

# A Portfolio Approach in Local Energy Planning and Building Upgrades: The Case of New York City

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## Agenda

- Main Issues in New York City Electrical System
- Objective and Scope of Study
- Institutional Organization
- Description of Portfolio Approach
  - MARKAL
  - MM5
  - EnergyPlus
- Project Challenges



## New York City Electrical System: Issues

August 14, 2003 **Blackout**



- Deteriorating System reliability: load requirement at 9 GW in 2004, increasing to 9.6 GW in 2009, 3 GW in shortfall without demand response & out of state capacities
- Frequent overload & congestion at distributed load pockets
- Limited distributed generation capacity to support critical services



## Objective & Scope of Study

### Applying a portfolio of models to:

- Evaluate efficiency improvements (Energy Star) and building upgrades in lowering electricity demand
- Develop mitigation strategies in reducing summer urban heat island effect
- Study the potentials and benefits of distributed generation (BCHP, FC) in load pockets
- Integrate interactive impact: energy - power, benefit/cost, and environmental emissions

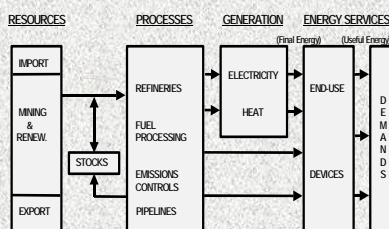


## Institutional Organization

Sponsor	Stakeholder	Working Group
U.S. EPA Region 2	Con Edison & ConEd Solution of New York	Brookhaven National Laboratory
NYSERDA	New York ISO	SUNY at Stony Brook
NYC Department of Environmental Conservation	NY Building Owners Management Association	GISS/Columbia University /CUNY at Hunter
Stony Brook Research Foundation	EarthPledge	SAIC



## MARKAL for Local Energy Planning

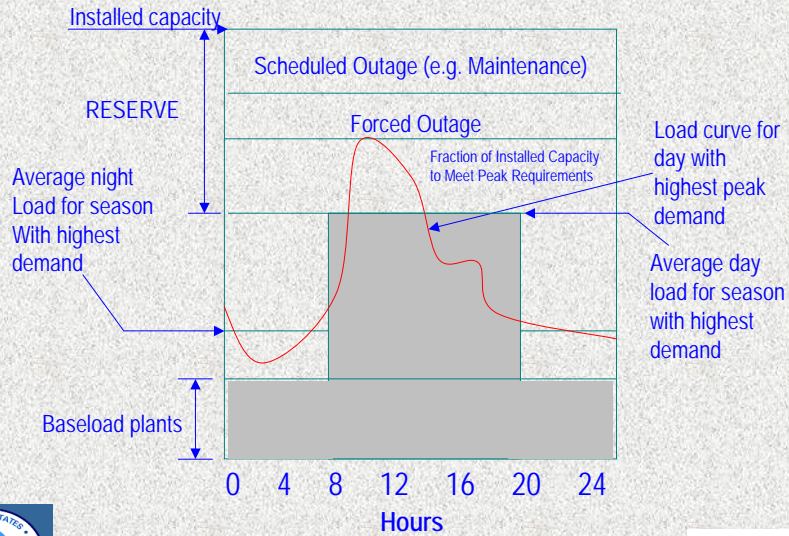


- Bottom-up approach to model technology mix and energy service demands
- Integrated framework for consistent energy/electricity flow and emission accounting
- Network capability to represent transmission, distribution & distributed generation of electricity
- Conversion of electricity demand at end-use to peak load

Web: [www.etsap.org](http://www.etsap.org)

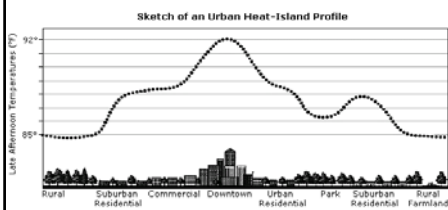
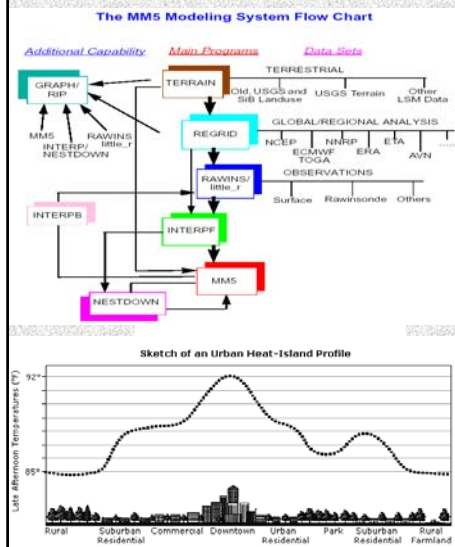


## Peak Load and Electricity Demand in MARKAL



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## The Fifth-Generation PSU/NCAR Mesoscale Model (MM5)



- A nonhydrostatic, terrain-following sigma-coordinate model designed to simulate or predict mesoscale atmospheric circulation.
- Mitigation Analysis of UHI effect from “green” and vegetated roofs, reduction of anthropogenic heat, urban forestry, etc



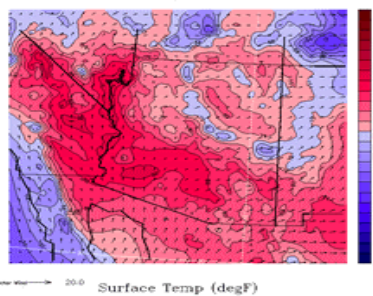
Web: [www.mmm.ucar.edu/mm5](http://www.mmm.ucar.edu/mm5)

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NYC Air Temperature, Aug14, 2002 10:30 AM



MM5 Simulation, 10 Km, August 10, 2003



## MM5 Focus & Output

- 4 - km resolution to simulate mesoscale climate of New York City metropolitan area
- 1 - km resolution to study UHI processes and effects and mitigation strategies on electricity load pockets and hot spots
- Key output includes surface temperature, wind speed and humidity

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## The EnergyPlus Building Energy Simulation Program

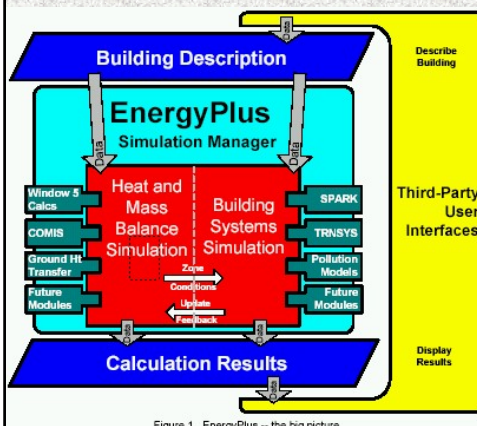


Figure 1. EnergyPlus -- the big picture

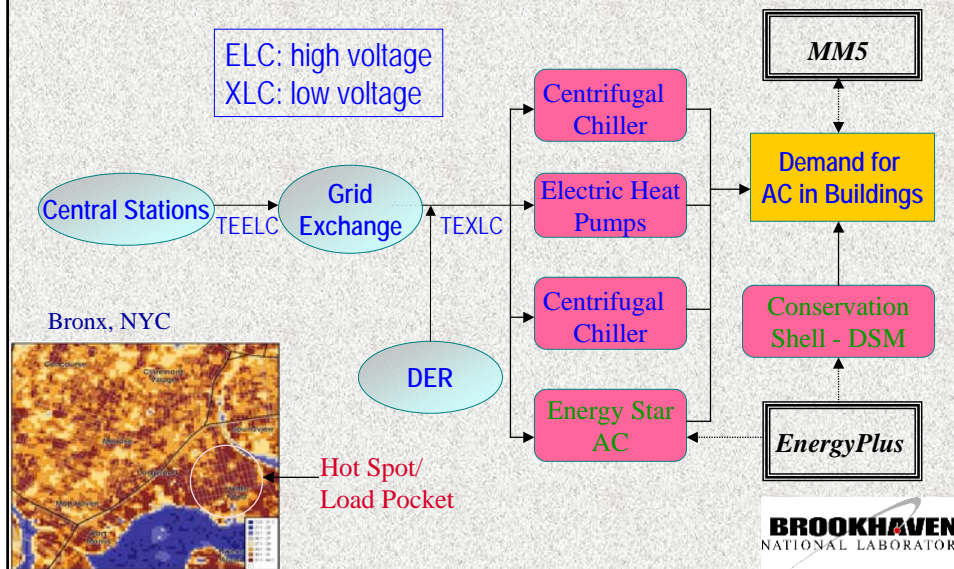
- Builds on the most popular features and capabilities of BLAST and DOE-2
- Calculates HVAC loads to maintain thermal control setpoints, based on the building's physical make-up, mechanical systems, environmental conditions, etc.



Web: [gundog.lbl.gov/EP/ep\\_main.html](http://gundog.lbl.gov/EP/ep_main.html)

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## MARKAL - EnergyPlus - MM5 Interaction



## Project Challenges

- Interfacing input-output of models to generate realistic results useful to study objectives
- Establishing the baseline requires extensive data from local utilities and GIS-Satellite imagery
- Collecting data & analysis at building specific level require highly specialized and laborious work
- Removing institutional barriers & cooperating with stakeholders

