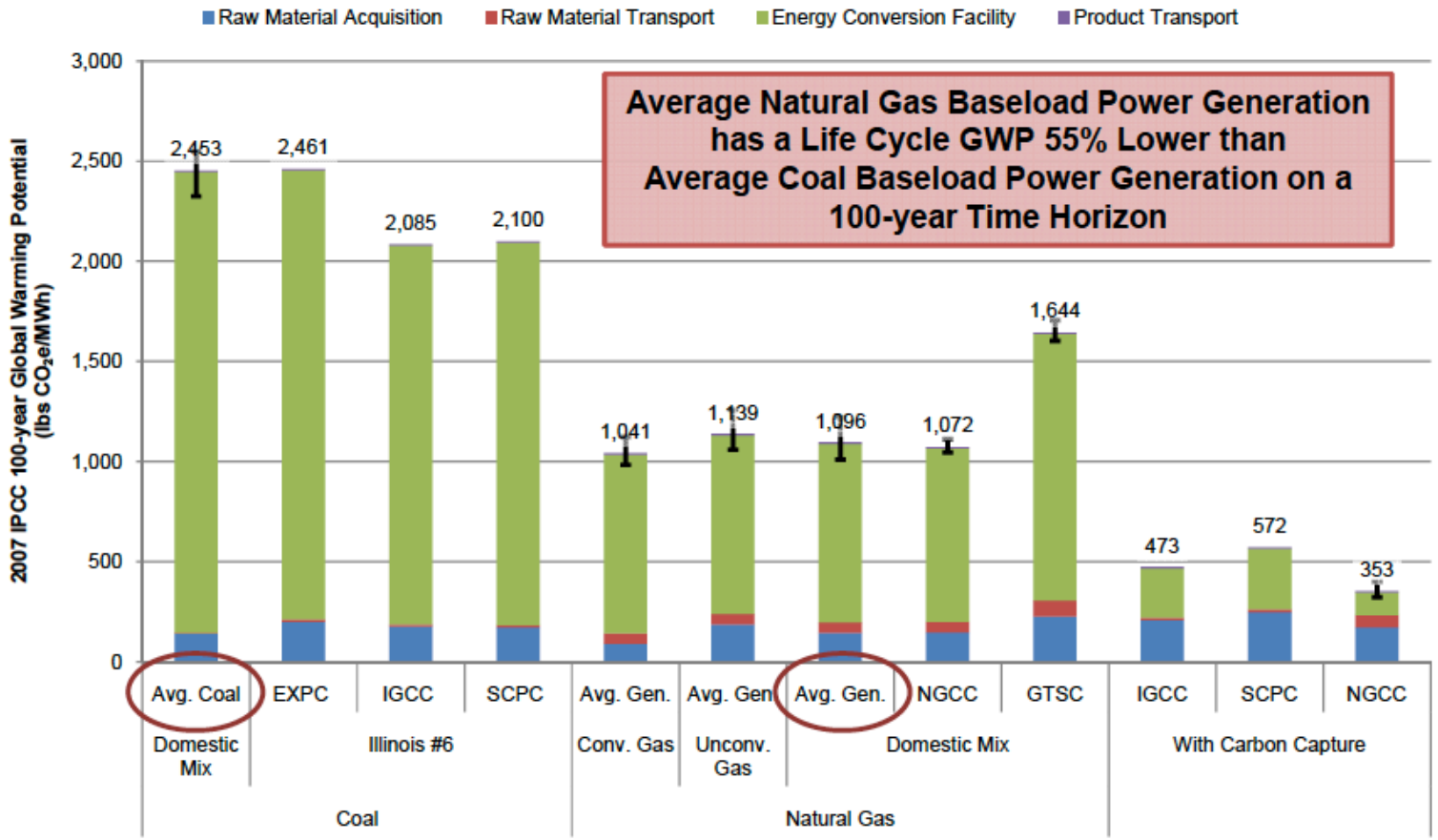
What About GHG Emissions?

Using a fuel cycle comparison (upstream and downstream emissions), on average, gas-fired generation emits at least 50% less GHGs than coal fired generations.

Sources: MIT, NERC, Staple & Swisher "The Climate Impact of Natural Gas and Coal-Fired Electricity: A Review of Fuel Chain Emissions Based on Updated EPA National Inventory Data," (ACSF, May 2010)

Comparison of Power Generation Technology Life Cycle GHG Footprints

Raw Material Acquisition thru Delivery to End Customer (lb CO_2e/MWh)



Note: EXPC, IGCC, SCPC, and NGCC (combustion) results, with and without CCS, are based on scenario specific modeling parameters; not industry average data.

Source: "Life Cycle Greenhouse Gas Analysis of Natural Gas Extraction & Delivery in the United States," Timothy J. Skone, Office of Strategic Energy Analysis and Planning, DOE (May 23, 2011)

What About The Other 50% (of CO_2)?

- Save the date: November 4, 2011
- ACSF, Washington, D.C. Leadership Forum on Carbon Capture & Storage For Natural Gas-Fired Power Plants

  An invitation only conference for power generators, technology vendors, R&D professionals, environmental groups and the government
- Industry sponsorship opportunities are still available

Renewables Need Flexible, Gas-fired Generation for Firming and Ramping

- High penetrations of coal and nuclear steam plants reduce flexibility and increase RE integration problems
- Lack of flexibility can curtail RE generation or risk operational problems or costly shut-downs
- Growth of renewables requires increased gas capacity, supplemented by new transmission capacity and other ancillary services.

Promoting Cleaner Power & Healthier Air

Strategy:

- Speed up retirement of least efficient and dirtiest power plants by promoting positive site redevelopment models
- Get real estate, public health and community groups involved

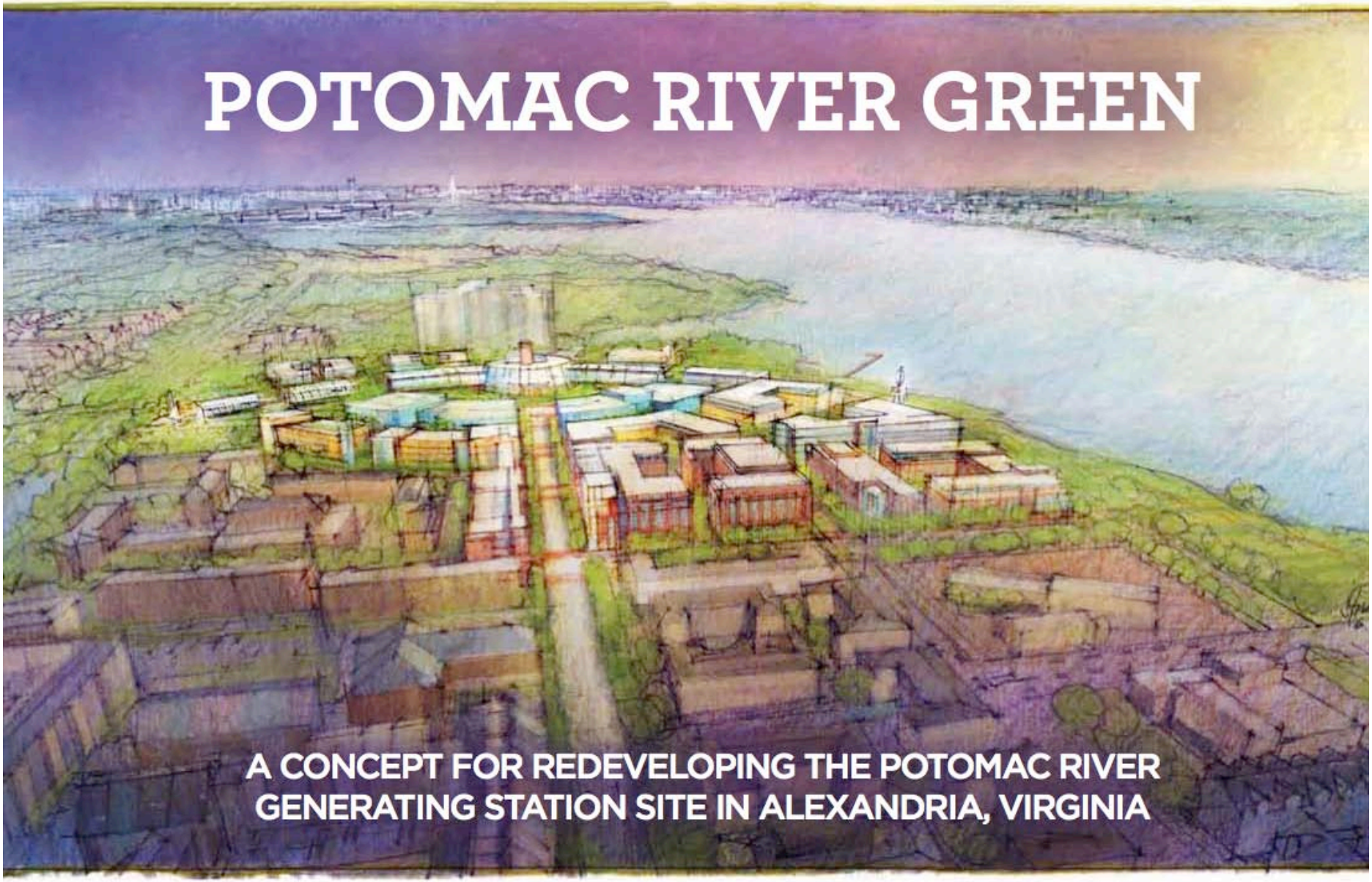
Promoting Cleaner Power & Healthier Air (cont'd)

First Steps -- August 2011:

- Report on national opportunities for repurposing old power plant sites
- Model, high-visibility redevelopment plan for the Potomac River Generating Station (PRGS) in Alexandria, VA

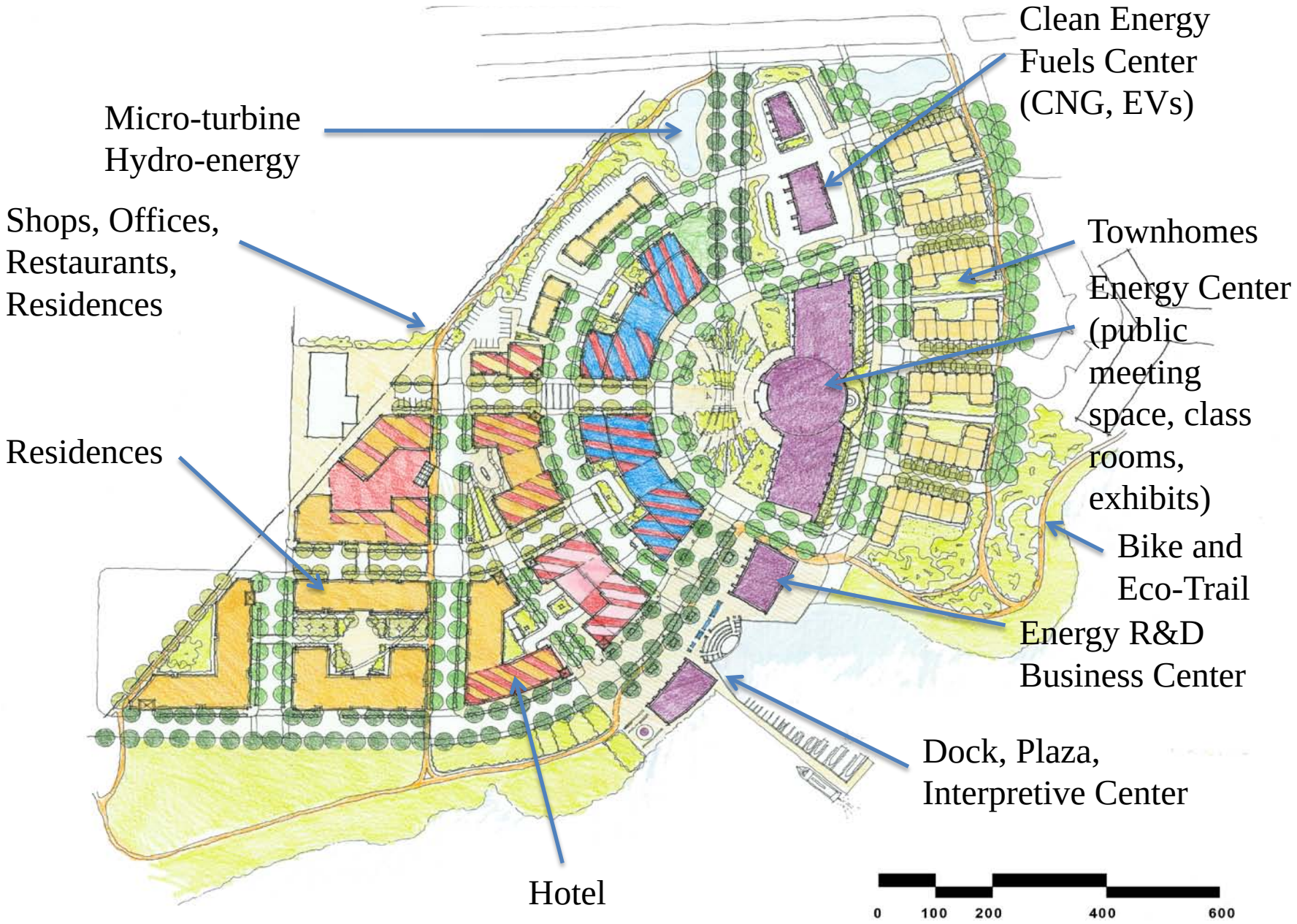
PRGS Today

PRGS Site Tomorrow



www.PotomacRiverGreen.com

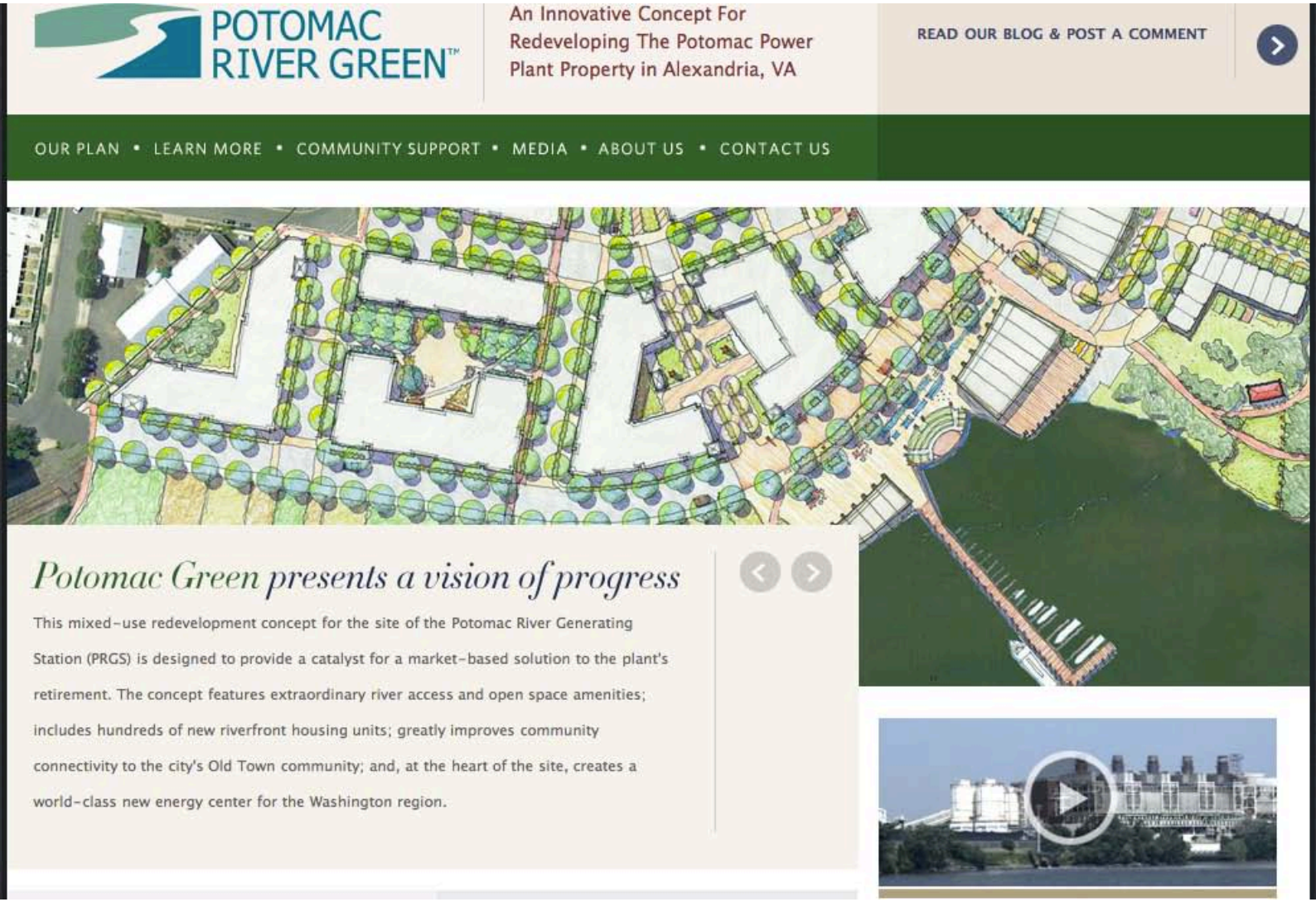
Potomac River Green Site Plan



Potomac River Green Overview

Recreation and Open Space	About 30% green space: waterfront park, central plaza, new trail system; water taxi dock and station; boat house
Residential Units	467 multi-family units, 96 townhouse units
Office and Retail	89,600 sq. ft. of office, 114,500 sq. ft. of retail and restaurants
Center For Energy Innovation	First in nation with hands-on exhibits and demonstration of energy past and future; auditorium, class rooms and space for community and nonprofit events; 63,000 sq. ft.
New Energy Enterprise Center	Green business and technology incubator with offices, support programs, and services for start-ups and mid-stage businesses
CNG/EV Refueling Station	Station access from GW Parkway for EVs and CNG fleet vehicles, taxis
Hotel	125-room boutique hotel

www.PotomacRiverGreen.com



A National Opportunity

- 15 – 20% of U.S. coal-fired power plants to be retired by 2020 due to economics and new EPA rules.
- 30 – 50 GW+ and 75+ plants, many in urban areas or riverfronts
- At least 20 sites may be good candidates for redevelopment

AMERICAN CLEAN SKIES FOUNDATION

REPURPOSING LEGACY POWER PLANTS

LESSONS FOR THE FUTURE









AMERICAN CLEAN SKIES FOUNDATION

750 1ST Street, NW, Suite 1100
Washington, D.C. 20002
T: 202-682-6294 | F: 202-682-3050
www.cleanskies.org