Tompkins County Electricity Supply & Demand

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Cornell University, MBA 2012

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Agenda

- Project description
- Power generation
- Transmission and distribution
- End-use
- Next steps

Project description

Project goal

Provide overview of energy supply and demand conditions in Tompkins County

Purpose

Facilitate development and analysis of scenarios for efficiently meeting county's future energy needs

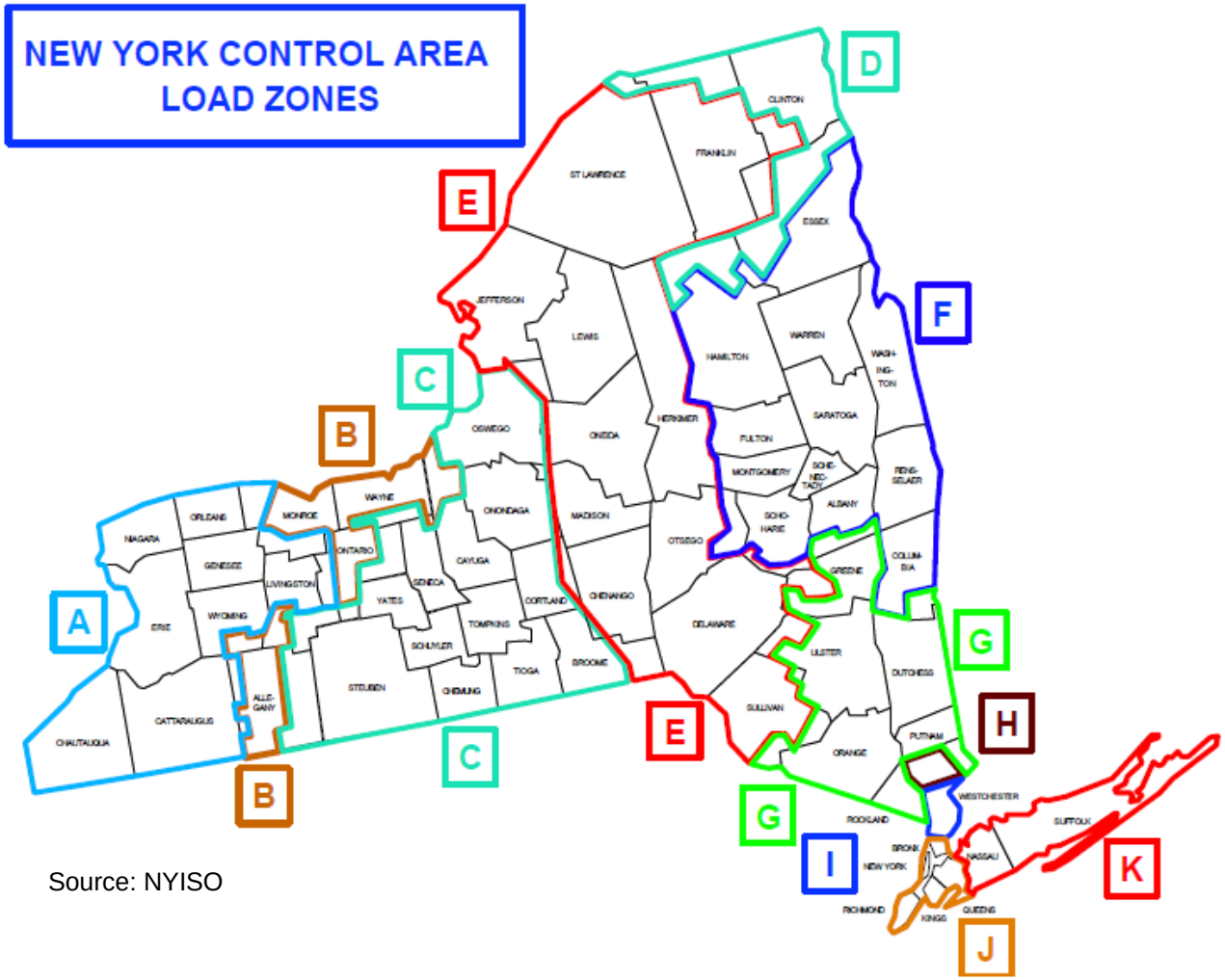
Project methodology

Interviewed 15 energy professionals and key local stakeholders

Conducted secondary research using diverse group of sources

Project Description → Power generation → T&D → End-use → Next steps

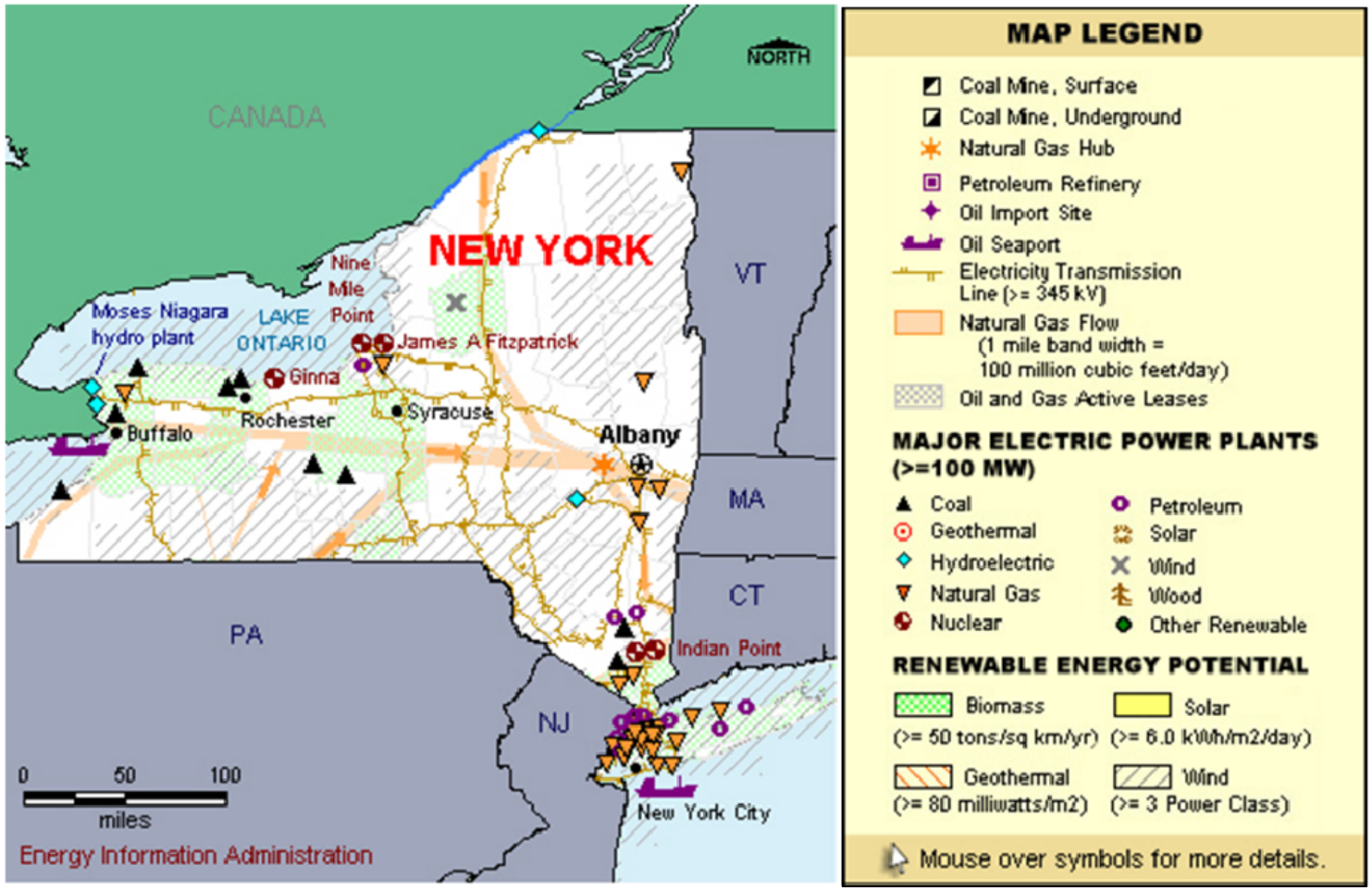
Tompkins is one of ~14 counties in NYISO Zone C



Source: NYISO

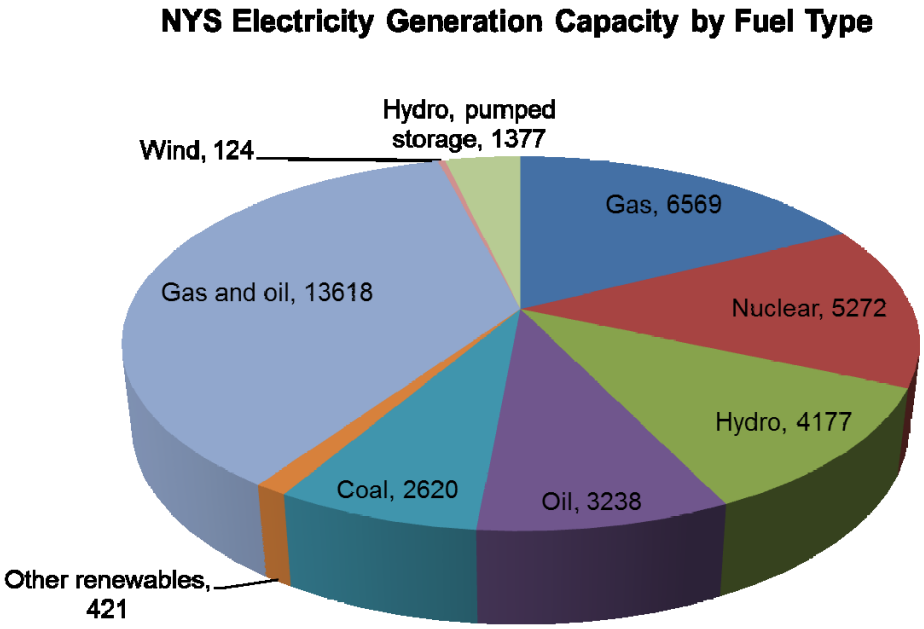
Project Description | Power generation | T&D | End-use | Next steps

Tompkins County relies on infrastructure outside local area to meet energy needs

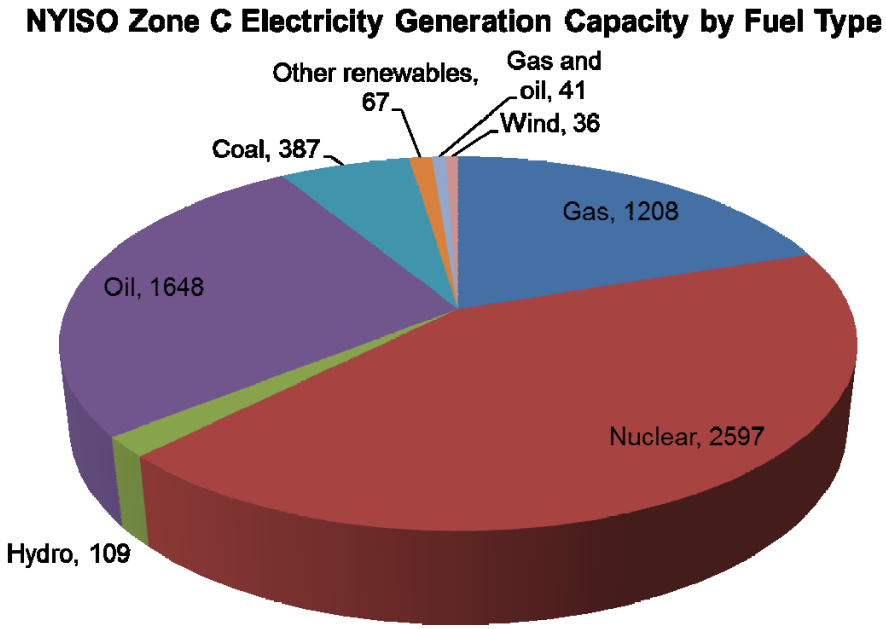


Source: EIA (updated November 2009)

Nuclear higher share of generation capacity in Central New York than in state as whole



Source: NYISO



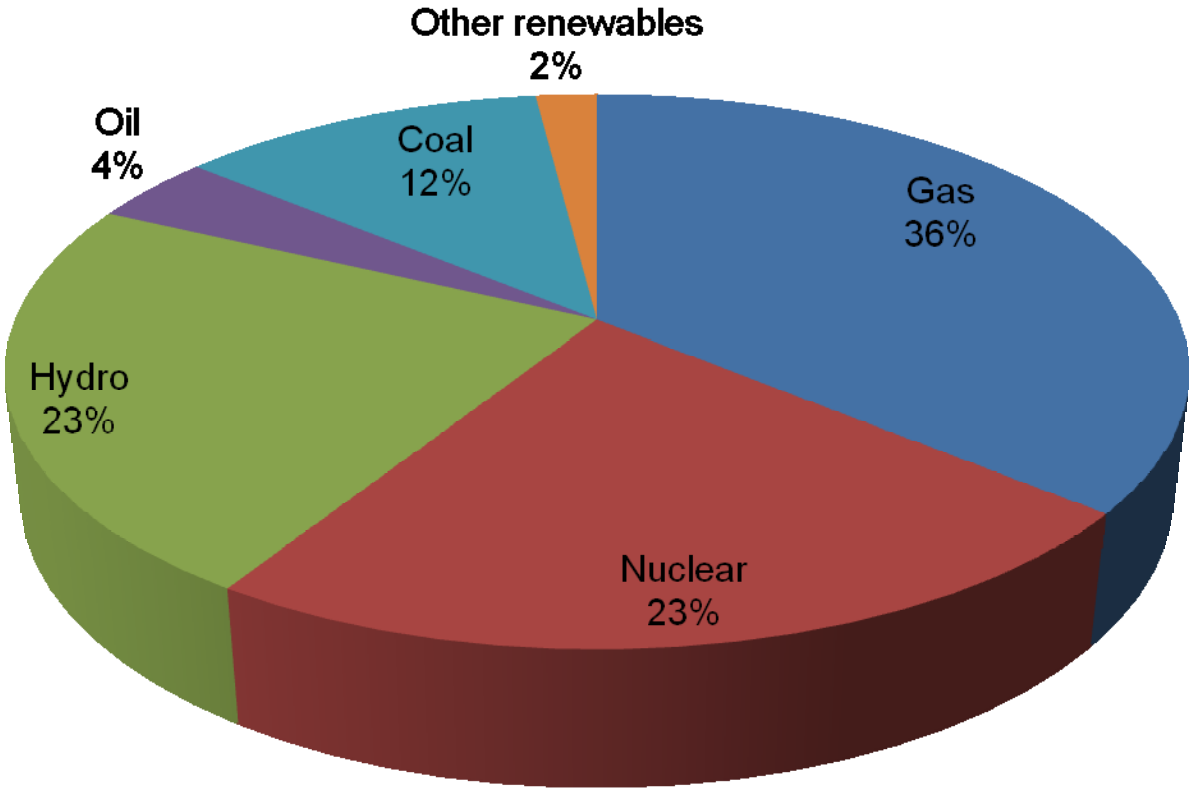
Source: NYISO

Total: 37416 MW

Total: 6093 MW

NYSEG estimate shows balance of gas, nuclear, and hydro in Tompkins County

Tompkins County Estimated Electricity Fuel Mix



Source: Tompkins County Comprehensive Plan, data provided by NYSEG

AES Cayuga's operating challenges impacting local tax revenues

Plant overview

- Commissioned in 1955
- Coal-fired
- Rated capacity ~323 MW
- Base load
- Sell power into merchant market

Recent developments

- AES Eastern Energy filed bankruptcy in December 2011
- PILOT agreement to lower assessment from $112.5 million to $60 million by 2014, reduce local taxes from $3.2 million to $1.7 million
- Plant typically running only one of two turbines since summer 2011
- Headcount reduced to 63 from peak of 110

Photo credit: Unidentified Flickr user

Retrofit potential

- CC gas more attractive downstate where electricity prices higher
- Interconnection only asset of real value if converted to gas-fired
- Significant obstacles for pump storage (low demand, narrow peak v. non price spread, eco concerns)

Cornell ERL project would increase campus electricity usage ~53%

Cornell electricity overview

- Peak load ~36 MW
- Central energy and hydro plants meet ~90% of campus electricity needs
- CHP plant overall efficiency ~79% v. ~49% conventional plant/boiler combo
- Lake source cooling saves ~25,000,000 kWh annually

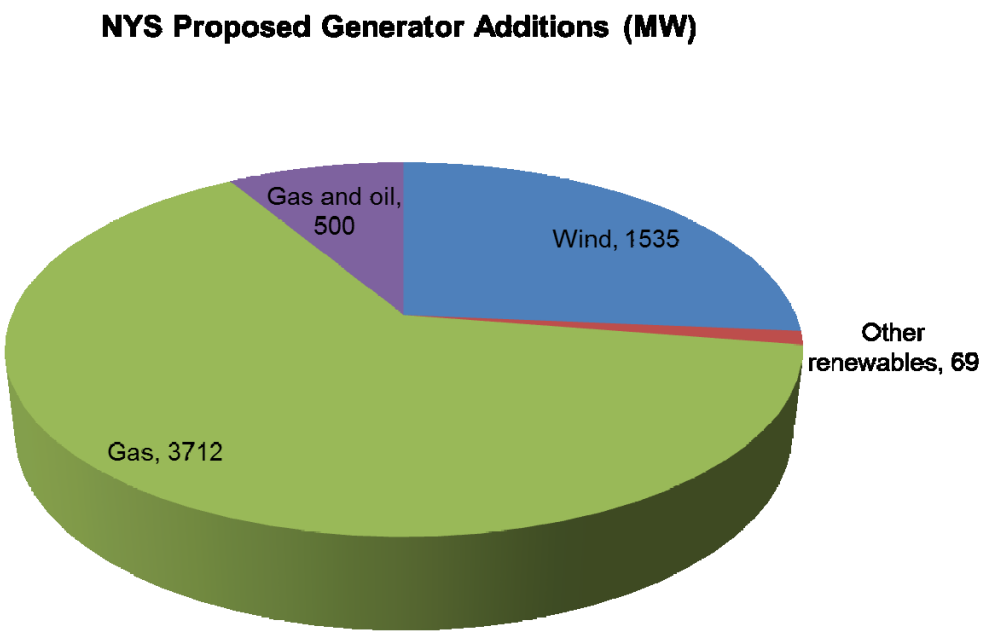
ERL project description

- ERL = Energy recovery linear accel.
- Projected load ~19 MW
- Application on hold due to DC political climate ($500 million cost)
- Approval process ~3 years plus ~5 years to build
- Approached NYPA re: hydro but no firm plans for meeting power needs

Cornell central energy plant

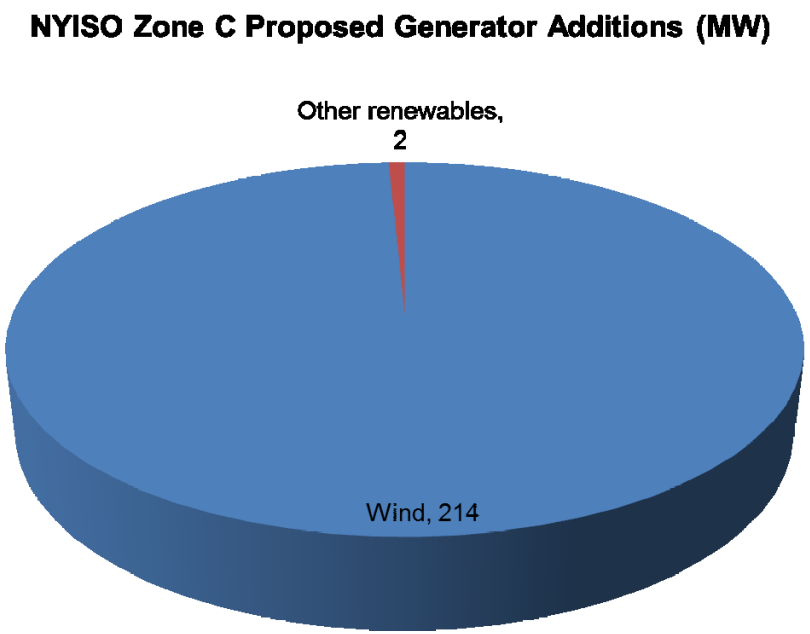
Photo credit: Cornell Daily Sun

Natural gas dominates proposed generator additions in New York State



Source: NYISO

Total: 5817 MW



Source: NYISO

Total: 216 MW

Black Oak Wind Farm largest generator addition being considered in county

Black Oak Wind Farm

- Sited in Enfield
- Rated capacity ~20 MW
- Developer projects commercial operation late 2013 to late 2014
- Pursuing ~$1 million private placement to complete development
- Capital raise of ~$40 million anticipated late 2012 early 2013
- Still seeking power purchaser

Projects under consideration

- Cayuga Medical Center CHP feasibility study undertaken Fall 2011
- Ithaca College central plant feasibility study to begin 2013 (peak load ~6 MW)

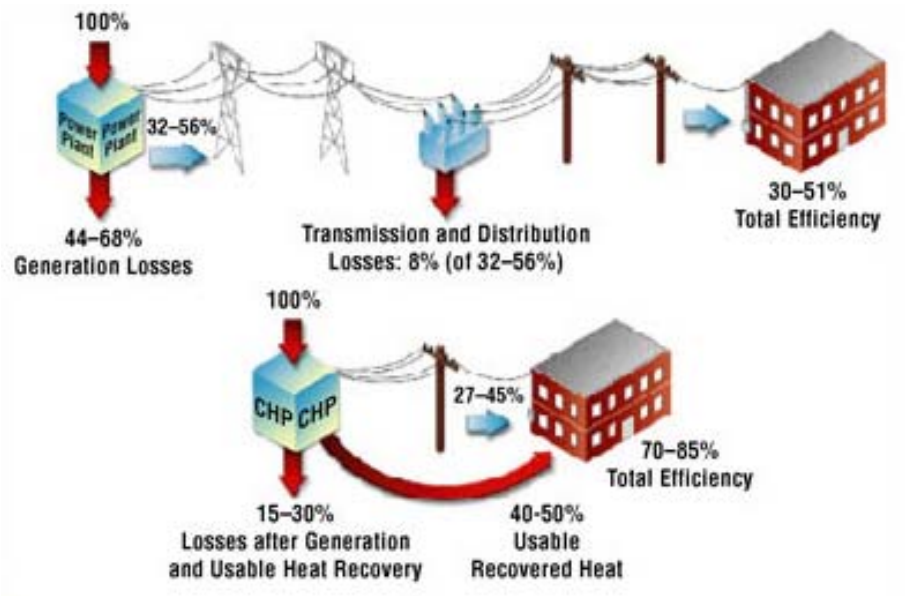
Distributed combined heat and power systems present opportunity to increase efficiency while reducing costs

Benefits

- Positive net present value
- Emissions reduction from efficiency and fuel options
- Feasible for many types of facilities
- Reduced transmission congestion
- Lower operating costs
- Increased reliability

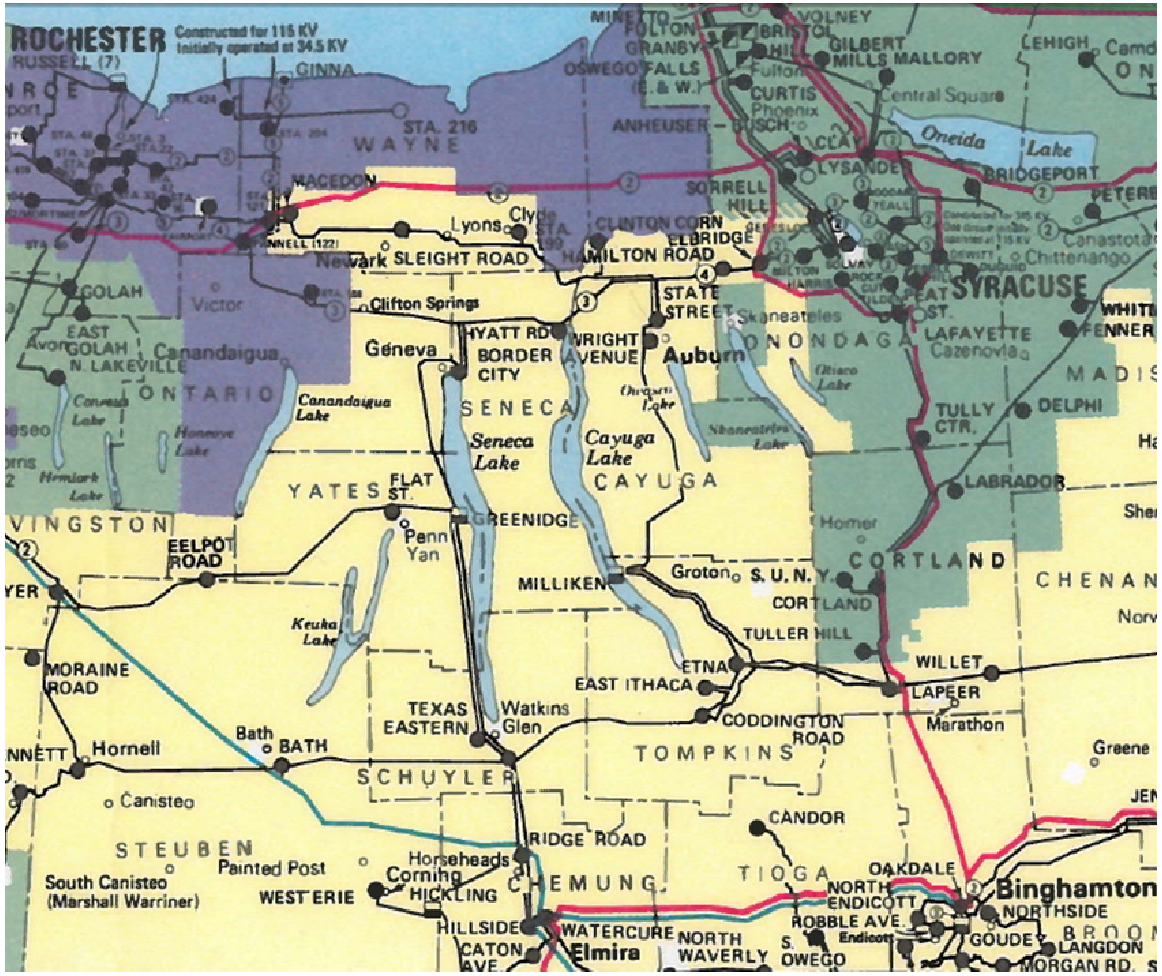
Challenges

- Capital investment required
- Inherent financial risk associated with owning and operating equipment
- Building ownership / management structure may not incentivize investment
- Interconnection requirements can be cumbersome



Source: US Department of Energy

NYSEG owns transmission and distribution system in Central New York



Source: NYISO

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Transmission project completed in 2010 eliminated Ithaca load pocket

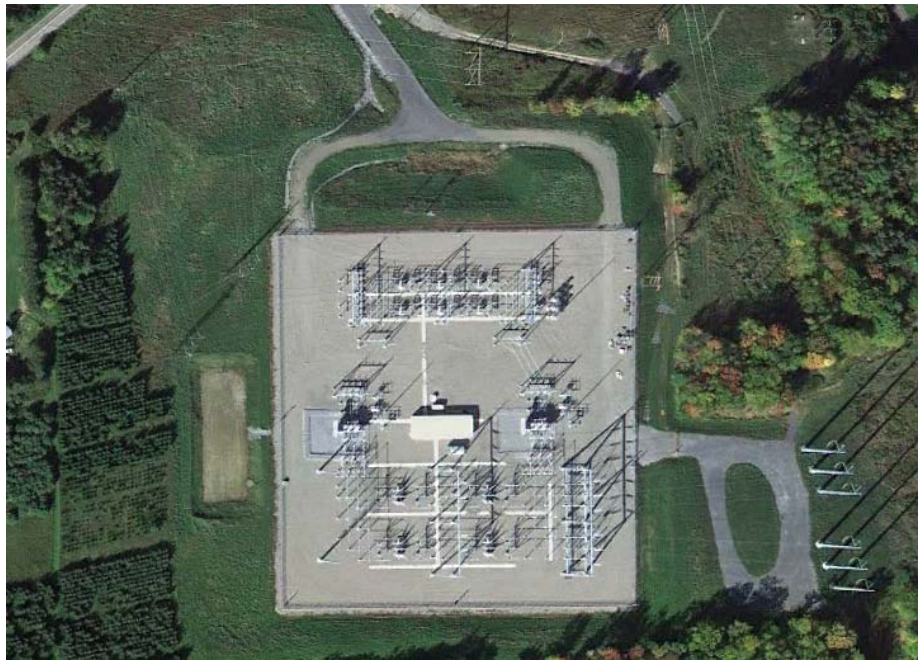
Ithaca Transmission Project

- New 345-115 kv substation in Lapeer (Cortland County)
- New and rebuilt 115 kv lines from Dryden to Lapeer
- Increased electricity reliability in area, decreased dependence on AES Cayuga

Possible future constraints

- NYISO Zone C interconnection queue 703 MW of projects, including 451 MW wind farm in Watkins Glen
- Generators (e.g. Black Oak wind farm) could be curtailed when transmission congestion occurs and when demand is low

NYSEG substation in Lapeer



Source: Google Earth

Village of Groton owns and operates distribution system within its boundaries

Groton Electric Department

- Established in 1896
- Distribution system, no power generation
- Upgraded ~8 years ago and has significant reserve capacity
- Full utility responsibilities including maintenance and billing
- Three-person line crew with dedicated equipment

Photo credit: Village of Groton

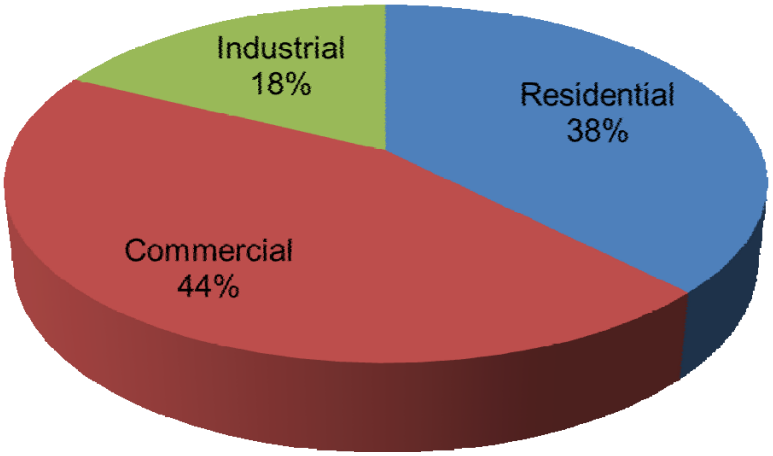
Power purchases

- Village purchases 4,483 kWh monthly from NYPA Niagara hydro project, agreement in place through 2025
- Incremental power purchased through NY Municipal Power Agency
- Pay “wheeling” charge to NYSEG for transmission

New York Power Authority

Tompkins County's electricity use per household above state average but below national level

Tompkins County Electricity Use by Sector



Source: Tompkins County Community GHG Emissions Report, 1998-2008

Residential electricity use

Average kWh / year / household

- **Tompkins County – 7,839**
- New Jersey – 8,772
- **New York – 7,320**
- Pennsylvania – 10,536
- **US – 11,496**

Source: EIA

Total: 779,501,347 kWh
Average load: ~89 MW

Many incentives available for increasing energy efficiency and renewables

Energy efficiency

- NYSERDA Assisted Home Performance Grants
  - 50% of costs for residents below 80% median income
- NYSERDA EmPower New York Grant
  - 100% of costs for residents below 60% median income
- NYSERDA Energy $mart New Construction Program
  - Up to 75% of incremental costs
- NYSERDA Existing Facilities Program
  - Up to $30,000 per facility per year for electricity and $25,000 for natural gas
- NYSEG Small Business Lighting Retrofit Program
  - Free energy assessment
  - 70% of installed cost of recommended measures

Renewables

- Federal Residential Renewable Energy Tax Credit
  - 30% of system cost
- Federal Business Energy Investment Tax Credit
  - 30% of system cost for solar, fuel cells, small wind and 10% for geothermal, microturbines, CHP
- NYSERDA On-Site Small Wind
  - Up to lesser of $400k or 50% of system cost
- NYSERDA PV Incentive
  - Up to 40% of system cost after tax credits
- NYSERDA Solar Thermal Incentive
  - Up to $4,000
- New York State Residential Solar Tax Credit
  - 25% of system cost for solar PV and thermal (up to $5,000)

More opportunities needed to increase awareness about economic benefits of energy efficiency and renewables

Local end-users

- Economic factors drive energy decisions
- Environmental and social considerations generally secondary
- Energy efficiency and renewables awareness limited
- View incentives as difficult to identify and capture

"We are not in a position to do anything that is not economically justifiable."

"NYSERDA is impossible to navigate."

"Once we *actually* looked at this [energy efficiency] we realized it was a no-brainer in a lot of regards."

Moving forward TCPD should focus on stakeholder engagement and education

Findings	Recommended next steps
No formal system for collecting county-level energy data	Engage NYSEG to determine feasibility of regular data reporting and outline way forward
Education and financial incentives critical to increasing efficiency and renewables	Form working group to examine education options and engage municipality re: compulsory efficiency measures and local incentives
CHP presents significant opportunity for cost-effective efficiency increases	Identify potential candidates and engage re: feasibility study
ERL project would significantly increase Cornell's electricity usage	Engage key decision makers throughout energy procurement process

JOHNSON
Cornell University

Appendices

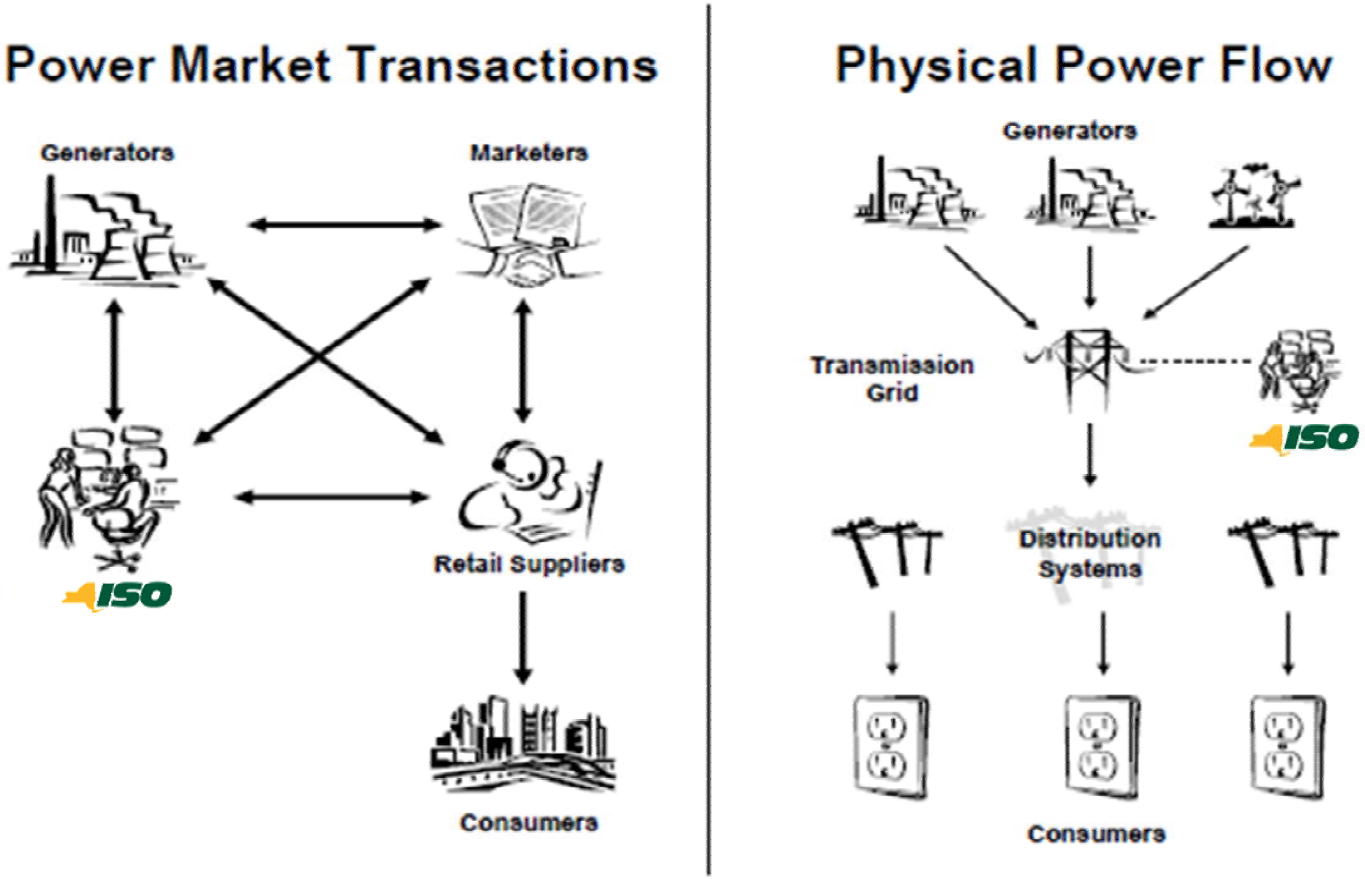
Project resources

Name	Title & Organization
Heather Filiberto	Director of Economic Development Services - Tompkins County Area Development
Jerry Goodenough	General Manager - AES NY (Cayuga and Somerset plants)
Michelle Jones	Energy Manager - Ithaca College (current) Project Manager – NYSEG (past)
Jamease Leonard	Associate - GE Energy (current) Energy Trader - The Energy Authority (past)
Jeff Lucas	Equipment Service Manager – Tompkins County Highway Department
Phil Maguire	Owner / Dealer Principal - Maguire Cars
George May	Facilities Manager – Therm, Inc.
Leo McGrattan	Chief Financial Officer – Therm, Inc.
Bob Morey	Mechanical Engineer – Cornell University Wilson Lab (current) Mechanical Engineer – AES and NYSEG (past)
Tim Peer	Manager – Cornell University Central Energy Plant
Chuck Rankin	Administrator – Village of Groton
Dave Rice	Technical Director – Cornell Laboratory for Accelerator Based Sciences and Education
Marguerite Wells	Project Manager – Black Oak Wind Farm
Ed Wilson	Sustainable Energy Team Manager – Cornell University
Tim Winderl	Key Account Manager - NYSEG

Tompkins County electricity SWOT analysis

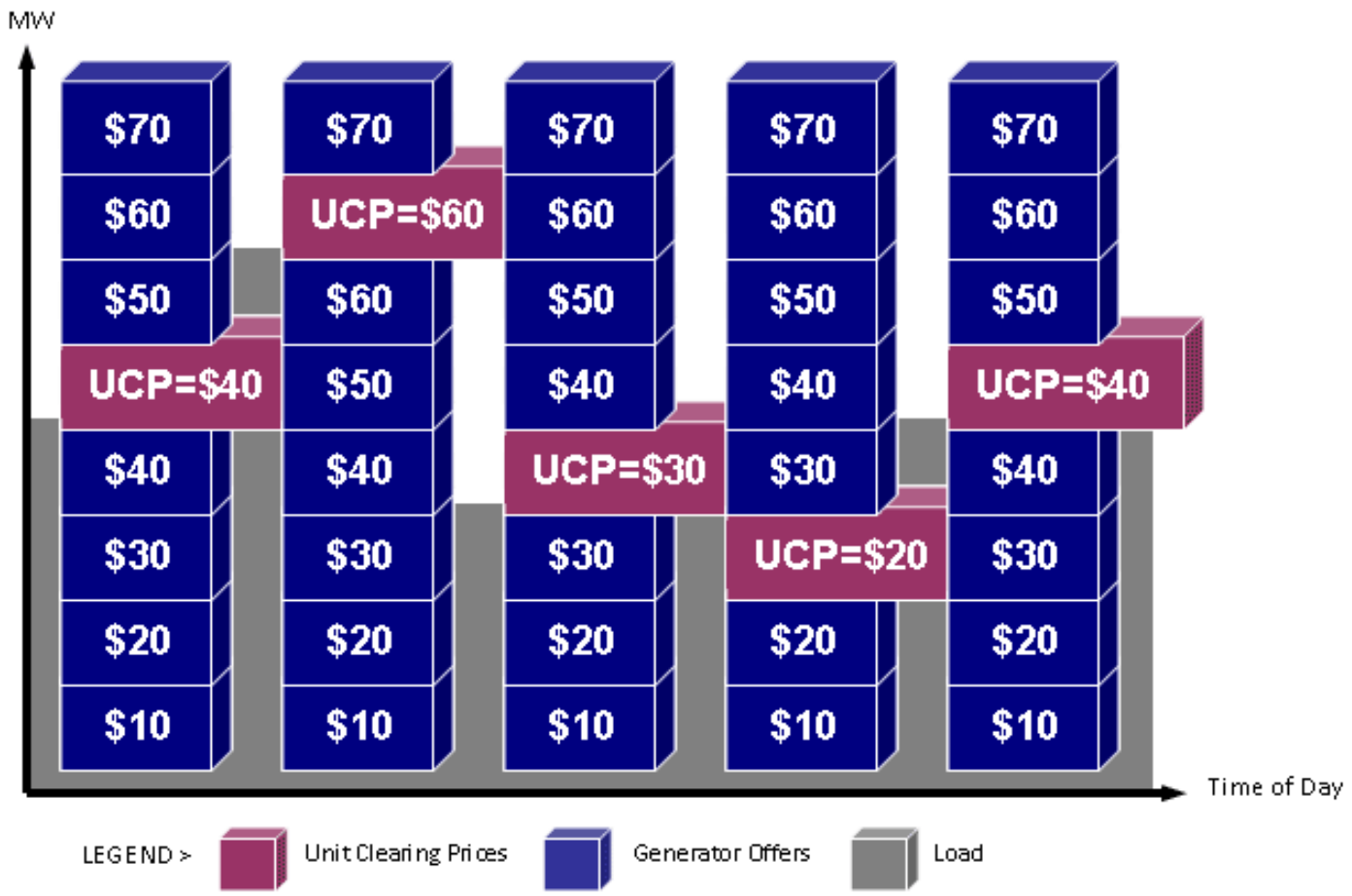
Strengths •Cornell University CHP plant •Transparency of educational institutions and commitment to emissions reduction •Few large polluters •Progressive community	Weaknesses •Limited awareness of energy efficiency benefits and available incentives •Lack of distributed generation •Air pollutants from AES Cayuga •NYSEG difficult to engage
Opportunities •Black Oak wind farm •Ithaca College central plant •Distributed generation and energy efficiency	Threats •Cornell ERL project would nearly double university's energy usage •Economic environment could constrain local investment in efficiency and renewables

Electricity purchased by end-user typically differs from physical electricity used



Source: New England Power Generators Association (modified with NYISO logo)

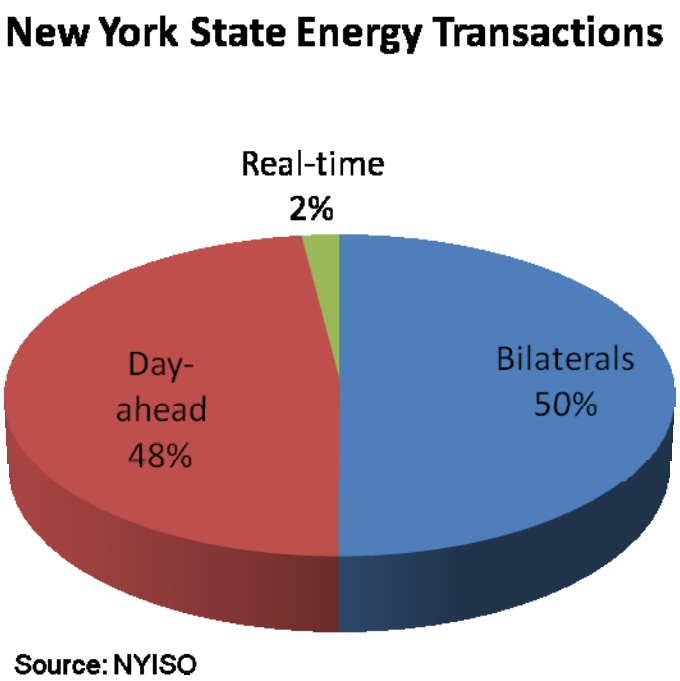
Generators are paid uniform clearing price at intersection of supply and demand



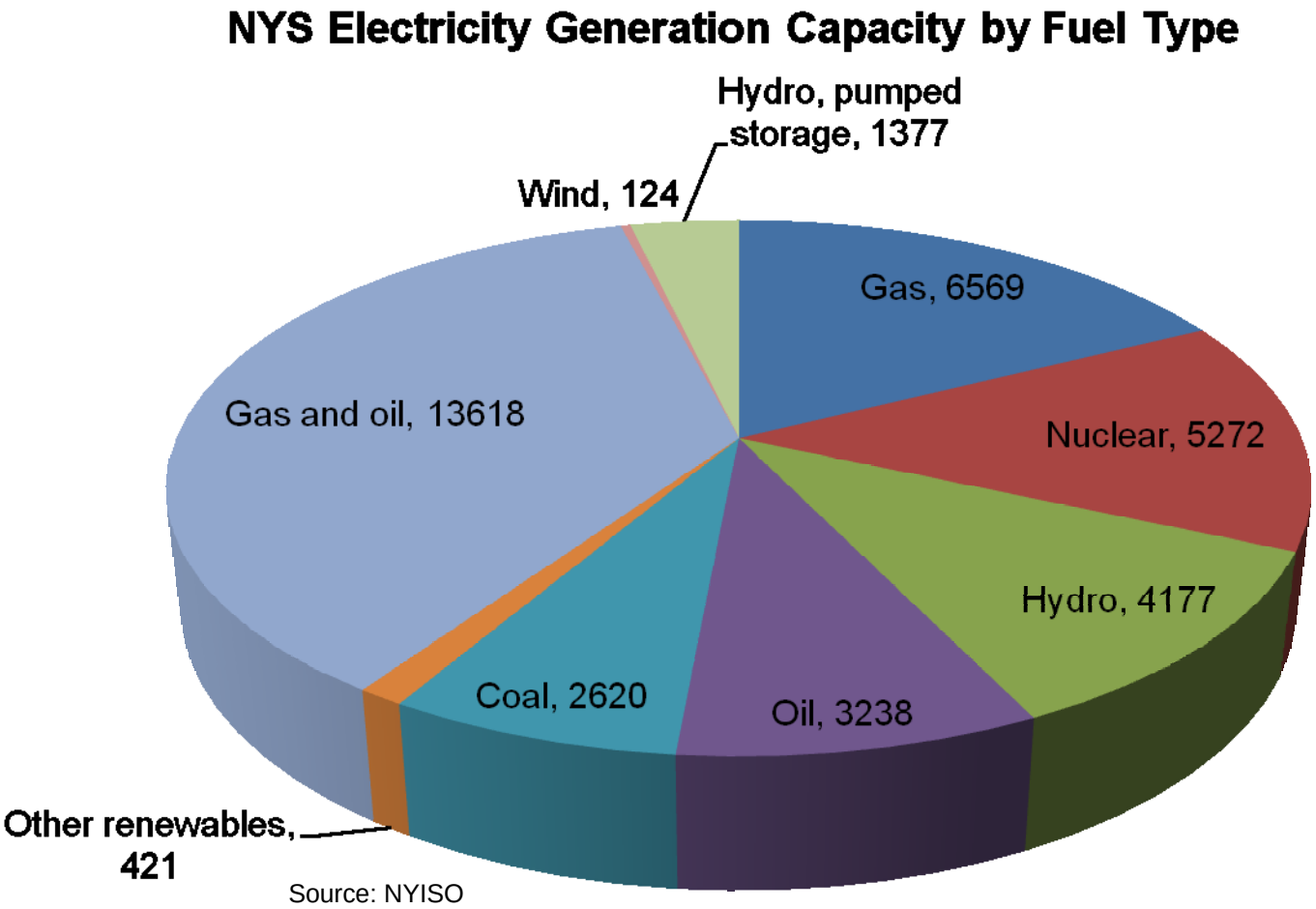
Source: NYISO

Energy financial transactions take place in three primary markets

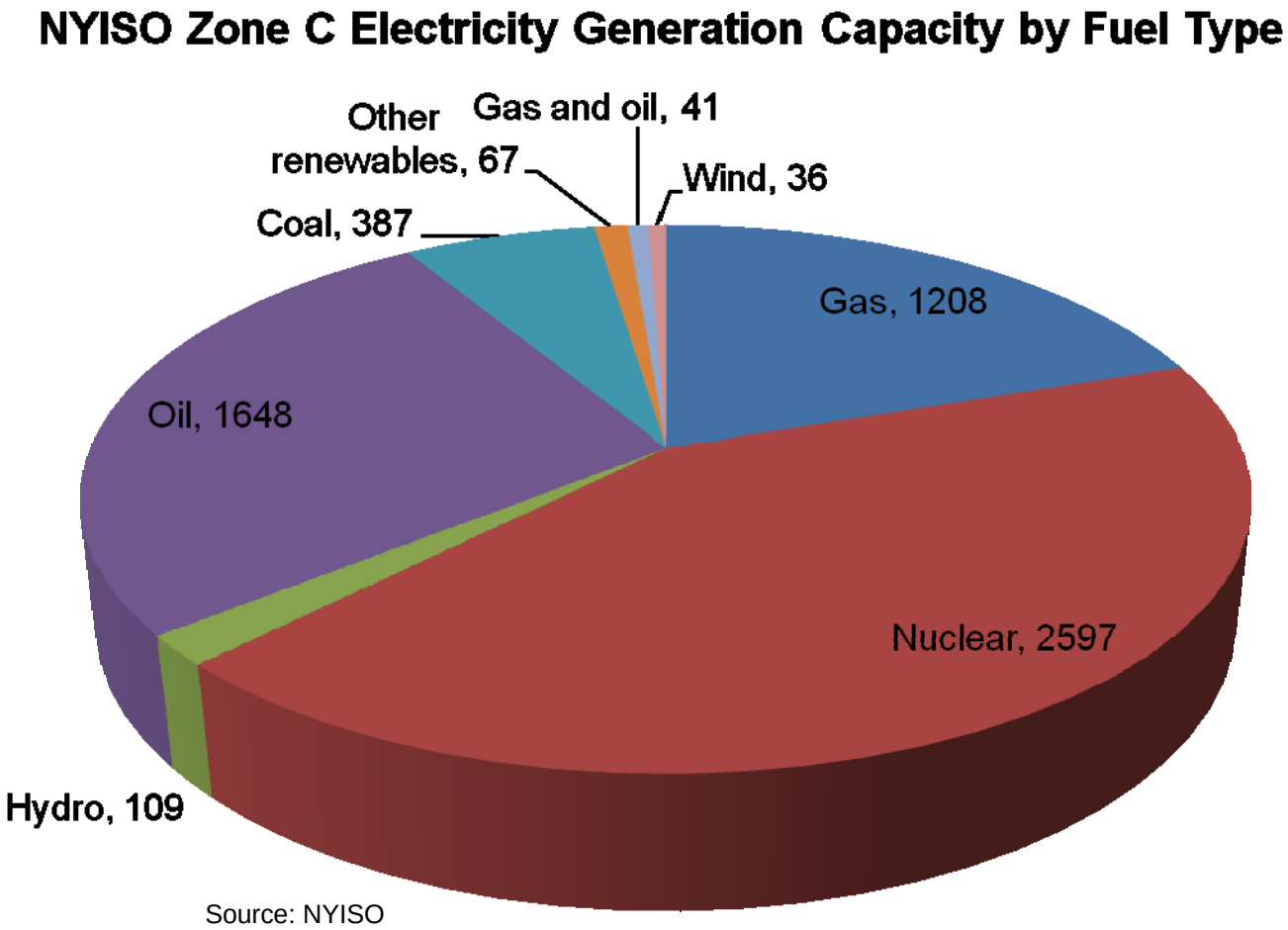
- Day-ahead
  - NYISO forecasts load
  - Generators bid into NYISO marketplace and uniform clearing price set
- Real-time
  - Balances system as generation and load vary from day-ahead forecasts
  - Spot price fluctuates depending on system conditions and demand
- Bilaterals
  - Direct transactions between parties that take place outside NYISO marketplace
  - NYISO still runs bid-based system for transmission access



NYS fuel mix admin slide

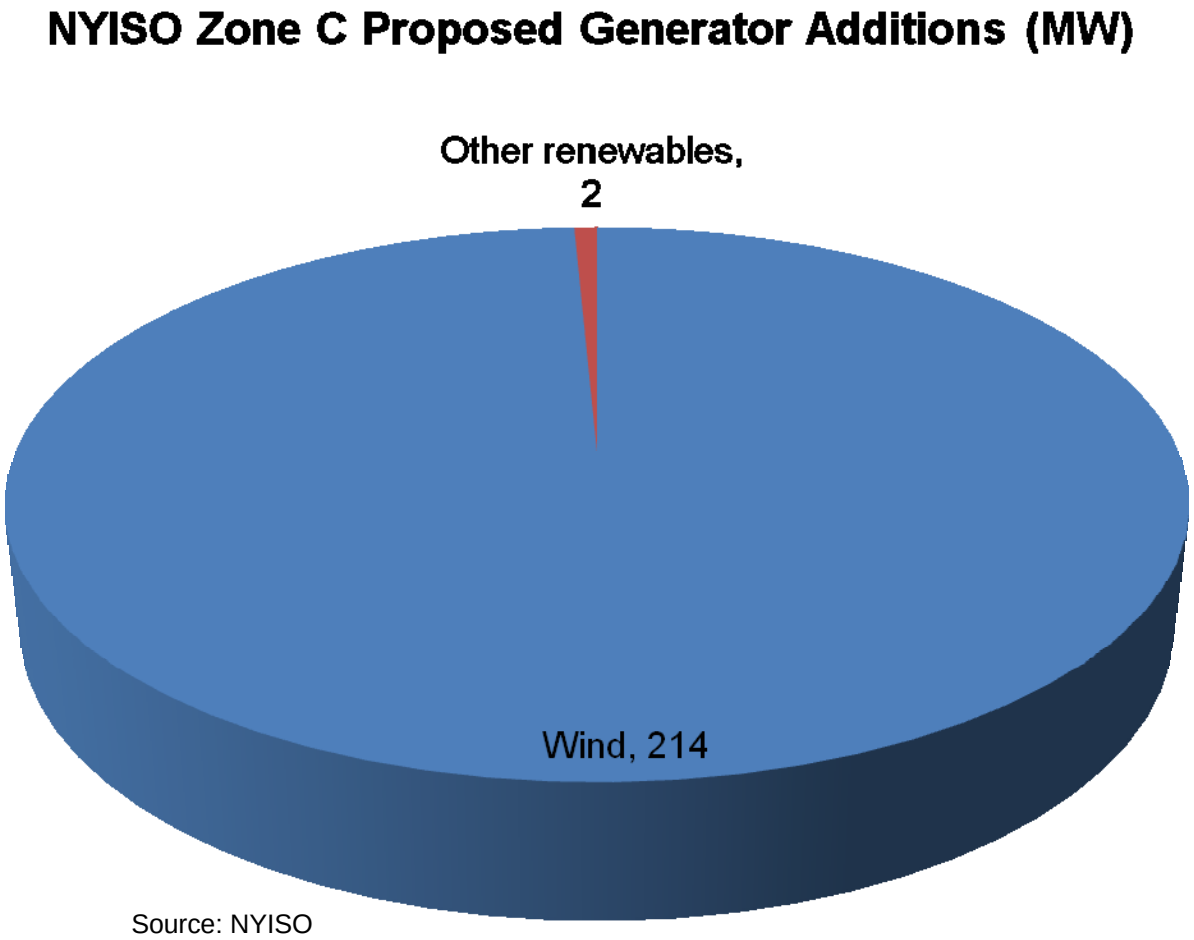


NYISO Zone C fuel mix admin slide



Source: NYISO

NYISO Zone C proposed additions admin slide



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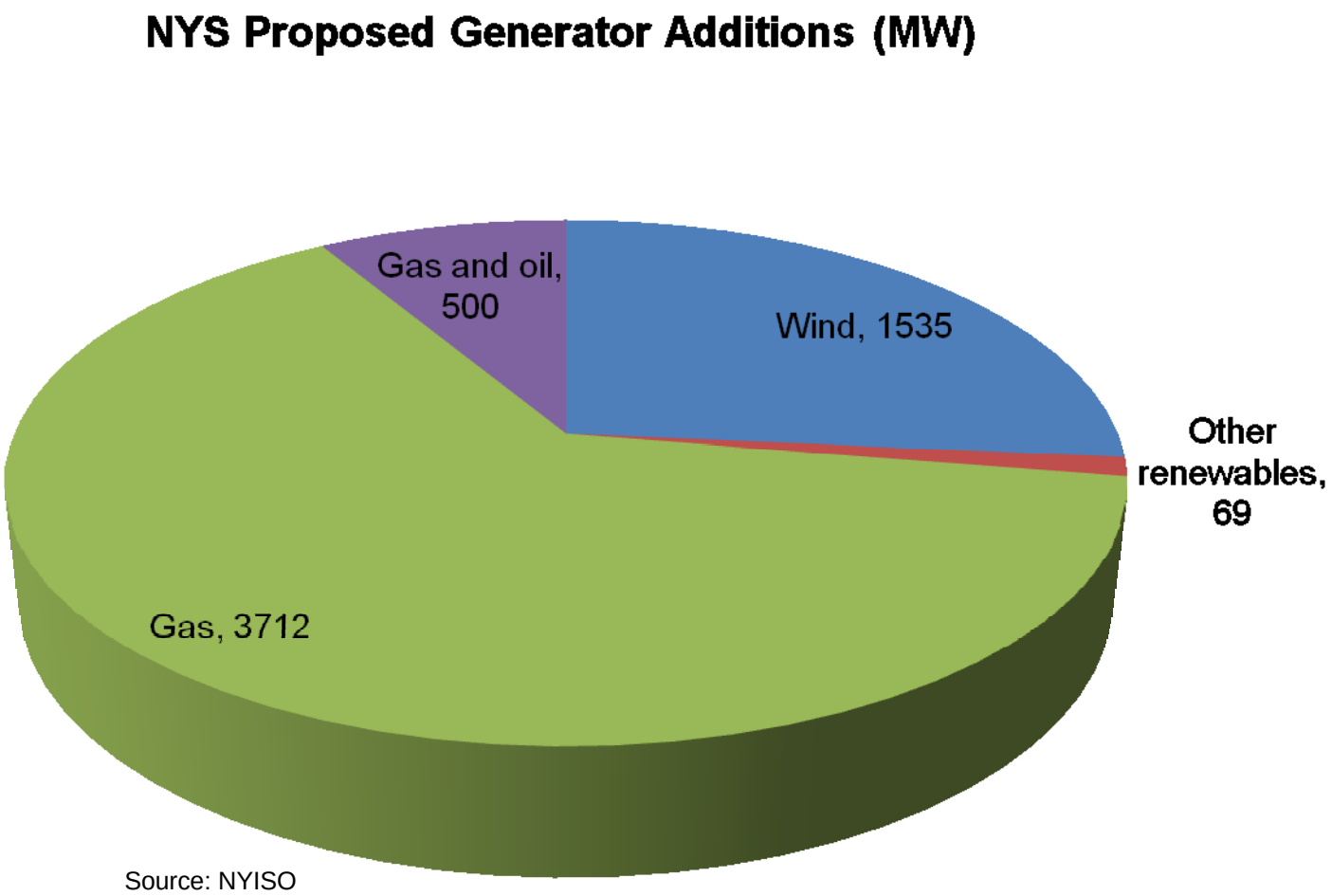
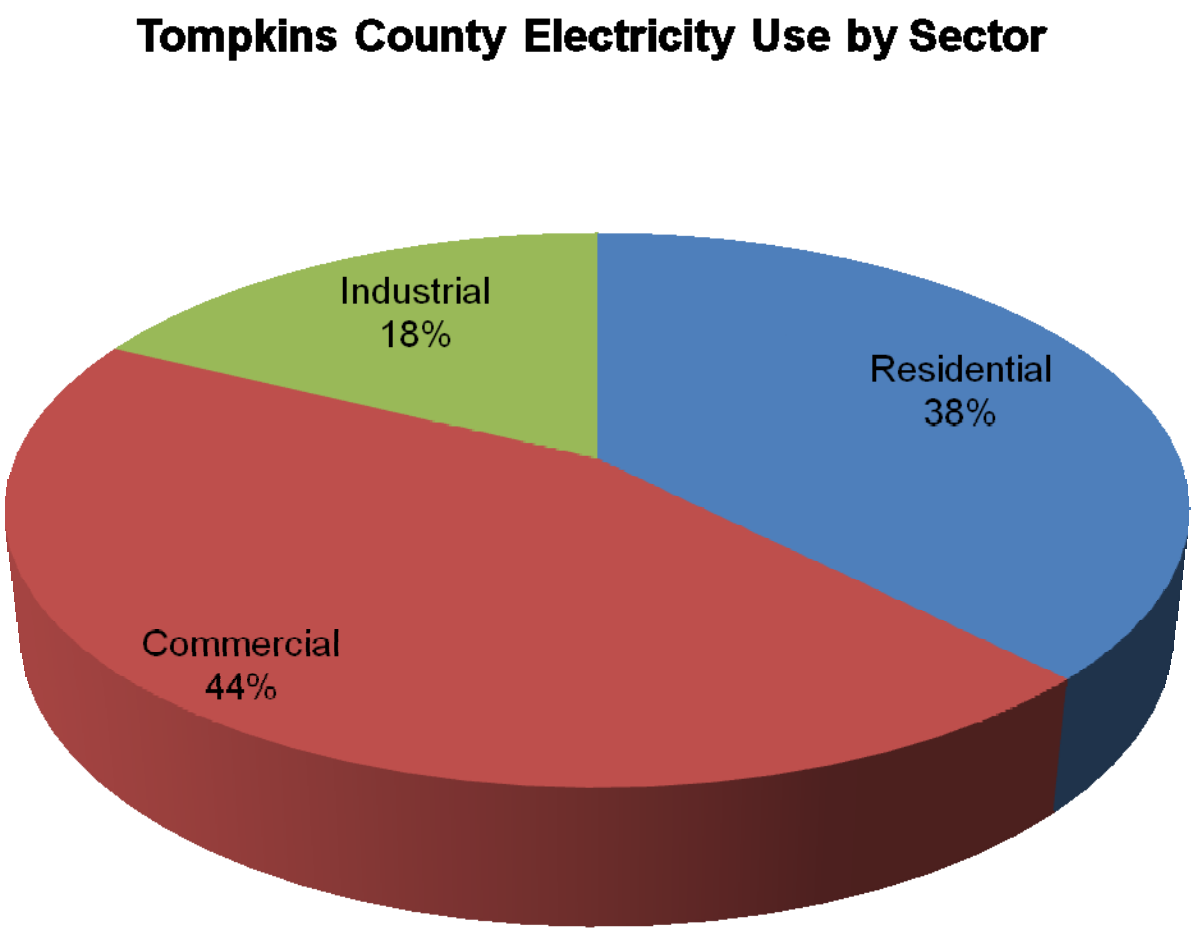


Tompkins County electricity by sector admin slide



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