Shekóli
Oneida Nation
Solar Deployment
on Tribal Facilities

Department of Energy
Tribal Energy Program Review
Denver, CO
November 14, 2017

Michael Troge
Oneida Nation
AGENDA

• Past work
• Solar project
• Training
Thank you!

- Department of Energy, Tribal Energy Program, Office of Indian Energy, National Renewable Energy Lab, START

- Oneida Team: Oneida Nation Energy Team, Business Committee, Land Commission, Finance, Legal, Land Management, Public Works, Electrical, Zoning Engineering, Environmental Division, Environmental Resource Board, Planning, Staff

- Project Team: Oneida Electrical, Zoning, Legal, OEI/NREL (START program), Ater Wynne, BDO Consultants

- Investor partner: SunVest, Inc.

1 QUAD is enough energy to power 32 million homes.

https://flowcharts.llnl.gov (Lawrence Livermore National Laboratory)
Oneida Energy Team

- Formed in 2007
- EE & RE an important combined strategy
- Supported Brown County, WI (2008)
  - Energy Independent Community, RPS 25 by 2025
- Wind study (2009 – 2011; TC, FOE)
- SHW upgrades (2010; FOE)
- Energy Crop Study (2011 to present; TC, DOE, EPA, UWGB)
- Pellet boiler at Conservation Dept. to supplement LP (2014 to present; Focus on Energy)
Oneida Energy Team (continued)

- Anna John Resident Centered Care Community SHW (2009-2013; TC, EECBG, WPS, FOE, TC)

- Energy Audit Program (2012-2014, DOE)

  - No obvious RE winner – solar, wind, bio, ground
  - Grants and financial creativity

- Solar Deployment on Tribal Facilities (2015 to now)
Energy Team Projects

**Energy Audits & Upgrades**
- Improved lighting
- Decreased energy use

**Energy Crop Study**
- Locally grown energy crop for heat, fuel
- UWGB partner

**Anna John Solar**
- 48 collectors, 75% of hot H2O
- 75% grant funded

**Wind Power Study**
- Wind best in the west
- Part of clean energy strategy

**Biomass Energy**
- 100,000 Btu biomass boiler Demonstration

**Solar Deployment Project**
- Application to DOE for $1 M
- Solar electric on 9 buildings
### Oneida Energy Situation
(results from EOM RFP)

Current Tribal community energy usage as of 2011 = **412,000 MMBtu**.  
= 121 million kWh

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
<th>Conversion</th>
<th>Energy Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional energy</td>
<td>31,000,000 kWh</td>
<td>=</td>
<td>105,000 MMBtu</td>
</tr>
<tr>
<td>Institutional gas</td>
<td>540,000 therms</td>
<td>=</td>
<td>54,000 MMBtu</td>
</tr>
<tr>
<td>Institutional transp</td>
<td>145,000 gallons</td>
<td>=</td>
<td>5,000 MMBtu</td>
</tr>
<tr>
<td>Housing electricity</td>
<td>16,000,000 kWh</td>
<td>=</td>
<td>48,000 MMBtu</td>
</tr>
<tr>
<td>Housing gas</td>
<td>2,000,000 therms</td>
<td>=</td>
<td>200,000 MMBtu</td>
</tr>
</tbody>
</table>

5% RPS = **20,600 MMBtu** = 6 million kWh

10% RPS = **41,200 MMBtu** = 12 million kWh

20% RPS = **82,400 MMBtu** = 24 million kWh
Electricity Use by Building (not therms)

- **Main Casino** 17%
- **IMAC** 13%
- **Main Casino Parking Ramp** 11%
- **Mason Street Casino** 10%
- **Oneida Nation Elementary School** 4%
- **Social Services & 4 Cottages** 4%
- **Oneida Community Health Center** 4%
- **Norbert Hill Center** 4%
- **Anna John Nursing Home** 3%
- **Travel Center Casino** 2%
- **One Stop Hwy 54** 2%
- **Skenandoah Wastewater Treatment Facility** 2%
- **One Stop Packerland** 2%
- **Gaming Warehouse** 2%
- **Remaining 77 Buildings Which Each Use Less Than 415,000 kWh / yr** 19%
<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Oct, 2014</td>
</tr>
<tr>
<td>Notification</td>
<td>Apr, 2015</td>
</tr>
<tr>
<td>Acknowledged</td>
<td>Sept, 2015</td>
</tr>
<tr>
<td>RFP</td>
<td>Nov, 2015</td>
</tr>
<tr>
<td>ITC extended</td>
<td>Dec, 2015</td>
</tr>
<tr>
<td>Selection</td>
<td>Mar, 2016</td>
</tr>
<tr>
<td>Final site list</td>
<td>Dec, 2016</td>
</tr>
<tr>
<td>PPA documents</td>
<td>Jan, 2017</td>
</tr>
<tr>
<td>Approvals</td>
<td>July, 2017</td>
</tr>
<tr>
<td>Installation</td>
<td>Fall, 2017</td>
</tr>
</tbody>
</table>
Grant Application Prep

• **Project:** 800 kilowatts for $2 million

• **Budget:** DOE $1M + Investor $1M + Oneida $60k + state OEI $23,000

• **Soft cost budget items:**
  – Set aside grant funds for Electrician training ($)
  – Set aside grant funds for Legal consultant ($$$$)
  – Set aside grant funds for Finance consultant ($$$)

• **TC:** Set aside enough match and staff in-kind time to match soft cost budget items

• **Project team:** Stakeholders

• **Contracts:** Meet all grant and contract requirements

• **Tribe:** Due diligence
Now

$80,000 per year

Utility costs

Tribe

PPA

$80,000

$80,000 for ~7 years

Utility Costs

Tribe

Investor

Loan & energy
Elementary School

Benefits

• Favorable utility
• Favorable rate
• Large load
• Large roof
• In Central Oneida
• High visibility
• Excellent educational opportunity

Challenges / Unforeseeables

• Facilities folks leery of roof mount and warranties
• Snow and drifting
• Existing roof maintenance challenges
• Limited space for ground mount (1.6+ acres)
• Only modest support from the school board
• BIA/BIE agreement for energy compensation
# School Options

## Solar Electric Concept Design

### Oseida Nation Turtle Elementary School

**Date:** 9/19/2016

<table>
<thead>
<tr>
<th>Option</th>
<th>Roof mount 368 kW</th>
<th>Ground mount 368 kW</th>
<th>Ground mount 322 kW</th>
<th>Ground mount 322 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Array Location</strong></td>
<td>South half of roof</td>
<td>North field; north of basketball courts</td>
<td>North field; north of basketball courts</td>
<td>South lawn; between parking lot and road</td>
</tr>
<tr>
<td><strong>Number of Arrays</strong></td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Infrastructure Location</strong></td>
<td>Roof &amp; Attic</td>
<td>Trench and boring east of building</td>
<td>Trench and boring east of building</td>
<td>Trench and boring south of building</td>
</tr>
<tr>
<td><strong>System Footprint</strong></td>
<td>43,000 sq ft</td>
<td>80,000 square feet (1.8 acres)</td>
<td>70,000 square feet (1.6 acres)</td>
<td>70,000 square feet (1.6 acres)</td>
</tr>
<tr>
<td><strong>Power Rating (kWatt)</strong></td>
<td>368.6</td>
<td>368.6</td>
<td>322.6</td>
<td>322.6</td>
</tr>
<tr>
<td><strong>Number of Modules</strong></td>
<td>1,182</td>
<td>1,182</td>
<td>1,008</td>
<td>1,008</td>
</tr>
<tr>
<td><strong>Array Height above Surface</strong></td>
<td>6 inches above roof</td>
<td>36 inches above ground</td>
<td>36 inches above ground</td>
<td>36 inches above ground</td>
</tr>
<tr>
<td><strong>Array Tilt</strong></td>
<td>10 degrees</td>
<td>30 degrees</td>
<td>30 degrees</td>
<td>30 degrees</td>
</tr>
<tr>
<td><strong>Number of Inverters</strong></td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td><strong>Inverter Location</strong></td>
<td>on roof</td>
<td>at each sub-array</td>
<td>at each sub-array</td>
<td>at each sub-array</td>
</tr>
<tr>
<td><strong>Production (kWh/kW)</strong></td>
<td>1,218</td>
<td>1,283</td>
<td>1,191</td>
<td>1,327</td>
</tr>
<tr>
<td><strong>Production/year (kilowatt-hours, kWh)</strong></td>
<td>448,955</td>
<td>472,914</td>
<td>416,477</td>
<td>428,090</td>
</tr>
<tr>
<td><strong>Annual Value @ $0.07/kWh</strong></td>
<td>$31,427</td>
<td>$33,104</td>
<td>$29,153</td>
<td>$29,966</td>
</tr>
<tr>
<td><strong>Preliminary Cost Estimate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Modules</strong></td>
<td>$381,372</td>
<td>$381,372</td>
<td>$312,529</td>
<td>$312,529</td>
</tr>
<tr>
<td><strong>Inverters</strong></td>
<td>$83,744</td>
<td>$12,146</td>
<td>$73,437</td>
<td>$73,437</td>
</tr>
<tr>
<td><strong>Racking</strong></td>
<td>$98,441</td>
<td>$110,569</td>
<td>$105,822</td>
<td>$105,822</td>
</tr>
<tr>
<td><strong>Electrical Balance</strong></td>
<td>$147,732</td>
<td>$152,583</td>
<td>$150,708</td>
<td>$150,708</td>
</tr>
<tr>
<td><strong>Shipping</strong></td>
<td>$3,766</td>
<td>$8,613</td>
<td>$7,433</td>
<td>$7,433</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>$19,161</td>
<td>$17,244</td>
<td>$17,290</td>
<td>$17,290</td>
</tr>
<tr>
<td><strong>Fencing</strong></td>
<td>NA</td>
<td>$36,192</td>
<td>$36,192</td>
<td>$36,192</td>
</tr>
<tr>
<td><strong>Underground Electrical</strong></td>
<td>NA</td>
<td>$29,657</td>
<td>$29,657</td>
<td>$29,657</td>
</tr>
<tr>
<td><strong>Labor</strong></td>
<td>$223,077</td>
<td>$246,715</td>
<td>$212,407</td>
<td>$212,407</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>$953,312</td>
<td>$1,046,141</td>
<td>$960,380</td>
<td>$960,380</td>
</tr>
<tr>
<td><strong>Installation Costs ($/kW)</strong></td>
<td>$2,586</td>
<td>$2,838</td>
<td>$2,977</td>
<td>$2,977</td>
</tr>
<tr>
<td><strong>Installation Costs ($/kWh)</strong></td>
<td>$2.12</td>
<td>$2.21</td>
<td>$2.31</td>
<td>$2.24</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>Roof mounted discourages free access</td>
<td>Chain link fence</td>
<td>Chain link fence</td>
<td>Chain link fence</td>
</tr>
<tr>
<td><strong>Maintenance</strong></td>
<td>Annual inspection of all components; Annual roof inspection; inverter replacement at year 12 to 15</td>
<td>Annual inspection of all components; Mow between sub-arrays; inverter replacement at year 12 to 15</td>
<td>Annual inspection of all components; Mow between sub-arrays; inverter replacement at year 12 to 15</td>
<td>Annual inspection of all components; Mow between sub-arrays; inverter replacement at year 12 to 15</td>
</tr>
<tr>
<td><strong>Maintenance Costs @ $13/kWh</strong></td>
<td>$4,792</td>
<td>$4,792</td>
<td>$4,914</td>
<td>$4,914</td>
</tr>
<tr>
<td><strong>Inverter Replacement Costs</strong></td>
<td>$96,573</td>
<td>$96,573</td>
<td>$84,521</td>
<td>$84,521</td>
</tr>
</tbody>
</table>
Other challenges/lessons

- **Project**: Financial consultant contract was delayed
- **Project**: Some personnel changes
- **Tribe**: Long-term maintenance questions
- **Utility**: Different interconnection terms between utilities
- **Utility**: Few buildings in the favorable service territory
- **Utility**: 3rd party........
- **Overall**: Despite the suspected benefits of ITC, a relationship between taxable and non-taxable entities is not a certainty.
- **Overall**: Fortunately, the ITC extension allowed us to push construction to 2017.
- **Lesson**: The longer the project, the more expensive it gets!
checklist

✓ Consultant contracts and amendments
✓ O&M plan
✓ Training
✓ Early participation
✓ Budget planning & adjustments
✓ Agreements
✓ Capital calls
✓ Grants, invoices, and timing
✓ Equipment availability
✓ Qualified personnel
✓ Stakeholder communication
✓ Permitting
✓ Construction scheduling
✓ Inspection scheduling
✓ Accurate capital analyses
✓ FAA and airport approval
✓ Utility agreements
✓ Warranty issues
✓ Structural analysis
✓ Backup plans
✓ Staging plan
✓ Grant extensions
Latest Project Details

- **Project design:** 800 kilowatts on 6 buildings
- **Project hard costs:** $2 million
- **DOE grant:** $1 million
- **Investor/partner:** $1 million
- **Tribe’s contribution:** $80,000/yr for 6-7 years
  - **Estimated maint:** $20,000/year (maint. agreement & TC)
  - **Tribal solar costs:** $60,000/year
- **Install cost:** $2,556 / kilowatt
- **Put-Call:** year 5 to 7
- **Selling point:** solar costs = utility costs
ANNA JOHN
RESIDENT CENTERED CARE COMMUNITY

168 KILOWATTS
GENERATOR MADE THINGS INTERESTING!
PV + SHW

INSPECTION WITH SOLAR DESIGNER

DRONE SHOT
ANOTHER VIEW.....
DRONE SHOT....
COUNTY H RECREATION CENTER, 41 KILOWATTS
IRENE MOORE ACTIVITY CENTER + ANNEX

260 KILOWATTS
FOOD DISTRIBUTION & PANTRY

100 KILOWATTS

before

after
ELECTRICIAN TRAINING ON PV GROUNDMOUNT
UPGRADING AN OLDER SYSTEM

CLASSROOM, SAFETY, STAGING, SCAFFOLD, WIRING, MC4 CONNECTORS, OPTIMIZERS, INVERTERS, DISCONNECTS, GROUNDING, WIRE MGT, TESTING, TROUBLESHOOTING, DATA MONITORING
2017 CREWS
ONEIDA ELECTRICIANS, ZONING, LABOR POOL, CONTRACTORS, TECHNICAL COLLEGE STUDENTS
WEEKLY MEETINGS

ZONING, ELECTRICIANS & CONTRACTORS WORK SIDE BY SIDE
Exploring other support mechanisms

• **GET CREATIVE!**
• 3rd party ownership
• Bulk purchase programs
• Community investment
• Solar gardens
• Renewable Energy Credits
• PACE – Property Assessed Clean Energy
• Energy efficiency is still the primary goal
MT Era

- Midwest Tribal Energy Resources Assoc.
- Voice for Tribes & Midwest energy
- Increasingly difficult for individual Tribes to pursue energy projects.
- Recent DOE grant
- Aim to provide cost-share for activities leading up to construction.
- Presentation on Thursday
- Executive Director on staff
- Looking for members
Yaw^ko!

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