CCNY ESES Summer Bridge Program
July 11, 2013
Edward J. Linky, Esq.
USEPA Region II

Resilient Urban Coastal Communities
Public Policy Promoting Resilient Infrastructure

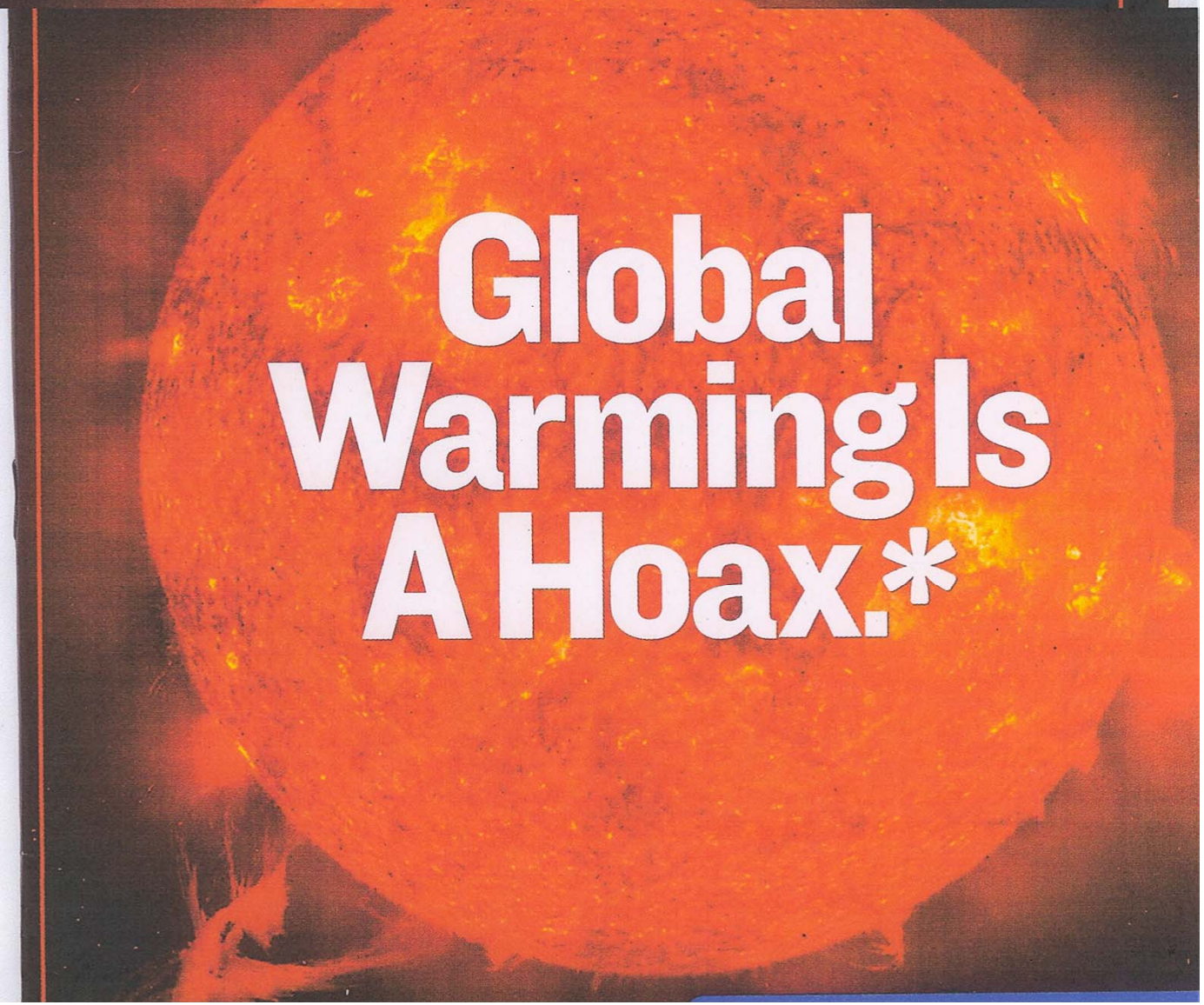
History

- “ Those who cannot remember the past are doomed to repeat it.” George Santyana
- “History does not repeat itself but it rhymes.” Mark Twain
- History Repeats Itself, that is one of the things wrong with history.” Clarence Darrow

Issues and Topics

- Urban Infrastructures Challenges: Storm Surges/Sea Level Rise
- Thermal Sandy: The Urban Heat Island
- Can the 100 year old central generation - distribution model for electricity and water services be maintained or must it evolve into a combination central/distributed model?
- Does Resiliency as a policy driver mislead with a degree of engineering/economic hubris?

Newsweek®
August 13, 2007 : $4.95 US
newsweek.com



Global Warming Is A Hoax.*

THE NEW YORK TIMES BESTSELLER

COLLAPSE

How Societies Choose to Fail or Succeed

JARED DIAMOND

author of the Pulitzer Prize–winning

GUNS, GERMS, and STEEL

HERNANDO DE SOTO

AUTHOR OF THE OTHER PATH

THE MYSTERY OF CAPITAL

WHY CAPITALISM TRIUMPHS IN THE WEST AND FAILS EVERYWHERE ELSE

Robert Constanza: Radical, Reformer or Both?

- Constanza's replacement for Gross Domestic Product is GIP- Genuine Indicators of Progress
- $US 4 Trillion pulse through the worlds various exchanges on a daily basis- indifferent to conventional political and social value systems.
- Capital wants to generate more Capital
- The world economy needs systems which can Tap not Trap this pulsing- tectonic- daily flow of Capital, allowing it to do what it is engineered to do_ Generate More Capital!
- GIP may be needed for adaptation to climate change
- How to utilize GIP with Ecosystem Services?

National Energy Policy

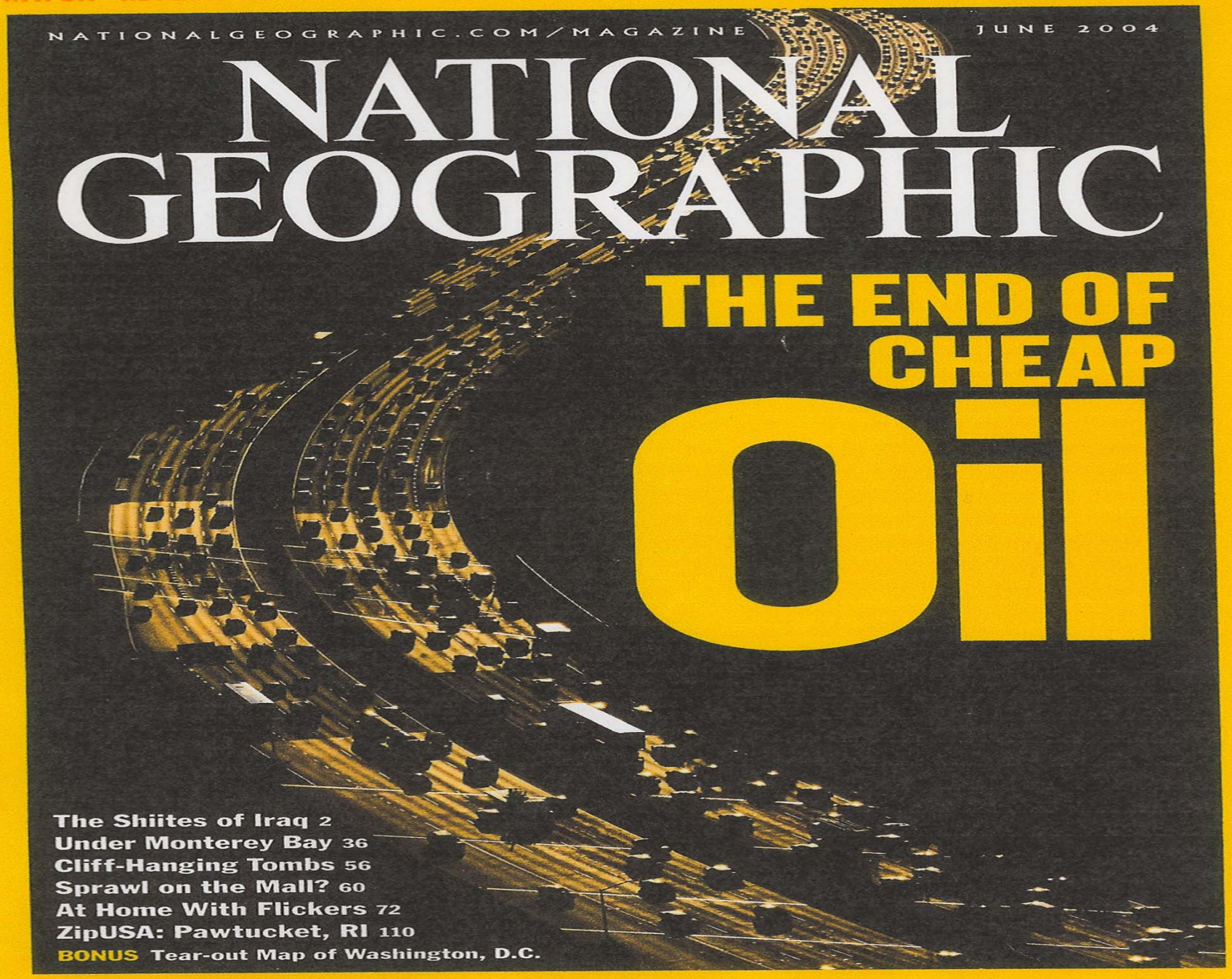
Report of the
National Energy Policy Development Group

May 2001

WATCH "RETURN TO TITANIC," NATIONAL GEOGRAPHIC CHANNEL, JUNE 7, 9 P.M. ET/PT

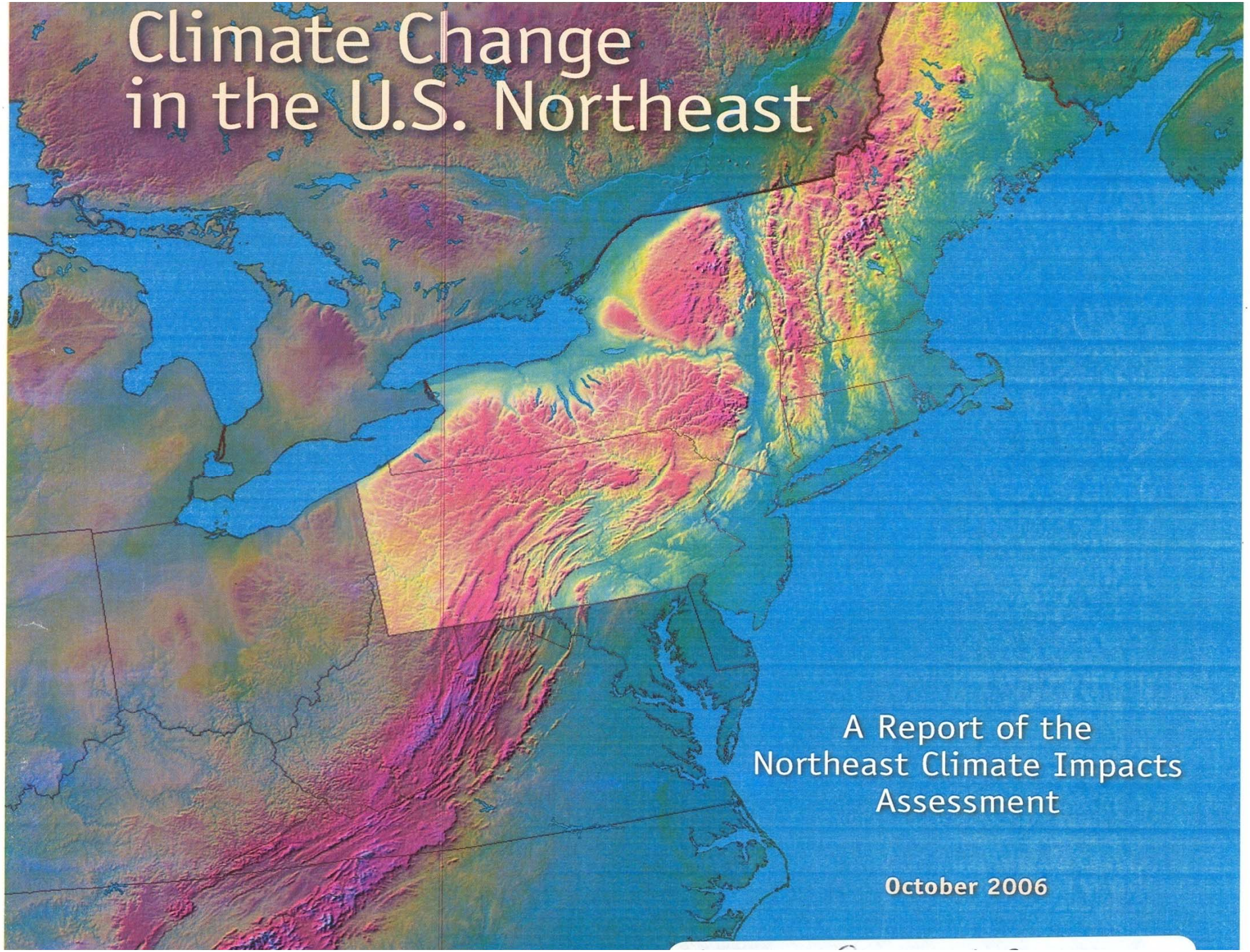
NATIONALGEOGRAPHIC.COM/MAGAZINE JUNE 2004

NATIONAL GEOGRAPHIC



THE END OF CHEAP Oil

Climate Change in the U.S. Northeast



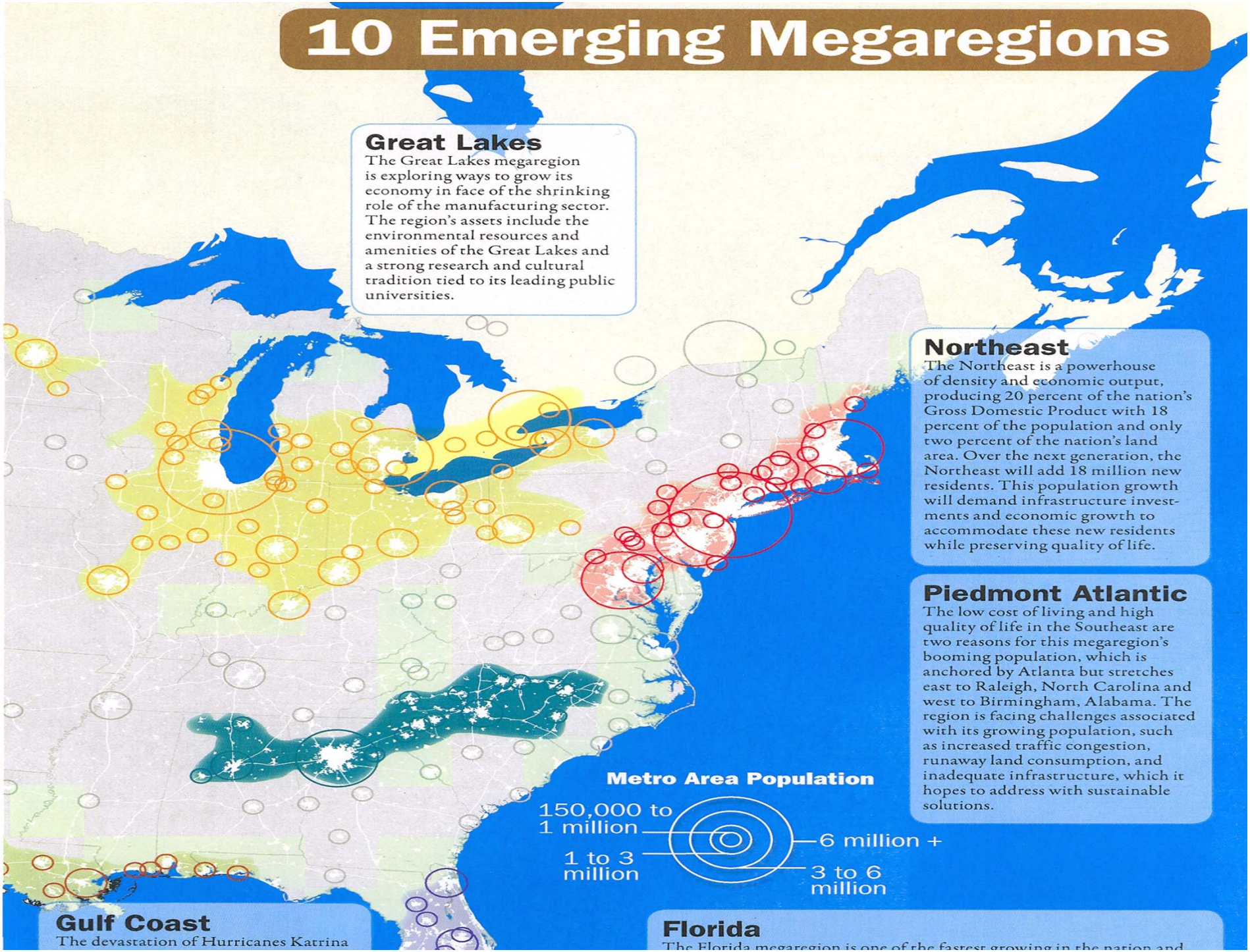
A Report of the Northeast Climate Impacts Assessment

October 2006

America 2050

A Prospectus

10 Emerging Megaregions



Great Lakes

The Great Lakes megaregion is exploring ways to grow its economy in face of the shrinking role of the manufacturing sector. The region's assets include the environmental resources and amenities of the Great Lakes and a strong research and cultural tradition tied to its leading public universities.

Northeast

The Northeast is a powerhouse of density and economic output, producing 20 percent of the nation's Gross Domestic Product with 18 percent of the population and only two percent of the nation's land area. Over the next generation, the Northeast will add 18 million new residents. This population growth will demand infrastructure investments and economic growth to accommodate these new residents while preserving quality of life.

Piedmont Atlantic

The low cost of living and high quality of life in the Southeast are two reasons for this megaregion's booming population, which is anchored by Atlanta but stretches east to Raleigh, North Carolina and west to Birmingham, Alabama. The region is facing challenges associated with its growing population, such as increased traffic congestion, runaway land consumption, and inadequate infrastructure, which it hopes to address with sustainable solutions.

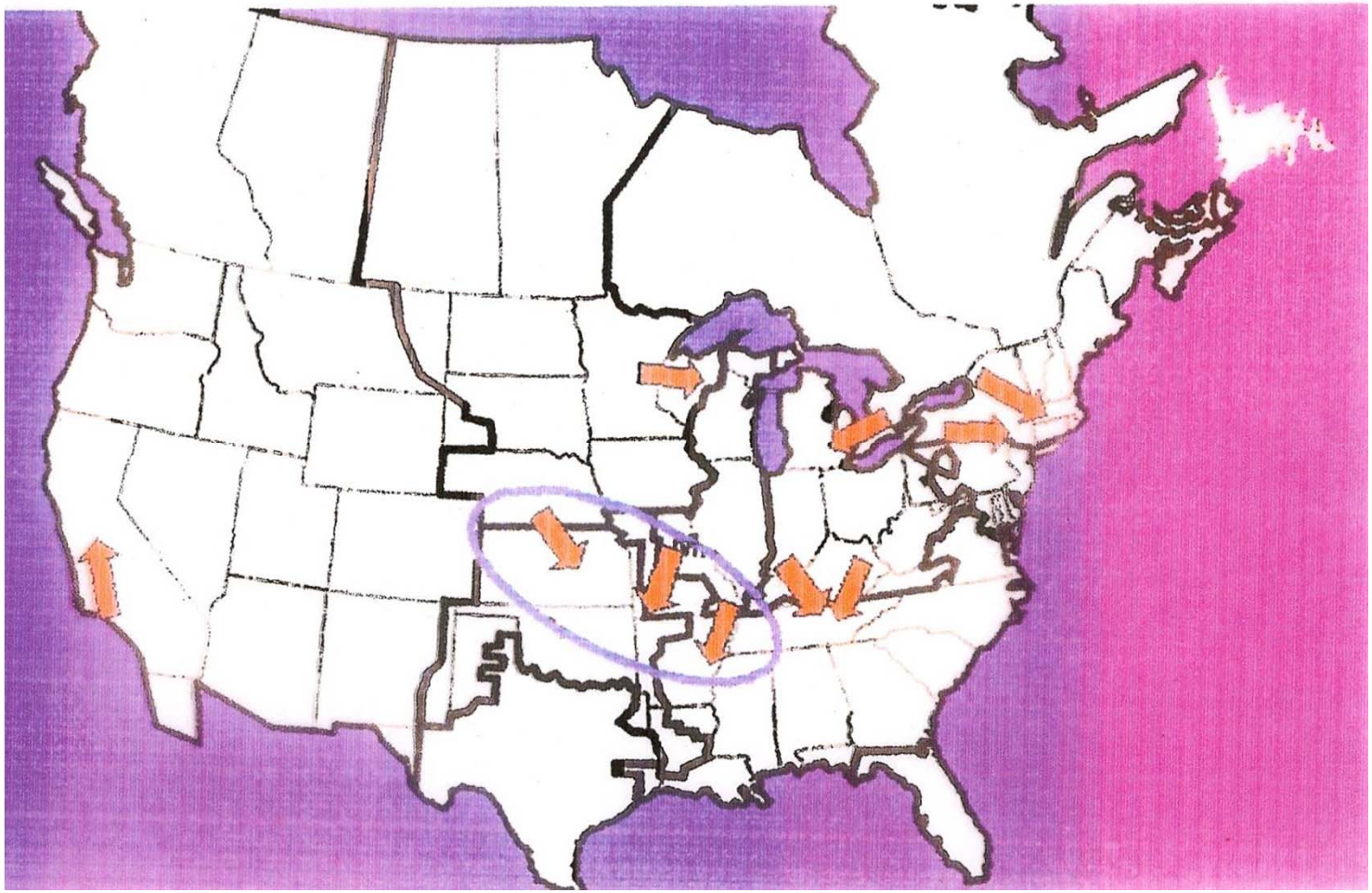
Gulf Coast

The devastation of Hurricanes Katrina

Florida

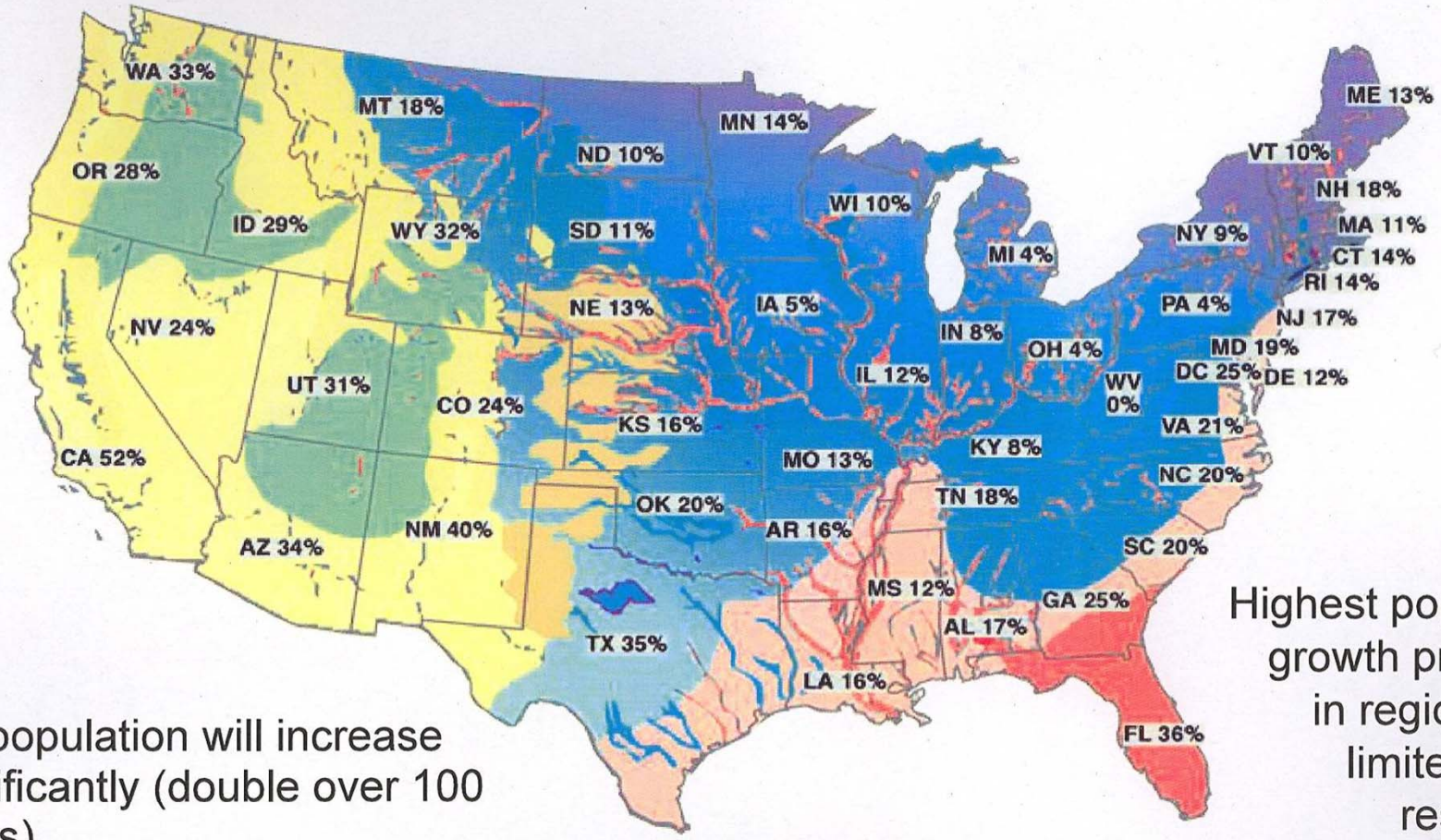
The Florida megaregion is one of the fastest growing in the nation and

Electric Bottlenecks




ENERGY and WATER
Eastern Region
Needs-Assessment Workshop

Water Resources and Population Growth, 2000-2020



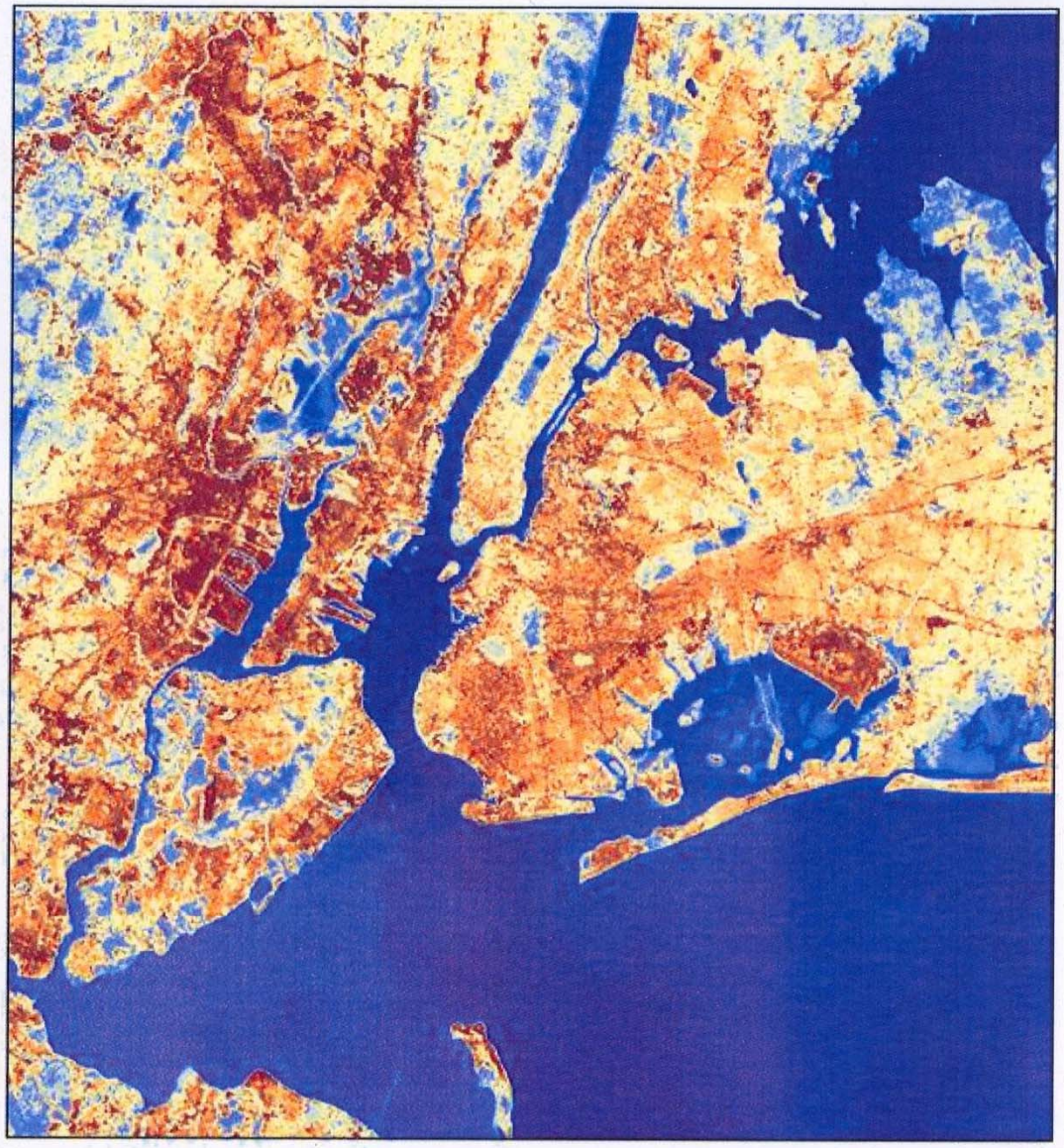
US population will increase significantly (double over 100 years)

Highest population growth projected in regions with limited water resources

Less Water — More Water

Source: DOE/NETL (M. Chan, July 2002)

New York City Surface Temperature



SURFACE TEMPERATURE
Landsat ETM
July 22 2002
10:30 AM

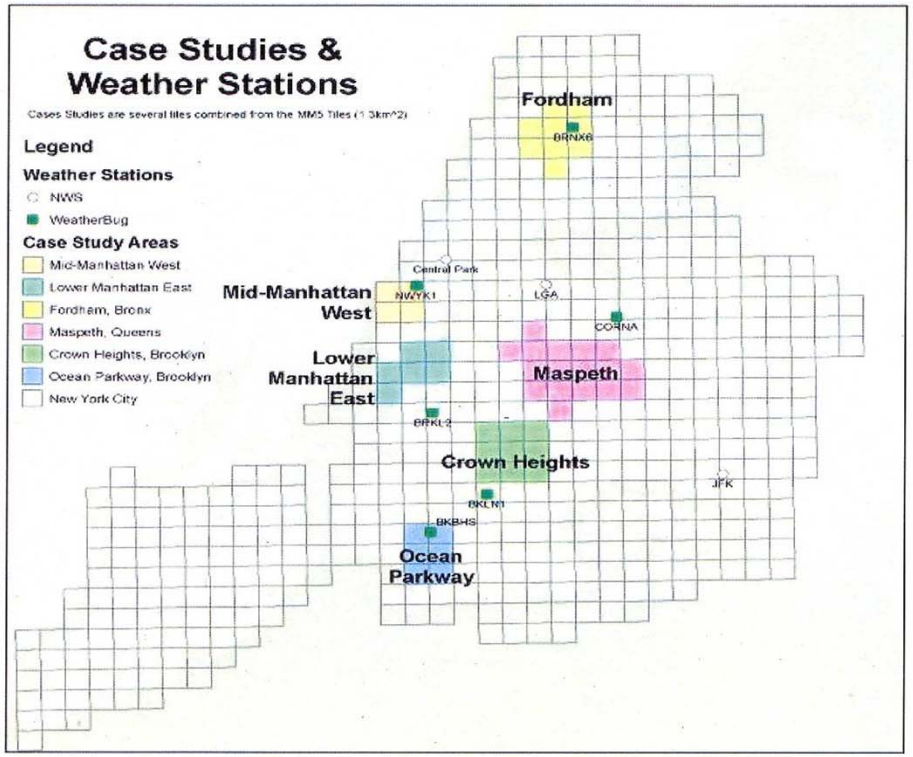
Legend

- 20.56 - 27.63
- 27.64 - 28.61
- 28.62 - 31.50
- 31.51 - 35.26
- 35.27 - 38.01
- 38.02 - 39.82
- 39.83 - 41.60
- 41.61 - 43.36
- 43.37 - 45.10
- 45.11 - 63.01

N

Overview

Urban Heat Island Case Studies



Project Partners: NYSERDA, NYSDEC

Investigate community-scale options for reducing the heat island through:

- urban forestry
- living (i.e. green, vegetated) roofs
- light (i.e. reflective) surfaces

Link mitigation to impacts on:

- energy demand
- air quality
- health
- environmental justice

Center for American Progress

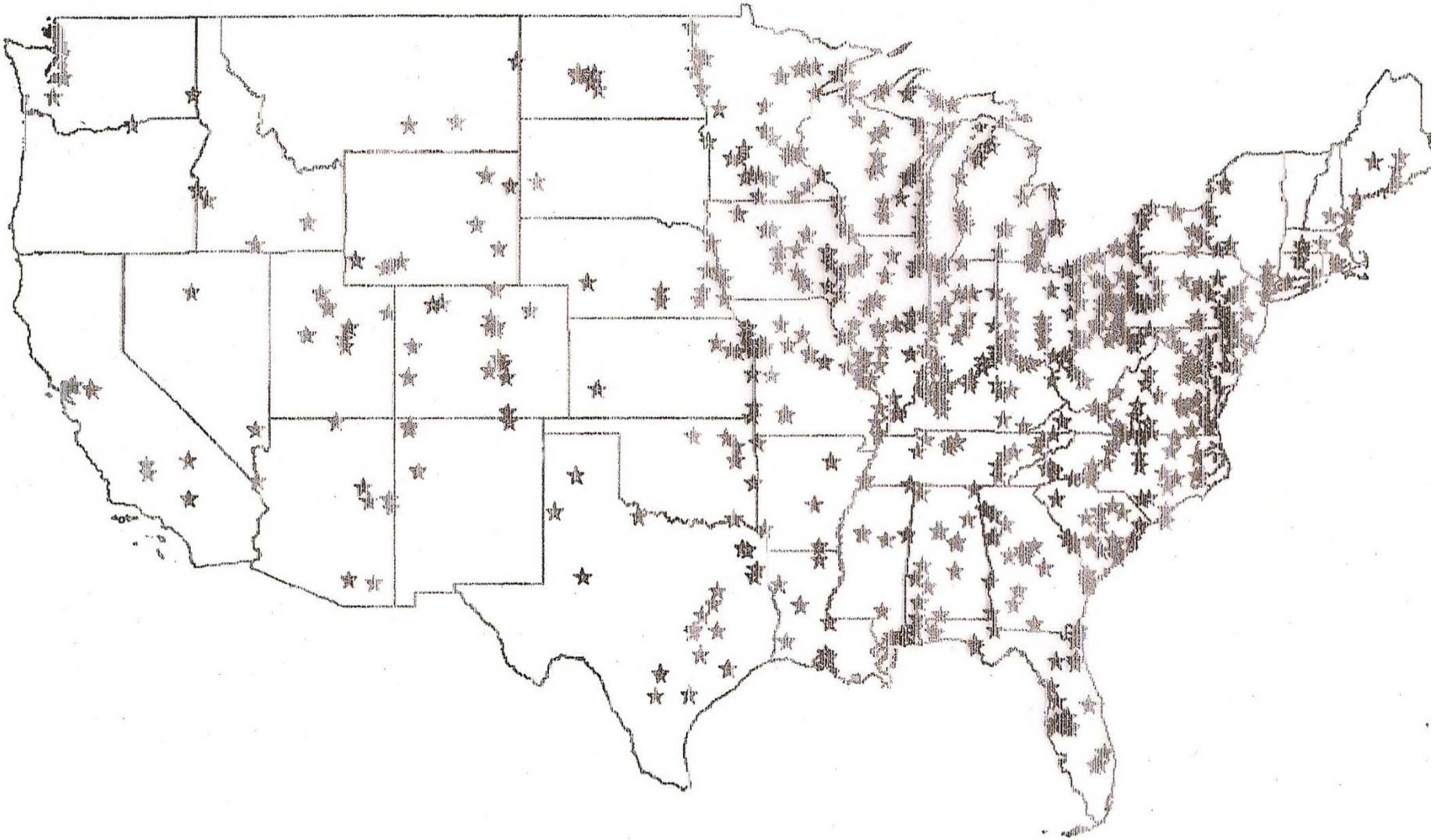
Global Warming and the Future of Coal

The Path to Carbon Capture and Storage

Ken Berlin and Robert M. Sussman

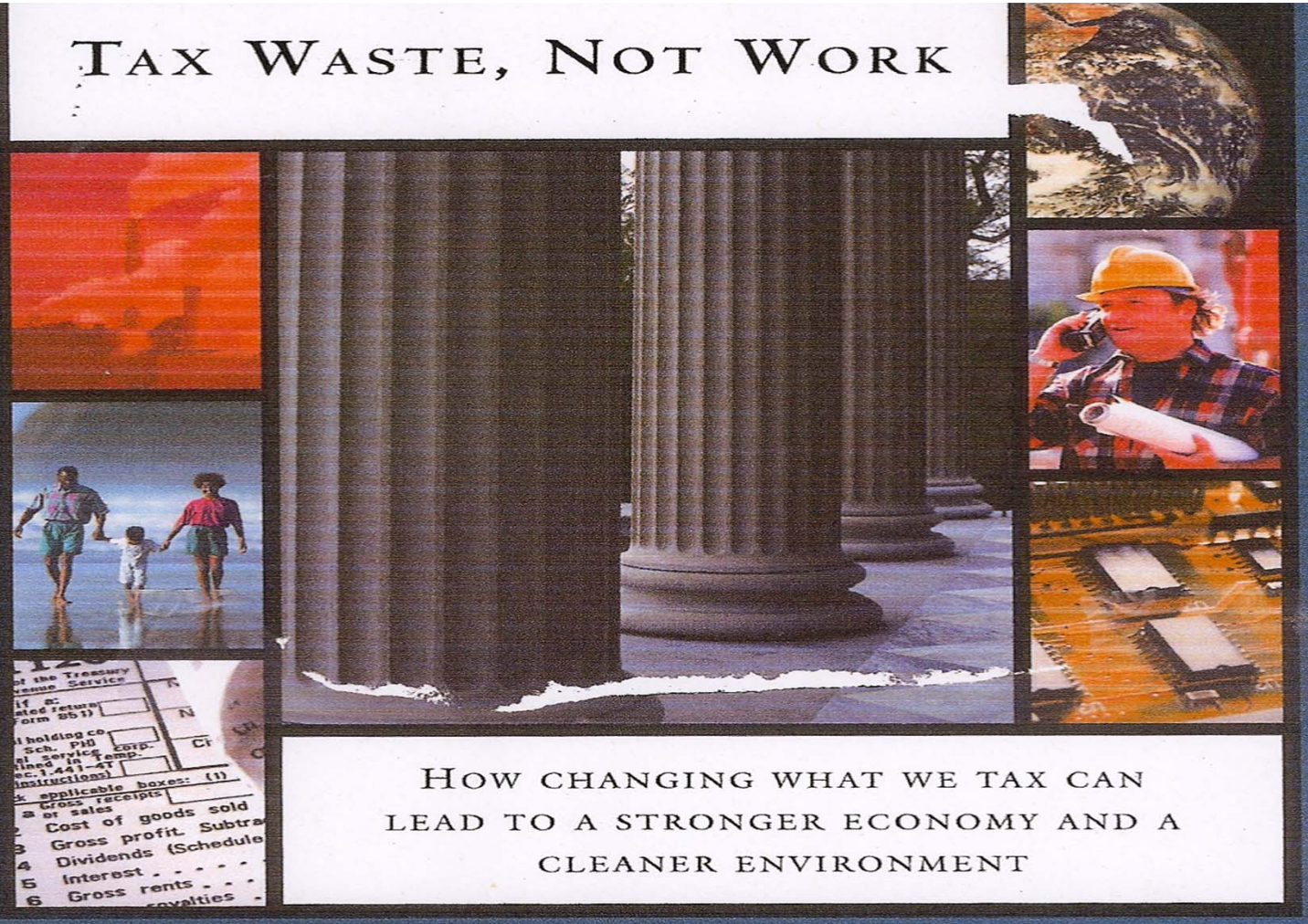
May 2007

U. S. Coal Plant* Locations



** Electricity generating plants using coal as a primary*

TAX WASTE, NOT WORK



HOW CHANGING WHAT WE TAX CAN LEAD TO A STRONGER ECONOMY AND A CLEANER ENVIRONMENT

M. JEFF HAMOND

STEPHEN J. DECANIO • PEGGY DUXBURY

ALAN H. SANSTAD • CHRISTOPHER H. STINSON

Introduction by

PAUL KRUGMAN

April, 1997

What is Public Policy

- “We have always or will have the right answers- What we need are the right Questions”
- Extracted from the Great Karnak Skit Johnny Carson and Ed Mc Mann The Tonight Show circa 1970’s

Macro Public Policy and Infrastructure

- Marco Policy Debate: Mitigate Climate Change or Adapt? What are the implications for urban infrastructure?
- Focusing on Adaptation invites the worst consequences of climate change
- Should cost/benefit be the driver of this choice?
- Is there a moral obligation in public policy to attempt to mitigate climate change?

Elements of Public Policy

- Must serve all elements of society
- Policy should be Equitable and Just
- Applied to urban infrastructure systems safe, adequate and reliable service is the key
- Can Public Utility Systems as now confirgured and regulated meet these tests?
- Is Resilency the base level of service or the ceiling?

How is Public Policy Implemented?

- Depending on level of government-
- Executive Orders (example-Planyc)
- Legislative Action: Statements, Resolutions or enactment of Federal, State or Local legislation
- (Example Energy Efficiency NYC Local Laws 84 and 87)
- Implementation of Legislative Intent by Executive Department Rules and Regulations
- Challenges to Statute and Regulations in State or
- Federal Courts
- Unilateral Executive/Judicial Action Eminent Domain

How is Infrastructure Policy Connected to Climate Change?

- America 2050 Mega region urban concentrations demand quantity and quality of infrastructure services (AKA the 4G Standard) for both electricity and water.
- Evolving Choices between Centralized and Distributed Systems for reliability and resiliency.
- How to use analytical tools to shape policy and technology transformation?

The Role of Science and Engineering In Public Policy Formation

- As applied to urban infrastructure in the facing challenges of climate change threshold tests must be articulated:
- What is meant by resiliency?
- What should or can be the role of geo engineering in meeting resiliency?
- Can all segments of society be protected equally from a public health and economic perspective?

Policy Goal: Accelerate Decisions on Technology for Adaptation

- NEPAassist
- Community Scale MARKALs
- EPA Energy Star Portfolio Manager
- EPA CREATE(Climate Resilience Evaluation and Awareness Tool)
- Northeast Corridor Earth System Model (NEASM)
- EPA Existing Power Plant GHG Rules

Science and Policy on Global Warming

Harvey S. H. Lam

(Working with Rob Socolow)

May 5th, 2006 Princeton University

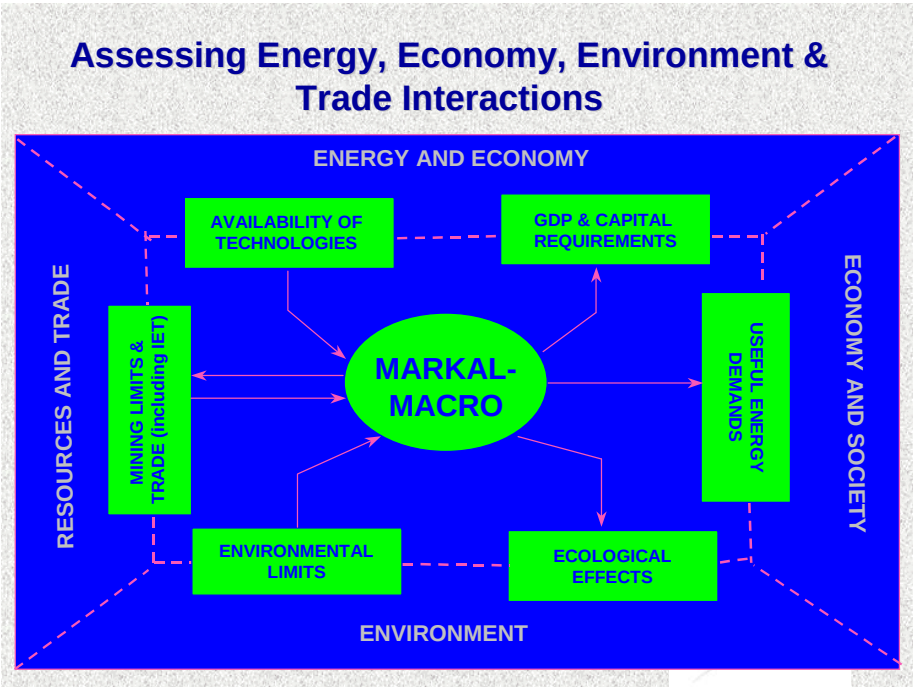
Harvey Lam of Princeton University

- Using Dimensional Analysis he asks:
- Can the global community establish a total ceiling of Carbon and what is that level?
- If ceiling is established the global community will need to hold to that level for a minium of 200 years.
- James Hansen formerly of NASA-GISS establishes a tipping point of 450ppm Co2
- Steven Pacala of Princeton says we are blowing past the Hansen tipping point and headed toward
- 525+ppm Co2.

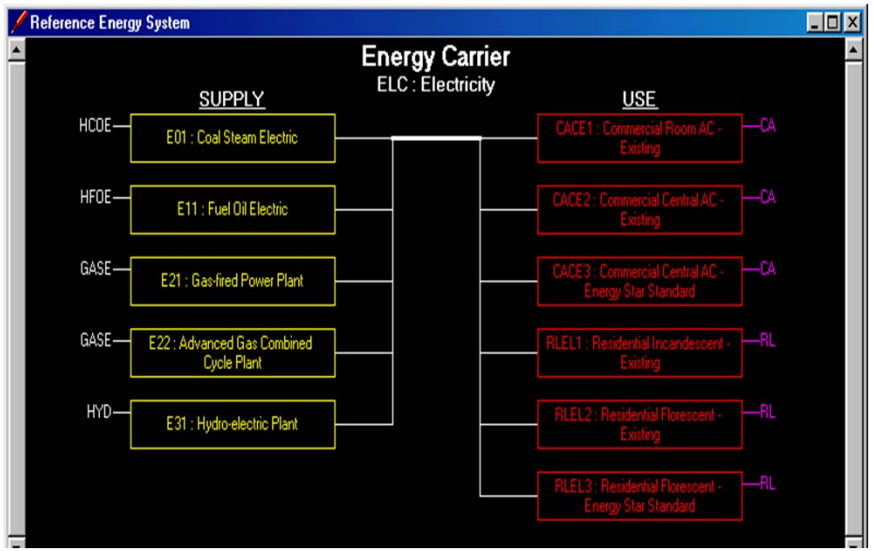
Adaptation Timetable

- Super Storm Sandy highlights the impacts and the need for expedited action to ensure urban resiliency.
- Trends toward Green and Renewable Energy headed in right direction BUT we need to pick up the pace dramatically!
- Eminent Domain may assume a larger role in implementation of NYC's storm protection plan to acquire necessary land.
- Historically used as a tool of last resort after negotiation and other legislative efforts have failed

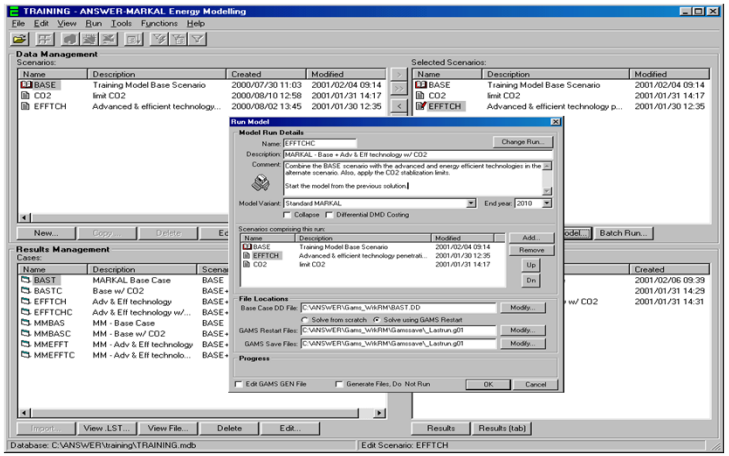
MARKAL Modeling System



RES Diagramming

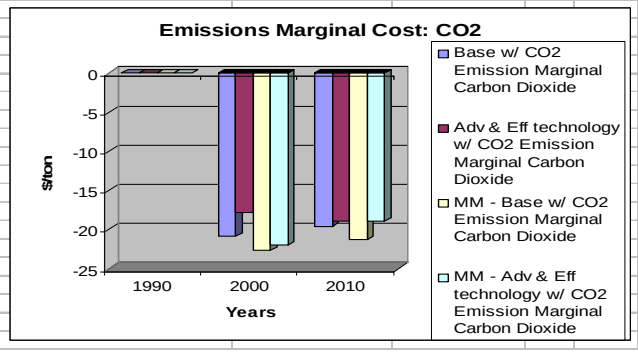


Data Management & Scenario Development



Output w/ Excel Graph

Case	Parameter	Emission	1990	2000	2010
Base w/ CO2	Emission Marginal	Carbon Dioxide	0	-20.91	-19.54
Adv & Eff technology w/ CO2	Emission Marginal	Carbon Dioxide	0	-17.81	-18.92
MM - Base w/ CO2	Emission Marginal	Carbon Dioxide	0	-22.62	-21.25
MM - Adv & Eff technology w/ CO2	Emission Marginal	Carbon Dioxide	0	-21.92	-18.91



Integrated Systems

- Atlantic County Utilities Authority Atlantic City
- Waste Water Treatment Facility
- Solar Arrays, Five Wind Turbines, Sludge Incinerator
- Landfill with Combined Heat and Power
- Difficulty of replicating this example:
- Utility Governance Structure and Bond Structure.


EPA

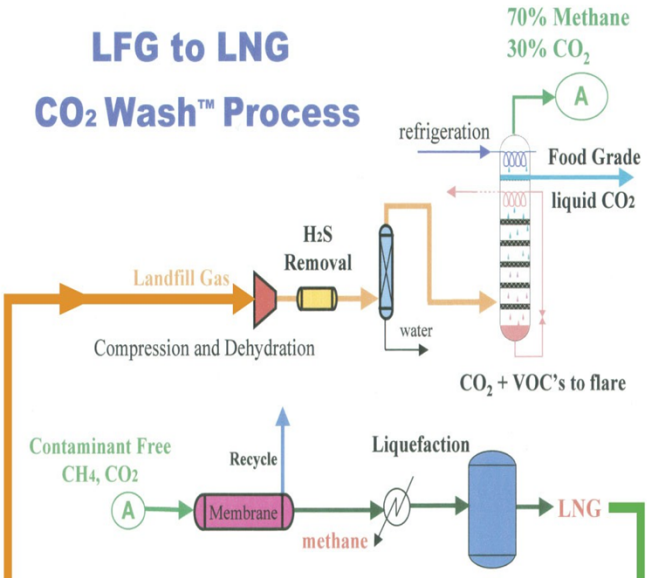
LANDFILL GAS [LFG] AS A SOURCE OF LIQUEFIED NATURAL GAS [LNG] FOR TRANSPORTATION FUEL USED BY REFUSE TRUCKS, BUSES AND OTHER LNG/CNG VEHICLES

MACK TRUCKS, INC. [LNG/CNG ENGINE TRUCKS] AND ACRION TECHNOLOGIES, INC. [CO_2 WASH™ TECHNOLOGY]

RESIDENTIAL & COMMERCIAL REFUSE
[Municipal Solid Waste]

LANDFILL

LNG FUELING STATION
with
PURIFIED and LIQUEFIED METHANE
(LFG → LNG)



RESULTS ACHIEVED

Burlington LNG Production

* Raw LFG Processed - 100 cfm
* Methane Liquefied - 350 gallon/day
* Production to Date ~ 10,000 gallons LM (LNG)
* Truck Service > 600 hours each on two WM Refuse Trucks

Project Team

* Waste Management - refuse trucks/routes
* Acrion - LFG cleanup technology
* Mack - project management, engineering analysis, maintenance
* Chart Industries - LNG fueling station
* Air Products - LIN refrigeration
* Rutgers EcoComplex - infrastructure
* DOE Brookhaven - supplemental funding

NEXT STEP

* Coupling Federal Energy Incentives with State Initiatives

GOALS:
Strengthening US Economic and Energy Security
and
Achieving Significant Environmental Benefits
in EPA Non-Attainment Areas

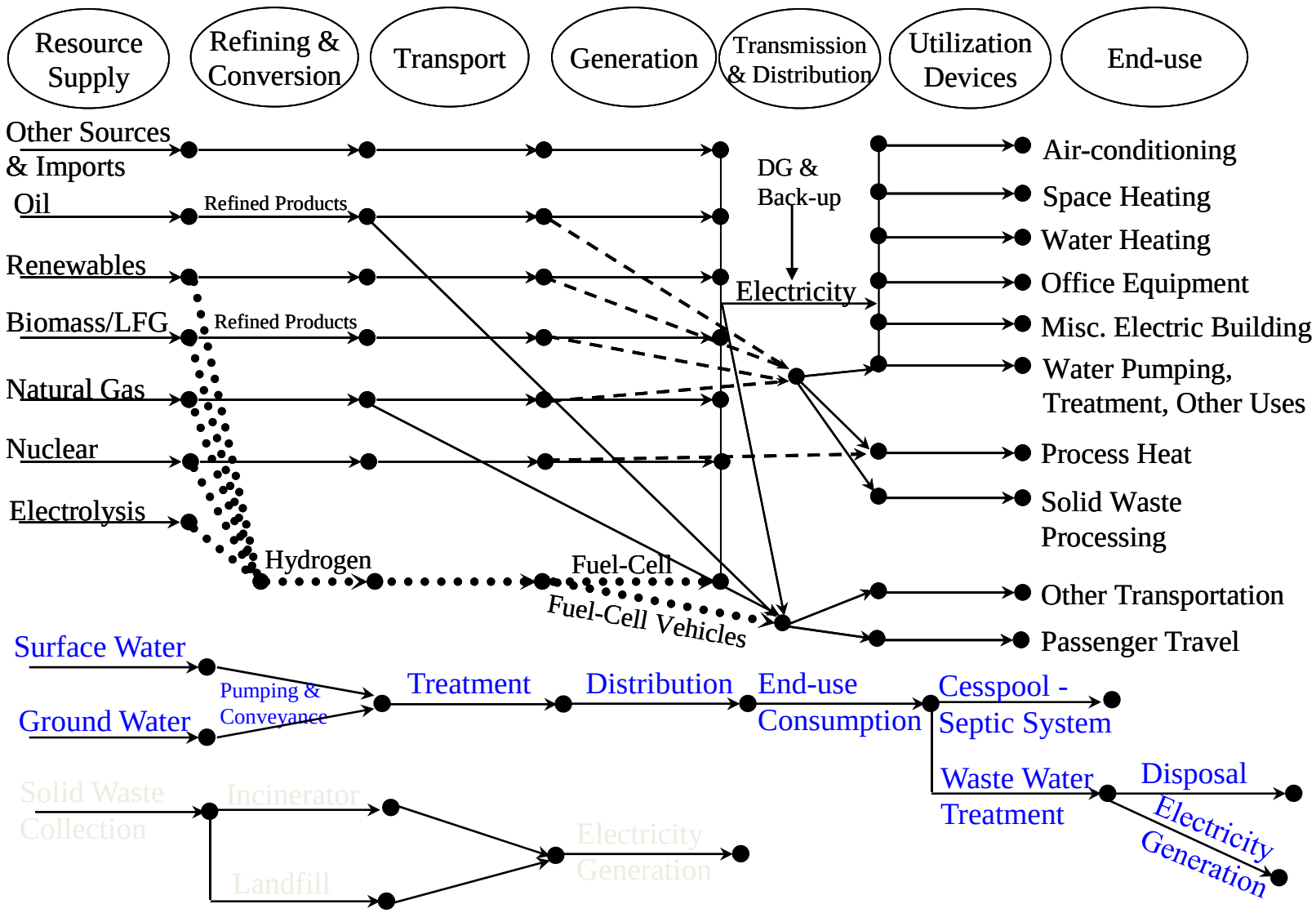
LFG to LNG
Example of a Full-Scale Project

Raw LFG Processed	1,000 scfm
Liquid Methane	9,700 GPD
Diesel Equivalent	5,190 GPD
Trucks 100 LNG GPD	100
Liquid CO_2	33 TPD
Power	1,400 kW

[Preliminary design/economics are favorable]

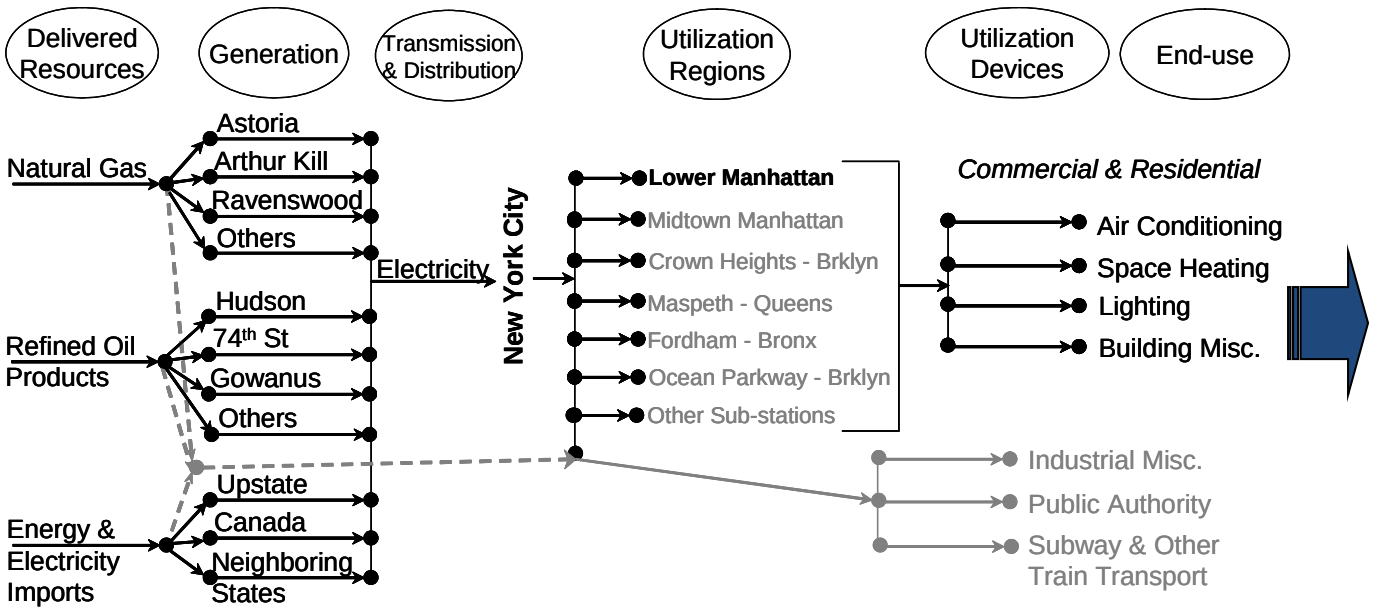
MARKAL Reference Energy System

For Urban, Regional or National Systems Analysis



Community Scale MARKAL – NYC/LI

- MARKAL's acceptance to date is at ***multiple geographic scales*** and level of technology complexity
- ***NYC/LI Energy-Water-Solid Waste*** offers the most current platform on which to build any urban application
- This integrated urban methodology can ***assist financial or insurance sector decisions*** on environmentally sustainable and economically viable ***optimal investment opportunities***



Schematic of NYC Model

- Technology/resource deployment pathways
- Clean/efficient technology
- Investment opportunities
- Technology & investment additionality
- Economic decisions
- System reliability
- Environmental sustainability
- Risk, adaptation and mitigation options
- Energy pricing trade-offs
- Carbon markets – emission credits
- Policy analysis
- Energy security

Energy and Water

- Carlsbad California Desalinization Facility
- Is this creating a false engineering security?

Integrated Strategic Decision Making

- Energy, water, waste water and solid waste are ***highly interdependent complex systems***
- MARKAL provides ***comprehensive and integrated*** long-term infrastructure investment decisions methodology (2005-2050)
  - Identifies the ***most cost-effective*** pattern of ***technology deployment and resource use*** (e.g. energy efficient or clean energy techs), including tradeoffs (e.g. Carbon Pricing)
  - Guides investment decisions based on ***technology and investment additionality*** of competing alternatives (e.g. EPA Clean Water Revolving Fund decisions or renewable techs)
  - Assesses ***long-term economic and environmental benefits and measurable payouts*** of infrastructure decisions (e.g. Investment banking or Insurance industry decisions based on risk, adaptation and mitigation benefits or Socially Responsible Investment Pools)
  - Evaluates impacts of ***environmental, technological and policy*** restrictions on current and future decisions (e.g. carbon reduction or vehicle efficiency/cleaner standards)

Elements of Eminent Domain

- Power derived from Fifth Amendment to the US Constitution. Government cannot take private land for a public purpose without just compensation.
- Historic use is to acquire land for roads, schools, transmission right of way or other infrastructure uses which directly serve the public health,safety and welfare

Dramatic Expansion of Eminent Domain

- US Supreme Court in a 5-4, 2005 decision Kelo v. City of New London Connecticut expands the concept of public use within Eminent Domain
- Historic use involved obtaining land for direct public benefit as previously noted.
- Kelo Case involves the City of New London redevelopment of run down urban waterfront
- City of New London used eminent domain to obtain the land for a private developer.
- Court determined that there was a tangible public benefit in having the area redeveloped even if the developer was a private party.

Ecosystem Services and Accounting

- A concrete first step beyond Cap and Trade and milestone toward Constanza's vision is Ecosystem Services Accounting (ESA)
- ESA requires technology driven monitoring systems of ecosystems which can define productivty and health and thereby lead to valuation of those ecosystem services
- ESA is still in its infancy in an environment where enviromental costs and benefits are still classified
- as externalities

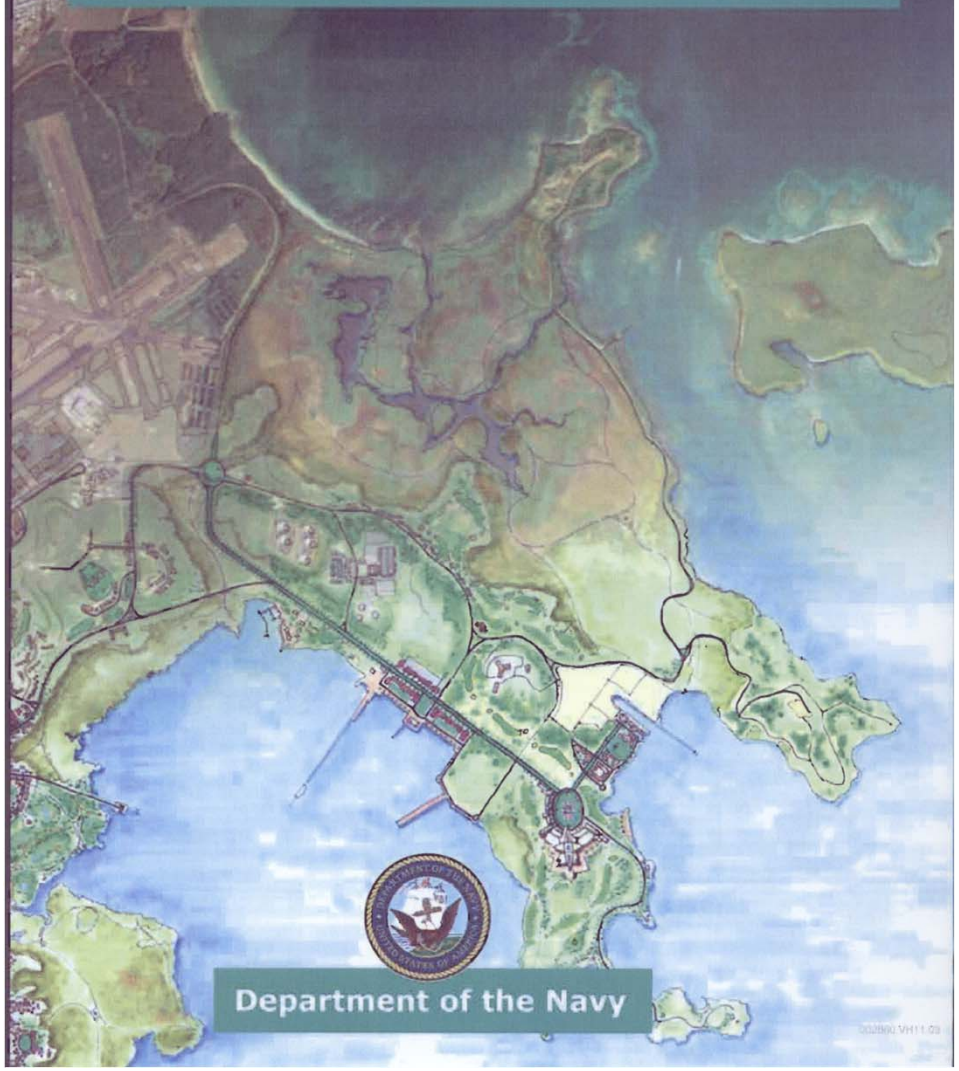
Problem

- Design a set of public policies that can be technically supported by the tools or mechanisms mentioned.
- Two examples: Redevelopment of the Roosevelt Roads former Navy base in Puerto Rico as a sustainable city(identify criteria such as low carbon or thermal impact)
- Infrastructure needs for a resilient Community Planning Board No.6 Brooklyn New York

Supplemental Environmental Assessment for the Disposal of Naval Activity Puerto Rico (formerly Naval Station Roosevelt Roads)

Draft

May 2011



Department of the Navy

The 2013 NYC Resiliency Plan

- Does it absorb the lessons of the Manahatta Project?
- Manahatta offers solutions to Urban Heat Island as well as coastal surge and flood impacts
- Manahatta stimulates thinking about a new spatial format for NYC and hence influences infrastructure

The Mannahatta and Welikia Projects: Past, Present and Future of New York City's Ecology

Image courtesy of: Markley Boyer / The Mannahatta Project / Wildlife Conservation Society

On a fair, hot day, the twelfth of September, 1609, Henry Hudson and a small crew of sailors rode the flood tide past a long wooded island beside the North American continent. That island was known then as Mannahatta, the island of many hills, and today it is known as Manhattan, the heart of the global economy. One day the island would become as densely filled with people and avenues as it once was trees and streams, but not that afternoon. That afternoon the island still hummed with green wonders. Those green wonders persist, shaping the way the city grows, and its future as habitat for concentrated humanity. The story continues beyond the boundaries of one island. In this presentation, we will explore the ecology of the five boroughs of New York City as it once was, the ecology of the city of today, and mechanisms for re-imagining the ecology of New York City over the next 400 years.

The NYC Storm Resilency Plan

- Practical Economic/Political reality: No retreat offers challenges and opportunities
- Seaport City: Is this the best approach?
- What about the Thermal Sandy:UHI and City's spatial design?
- Are we solving the "Worst Case Scenario" or is this hubris?
- Are We asking the right questions?

Suggested Readings

- Cass Sunstein Worst Case Scenarios Harvard 2007
- Jared Diamond Collapse 2007 Penquin
- Michael Sandel Justice2009 Farr, Strauss &Giroux
- Robert Wright Non Zero The Logic of Human Destiny 2000 Pantheon
- Cleveland,Stern&Constanza ed. The Economics of Nature and Nature of Economics Elgar, 2001
- Katz and Bradley The Metropolitan Revolution Brookings 2013