ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Siting Energy Facilities in New England: What, Why, Where, and How

Susan Tierney

Energy and Climate Forum

Tufts University – April 19, 2007

Overview of remarks

What – "Siting" defined

Why – What's "special" about energy facility siting?

Where – The context: New England's energy infrastructure

How – Best practices

Note:
The fact that this presentation focuses on energy facilities should not be interpreted as a comment on the region not needing substantial investment in and implementation of energy efficiency and other demand-side resources.
It does.

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The "What"– "Siting" defined

"Siting" – what's is all about

Private and public activities relating to planning, permitting, approvals for and construction of private energy facilities at particular sites

- **Private "siting" activities –**
  - **Tend to encompass:**
    - **Site selection processes for a particular technology type of interest to a particular developer (given its own business model)**
    - **Tends to balance a variety of issues relating to access to needed infrastructure, zoning, neighboring uses, cost, ease of environmental permitting, etc.**

"Siting" – what's is all about

Private and public activities relating to planning, permitting, approvals for and construction of private energy facilities at particular sites

- **Public "siting" activities –**
  - **Tend to encompass:**
    - **Reviews of facilities under special laws looking at need, cost, environmental impact, public benefit**
    - **Typically state jurisdiction (omnibus or permit-specific, sometimes preemptive over local approvals)**
    - **Sometimes federal jurisdiction (preemption and/or backstop)**

Underlying assumption of many energy facility siting issues:

The performance of the region's energy markets depends on the availability of adequate infrastructure.

- **Adequate generation capacity.**
- **Adequate transmission infrastructure.**
- **Adequate fuel-delivery systems – in particular, for natural gas.**
- **Adequate systems for "smart" use of the grid**
- **Delivery systems for energy efficiency services and installations.**

In the US most infrastructure is invested in by private actors:

- **Electric and gas utilities**
- **Independent project developers (e.g., wind projects, power plants, distributed generation units, LNG terminals, waste-to-energy facilities, etc.)**

Key drivers of siting energy projects

Market fundamentals

Capital markets

State and federal policies

Technology conditions

Since mid-1990s:

- **New power plants**
  - **In New England:**
    - **Gas-fired combined cycle power plants**
    - **Cogeneration facilities**
    - **Renewable resource projects (wind)**
    - **Distributed generation projects**
  - **Elsewhere:**
    - **Traditional coal-fired power plants**
    - **Coal gasification projects**
    - **New nuclear projects??**
- **Other energy facilities**
  - **High voltage electric lines (AC, DC)**
  - **Interstate gas pipelines**
  - **LNG facilities**

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The "Why" – What's special about energy facility siting?

Considerations in siting energy facilities

Numerous tensions resulting from such things as:

- **Localized impacts (typically negative) balanced against broader public interests (some positive, some negative)**
- **Complex permitting processes**
- **Regional energy markets v. state siting jurisdiction**
- **Countervailing policy pushes for different power technologies**
- **Cases of first impression**
- **Trade-offs of different kinds of environmental impact**

Energy facility siting laws

No "typical" approach across states, technology type

- **Many states have siting laws, many do not**
- **Some states treat energy facilities no differently than siting of other large infrastructure built by private developers (e.g., shopping centers, factories)**
- **Some states established siting laws after a big controversial fight over a proposed energy facility**
- **Some states have tied "energy facility siting" laws to the process of land taking for public purpose**
- **Some states have siting laws for large facilities**

Energy facility siting laws

- Federal jurisdiction versus state jurisdiction is idiosyncratic to history of different technologies, e.g.
  - **Natural Gas Act – federal preemption over interstate gas pipelines**
  - **Atomic Energy Act – federal preemption over nuclear reactors**
  - **Energy Policy Act of 2005 –**
    - **"clarified" federal preemption (by FERC) over on-shore LNG terminals**
    - **Established federal review authority over over-shore LNG terminals to Coast Guard (with ability of state to veto)**
    - **Established "back-stop" FERC authority over interstate electric transmission lines**

Environmental permitting – e.g., Massachusetts

	Federal	State	Local
Project Siting	•Endangered Species	•Energy Facilities siting Board •ACEC •Coastal Wetlands •Floodplain, Barrier Beach •Endangered Species •Underwater Arch •Historic Properties •Ocean Sanctuaries •Fisheries •Designated Port Area	•Municipal Harbor Plans •Local zoning
Site control	•FERC certificate of public convenience and necessity	• DTE certificate of public convenience and necessity	
Project Construction	•ACOE Dredging •ACOE Section 10/404 and 103 •NPDES Storm water	•MEPA •MA Wetlands Protection Act •Rivers Protection Act •Ch. 91 – Public Waterfront Act •Federal Consistency Review	•Building Codes
Project Operations	•NPDES - discharges •Section 401 Water Certification	•Water Management Act •Inter-basin Transfer Act •Hazardous materials •Clean Air Act	•Solid waste

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The "Where" – New England's energy infrastructure and systems

New England energy portfolio

New England's profile:

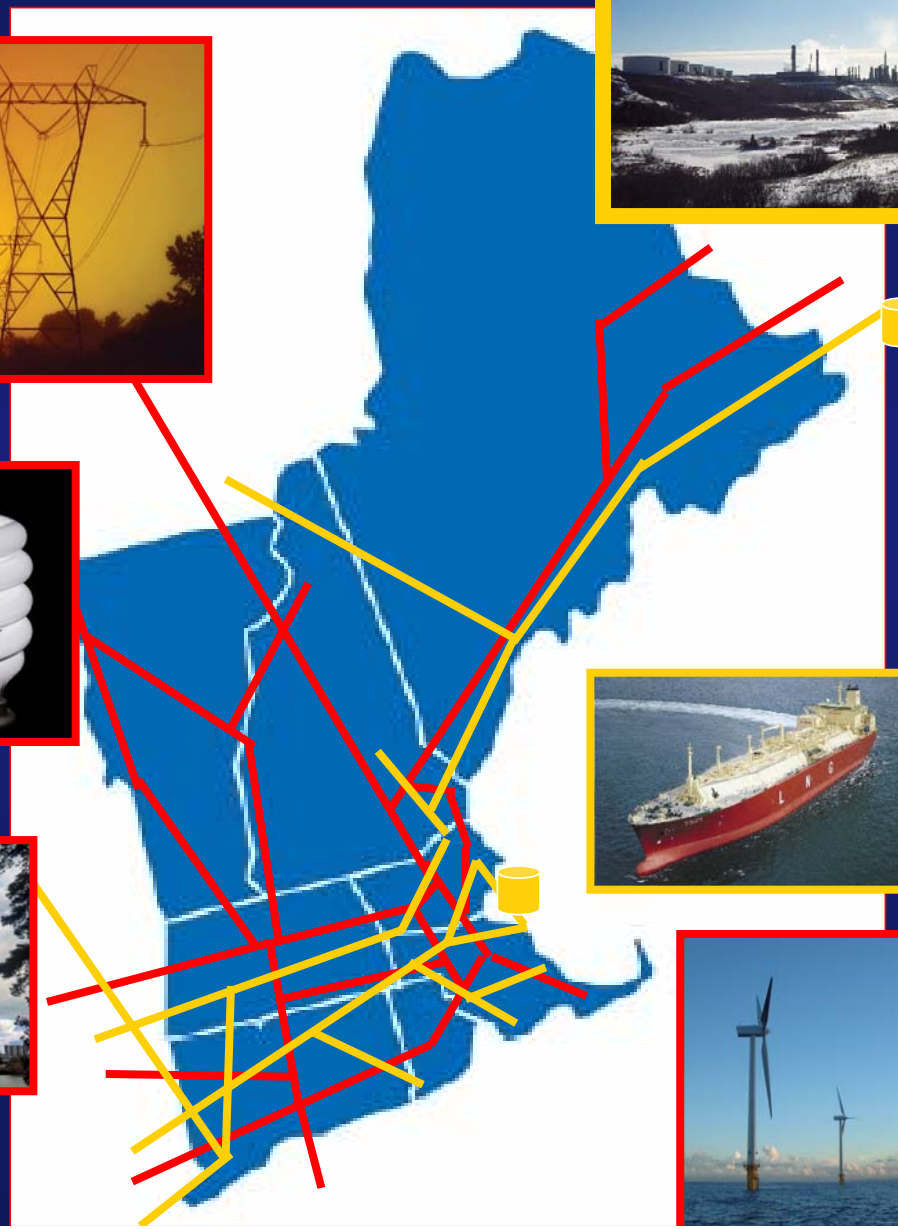
- **virtually no indigenous energy resources.**
- **at the end of the natural gas pipeline network.**
- **no oil refineries located in the region.**
- **2x dependent on home heating oil as rest of the nation.**
- **more nuclear and natural gas for power generation**
- **less coal and hydro**
- **electricity prices "set" by natural gas (in 85% of hours)**

NE is regularly hard hit by stresses on energy supply and delivery infrastructure, wherever they occur in the U.S.

New England's physical energy infrastructure

We import just about all of our energy supplies.

We have added considerable energy efficiency locally, but we still depend on a complex web of facilities.

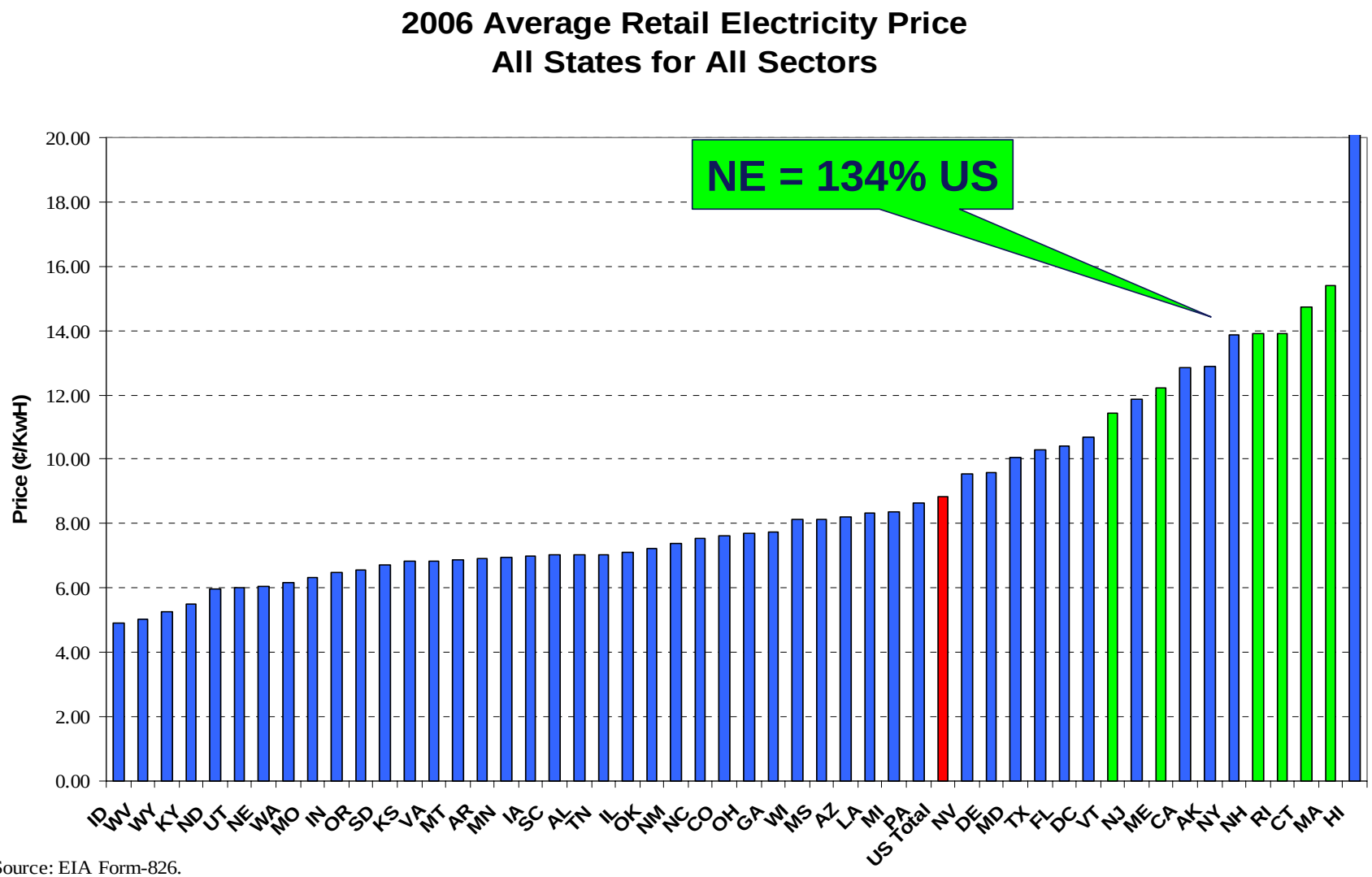


* Electric

* Natural Gas

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

NE has high electricity prices – 2006



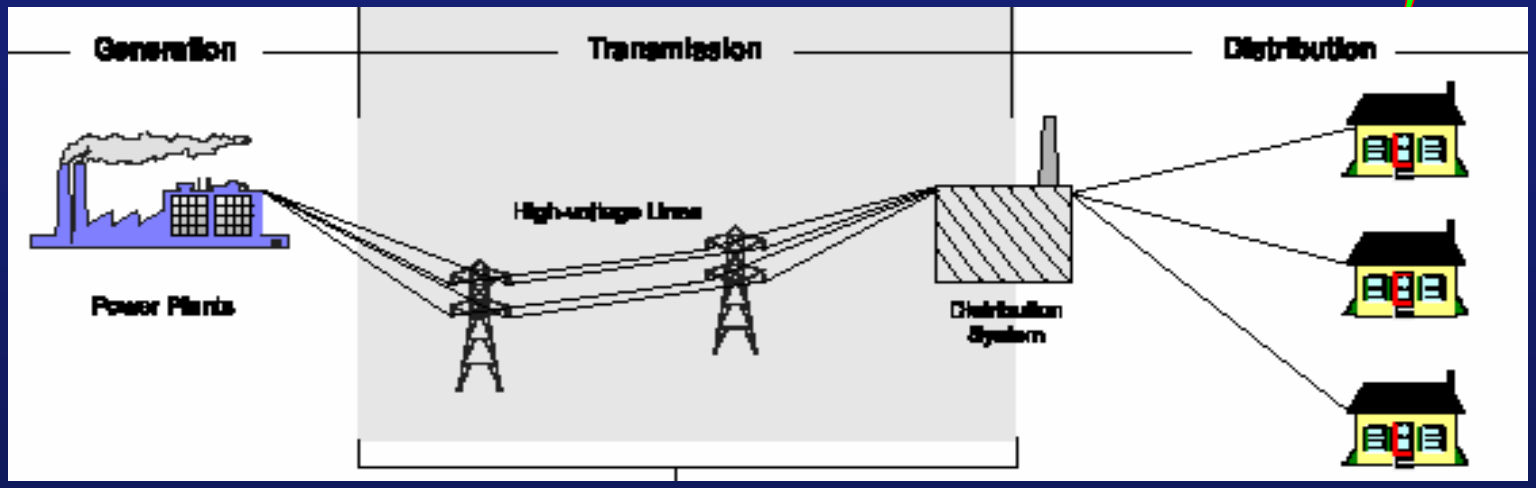
Source: EIA Form-826.

The U.S. Electric System

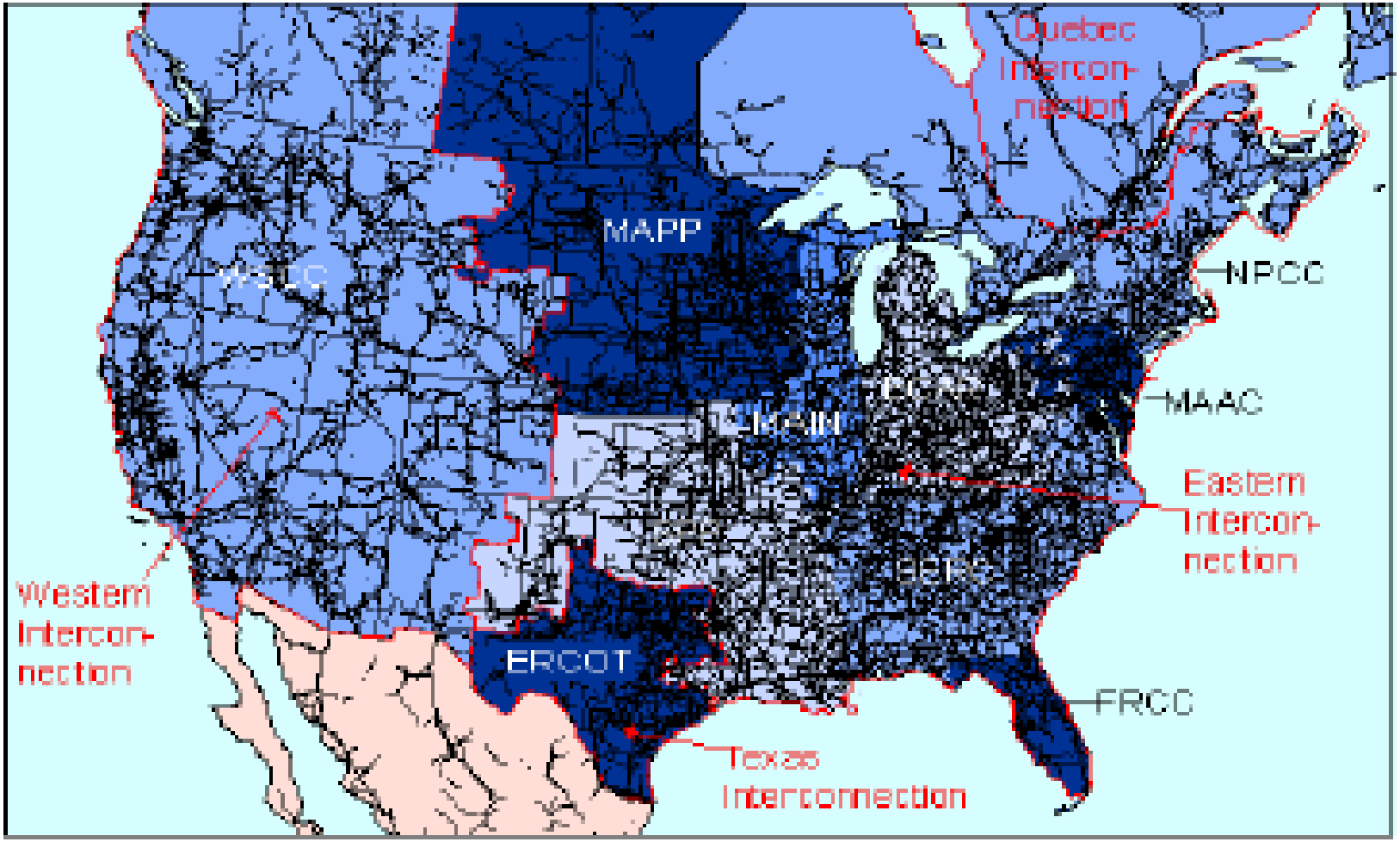
Plus: On-site meters and efficiency equipment

The power production supply chain:

- Historically, the electric industry's "functions" were vertically integrated under one company
  - Generation – produce power
  - Transmission – move it from power plants to local systems
  - Distribution – move it from transmission system to customers



High-Voltage Transmission Lines



EIA, Changing Structure of the Electric Industry, 1998.

Current N.E. Power Plants by Vintage & Type

Fuel Type	In-Service Date Prior to 1950		In-Service Date 1951 to 1970		In-Service Date 1971 to 1990		In-Service Date 1991 and After		Total	
	# of Units	MW	# of Units	MW	# of Units	MW	# of Units	MW	MW	Percent
Gas	0	0	0	0	0	0	24	6,378	6,378	20.6%
Dual fuel[b]	3	69	4	354	9	336	27	4,805	5,558	18.0%
Oil	7	26	63	2,486	32	4,966	7	60	7,538	24.4%
Nuclear	0	0	0	0	5	4,387	0	0	4,387	14.2%
Coal	0	0	14	2,592	2	256	0	0	2,848	9.2%
Pumped storage	1	29	0	0	3	1,643	0	0	1,672	5.4%
Hydro	65	877	8	316	159	411	49	58	1,663	5.4%
Miscellaneous[c]	0	0	0	0	81	656	33	240	896	2.9%
Totals[d]	79	996	89	5,748	238	12,655	140	11,540	30,940	100.0%
Percent of Total MW		3.2%		18.6%		41.2%		37.6%		

GAS

COAL, OIL, HYDRO

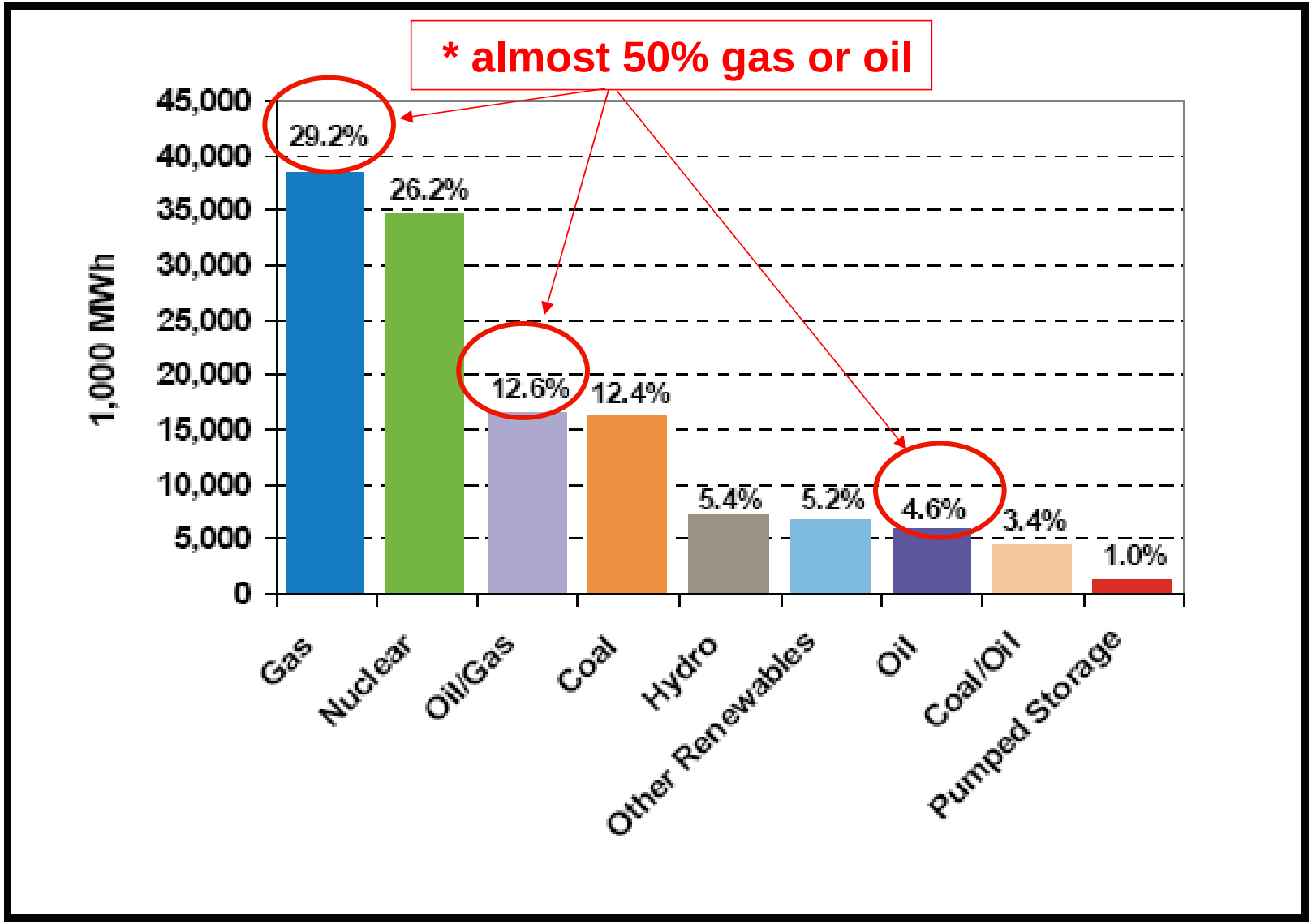
NUCLEAR and OIL

Additional 2300 MW retrofitted from Gas to dual fuel in past year

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

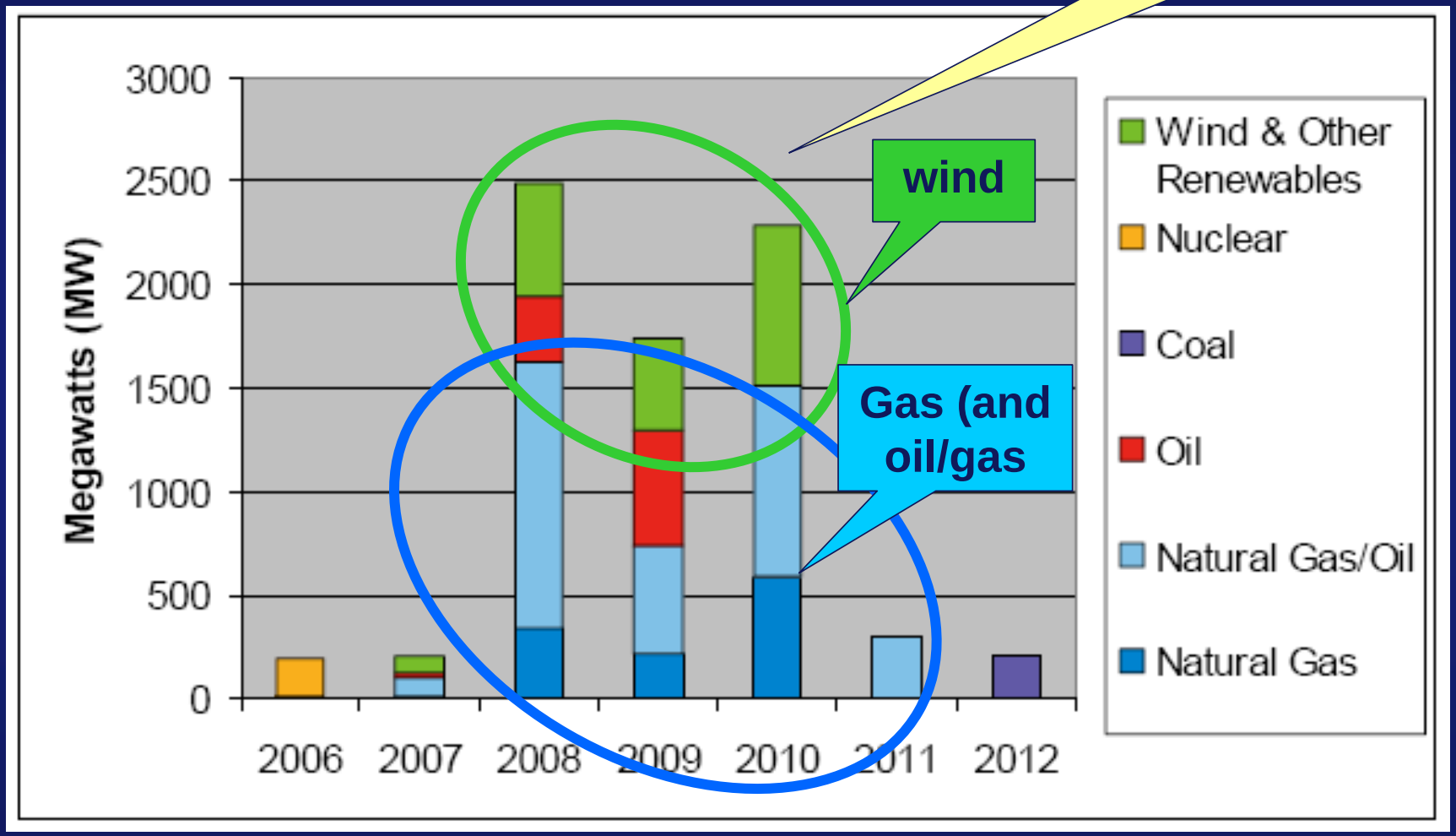
ISO-NE, Regional System Plan 2005 (RSP 05), Table 1.1(as of Summer 2005); ISO-NE, CELT Report, 2005; ISO-NE Capital Hill Briefing, December 2006.

N.E. electricity production (% by fuel – 2005)



ISO-NE, RSP06, Figure 6-2.

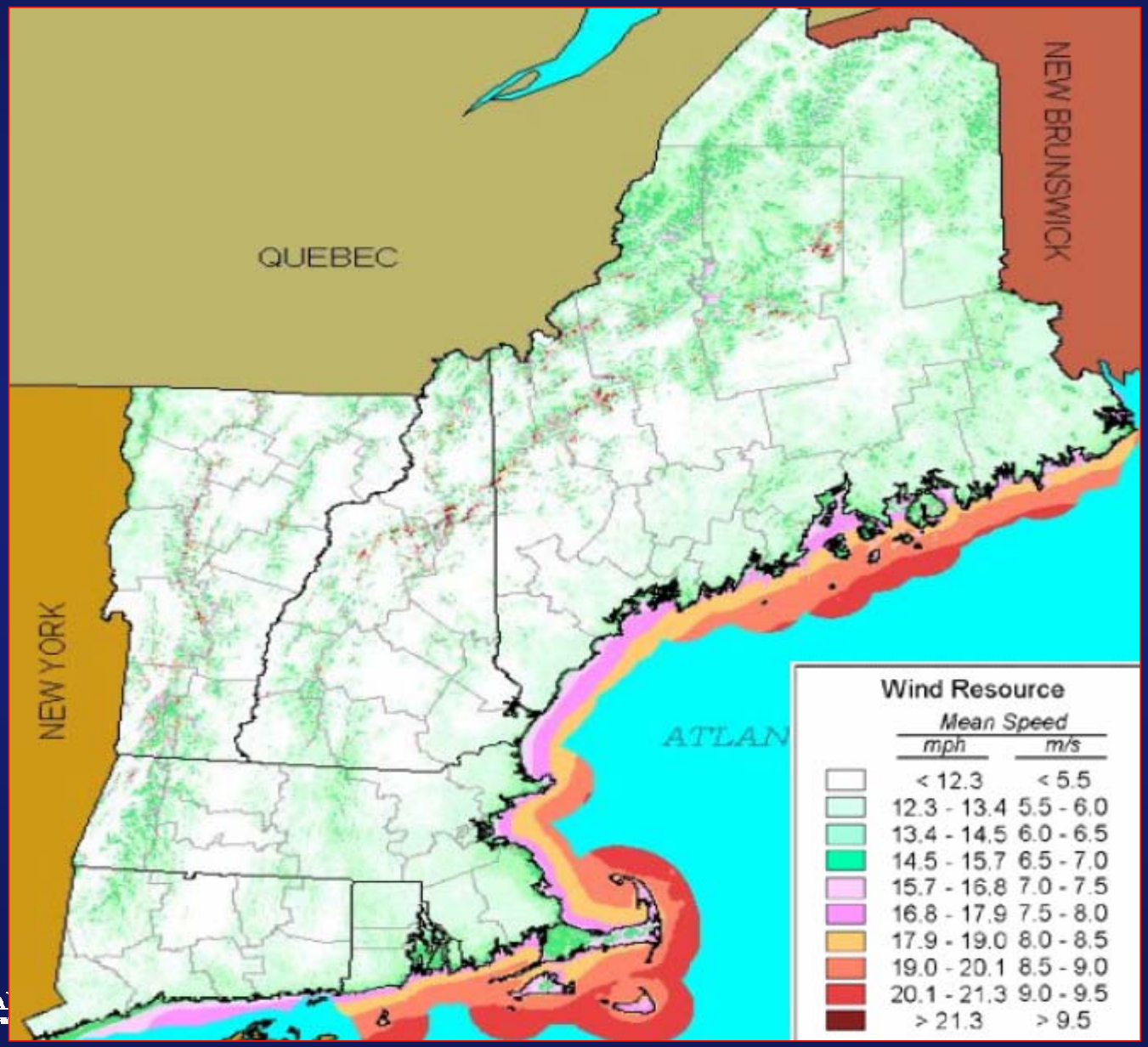
Power plant capacity on deck* (as of 12-2006)



* Proposed projects seeking interconnection studies

ISO-NE, Capital Hill Briefing, 12-2006.

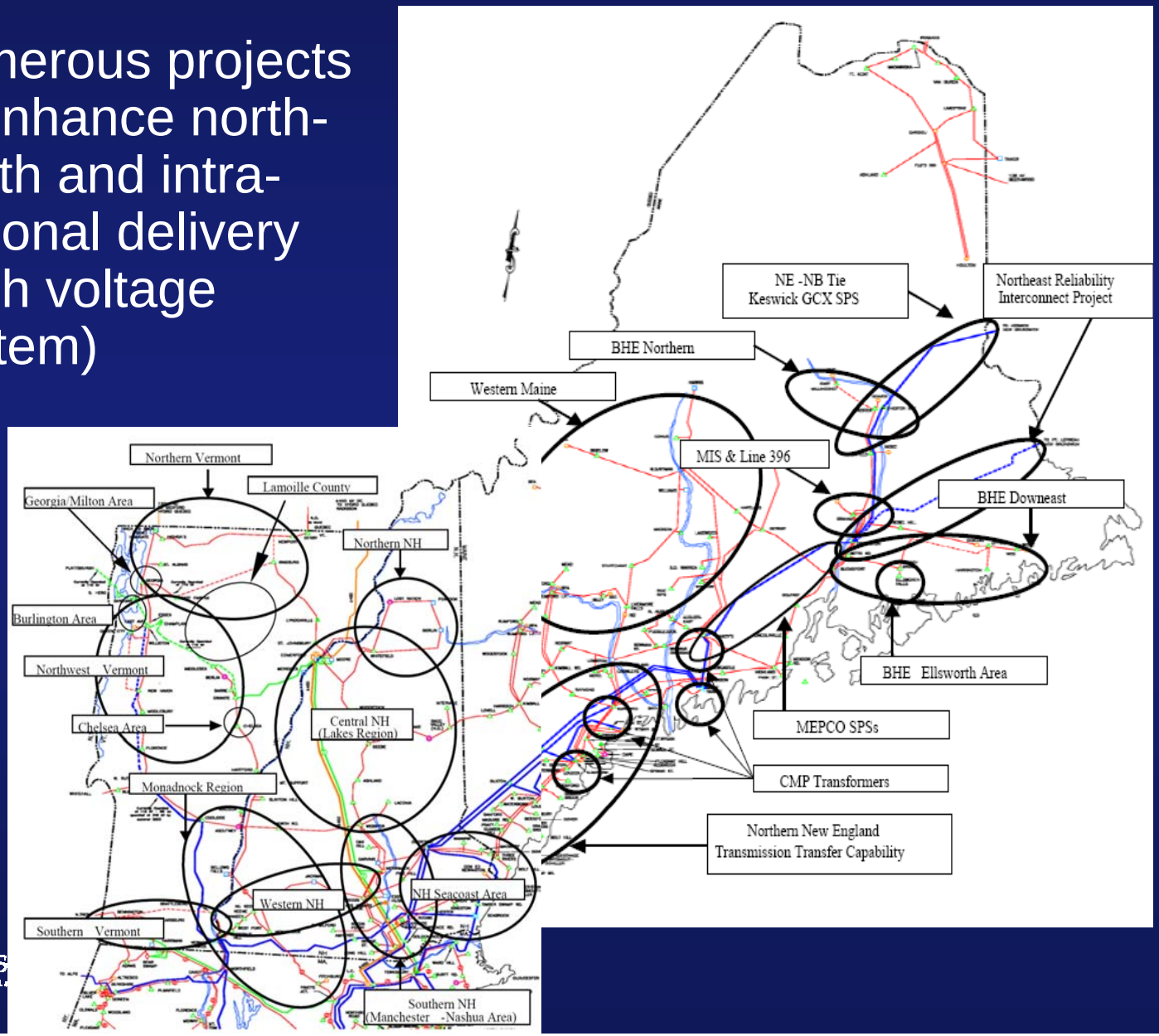
NE wind resources – the "potential"



ISO-NE, RSP05 Appendices

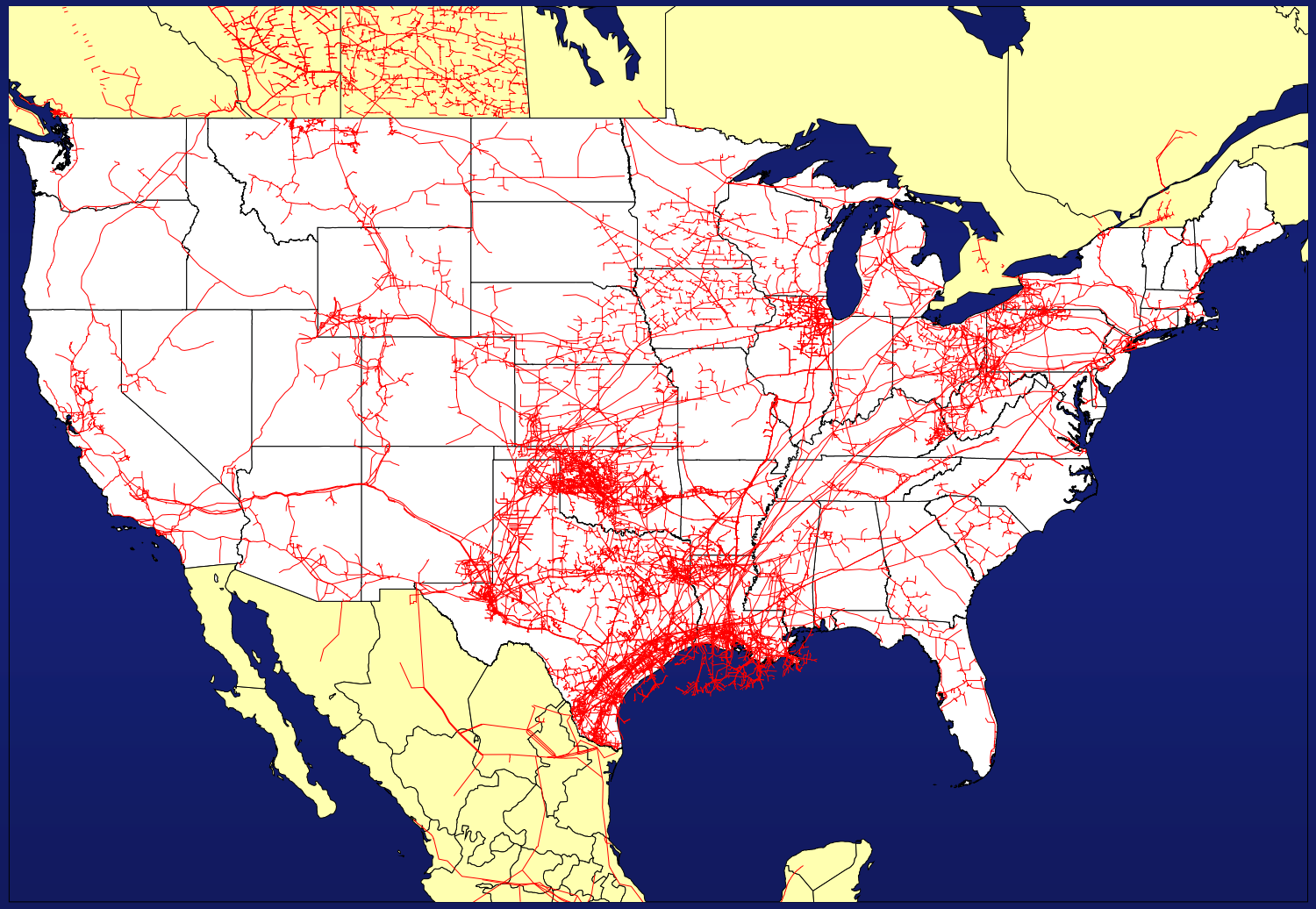
Electric delivery infrastructure plans

Numerous projects to enhance north-south and intra-regional delivery (high voltage system)



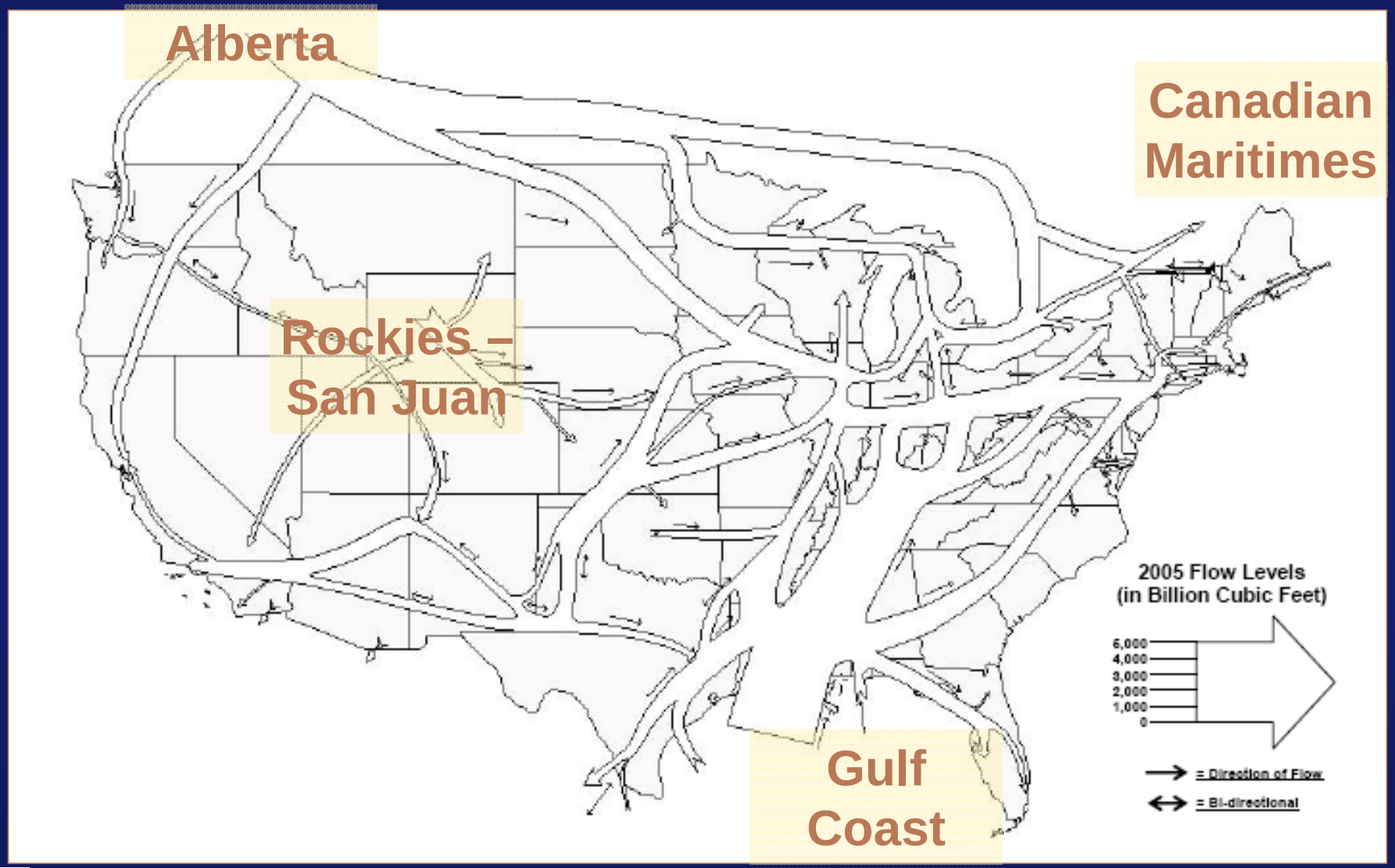
ISO-NE, RSP 2006

Gas Transmission Lines



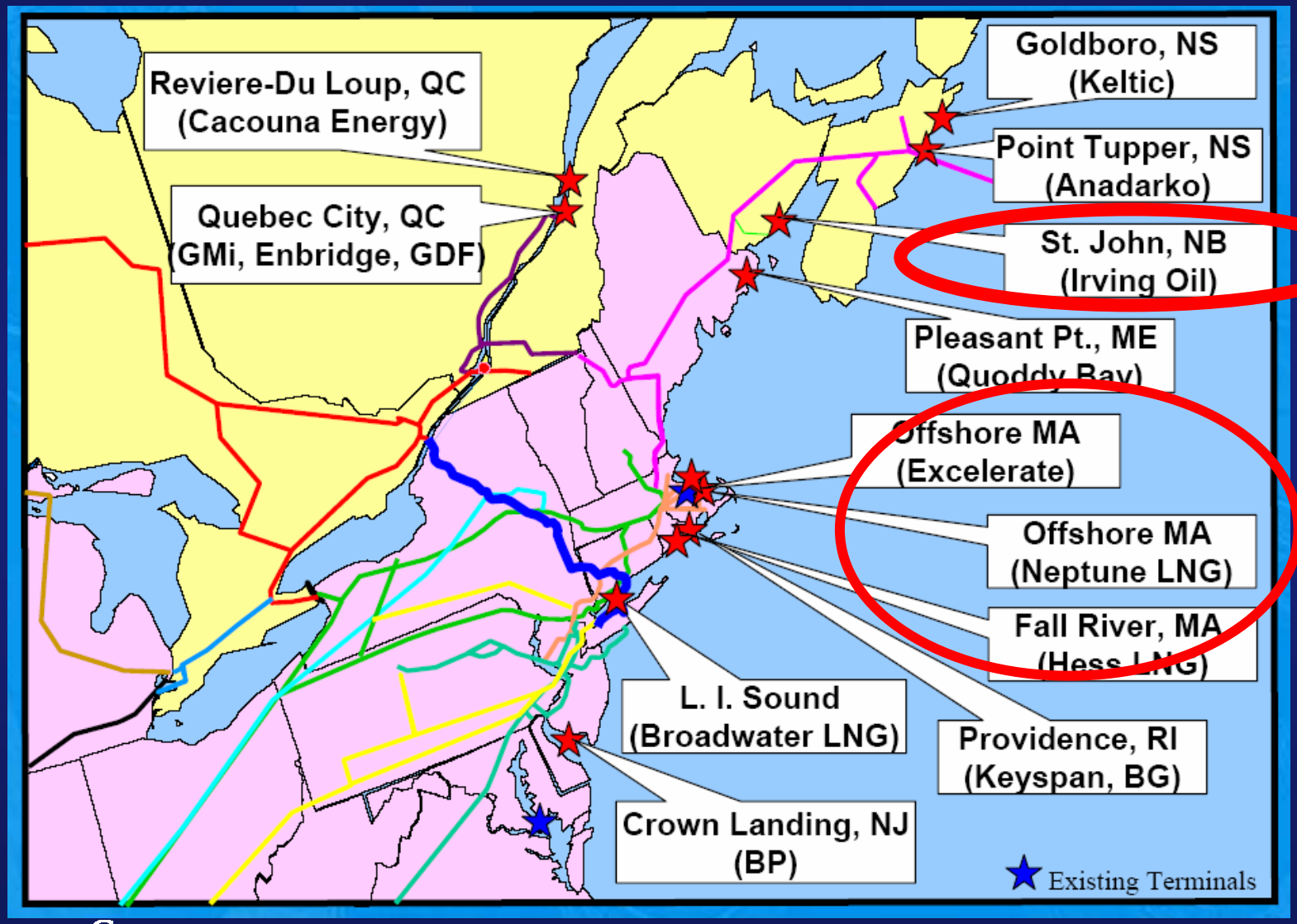
ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Natural gas flows



EIA, Natural Gas Annual, 2005

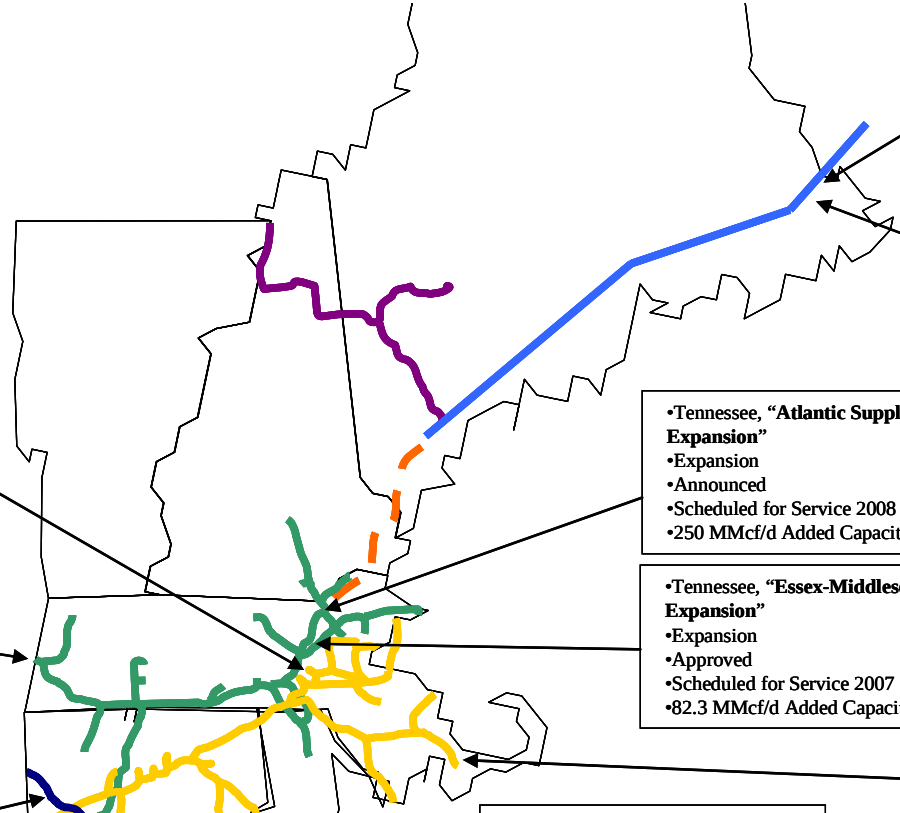
Northeast LNG facility proposals: A few will be approved, constructed?



ANALYSIS GROUP
economic, financial and strategy consultants

Vince Morrissette, Iroquois Gas Pipeline Company, Challenges Facing Natural Gas Infrastructure in the Northeast, NECA Natural Gas Conference, September 20, 2005, citing data from Ziff Energy Group.

Natural Gas Pipeline Projects Database as of November 15, 2006
Provided by Jim Tobin, Energy Information Agency



•M&NE, **"Phase IV Expansion"**
•Expansion
•Applied
•Scheduled for Service 2008
•420 MMcf/d Added Capacity

•M&NE, **"Phase V Expansion"**
•Expansion
•Applied (NEPA)
•Scheduled for Service 2009
•630 MMcf/d Added Capacity

•Algonquin, **"East-to-West Expansion"**
•Expansion
•Announced
•Scheduled for Service 2008
•1000 MMcf/d Added Capacity

•Tennessee, **"Atlantic Supply Expansion"**
•Expansion
•Announced
•Scheduled for Service 2008
•250 MMcf/d Added Capacity

•Tennessee, **"Northeast ConneXion New England"**
•Expansion
•Approved
•Scheduled for Service 2007
•110.3 MMcf/d Added Capacity

•Tennessee, **"Essex-Middlesex Expansion"**
•Expansion
•Approved
•Scheduled for Service 2007
•82.3 MMcf/d Added Capacity

•Iroquois, **"MarketAccess Expansion"**
•Expansion
•Applied
•Scheduled for Service 2008
•100 MMcf/d Added Capacity

•Algonquin, **"Cape Cod Lateral"**
•New Pipeline
•Approved
•Scheduled for Service 2007
•38 MMcf/d Added Capacity

•Algonquin, **"Islander East Upgrade"**
•Expansion
•Approved
•Scheduled for Service 2007
•280 MMcf/d Added Capacity

•Algonquin, **"Ramapo Expansion"**
•Expansion
•Applied
•Scheduled for Service 2008
•325 MMcf/d Added Capacity

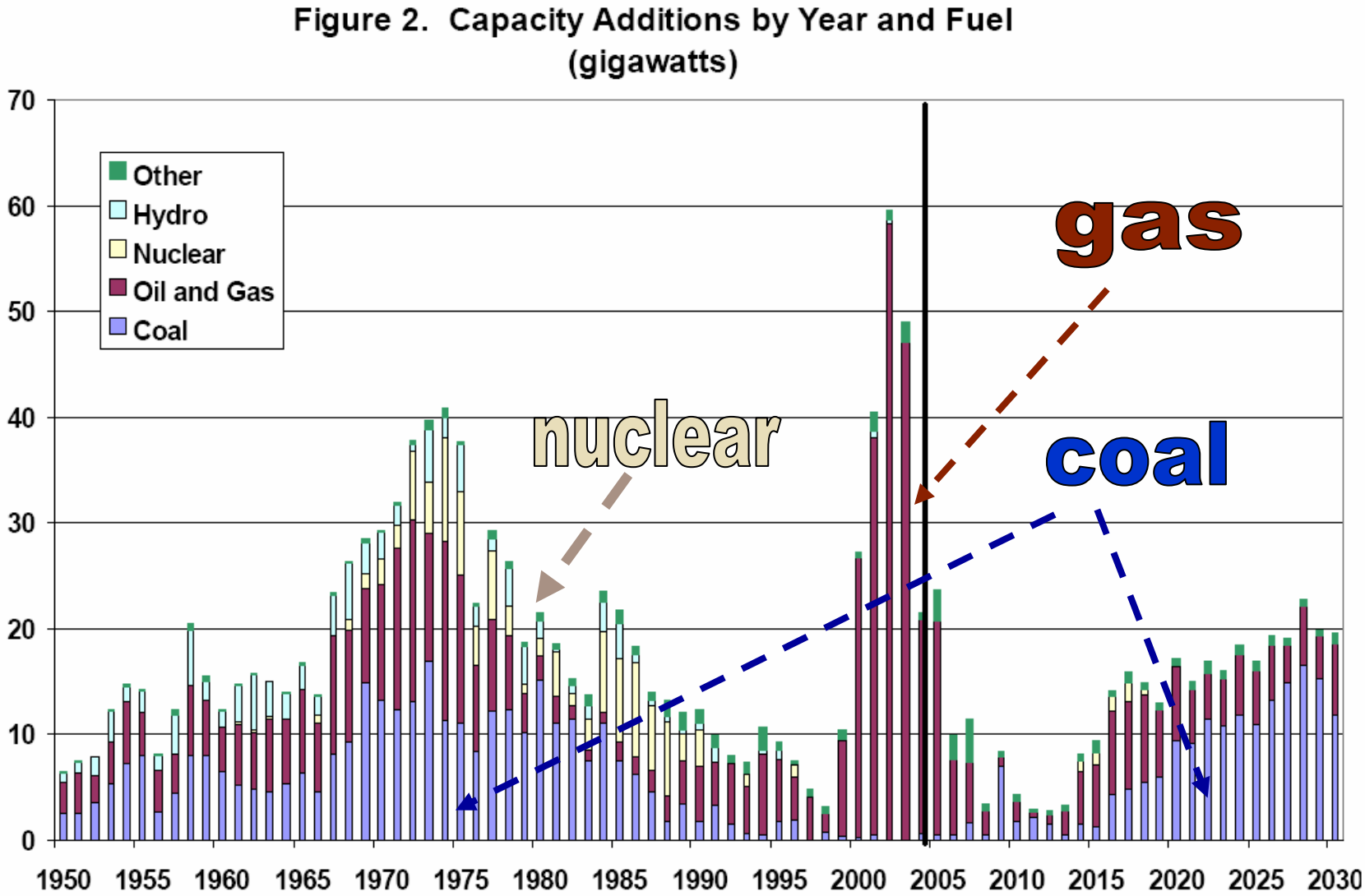
•Duke/KeySpan, **"Islander East"**
•New Pipeline
•Approved
•Scheduled for Service 2007
•250 MMcf/d Added Capacity

Notes: Excludes cancelled and other inactive pipeline proposals. All project locations are approximations.
Source: Information as of November 15, 2006 provided by Jim Tobin, Energy Information Administration.

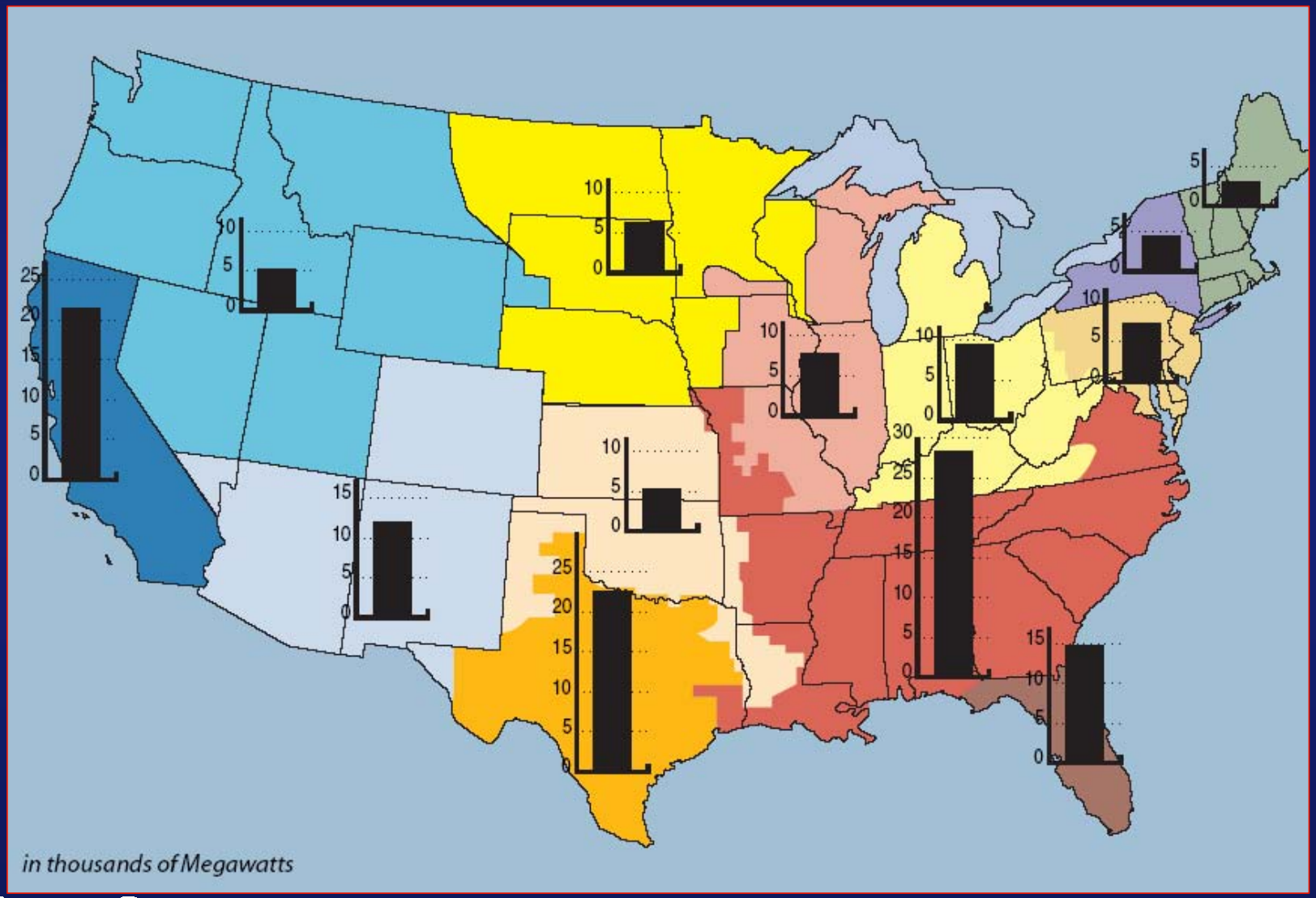
ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

More about the "Where" – A few words about the U.S.'s energy infrastructure and systems

EIA – Generating Capacity Additions: History and Outlook: "Fuel of the Decade"



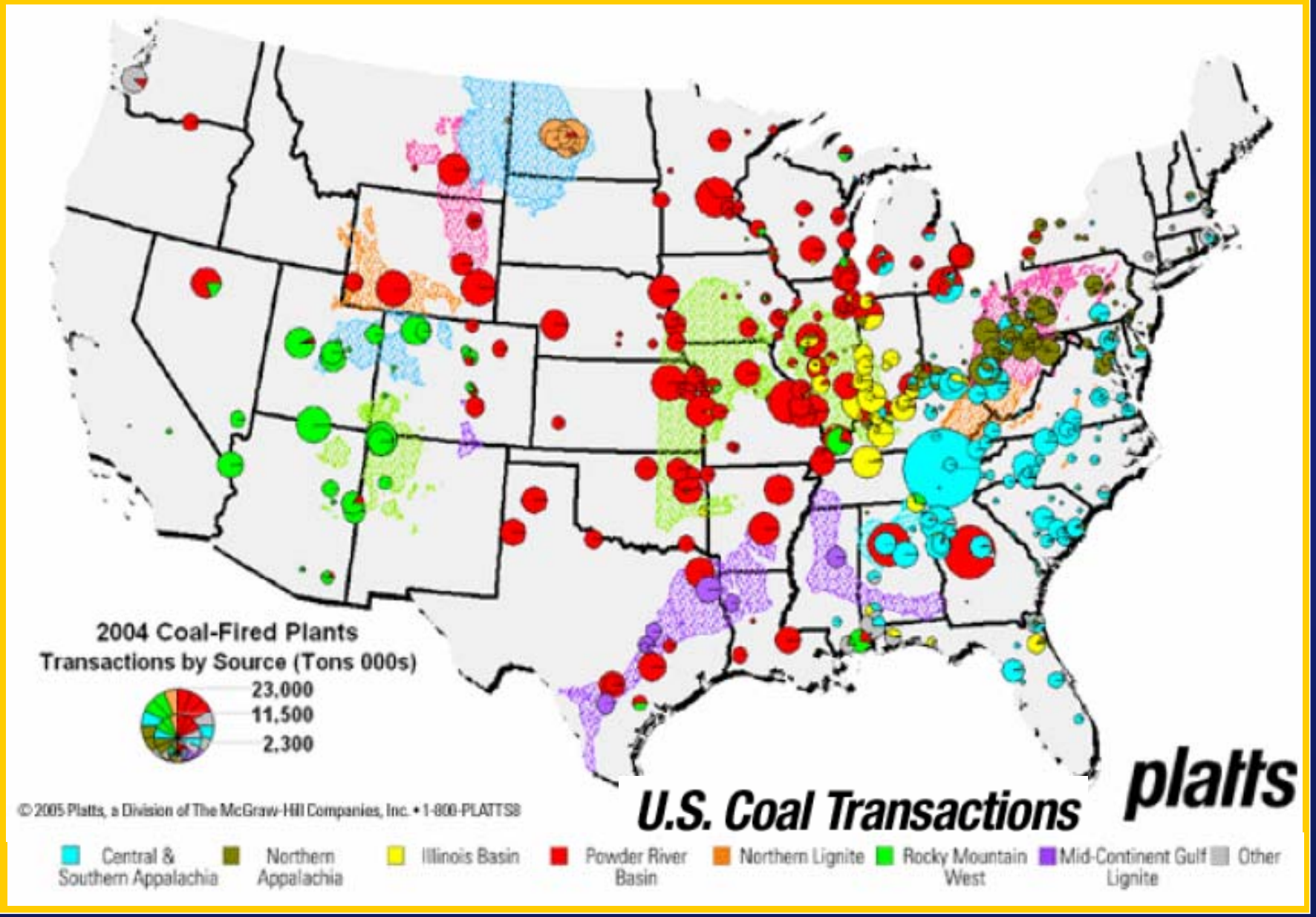
EIA outlook 2005-2030: implications for electric capacity additions



ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

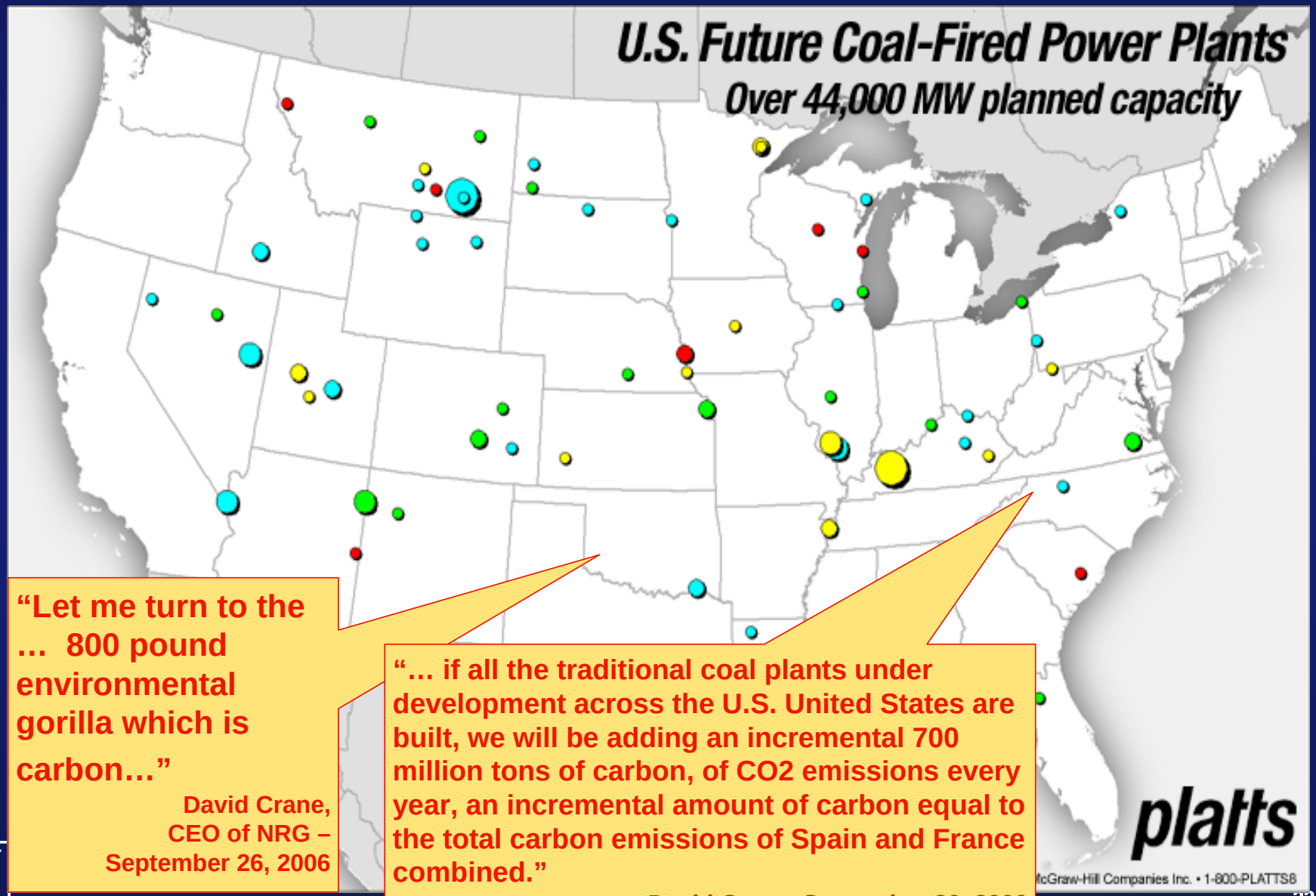
Source: Energy Information Administration, *Annual Energy Outlook 2006.*

Coal-fired Generation: ½ of U.S. Power Output



American Coal Council and Platts, 2004.

Resurgence of Interest in Coal Plants



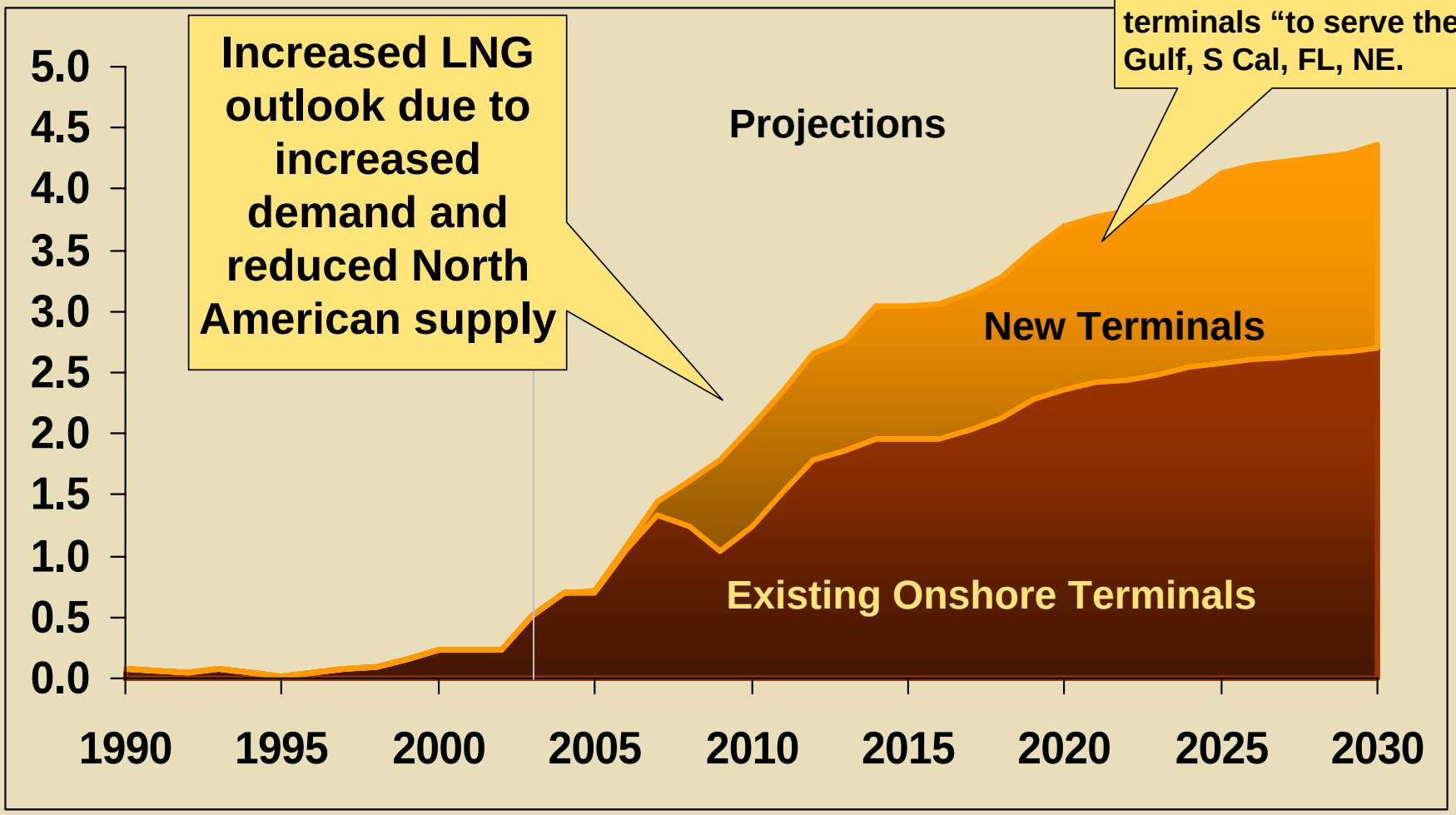
"Let me turn to the … 800 pound environmental gorilla which is carbon…"

David Crane, CEO of NRG – September 26, 2006

"… if all the traditional coal plants under development across the U.S. United States are built, we will be adding an incremental 700 million tons of carbon, of CO2 emissions every year, an incremental amount of carbon equal to the total carbon emissions of Spain and France combined."

David Crane, September 26, 2006

EIA Outlook: U,S. LNG Imports, 1990-2025 (tcf)



Assumes that:

- **2 terminals under construction are completed (TX and LA).**
- **1 expansion at existing terminal (MD)**
- **Plus "more" terminals "to serve the Gulf, S Cal, FL, NE.**

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Source: EIA, *Annual Energy Outlook 2006*

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

The "What" – Challenges for Siting Energy Facilities, and Best Practices for Addressing Them

Energy facility siting realities

Developers will be (and are) proposing energy facilities to meet:

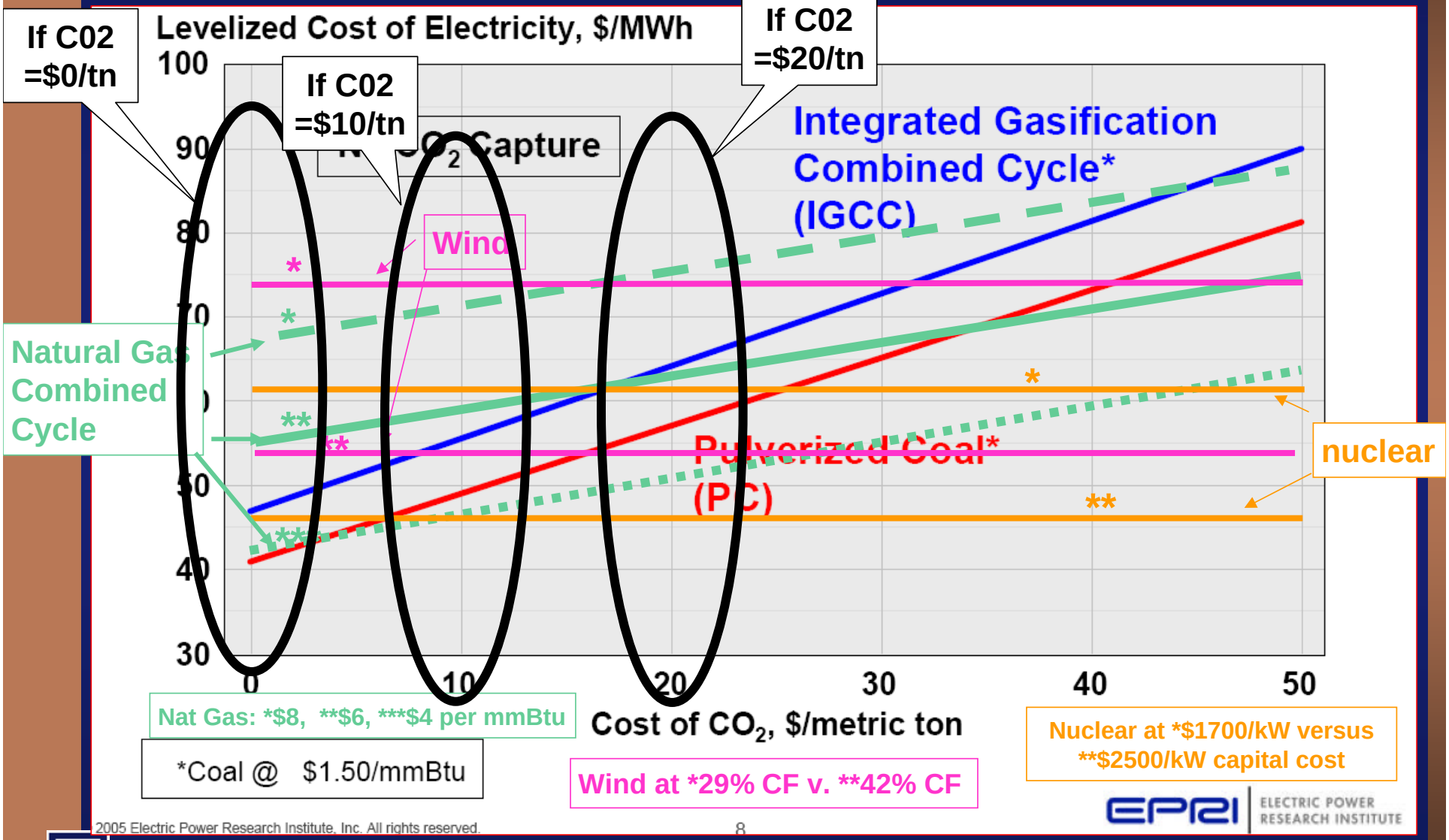
- **For them, a business opportunity**
- **For the "market" or "the public," to satisfy some need**
- **For local community, a pain in the neck**

A little later…

The siting process typically is focused on adjudicating these three sets of interests

- **Under what circumstances can the private actor get approvals to develop and operate a facility at a particular site?**

Energy choices react to fuel market conditions
Some generation choices in 2010 (EPRI)



Energy facility siting realities

Evolution of siting processes over time:

- Siting was once a largely linear process
  - From planning to permitting to construction to operation
- Siting is now:
  - Increasingly complex
  - Multi-jurisdictional
  - Multi-dimensional
  - Iterative, sometimes even circular
- "Silver bullet" tendencies make it harder to site anything.

Energy Issues resulting from the "friction" of siting challenges

Some problems are region-specific, some national:

- **Difficulty in adding any generation besides gas plants – narrowing fuel diversity, exposing consumers to higher price volatility.**
- **Fights over "cheap" "proven technology" coal plants v. "unproven" advanced technology coal plants, in absence of carbon cap.**
- **Failure to build transmission projects — at all, or only after lengthy siting battles — that would relieve electricity bottlenecks.**
- **Problems siting LNG facilities despite the benefits of increased access to overseas sources of natural gas.**
- **Difficulty in siting of large wind power projects, despite clear CO2-reduction benefits and desire for more renewable power.**
- **Continued delay in resolving nuclear waste issue; this keeps wastes dispersed and piling up around the U.S.**

Report of the National Commission on Energy Policy, December 2004.

Challenges – State policies for infrastructure

Need to balance demands of regional markets with state's interest in protecting local interests. Big challenges include:

- **best way to examine "cumulative effects" of new facilities.**
- **need to include "regional need" as part of "state benefit" review.**
- **timing of facility reviews consistent with market needs.**
- **allowing some retail consumers to "see" and be able to respond to wholesale prices.**
- **assuring that cost-effective demand-side resources have opportunity to advance**

Factors that contribute to successfully permitted projects

- **A determination that a project has important merits, particularly when compared to existing technologies and "non build" alternatives**
- **The ability to demonstrate, and clearly communicate, a project's broader public benefits**
- **The use of planning or siting processes that provide for an objective evaluation of a project's full merits while also effectively addressing local concerns**
- **Restraint on the part of political leaders in terms of avoiding categorical declarations of opposition to projects before the evidence on the merits unfolds**

Susan Tierney and Paul Hibbard, "Siting Power Plants in the New Electric Industry Structure: Lessons California and Best Practices for Other States," *The Electricity Journal*, June 2002.

Best practices: Standards of Review

Attention to determine whether the public benefits exceed the adverse impacts:

- **"Public convenience and necessity": project need**
- **Regional v. state v. local interests and impacts:**
  - **Do the broader public interests outweigh local impacts?**
  - **Ability to obtain state override of local permits/approvals**
- **Environmental impacts**
  - **State env'l impact review before other agency actions**
  - **State-of-the-art benchmark for evaluating project impacts**
  - **Preparation of cumulative impact statements where clustered facilities are proposed for single geographic region**

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Susan Tierney and Paul Hibbard, "Siting Power Plants in the New Electric Industry Structure: Lessons California and Best Practices for Other States," *The Electricity Journal*, June 2002.

Best Practices: Process Administration

Public Participation:

- **Finding a balance between meaningful participation and streamlining of process:**
  - **Assistance and Funding Mechanisms**
  - **Pre-Filing Requirements and Procedures**
  - **Formal Procedures**

Process Administration

- **Mechanisms that impose discipline in deadlines:**
- **"One-Stop Shopping" / Interagency Coordination**
- **Substantive Content and Consistency of Reviews**

Susan Tierney and Paul Hibbard, "Siting Power Plants in the New Electric Industry Structure: Lessons California and Best Practices for Other States," *The Electricity Journal*, June 2002.

Trends and tensions in electric facility siting

Growing frictions among:

- **Infrastructure projects to serve regional power markets**
  - **which span state borders**
  - **which impose localized impacts**
    - **e.g.,**
    - **transmission lines**
    - **power plants**
    - **gas pipelines**

Facilities that operate in interstate markets

CASE STUDY – Cross Sound Cable

- **DC transmission line - underwater**
- **Crossing of Long Island Sound, connecting CT to Long Island, NY**
- **Non-utility project, under contract to LIPA**
- **CT and NY siting approvals – "public benefit," environmental impact**
- **Project constructed, ready to operate, 6+ years (?)**
- **CT legislative moratorium on operations**
- **DOE emergency authorization to operate (summer 2003, and post Blackout)**

Trends and tensions in electric facility siting

Growing frictions among:

- **Infrastructure development projects that**
  - **respond to federal or state policy initiatives**
  - **stir up local controversies over policy premises and market responses to them**
    - **e.g.,**
    - **wind farms**
    - **gas-fired generators**

Facilities with regional/local trade-offs

CASE STUDY – Cape Wind

- **Wind farm in Nantucket Sound, off Massachusetts**
- **Federal waters, to be connected to grid via underwater transmission line in state ocean**
- **Merchant project, responds to state policy to promote renewable resources ("renewable portfolio standard")**
- **Federal ACOE permit over wind turbines, MA siting approval over transmission lines**
- **Need and environmental impacts**
- **New jurisdiction established in state and federal legislation**

Trends and tensions in electric facility siting

Growing frictions among:

- **"Case of 1st impression" infrastructure projects**
  - **Involving new technologies with special features**
  - **Raising new permitting questions for regulators**
    - **E.g.,**
    - **pollution control equipment**
    - **DC lines**
    - **ocean infrastructure**
    - **distributed generation**
    - **repowerings and brownfield developments**

Repowering projects - new impacts at existing facilities

CASE STUDIES – Hubline

- **Interstate gas pipeline – Massachusetts Bay**
- **Part of international pipeline project, to deliver natural gas from Nova Scotia to MA**
- **underwater, connecting northern and southern parts of Boston pipeline system**
- **Permitting – MA Ocean Sanctuary Act, MA MEPA, federal NEPA, local con comm's – 6 year process**
- **"public benefits," "public convenience & necessity," "water-dependent," "coastal dependent", "least damaging feasible alternative"**

Trends and tensions in electric facility siting

Growing frictions among:

- **Trade-offs of distribution of project impacts**
  - **cumulative infrastructure impacts on populations and natural resources where projects are densely located, versus**
  - **protection against sprawl and development in still-natural places**
  - **E.g.,**
    - **environmental justice considerations**
    - **comprehensive planning standards for siting projects with different impacts**
    - **use versus non-use values**

Repowering projects - new impacts at existing facilities

CASE STUDIES – Mystic Station

- **Merchant power plant – near Boston, MA**
- **New gas-fired combined cycle addition (1750 MW) to existing thermal power station (oil and gas, 1000 MW)**
- **Existing plant – one of "Filthy Five"**
- **New plant – efficient, low-emissions plant**
- **State siting and environmental permits**
- **"Best available control technology" and Air Quality Improvement Plan**

ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Susan F. Tierney, Ph.D.
Managing Principal
Analysis Group, Inc.
111 Huntington Ave., 10th Floor
Boston, MA 02199
ph: 617-425-8114
fax: 617-425-8001
stierney@analysisgroup.com