SUFFOLK COUNTY LEGISLATURE

BUDGET REVIEW OFFICE
DIVISION OF LIPA OVERSIGHT

Prepared for: Suffolk County Legislature

Subject: **Large Scale Solar PV**
Clean Energy Standard
Case 15-E-0302

Date: May 31, 2016

Executive Summary

- New York State Energy Policy and local policies adopted by LIPA support deployment of Renewable Electric Generation Resources.
- Those projects already built or in progress have been predominantly sited in Suffolk County.
- How and where these projects are developed is likely to impact the people of Suffolk County.

NYS Energy Policy and PSEG LI/LIPA Request for Proposals

Source: NYS Department of Public Service (DPS)

NYS Energy Policy:

- The 2015 State Energy Plan (SEP) states that **50 percent of all electricity used in New York State by 2030 should be generated from renewable energy sources** (the 50 by 30 goal).

LIPA Energy Policy:

- Effective October 2012 **LIPA adopted a goal to add 400 MW of new renewable energy generation to its resource portfolio**.

- **LIPA issued Large Scale Renewable RFP**
  - Objective: to secure 280 MW of new renewables on Long Island
  - Selected: 122 MW from 11 solar projects
  - Status: 9 projects remaining for 96 MW

Large Scale Solar Photovoltaic (PV) Projects Built and/or Pending on Long Island

(Based on best available information)

Projects with Executed Power Purchase Agreements (PPAs)
(as of March 2015)

	# of Projects	Capacity (MW)
➢ Nassau County	9	2.8
➢ Suffolk County	67	110.6
Total	76	113.5

Suffolk County % of Total Capacity = ... 97.5%

Note: Projects above include the Long Island Solar Farm at BNL and the enXco projects built on Suffolk County properties.

PSEG LI/LIPA Request for Proposals (2015)

Source: NYS Department of Public Service (DPS)

- **South Fork RFP**
  - Issued: June 24, 2015 – sought **63 MW** of peak day capacity installed between 2017 and 2019
- **Additional Renewable RFPs**
  - **Part 1 - 2015 Renewable RFP** (issued December 22, 2015)
    - Objective: to secure **210 MW** of additional renewable capacity connected directly to the distribution system
  - **Part 2: Fuel Cell Feed-in Tariff (up to 40 MW)** – must inject power directly into the PSEG LI system
  - **Part 3: Commercial Solar Feed-in Tariff** targeted to rooftop and carport **solar projects greater than 200 kW but less than 1 MW in size**. Must inject power directly into the PSEG LI system
- **Rockaway and Glenwood RFP** *(not yet issued)*

PSEG LI/LIPA Resource Requests

Source: NYS Department of Public Service (DPS)

- Eligible Resources:
  - solar, on & offshore wind, hydropower, tidal, and geothermal
  - fuel cells that use 100% renewable energy sources and offer a fixed price
  - direct-fired generators using a biomass fuel (I.e. agriculture or animal waste, small diameter timber, and others)
  - storage systems paired with the above renewable technologies

Large Scale Renewable Generation Project Sites

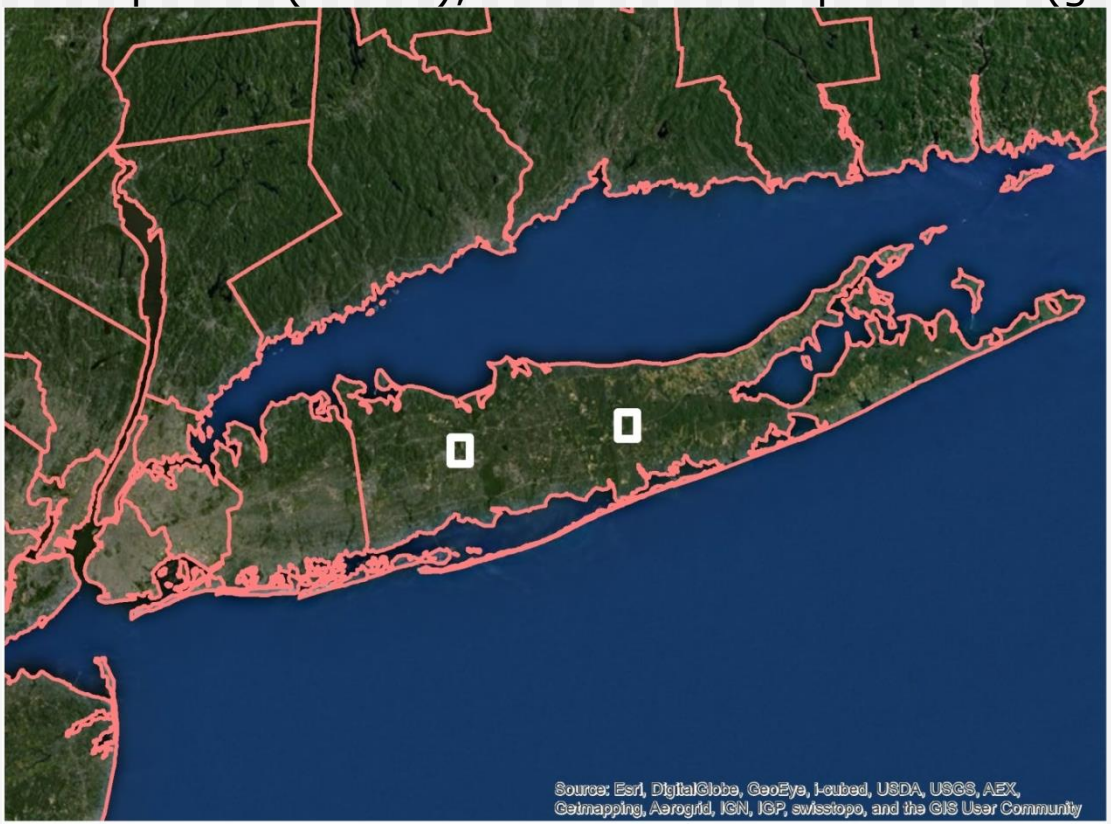
- Proximity to Utility Substations (for direct connection to utility grid).
- Preferred Locations for Ground Mounted Systems
  - Parcels with adaptable zoning (have included sod farms, golf courses, and wooded lots).
  - Lowest 1st Cost
- Parking Lots (carports built at Suffolk County owned facilities)

What is the regional impact of site selection?

NAIP Aerial Imagery
Long Island Region (July 31, 2014)

http://www.fsa.usda.gov/programs-and-services/aerial-photography/imagery-programs/index

An aerial view of Long Island reveals a distribution of urban/suburban development (brown), and less developed areas (green).



NAIP - National Agriculture Imagery Program acquires imagery during the agricultural growing seasons in the continental U.S.

Thermal Radiance *(warmth)* of Surface Features (July 31, 2014)

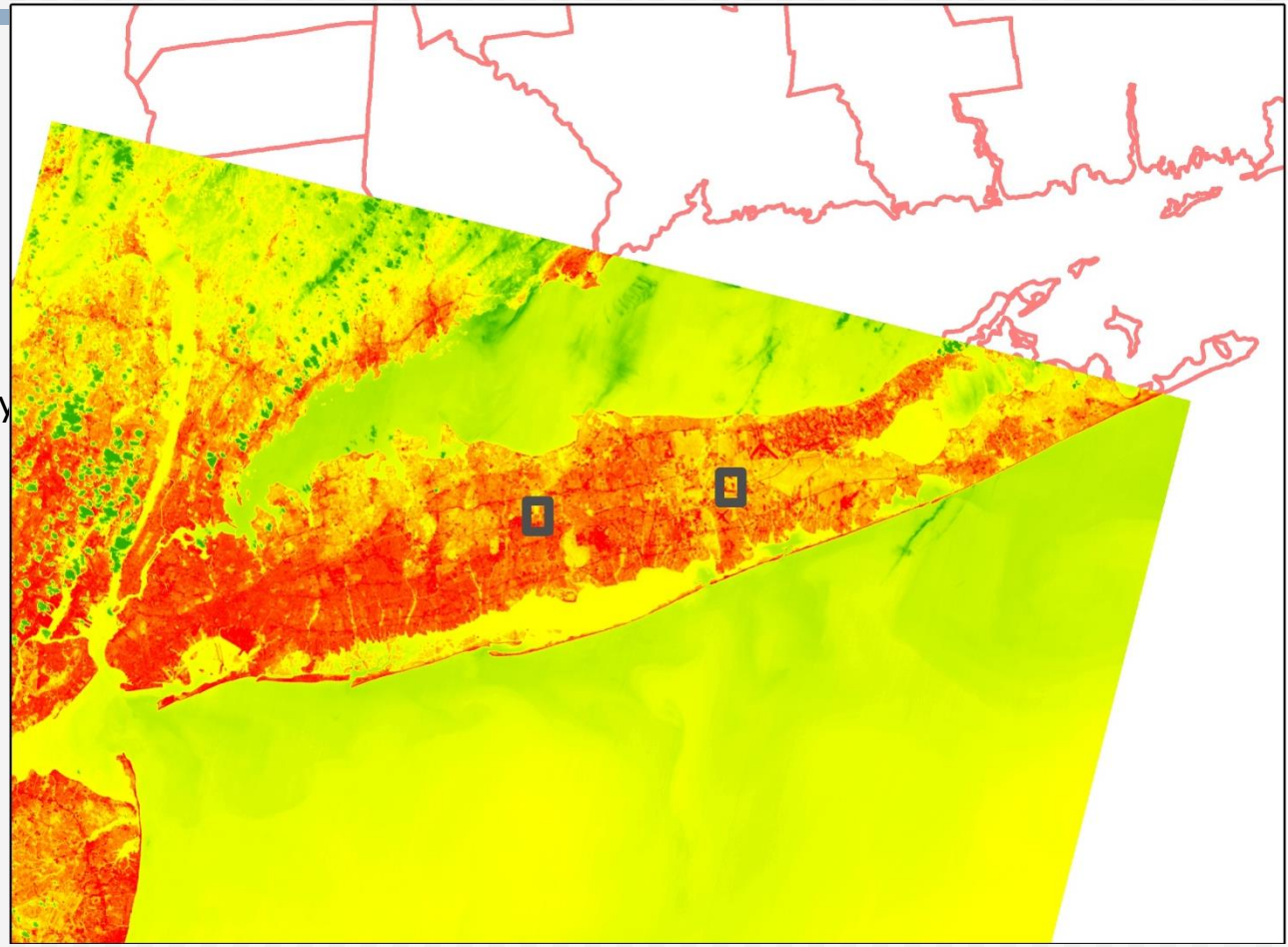
Earthexplorer.usgs.gov

Note: USDA Forest Service assumes a 0.5 °F temperature reduction for every 10% canopy increase.

Heat Island

Eastward migration from NYC via development (i.e. roads, parking lots, and buildings).

See also the influence of cyclical agricultural activity (summer harvest) on the "east end".



Landsat - U.S. Geological Survey Earth Resources Observation and Science (EROS) Center - SATELITE (LANDSAT 8) THERMAL BAND 11

Narrative: There are more trees on Long Island today than there were 100 to 150 years ago. (True? False? Relevant?)

Reference:

A History of Long Island From its Earliest Settlement to the Present Time, by Peter Ross, LL.D., published in 1902 (Topography of the Island, pg. 6)

"Although from a botanical point of view the plant life of Long Island is not as varied or interesting as might be expected, still, **if we accept the estimate made by Elias Lewis in 1883 that there were then eighty-three species of forest trees within its boundaries, there is not much cause for complaint**…"

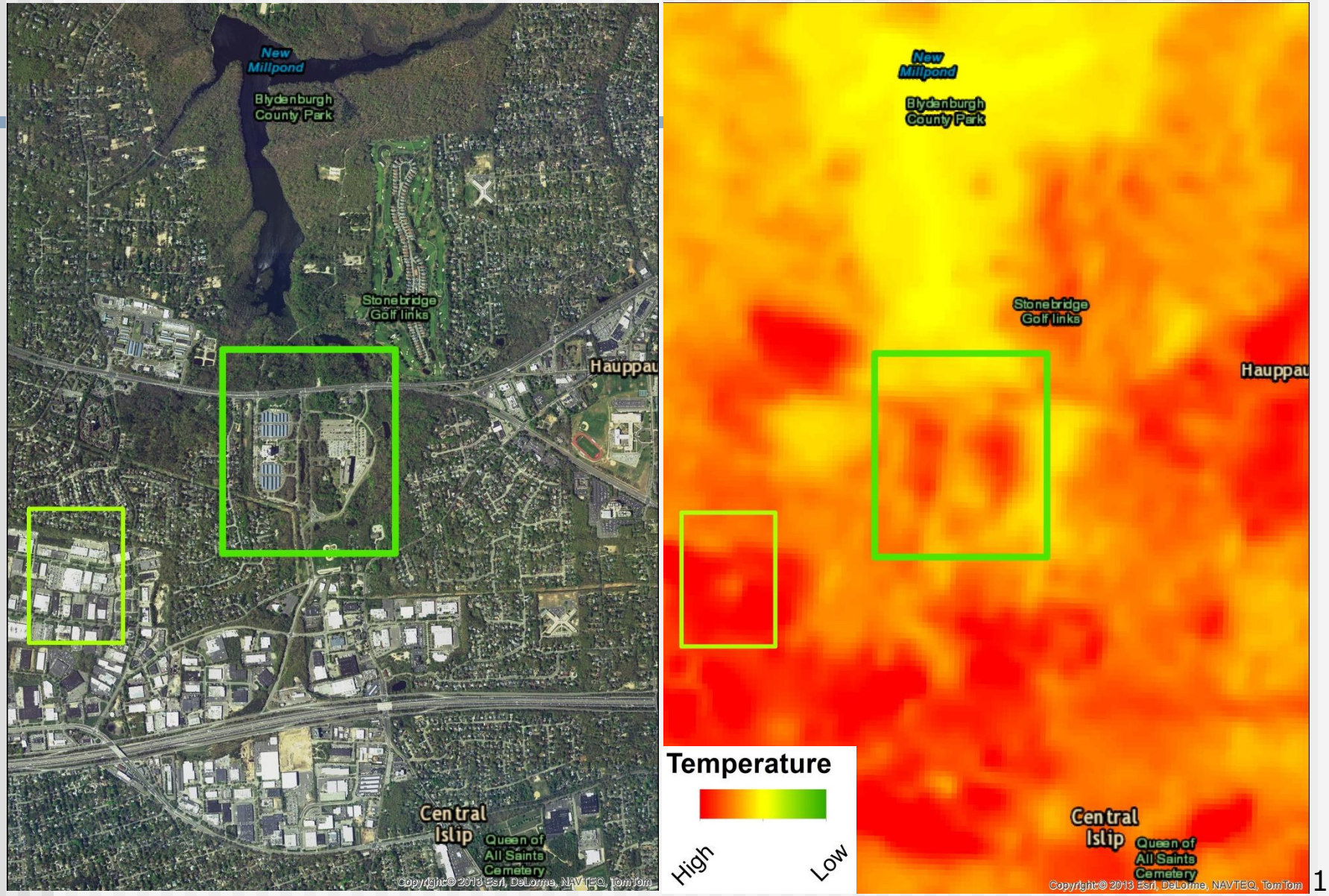
"Long Island," writes Mr. Elias Lewis, "is fairly well wooded. Its forests are of oak, hickory, chestnut, locust, with many other species of deciduous trees. The evergreens indigenous to the soil are almost entirely of the yellow or pitch pine …"

"At an early period of its history the forest growth of the island was doubtless heavier than now."

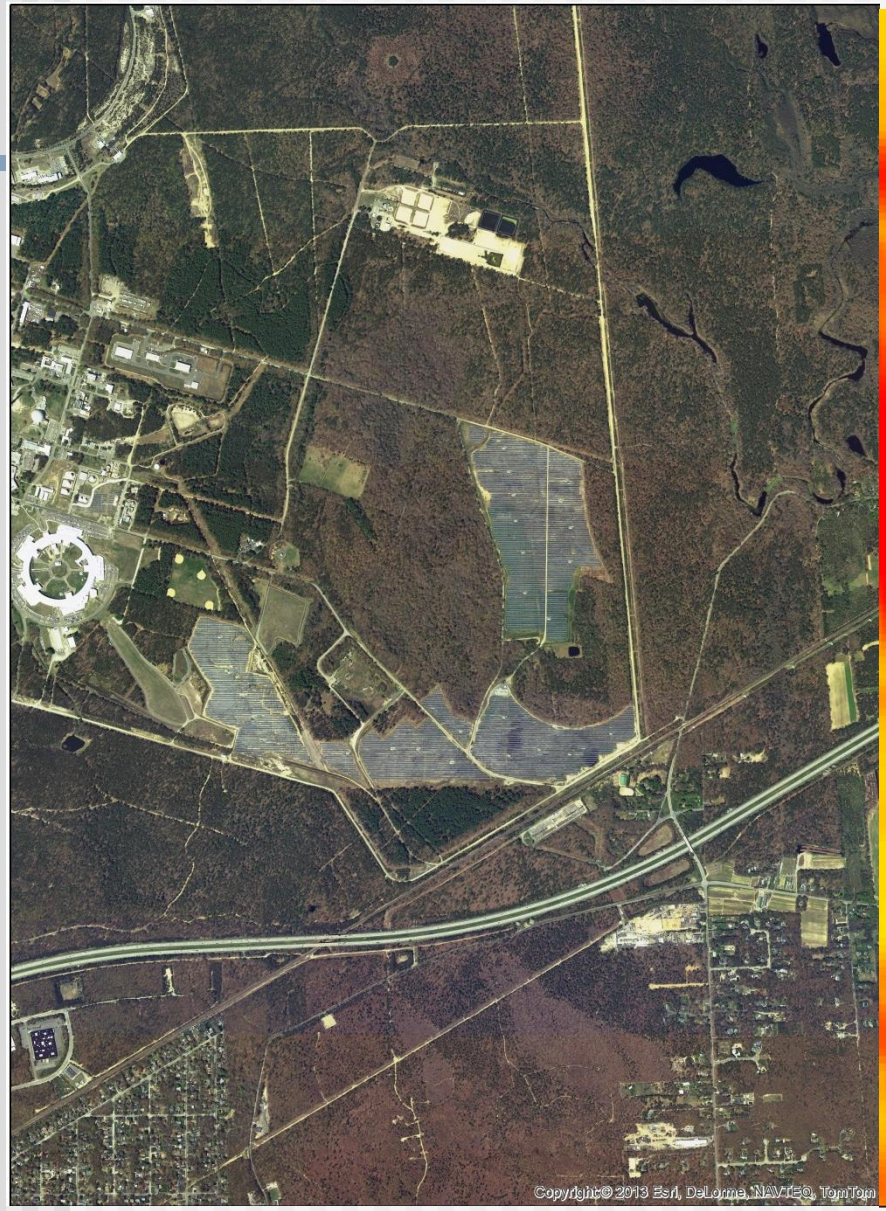
"The growth of hard-wood trees on Long Island is rapid."

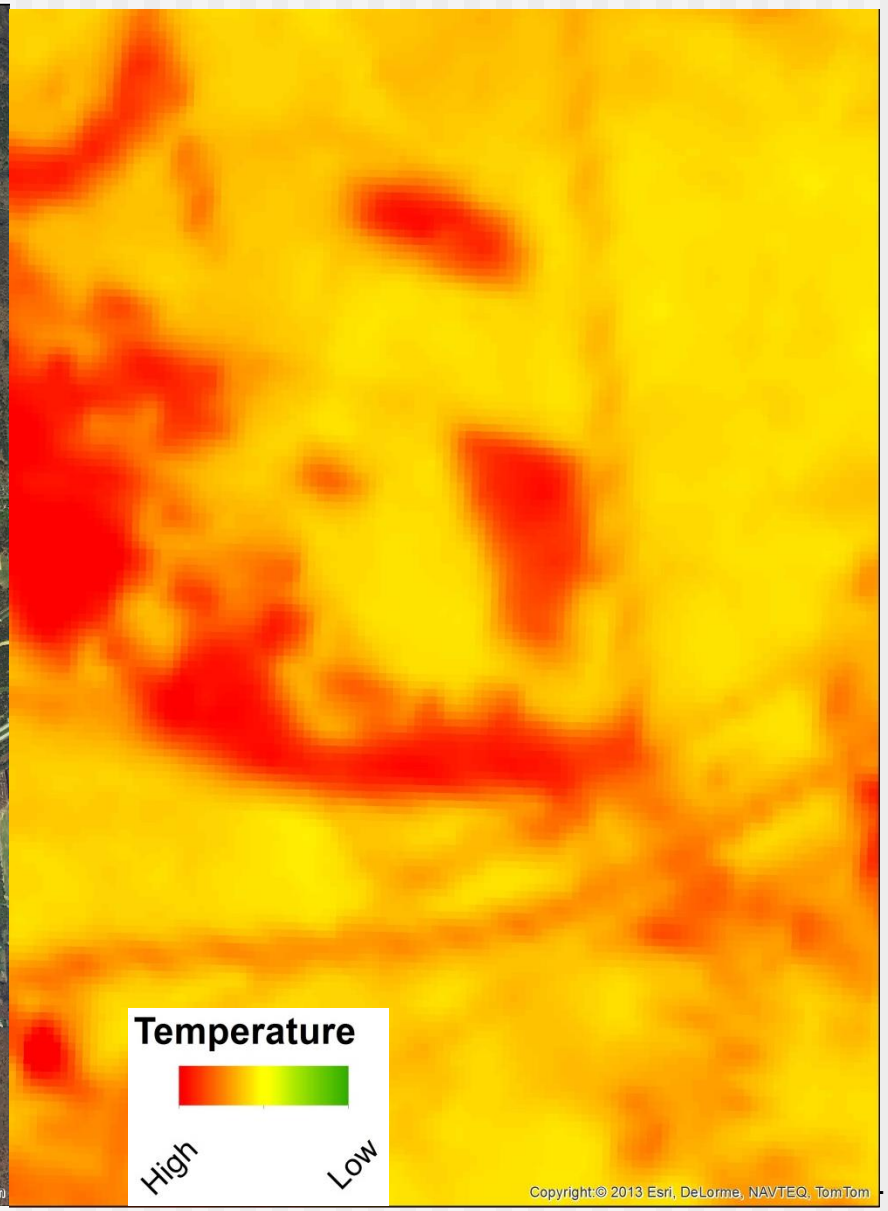
Given the progression of suburban development across Long Island, is the narrative relevant?

H.L. Dennison & P.B. Duryea Buildings Hauppauge, NY (July 31, 2014)

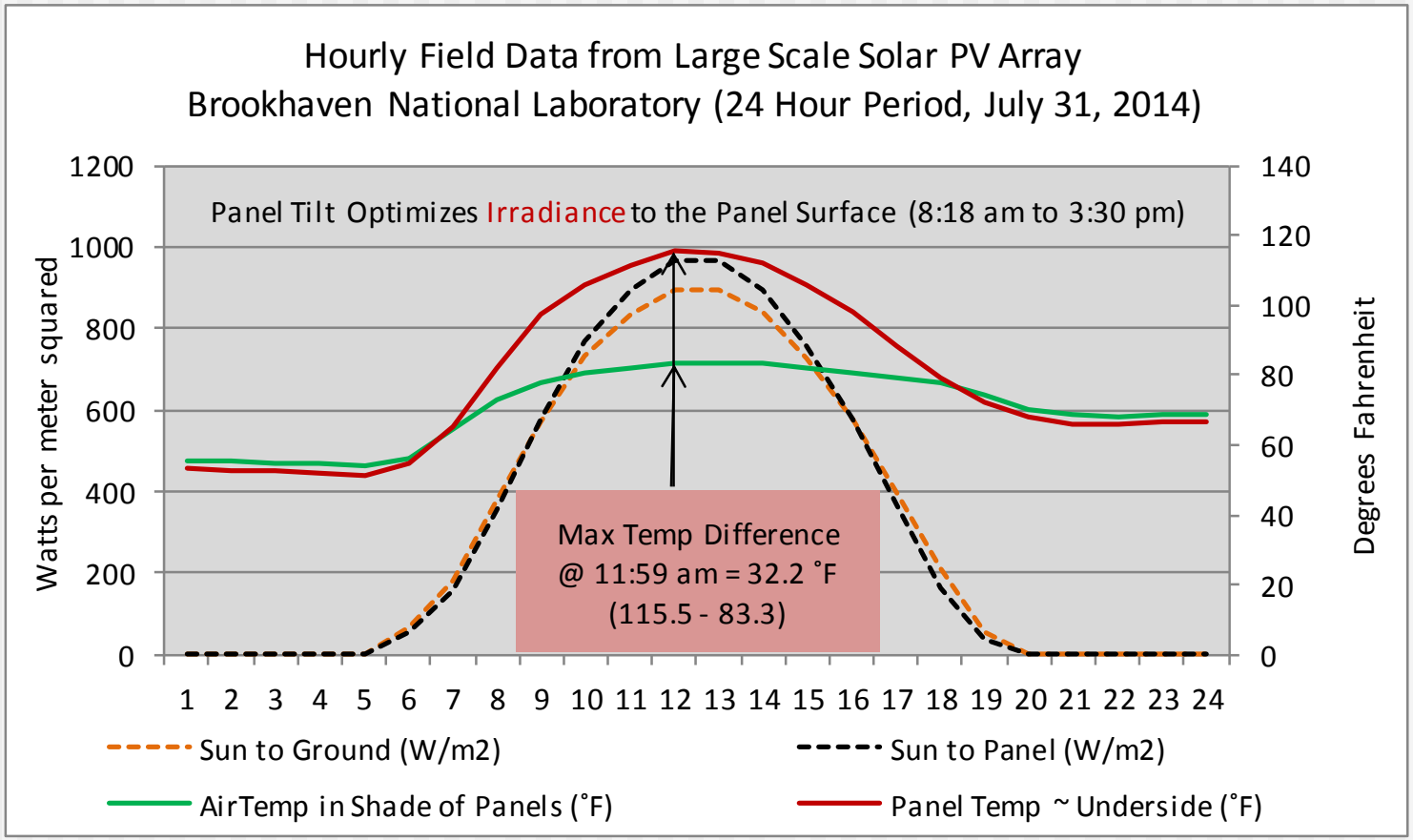


Brookhaven National Laboratory (BNL) Solar PV Array (July 31, 2014)





Temperature Profile of Large Scale Solar PV Array (July 31, 2014)



Division of LIPA Oversight, Suffolk County Legislature (Source: BNL, Solar PV & Ground Temp Data)

Irradiance is the radiant flux (power) received by a surface per unit area (i.e. W/m^2).

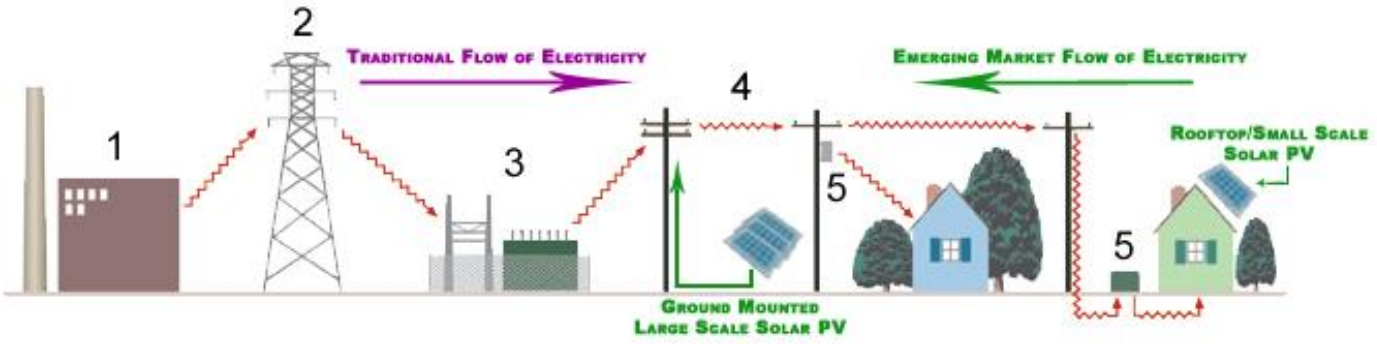
The Evolving Energy Marketplace

- Deregulation (1990s)
  - Electric utilities forced to divest of electric generation (became "Load Serving Entities")
- Reforming the Energy Vision (2014-Present)
  - Restructuring the role of electric utilities, including a focus on **Distributed Energy Resources (DER)**
  - DERs include a variety of technologies and programs but are expected to include a considerable emphasis on solar PV

Questions Relating to DER:

1. Does it matter where Distributed Energy Resources are deployed?
2. How will the success of those projects be measured (i.e. total MW installed)?
3. What impact are they likely to have on the Suffolk County region?

Evolving Electric Utility Grid
(Dealing with two-way flow of electricity)



Reforming the Energy Vision (REV)

- Supports installation of Distributed Energy Resources (DER) which includes a strong focus on Solar PV Systems.
- As more Solar PV Systems are installed, the "two-way" traffic of electricity over utility wires increases and the available "capacity" of those wires is reduced.

1 - Power Plant
2 - Transmission Wires
3 - Electric Substation
4 - Transmission and Distribution (T&D) Grid
5 - Overhead and/or Underground Service to Consumer

A Self-Limiting Strategy:

Industry experience demonstrates that as more distributed electric generation feeds into the utility grid, grid circuits become less able to accommodate that energy (see SunEdison project at Gabreski Airport).

Summary of Comments Submitted on Behalf of Suffolk County

Department of Public Service (DPS) Proceedings (Matter 15-00262)

- Utility scale solar PV (USPV) **projects that are built on parking lots in commercial and industrial areas should be given preference** over projects that are built on vegetated lands and/or in or "near" residential communities.

- USPV **projects should be encouraged in high electric load areas** (i.e. shopping malls and industrial parks) … **to serve those loads as a first priority**.

- To help reduce project costs borne by ratepayers, **LIPA/PSEG LI should** fund a solicitation, in cooperation with local municipalities, to **establish one-time engineering specifications for a "universal" carport** that would be adopted as a basic standard by all municipal jurisdictions across the LIPA service territory.

New in 2016:

- **"Community Net Metering"** could be employed as a benefit to communities that host large scale solar PV projects at School Districts and other Municipal sites.

Land Use Alternatives for Electric Resource Development

Based on comments submitted on behalf of Suffolk County as part of DPS Proceedings (Matter 15-00262):

- **Proposals for utility scale DER should include a land use assessment** that compare the propose project at the proposed site in context to:
  - **potential alternative locations (i.e. paved vs vegetated)**, and
  - **alternative land use under existing zoning.**

- Resource planning should include a strategic progression toward a growing market share of renewable electric generation platforms…**the status of renewable market share should be made apparent to ratepayers**…and should be updated as a component of ongoing resource planning and the project award process.

Simple Comparison of Potential Large Scale Project Sites

Greenfield Arrays

- Typically Remote from Electric Load (consumers)
- May contribute to Utility Grid Circuit "Congestion" (i.e. strains available capacity)
- Result in higher operating temperatures during Peak Electric Demand Periods.
  - May contribute to greater air conditioning loads.
- Reduces Carbon Dioxide (CO_2) absorption by vegetation:
  - Probable Release of CO_2 already absorbed.
  - Eliminates/reduces CO_2 absorption over life of project.

Carport Arrays

- Typically Adjacent to Building Electric Load (consumers)
- May limit Utility Grid Circuit Congestion (serving host loads first reduces two-way transport of electricity over wires)
- Temperature neutral compared to paved areas during Peak Electric Demand Periods – and **cools more rapidly than paved areas**.
  - May help to reduce air conditioning loads.
- Preserves Carbon Dioxide (CO_2) absorption by Greenfields.

Peak Demand and LIPA's Load Factor

LIPA's Summer Peak Demand (5783 MW) - recorded in July 2011.
Summer Demand is driven primarily by Temperature and Humidity.

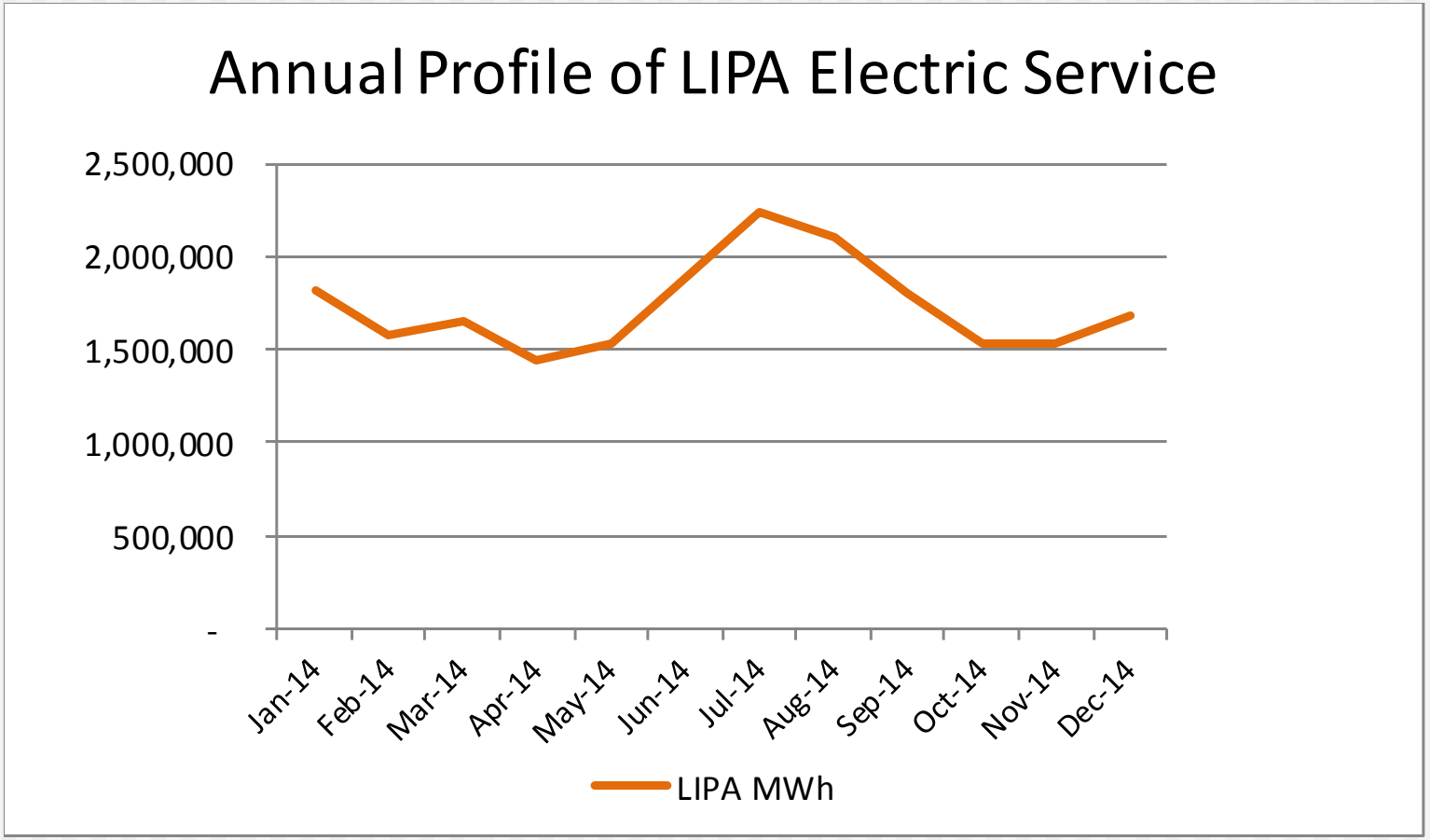
LIPA's Winter Peak Demand (3651 MW) - recorded in December 2004.
Winter Demand is driven by Temperature and Holiday Activities.

According to the Department of Public Service:
LIPA/PSEG LI currently has one of the worst load factors of all the New York electric utilities at 44%.

- Load factor is the relationship of the average demand to the peak demand.
- A low load factor indicates a system that is not efficient because of the amount of additional capacity needed to meet peak demand.
- This additional capacity requires additional costs that must be borne by LIPA and its ratepayers.

(Matter 15-00262, Transcript of June 24, 2015, pgs. 1221-1222)

LIPA's Annual Profile



Source: LIPA, Division of LIPA Oversight, Suffolk County Legislature *(BRO SCWA Pump Req)*

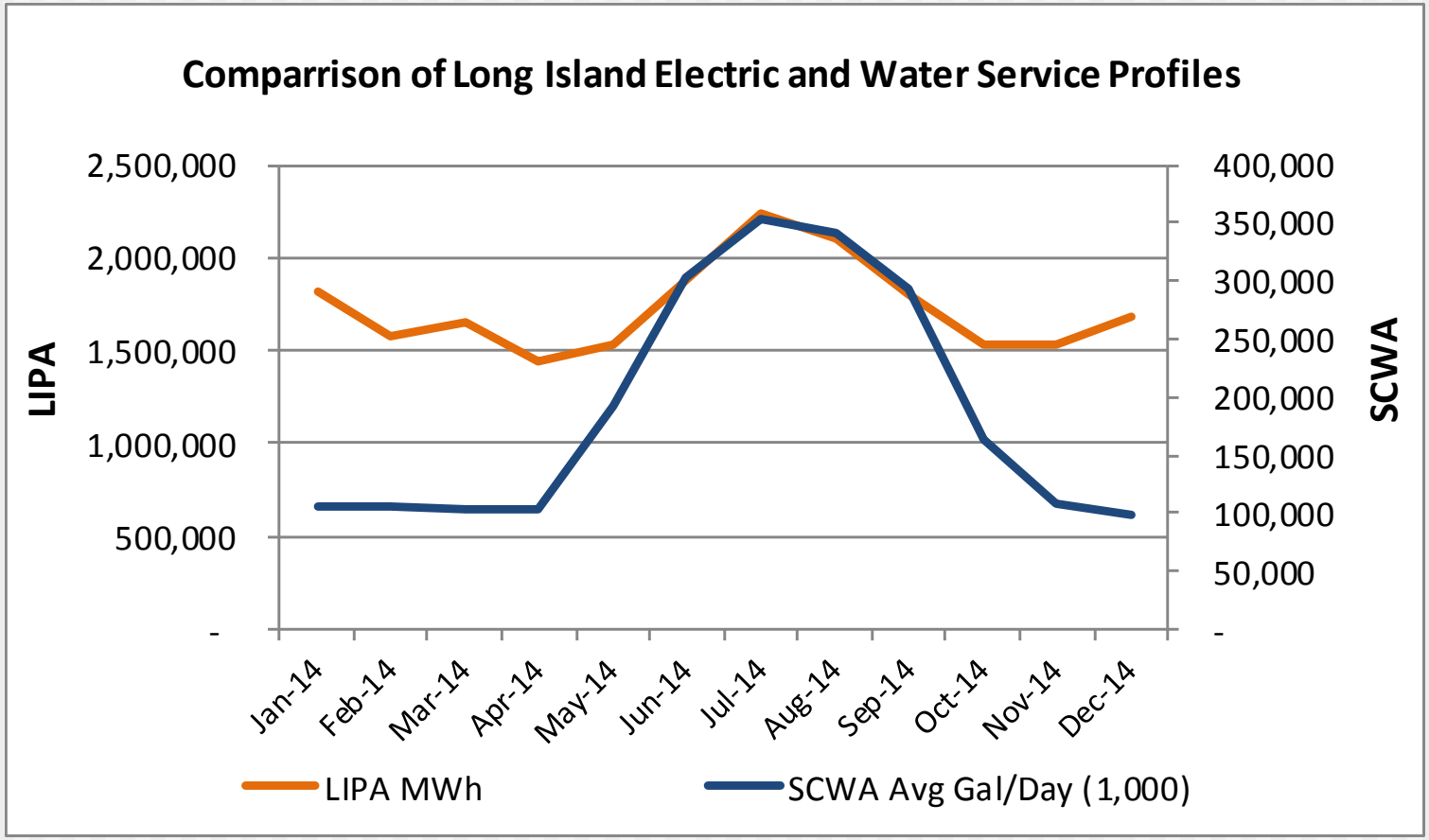
Other Consequences of Peak Summer Demand for Electricity

Electric and Water Utilities have similar seasonal profiles, including a Summer Peak.

The Water-Energy Connection is illustrated by:

- **U.S. Geological Survey (USGS)** Circular 1407, The Water-Energy Nexus-An Earth Science Perspective, 2015
  - "reducing the use of freshwater and protecting it from contamination conserves energy, and **reducing energy use conserves water**."
- The Johnson Foundation, Building Resilient Utilities, How Water and Electric Utilities Can Co-Create Their Futures, 2013
  - As per U.S. DOE, 2006; "Water and wastewater utilities are among the largest consumers of energy in communities across the United States."

Illustration of Long Island Demand for Electricity & Water



Source: LIPA and SCWA, BRO Div of LIPA Oversight *(BRO SCWA Pump Req)*

Most Studies Assess Environmental Benefits of Renewable Generation Based on Coal Fired Generators
(Typically the U.S. Average Blend)

Carbon Dioxide (CO_2) Emissions Profile

Different fuels emit different amounts of carbon dioxide (CO_2) in relation to the energy they produce when burned.

Pounds of CO_2 emitted per million British thermal units (Btu) of energy for various fuels:

Coal (anthracite)	**228.6**
Coal (bituminous)	**205.7**
Coal (lignite)	**215.4**
Coal (subbituminous)	**214.3**
Diesel fuel and heating oil	**161.3**
Gasoline	**157.2**
Propane	**139.0**
Natural gas	**117.0**

https://www.eia.gov/tools/faqs/faq.cfm?id=73&t=11

U.S. Electricity Generation by Fuel Source

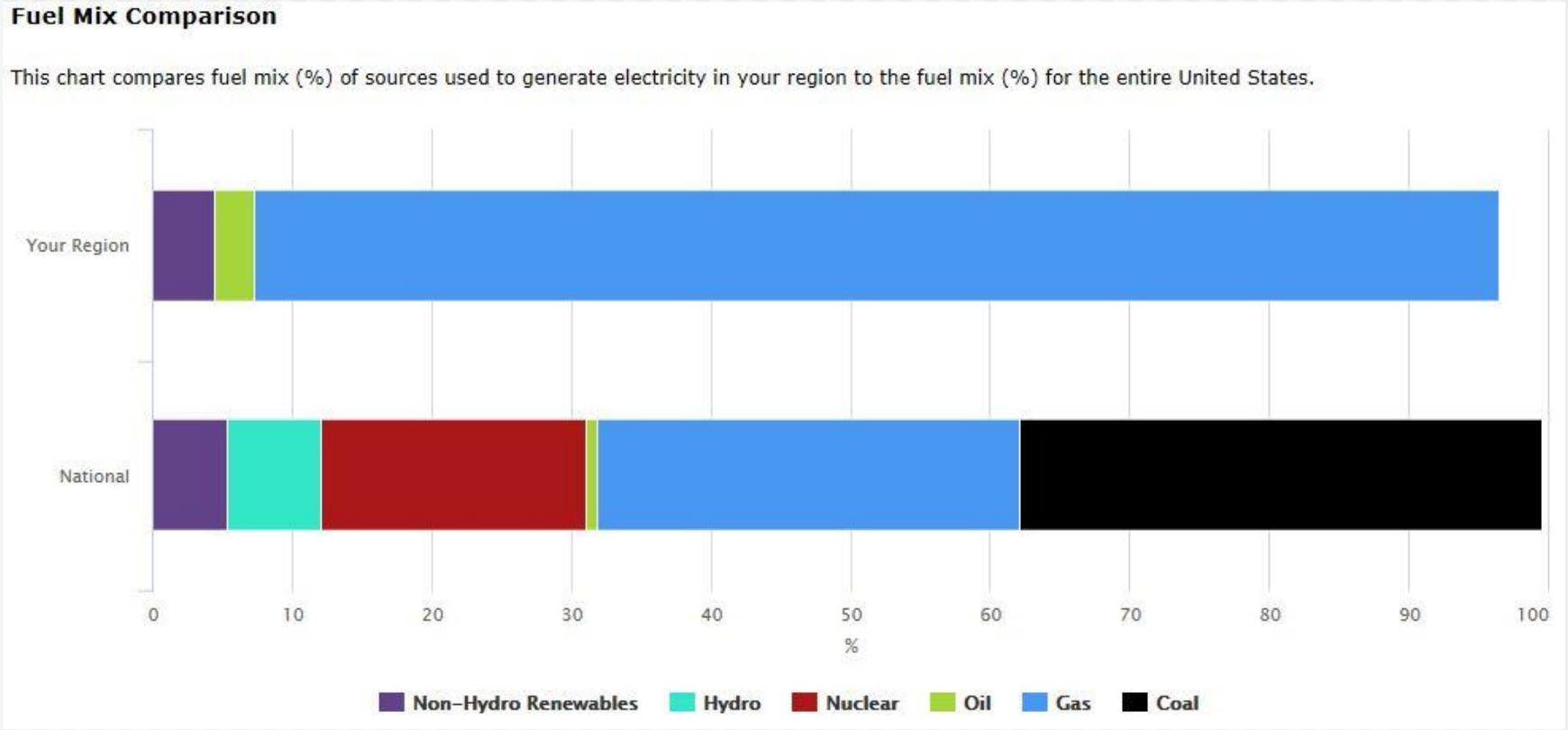
Emission Reductions are frequently calculated based on the U.S. Average Blend of Fuels used for electric generation, which may not reflect regionally relevant fuel blends.

	2010	2014
Coal	45%	39%
Natural Gas	23%	27%
Nuclear	20%	19%
Hydropower	7%	6%
Other Renewables	4%	7%
Petroleum	1%	1%

US-EIA, Electric power monthly, Washington, DC: U.S. Energy Information Administration: September 2010, and
http://www.eia.gov/tools/faqs/faq.cfm?id=427&t=3

Energy Information Administration Fuel Mix comparison

(February 22, 2016)



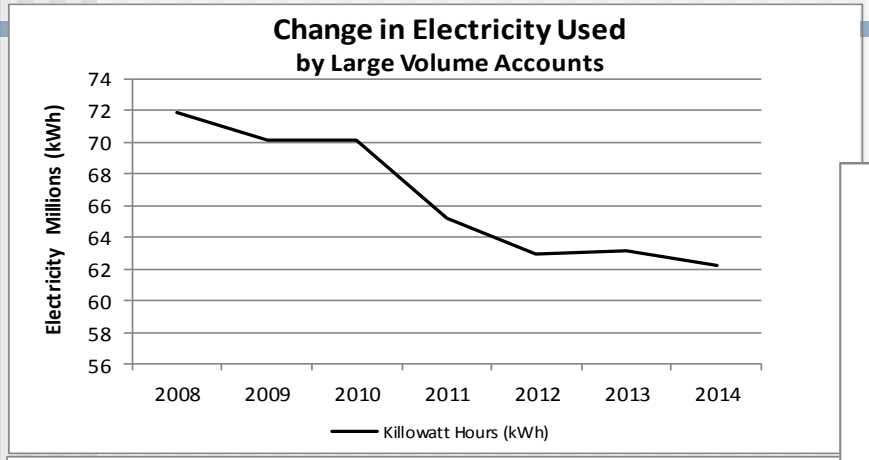
Annual average blend for LIPA is approximately 90% natural gas with the remainder being oil, renewables, and nuclear.

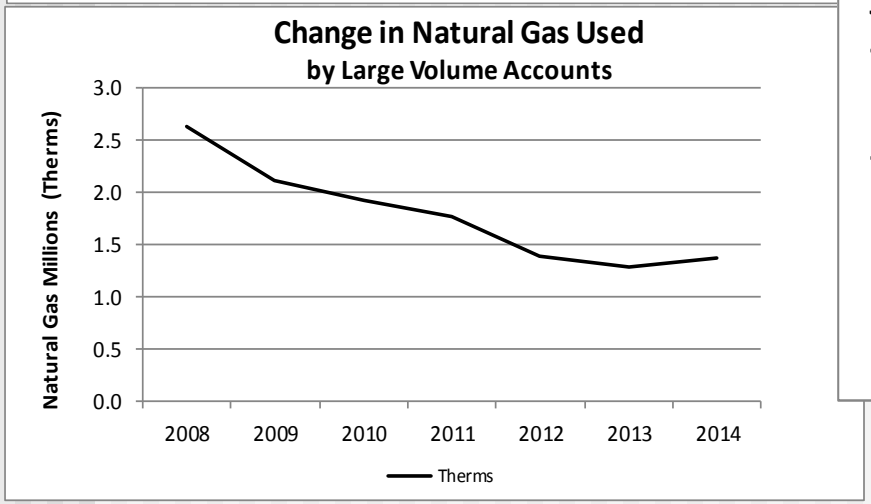
Suffolk County's Active Role to Reduce Expenditures for Energy = Recurring Annual Savings/Avoided Costs = $5 million

- Reduce Demand for Energy by improving the Energy Use Profile of Buildings. This is repeatable by municipal partners.
- Energy Assessment and Optimization of existing equipment and control systems.
  - Ensure that systems are performing as they should.
    - Adequate Staff Training
    - Proper Maintenance
    - Upgrade when appropriate
  - Ensure that systems that should be integrated are integrated.
    - Building Management Systems
    - Outdoor temperature sensors
    - Space conditioning controls (thermostats)
- Secure Lower Cost Energy via Commodity Contracts

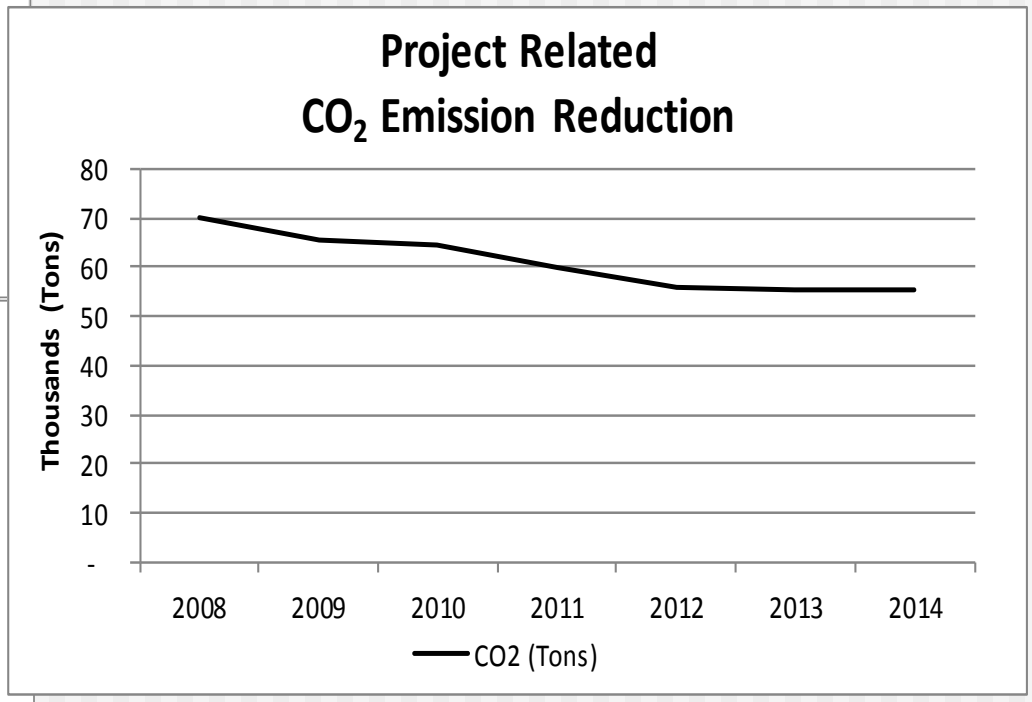
Note: Including Fuel Switching from Fuel Oil to Natural Gas, Recurring Annual Savings/Avoided Costs = $11.4 million

Result of the County's Self-directed Energy Efficiency Program





Source: Budget Review Office *(Utility Bill Analysis.xlsx)*



Source: Budget Review Office *(Utility Bill Analysis.xlsx)*