Tompkins County
Electricity Supply & Demand

Frank Nicklaus
Cornell University, MBA 2012
30 April 2012
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

Logos of various organizations related to energy and sustainability.
Tompkins is one of ~14 counties in NYISO Zone C

Source: NYISO
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

NYS Electricity Generation Capacity by Fuel Type
- Gas and oil, 13618 MW
- Nuclear, 5272 MW
- Hydro, 4177 MW
- Oil, 3238 MW
- Coal, 2620 MW
- Other renewables, 421 MW
- Wind, 124 MW
- Pumped storage, 1377 MW
- Total: 37416 MW

Source: NYISO

NYISO Zone C Electricity Generation Capacity by Fuel Type
- Nuclear, 2597 MW
- Gas, 1208 MW
- Oil, 1648 MW
- Coal, 387 MW
- Hydro, 109 MW
- Other renewables, 67 MW
- Gas and oil, 41 MW
- Wind, 36 MW
- Total: 6093 MW

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

Tompkins County Estimated Electricity Fuel Mix

- Gas: 36%
- Nuclear: 23%
- Hydro: 23%
- Coal: 12%
- Oil: 4%
- Other renewables: 2%

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

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

Photo credit: Cornell Daily Sun
Natural gas dominates proposed generator additions in New York State

NYS Proposed Generator Additions (MW)
- Gas: 3,712 MW
- Wind: 1,535 MW
- Other renewables: 69 MW
- Gas and oil: 500 MW

Total: 5,817 MW

NYISO Zone C Proposed Generator Additions (MW)
- Wind: 214 MW
- Other renewables: 2 MW

Total: 216 MW

Source: NYISO
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
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

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

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

**Tompkins County Electricity Use by Sector**

- **Residential**: 38%
- **Commercial**: 44%
- **Industrial**: 18%

**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

**Total**: 779,501,347 kWh

**Average load**: ~89 MW

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

*Source: EIA*
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

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

<table>
<thead>
<tr>
<th>Name</th>
<th>Title &amp; Organization</th>
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<tbody>
<tr>
<td>Heather Filiberto</td>
<td>Director of Economic Development Services - Tompkins County Area Development</td>
</tr>
<tr>
<td>Jerry Goodenough</td>
<td>General Manager - AES NY (Cayuga and Somerset plants)</td>
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</tbody>
</table>
|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

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

![New York State Energy Transactions Pie Chart](chart.png)
NYS fuel mix admin slide

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- Gas and oil, 13618
- Gas, 6569
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- Coal, 2620
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Source: NYISO
NYISO Zone C fuel mix admin slide

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- Gas, 1208
- Nuclear, 2597
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- Other renewables, 67
- Wind, 36
- Gas and oil, 41

Source: NYISO
NYISO Zone C proposed additions
admin slide

NYISO Zone C Proposed Generator Additions (MW)

- Wind, 214
- Other renewables, 2

Source: NYISO
NYS proposed additions admin slide

NYS Proposed Generator Additions (MW)

- Gas, 3712
- Wind, 1535
- Other renewables, 69
- Gas and oil, 500

Source: NYISO
Tompkins County electricity by sector admin slide

Tompkins County Electricity Use by Sector

- Commercial: 44%
- Residential: 38%
- Industrial: 18%

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