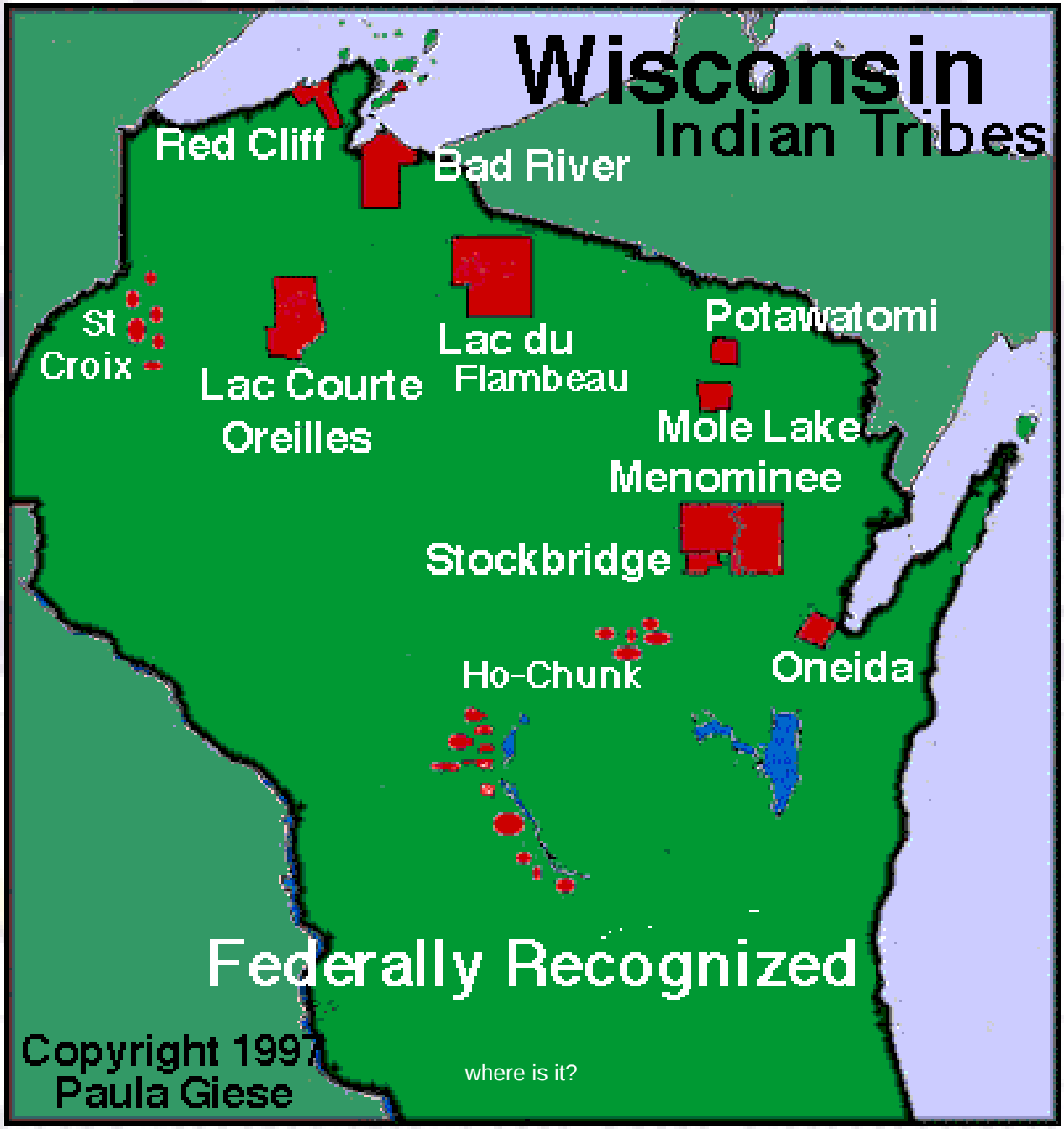
Oneida Tribe of Indians

Energy Optimization Model Development & Energy Audits

U.S. DOE – Tribal Energy Program – 11/14/12


Wisconsin
Indian Tribes
Red Cliff
Bad River
St Croix
Lac Courte Oreilles
Lac du Flambeau
Potawatomi
Mole Lake
Menominee
Stockbridge
Ho-Chunk
Oneida
Federally Recognized
Copyright 1997
Paula Giese
where is it?

Overview

- Reservation size of 65,430 acres (roughly 8 x 12 miles) with Oneida ownership of approximately 24,173 acres
- Membership of 16,877 with 7,360 members living on the Reservation or in immediate area
- Repurchase and restoration of lands a priority since casino started in 1993
- Surburban sprawl from Green Bay and rising land prices

Energy Team

- Oneida Energy Team started in 2005
- Four Main Areas of Focus
    1. Buildings and Operations
    2. Residential
    3. Energy Development
    4. Transportation
- Interdepartmental team reports to Business Committee
- Energy Action Plans / Energy Security Plan

Energy Team
Members

- Public Works
- Engineering
- Fleet/Transit
- Housing
- Statistics
- Oneida Gaming
- Land Management
- Environmental Health & Safety
- Environmental Resource Board
- Radisson Hotel

U.S. DOE Grants

- DOE Energy Efficiency and Conservation Block Grant - 75% funding for Master Electrician, funds for energy efficiency equipment, and solar thermal system for Assisted Living Facility. (*Complements bonding activities for Energy Efficiency improvements*)

- **DOE First Steps Grant** - Creating ***Energy Optimization Model Development*** plan for Oneida Nation, including ***biomass*** agricultural project on Oneida lands.

- **DOE Energy Efficiency Development and Deployment Grant** – ***Energy Audits*** of 44 tribal buildings to provide detailed feasibility studies and energy savings opportunities for each facility.

Energy Development Program – Mike Troge

West is rural

Northeast is suburban

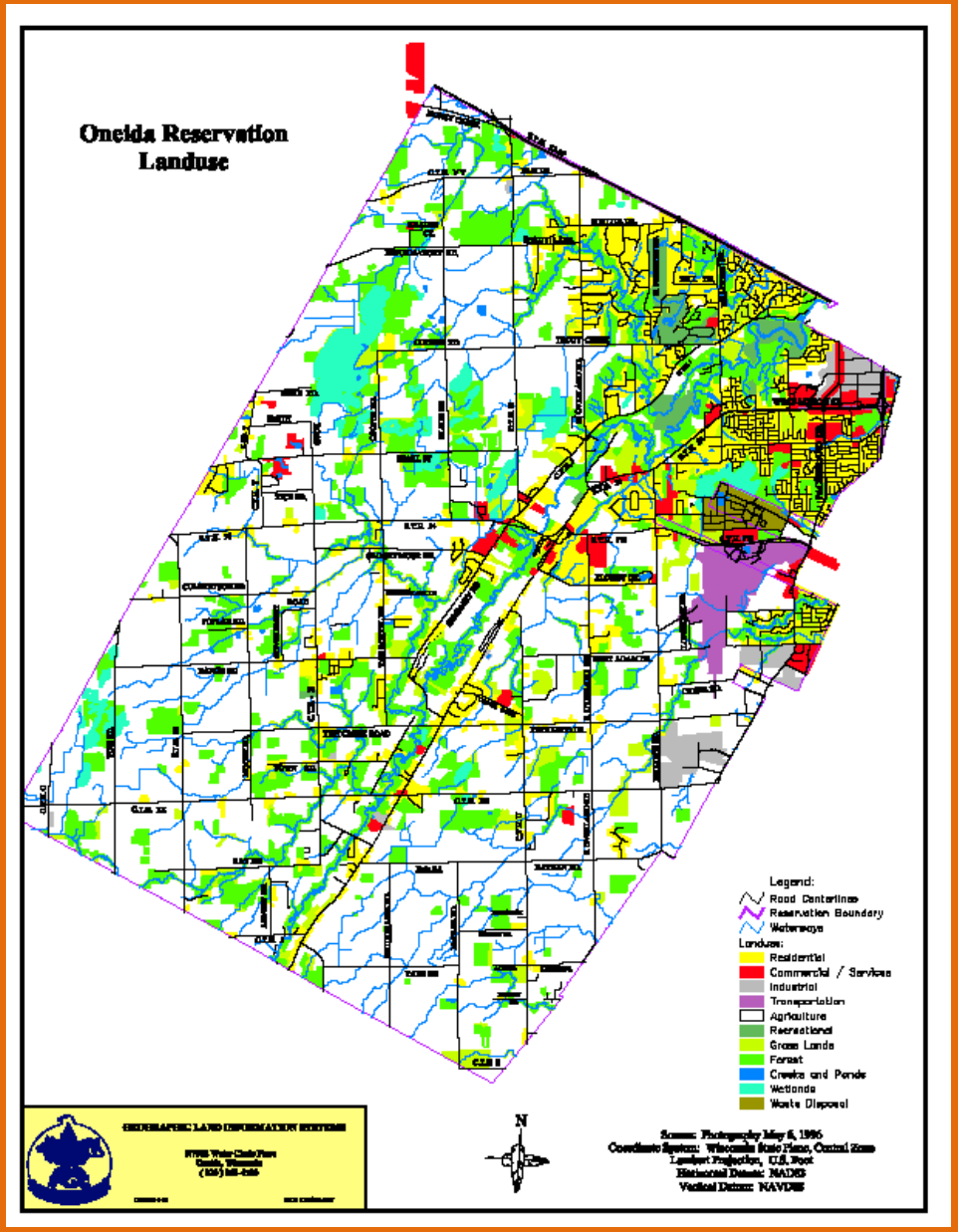
Approximately 80% agriculture

Oneida Farm manages 5,000+ acres

Oneida leases 5,000+ acres

68% use mainly N.G. for heat
16% use firewood for heat
13% use L.P. for heat
1% use oil for heat

70+% support alternative fuels



Energy Projects

1999 and 2002:

- 12 Solar Hot Water Systems
- 2 Photovoltaic Solar Electric System (11 kW and 2 kW) on Food Distribution and Community Center
- Solar Trailer
- Large SHW greenhouse system

Since 2002:

- Wind Assessments
- SHW Trainings and Inspection/Maintenance
- PV System in utility Buy-Back Program
- Grant Research (DOE, BIA)
- Wind Study (Anemometer)
- Geothermal system/study
- Assisted Living Center: Solar Thermal System (48 collectors)

Food Distribution PV

Provides 10% of Facility Electricity Demand, 20% of costs; built 2002.

Assisted Living Center SHW

- Large hot water user (48 beds - 3,500 gallons hot water / day)
- 48 4’x10’ collectors = 1,920 square feet
- Funded by Tribal, state, utility and ARRA sources.
- 2,000 gallons solar storage
- 50+% of hot water needs
- $8,000 savings per year

Figure 8. Wind Direction Distribution for 54-meter Wind Vane (w/ 57m Anemometer)

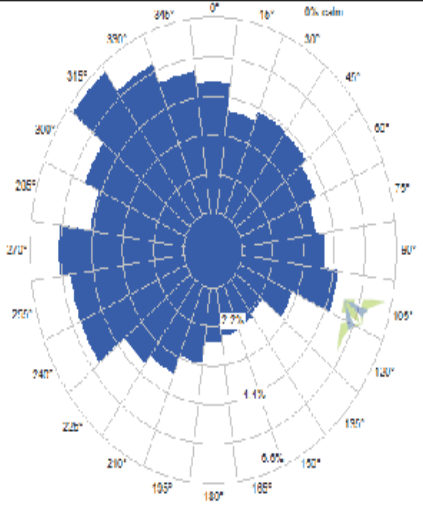
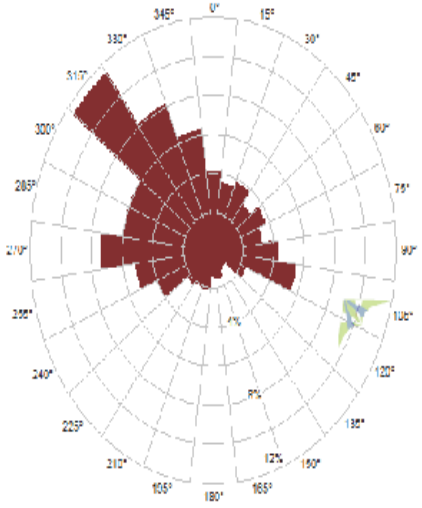
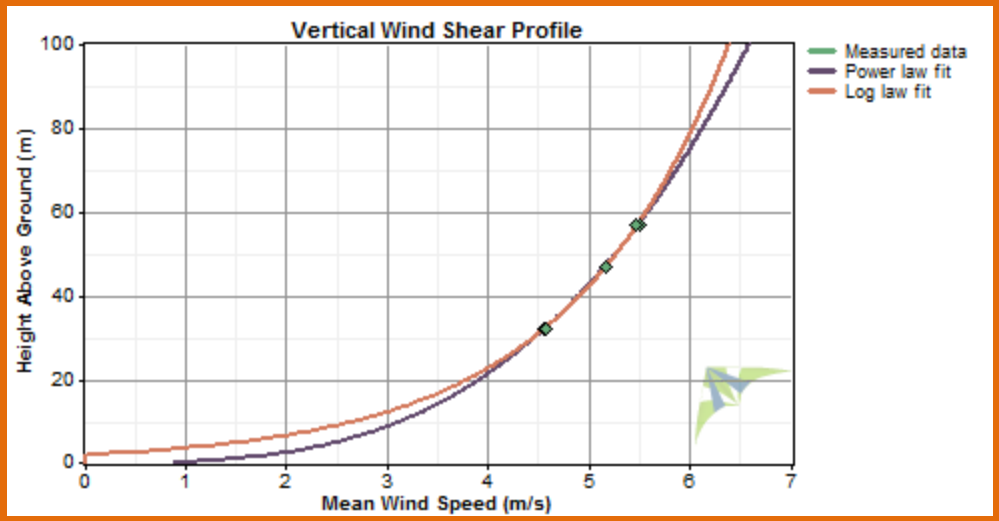


Figure 9. Power Density Wind Rose for 54-meter Wind Vane (w/ 57m Anemometer)



Wind Resources



Wind profile from met-tower results: Green points represent measured wind speeds

Wind rose based on met-tower results

Energy Development Program

DOE First Steps Grant: Activities to Come

- **Develop the Energy Optimization Model and Investment Portfolio**
  - The Tribe's "401k" for energy comparing different renewable portfolio standards
  - Provide social, financial, and environmental comparisons between technologies
  - Develop an implementation program
  - Support Community investment

Energy Development Program

Energy Optimization Model Action Plan

- **Assess resources**
  - Solar
    - Thermal
    - Electric
  - Wind electric
  - Ground-source thermal
  - *Bioenergy / Biomass*
    - Thermal
    - Electric
    - Fuels
  - CNG, biodiesel, electric
  - Conventionals
- **Strategy**
  - Energy history
  - Energy forecast
    - Community needs
  - Resource feasibility
  - Technology research
  - Energy Portfolio
  - Organizational development
    - Website development
    - Facility planning

Oneida Energy Optimization Model and Clean Energy Portfolio – RFP - 11/9/12

- Develop an energy use flowchart for the Oneida
- Complete a comprehensive resource assessment on local renewable energy resources
- Quantify regional and local fossil fuel distribution lines
- Evaluate Tribal buildings and properties for renewables
- Develop three renewable energy portfolios of investment opportunities for 5%, 10%, 25%, and 50%
- Provide a final report of recommended investment portfolio options

Bio-Energy

Considerable interest on the part of many organizations (local UW system, state agencies, other public and private interests).

Grasses are agriculture crops that Oneida is equipped to manage.

Requires land base (Oneida's got it!)

Challenge : Creating a market

The seed for the idea…

- Currently, Oneida delivers wood to elders on weekly basis from harvesting hazard trees
- Deliver 80-100 full cords per year, 1,800 MMBtu, heats about 18 homes based on 100MMBtu/ home/hearing season
- Can Oneida convert a % of cropland into an energy crop, pellet the crop, and distribute the pellets to its members for space heating?
- Switchgrass: 1-2 acres/home/heating season

Bioenergy Strategy

since 2011

Action Plan

- Organize work team ☑
- List partners ☑
- Determine scope of work ☑
- Determine available funding ☑
- Develop budget ☑
- Develop marketing work plan ☐
- Develop test plot work plan ☑
- Develop manufacturing work plan ☐
- Pilot Study (demonstration under development) ☐

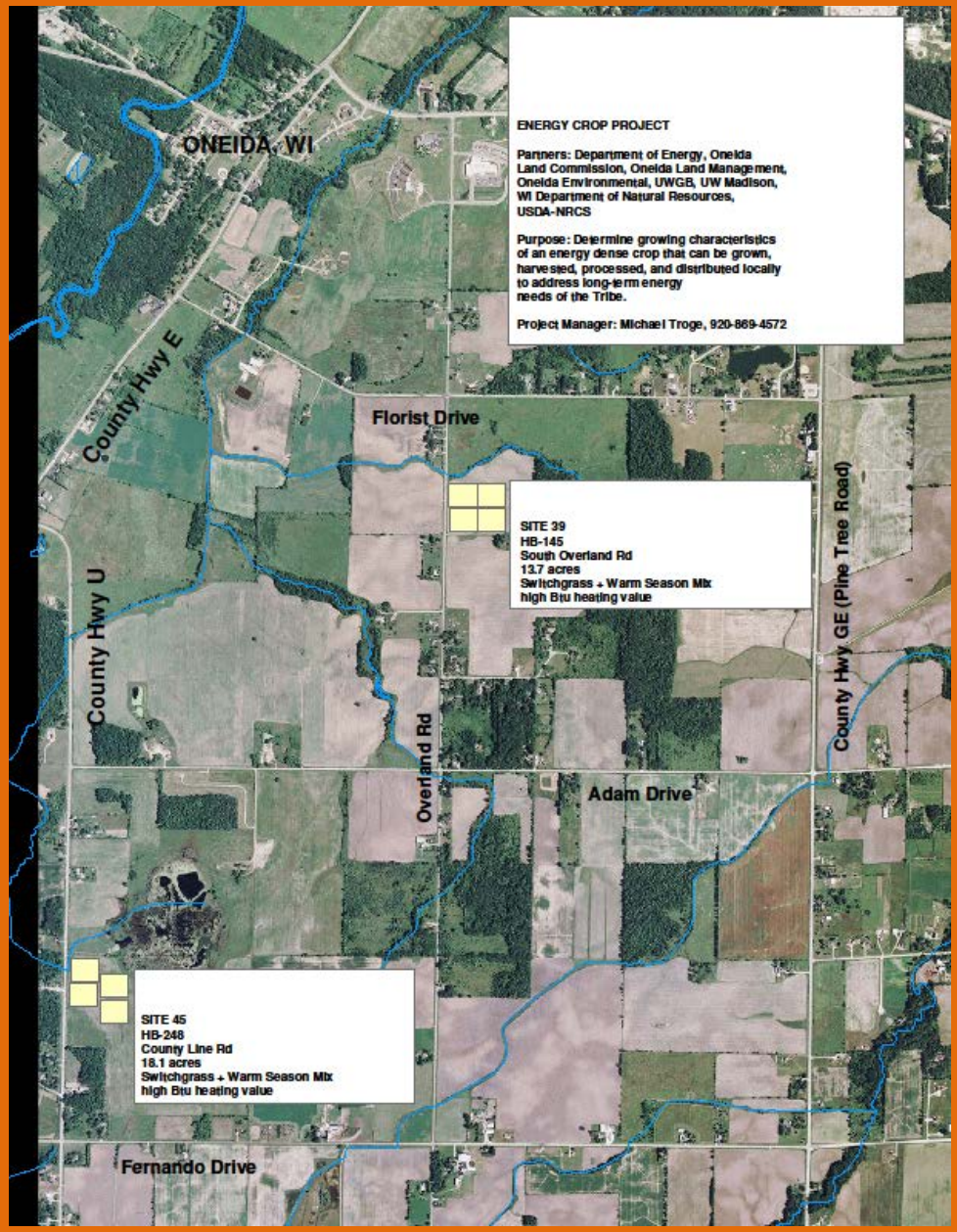
Test Plot Work Plan

- Locate field plots ☑
- Mobilize labor and equipment ☑
- Determine field prep needs ☑
- Determine seed mix choices ☑
- Develop timeline ☑
- Staging area ☑
- Material management ☐
- Year 1 ☑

Programs

Biomass resources

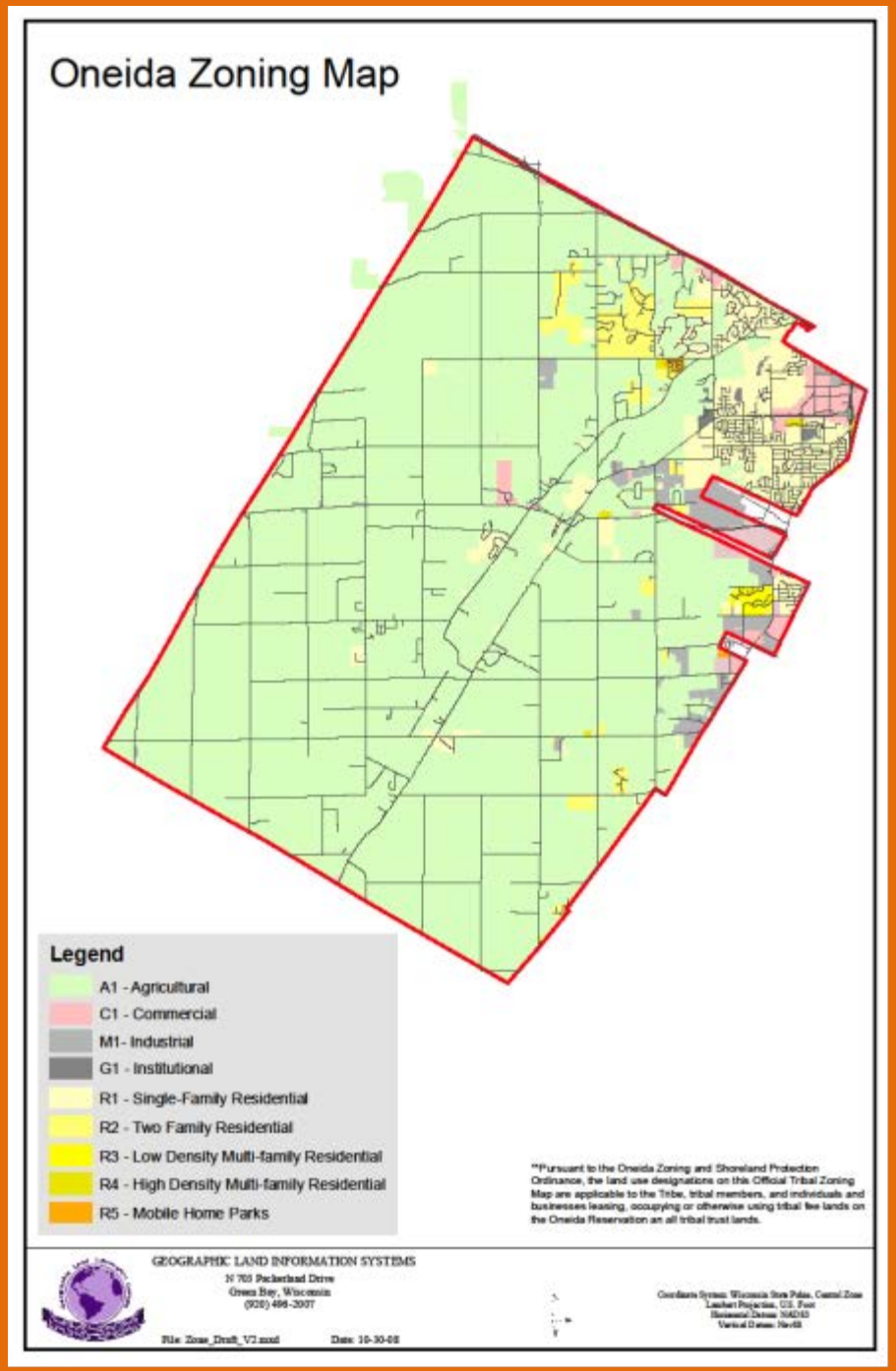
- DOE funding for first 2 years of 5-10 yr study
- Partnership: Oneida Tribe, UWGB, UWM, WDNR, NRCS, DOE
- Opportunity to use agriculture as a means to grow a local, clean energy crop toward a vision of energy independence
- Research, investment, marketing, & business model vital to success



Programs

Biomass resources

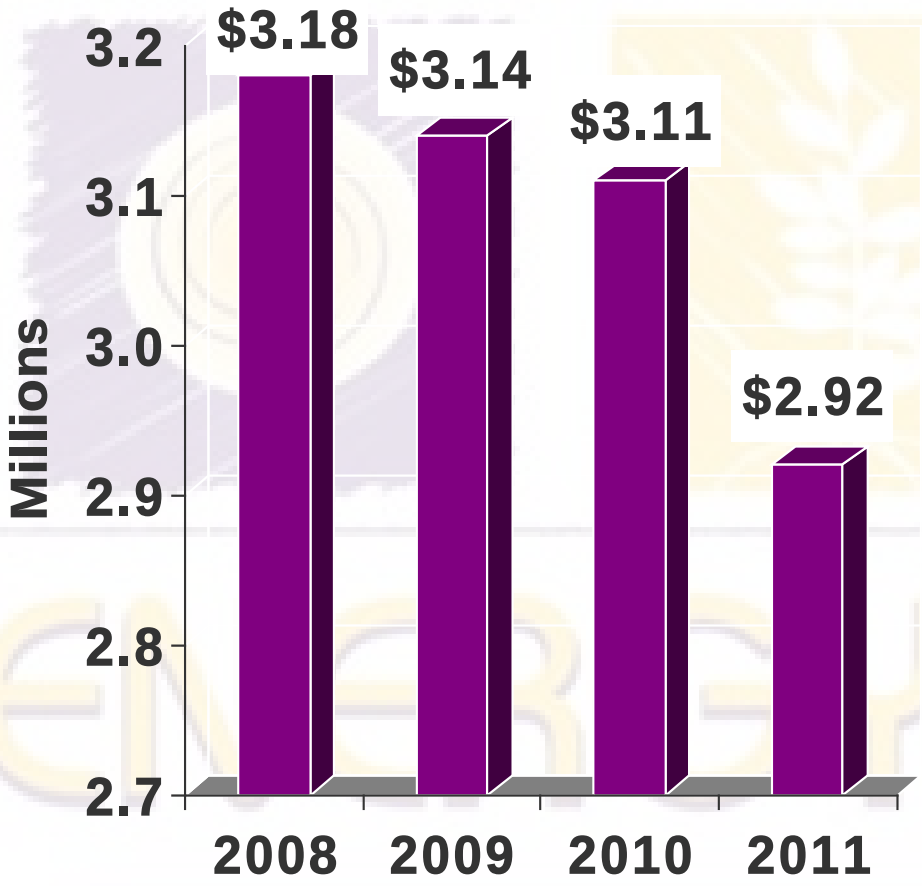
- Contract with UW-GB to perform multi-year analysis of warm season grass mixes
- Reduce phosphorous loads to streams, improve carbon sequestration, use of less productive land
- Drought tolerant, habitat opportunities, jobs program potential



Energy Audits of 44 tribal buildings

- Provide detailed feasibility studies and energy savings opportunities for each facility
- RFQ created, interviews and selection, subcontractor review by DOE, kickoff meeting, and starting Phase 1 of 3
- SEH selected to identify improvements for:
  - HVAC Systems
  - Lighting
  - Insulation
  - Motion Sensors
  - Temperature Setbacks

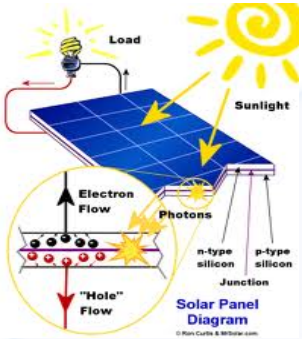
Oneida Buildings: Beginning the Baseline



- $258,000 reduction
- Added 3 facilities
- Fluctuations in natural gas and electricity prices
- Audit info (ROI / payback) helps justify capital expenditures

Short Elliott Hendrickson

- Engineering, Architecture, Planning – since 1927
- 550 staff; 10 offices in Wisconsin
- Worked with over 30 Tribes including grant funding



GDS Associates, Inc.
Engineers and Consultants

GDS Associates Inc (GDS)

- Engineers & Consultants
- Over 100 staff, including staff throughout MN, IL, and WI

GDS Offices

Our Mission

To Help Our Clients Succeed By Anticipating and Understanding Their Needs and By Efficiently Delivering Quality Services With Confidence and Integrity.

	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
Task 1 Baseline Determination												
Task 1A: Utility Records Analysis	X	X	X	X								
Task 1B: Benchmarking/Portfolio Manager Set Up (as applicable)			X	X	X							
Task 2: Energy Audits & Feasibility Studies (15 BUILDINGS)												
Task 2A: Obtain and review building plans	X	X										
Task 2B: Develop building profiles and existing conditions report		X	X									
Task 2C: Audit Site Visits	X	X	X									
Task 2D: Audit Calculations & Report Writing		X	X	X								
Task 2E: Review Draft Audits with Oneida Staff				X								
Task 3: Energy Audits & Feasibility Studies (15 BUILDINGS)												
Task 3A: Obtain and review building plans	X	X										
Task 3B: Develop building profiles and existing conditions report			X	X								
Task 3C: Audit Site Visits				X	X							
Task 3D: Audit Calculations & Report Writing				X	X	X						
Task 3E: Review Draft Audits with Oneida Staff						X						
Task 4: Energy Audits & Feasibility Studies (14 BUILDINGS)												
Task 4A: Obtain and review building plans	X	X										
Task 4B: Develop building profiles and existing conditions report				X	X	X						
Task 4C: Audit Site Visits					X	X	X					
Task 4D: Audit Calculations & Report Writing					X	X	X					
Task 5E: Review Draft Audits with Oneida Staff							X					
Task 5: Strategic Planning & Project Management												
Task 5A: Project Meetings	X	X	X	X		X		X		X		X
Task 5B: Database Development	X	X	X	X	X	X	X	X	X	X		
Task 5C: Capital Planning & Prioritization						X	X	X				
Task 5D: Strategic Energy Planning								X	X	X		
Task 5E: Database Training											X	X

Project Management
Schedule

Task	9 Week Phase								
	1	2	3	4	5	6	7	8	9
Site Visit	1		2		3				
Technical Calculations		1		2		3			
Energy Audit Draft & Review			1		2		3		
Feasibility Study Report				1		2		3	
ERO Database								★	

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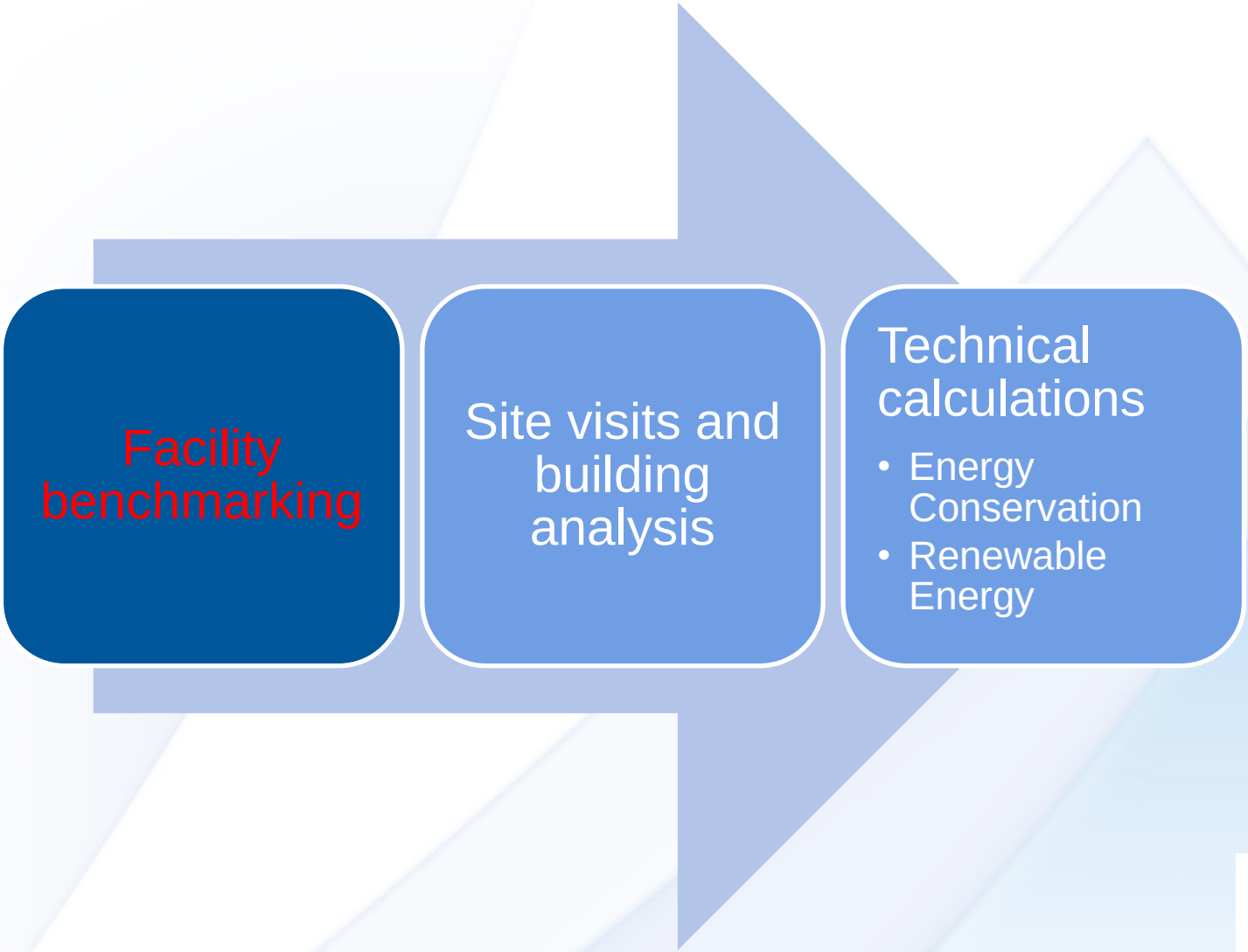
Energy Audits



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Step 1: Facility Benchmarking

3 Year Comparison - Account

Report Run On: 2/18/2011

[redacted]

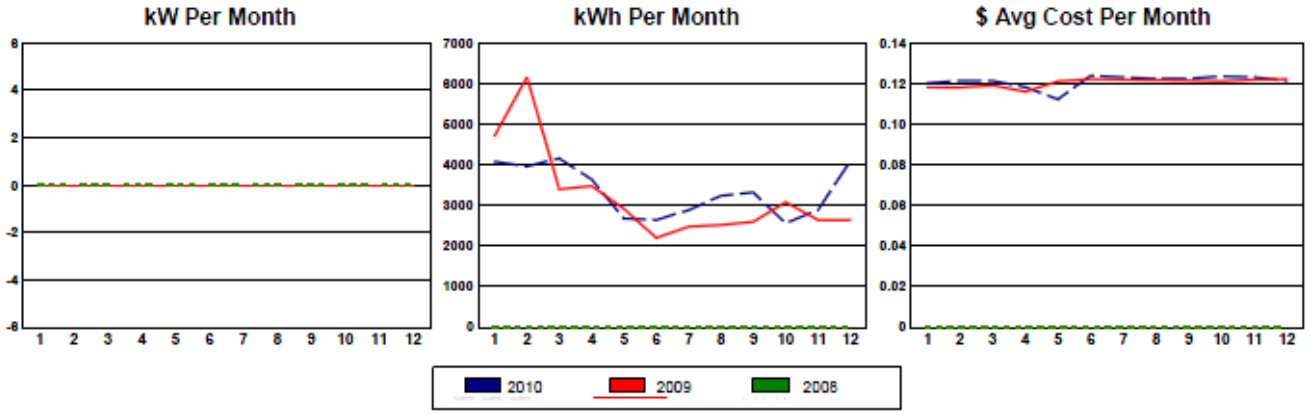
[redacted]

Account: [redacted]

Service Type: Electric

Operating District: [redacted]

	2010					2009					2008				
	kW	kWh	kWh Per Day	$ (w/o tax)	$/kWh Avg Cost	kW	kWh	kWh Per Day	$ (w/o tax)	$/kWh Avg Cost	kW	kWh	kWh Per Day	$ (w/o tax)	$/kWh Avg Cost
JAN		4,080	132	490.36	0.1202		4,720	139	557.88	0.1182					
FEB		3,960	137	480.71	0.1214		5,160	212	727.20	0.1181					
MAR		4,160	134	504.64	0.1213		3,400	117	405.13	0.1192					
APR		3,640	117	430.34	0.1182		3,480	112	403.57	0.1160					
MAY		2,680	92	300.81	0.1122		2,920	97	353.74	0.1211					
JUN		2,640	83	326.91	0.1238		2,200	73	268.73	0.1222					
JUL		2,880	96	354.66	0.1231		2,480	78	302.48	0.1220					
AUG		3,240	112	396.27	0.1223		2,520	84	306.74	0.1217					
SEP		3,320	104	406.42	0.1224		2,600	90	315.99	0.1215					
OCT		2,560	88	316.17	0.1235		3,080	96	373.01	0.1211					
NOV		2,880	96	354.45	0.1231		2,640	88	322.11	0.1220					
DEC		4,080	128	495.26	0.1214		2,640	83	322.67	0.1222					
		40,120		$4,867.00	0.1211		38,840		$4,658.25	0.1200					



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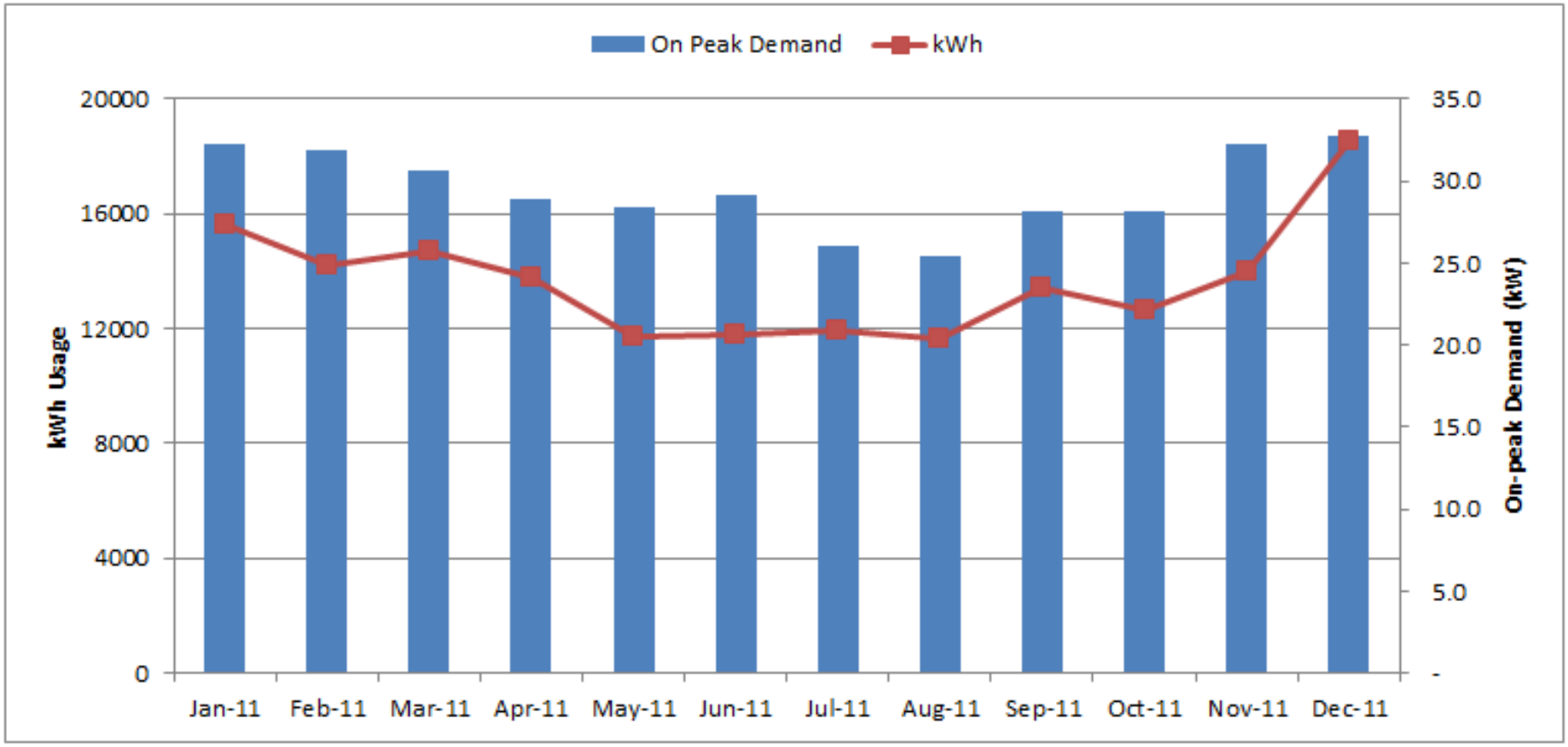
Step 1: Facility Benchmarking



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Step 1: Facility Benchmarking

Target Energy Performance Results (estimated)			
Energy	**Design**	**Target**	**Average Building**
Energy Performance Rating (1-100)	16	75	50
Energy Reduction (%)	N/A	26	0
Source Energy Use Intensity (kBtu/Sq. Ft./yr)	371	185	250
Site Energy Use Intensity (kBtu/Sq. Ft./yr)	196	98	132
Total Annual Source Energy (kBtu)	9,224,865	4,600,205	6,219,817
Total Annual Site Energy (kBtu)	4,875,340	2,431,208	3,287,173
Total Annual Energy Cost ($)	$ 95,522	$ 47,634	$ 64,405

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ENERGY STAR

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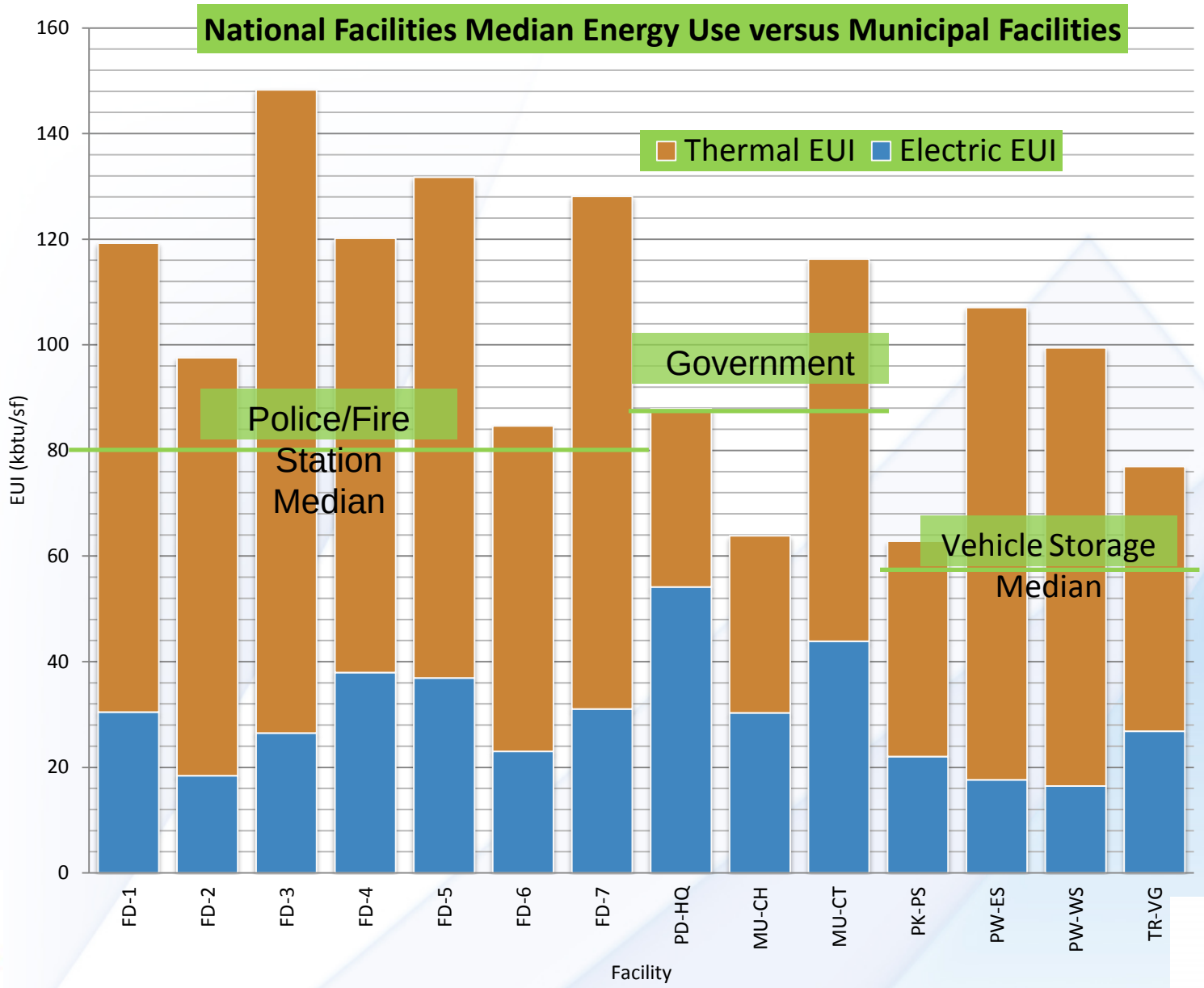
Step 1: Facility Benchmarking



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Energy Audits

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Step 2: Site Visits

Collect Data – System Operation

- Motor efficiency
- Lighting runtime
- Duct leakage
- Chillers
- RTUs/AHUs
- Sensors

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Step 2: Site Visits

Collect Data – Building Construction

- Doors
- Windows
- Insulation
- Weather stripping
- Roofs
- Layout

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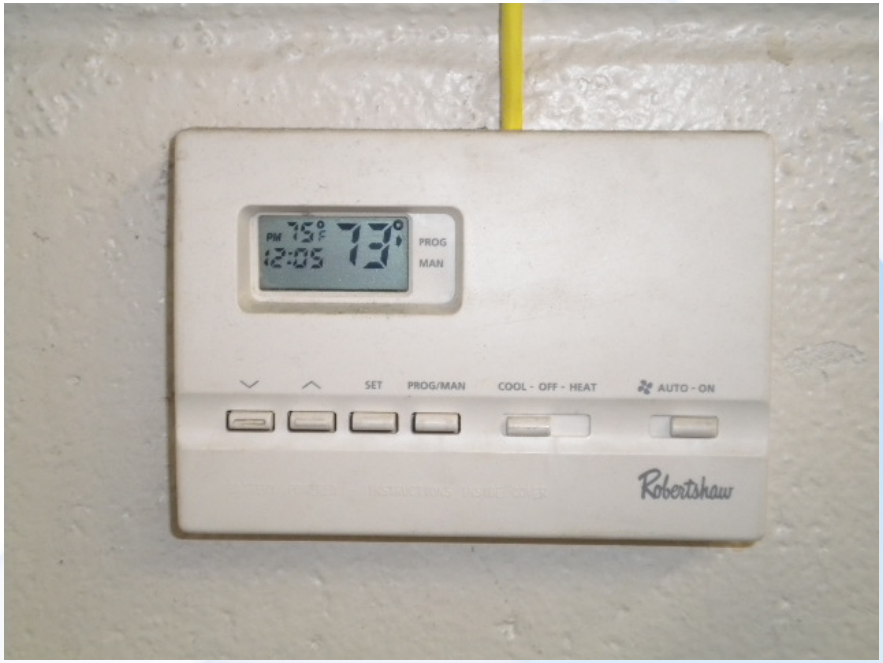
Step 2: Site Visits

Collect Data – Controls systems

- Thermostat Schedules
- Energy management systems
- VFD control algorithms
- Lighting controls



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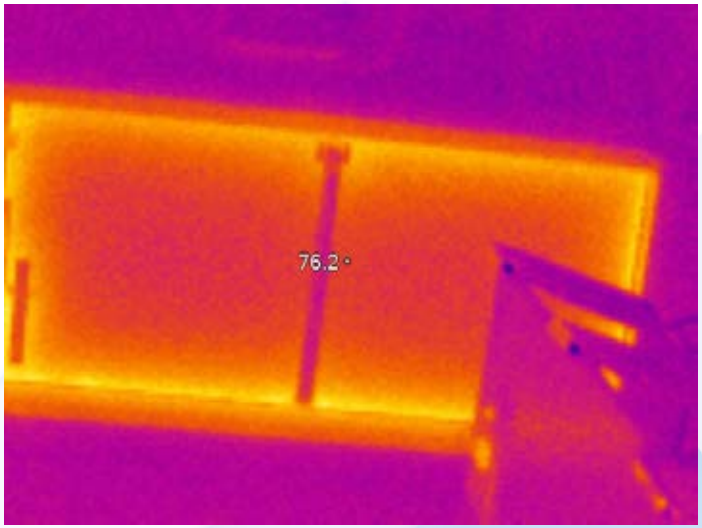
Step 2: Site Visits

Data collection tools

- IR camera
- Differential pressure gauge
- kW meter
- Ultrasonic detector
- Eyes and ears
- Building knowledge and awareness: Oneida building managers and electricians



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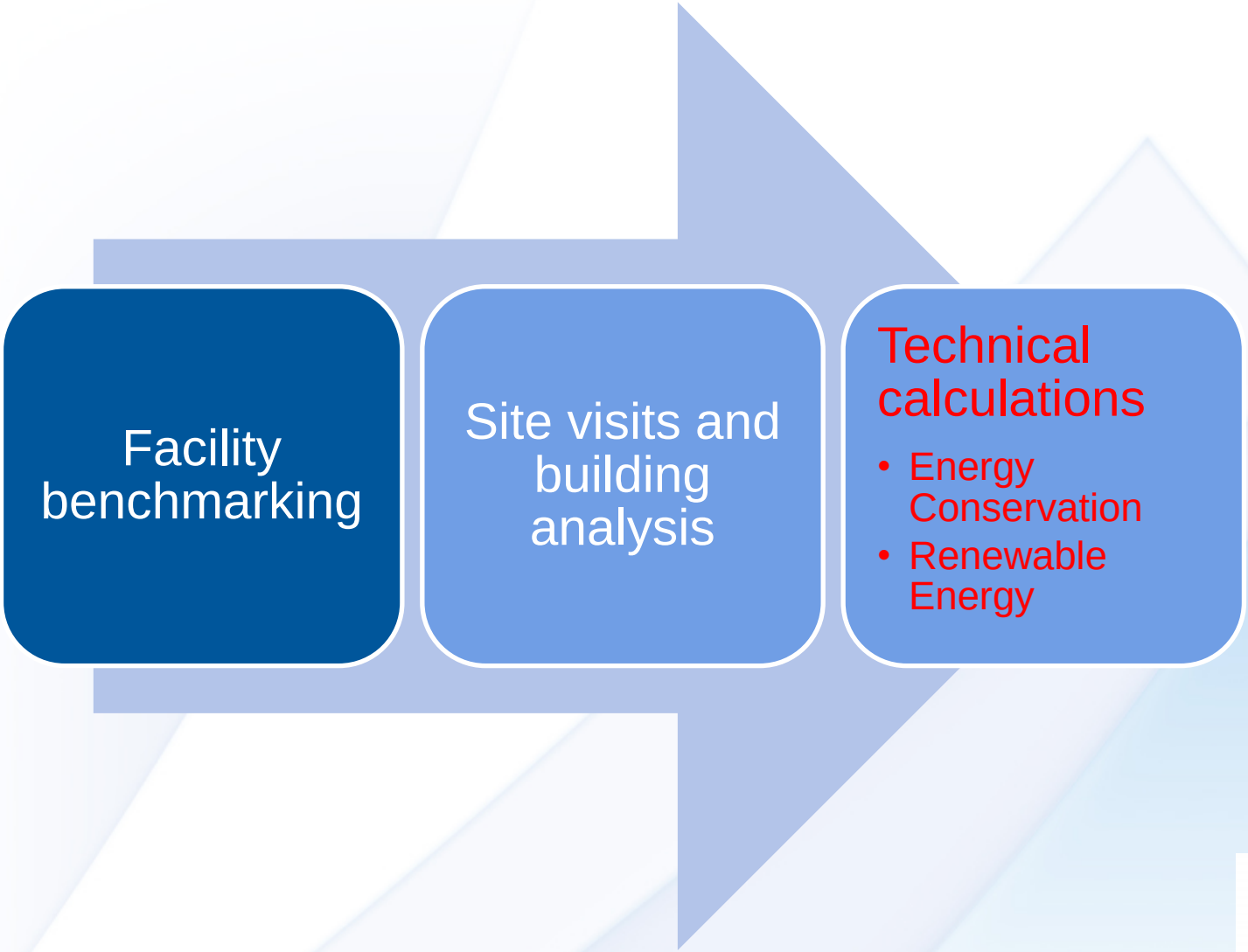
Energy Audits



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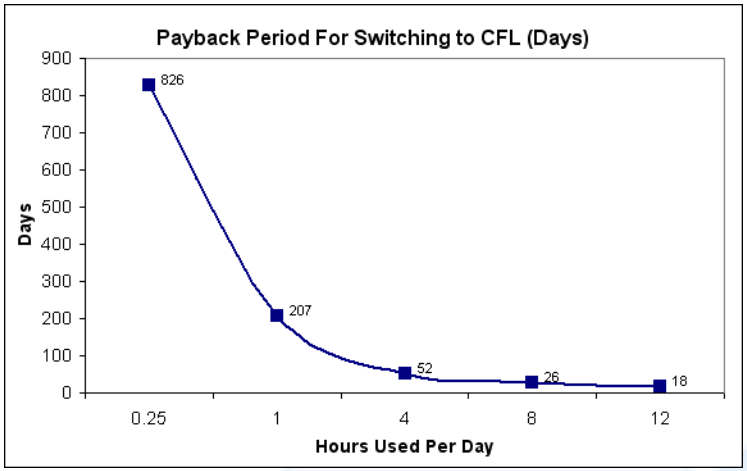
Step 3: Technical Calculations

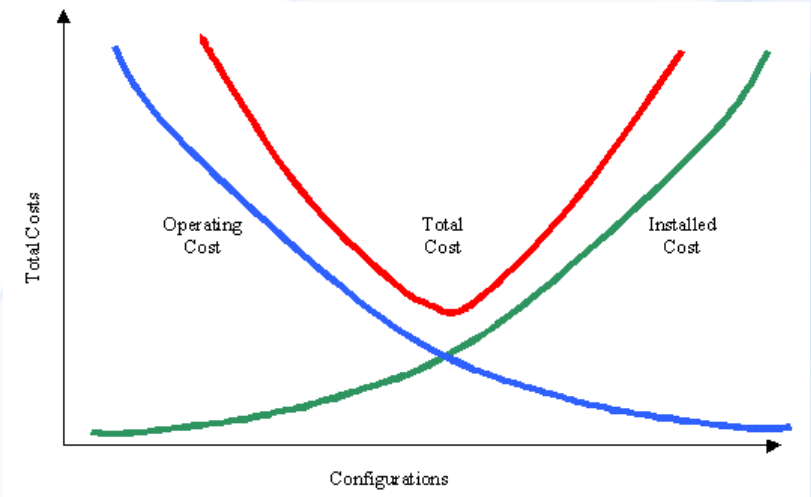
Simple Payback

Life Cycle Ratio

Greenhouse Gas (GHG)

Rebate Incentives





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Occupancy Sensors

Bay Bank Facility

- Many rooms and offices are frequently unoccupied and many of those had their lights on during the on-site visit
- Recommended to install occupancy sensing devices in each of these areas

Occupancy Sensors

Occupancy Sensors

Bay Bank Facility

Annual Savings (kWH)	Annual Electric Savings	Estimated Project Cost	Rebate	ROI
2,275	$238.62	$675.00	$67.50	2.55

Program Setback Periods

Community Health Center

- Average zone set point is 72F, which remains constant 24/7
- Entire facility is unoccupied between 5PM and 6AM weekdays and on weekends
- Recommended to program VAV runtime schedules with setbacks to 62F for heating and 85F cooling from 5PM to 5AM weekdays and on weekends
- Current CSI equipment can be programmed so *no capital investment* is required

Program Setback Periods

Program Setback Periods

Community Health Center

Annual Savings (kWH)	Annual Electric Savings	Annual Savings (Therms)	Annual Gas Savings	Estimated Project Cost	ROI
87,197	$6,889.00	11,079	$7,579.00	$0.00	Instant

Step 3: Technical Calculations

Project Prioritization List

Facility ID	Project #	Energy Efficiency Opportunity	Estimated Demand Reduction (kW)	Estimated Energy Savings (kWh)	Estimated Fuel and Water Cost Savings ($)	Estimated GHG Reduction (Mte)	Estimated Maint. Savings ($)	Estimated Capital Cost ($)	Simple Payback (Years)	Rebate - Incentive Est* ($)	Revised Simple Payback (Years)	Measure Life (Years)	Jobs Created/ Retained	Life Cycle Ratio	
PW-WS	H-01	Repair Boiler Vent Damper	0.0	0	$618	4.1	$0	$400	0.6	$0	0.6	10	0.0	**11.9**	
PW-WS	H-03	Insulate Condensate Piping	0.0	0	$678	4.5	$0	$785	1.2	$0	1.2	20	0.0	**10.8**	
FD-5	L-01	Hi-Bay Flourescent Lighting	4.2	27,073	$3,249	22.9	$0	$2,550	0.8	$0	0.8	10	0.0	**9.8**	
FD-ALL	L-01	LED Exit Signs	0.4	3,459	$415	2.9	$0	$360	0.9	$0	0.9	10	0.0	**8.9**	
PK-TS	A-01	Remove the Transformer at the Triangle Ski Hill	3.9	3,900	$397	3.3	$0	$500	1.3	$0	1.3	15	0.0	**8.2**	
FD-1	L-01	Hi-Bay Flourescent Lighting	0.3	858	$103	0.7	$0	$150	1.5	$60	0.9	10	0.0	**5.3**	
PK-RR	L-01	Install Occupancy Sensors in Park Restrooms	0.1	709	$78	0.6	$0	$120	1.5	$30	1.2	10	0.0	**5.0**	
TR-VG	A-04	Replace the Floor Scrubber	0.0	0	$568	1.9	$14,400	$50,000	3.3	$0	3.3	20	0.5	**4.6**	
TR-VG	A-01	Install VFD on 5 HP Boiler Pump Motor	0.0	4,984	$449	4.2	$0	$1,250	2.8	$250	2.2	15	0.0	**3.7**	
MU-PC	H-01	Replace the Electric Heater with IR Heater	112.0	249,000	(2,988)	0	$13,771	195.2	$0	$32,000	2.3	$480	2.3	10	0.3	**3.3**	3.4
MU-CH	H-01	Replace Cooling Tower	7.4	23,141	0	100,000	$2,393	19.6	$1,280	$15,000	4.1	$2,876	3.3	20	0.2	**3.3**	4.1
PK-JP	A-01	Install VFD on 40 HP Pool Pump Motor	0.0	28,457	0	0	$2,561	24.1	$0	$10,000	3.9	$2,000	3.1	15	0.1	**2.7**	3.3
PK-RA	A-02	Install VFD on 20 HP Double Slide Pump Motor	0.0	15,425	0	0	$1,388	13.1	$0	$5,500	4.0	$564	3.6	15	0.1	**2.6**	2.9
PK-PS	A-01	Reduced Compressed Air Pressure	0.0	1,627	0	0	$165	1.4	$0	$500	3.0	$65	2.6	10	0.0	**2.5**	2.9
PK-CP	A-01	Install VFD on 3 HP Pool Pump Motor	0.0	2,352	0	0	$212	2.0	$0	$900	4.3	$150	3.5	15	0.0	**2.4**	2.9
PK-BB	H-01	Replace the Existing Main Furnace with a High Efficiency Furnace	0.0	0	2,629	0	$2,162	14.0	$640	$15,500	5.5	$450	5.4	20	0.2	**2.4**	2.5
MU-CT	S-03	Add Spray Foam Insulation to Exterior	0.0	1,771	1,930	0	$1,775	11.7	$0	$11,475	6.5	$570	6.1	30	0.1	**2.4**	2.5
MU-CH	P-01	Replace Faucets with Laminar Flow Faucets	0.0	0	521	67,200	$733	2.8	$0	$2,400	3.3	$208	3.0	10	0.0	**2.4**	2.6

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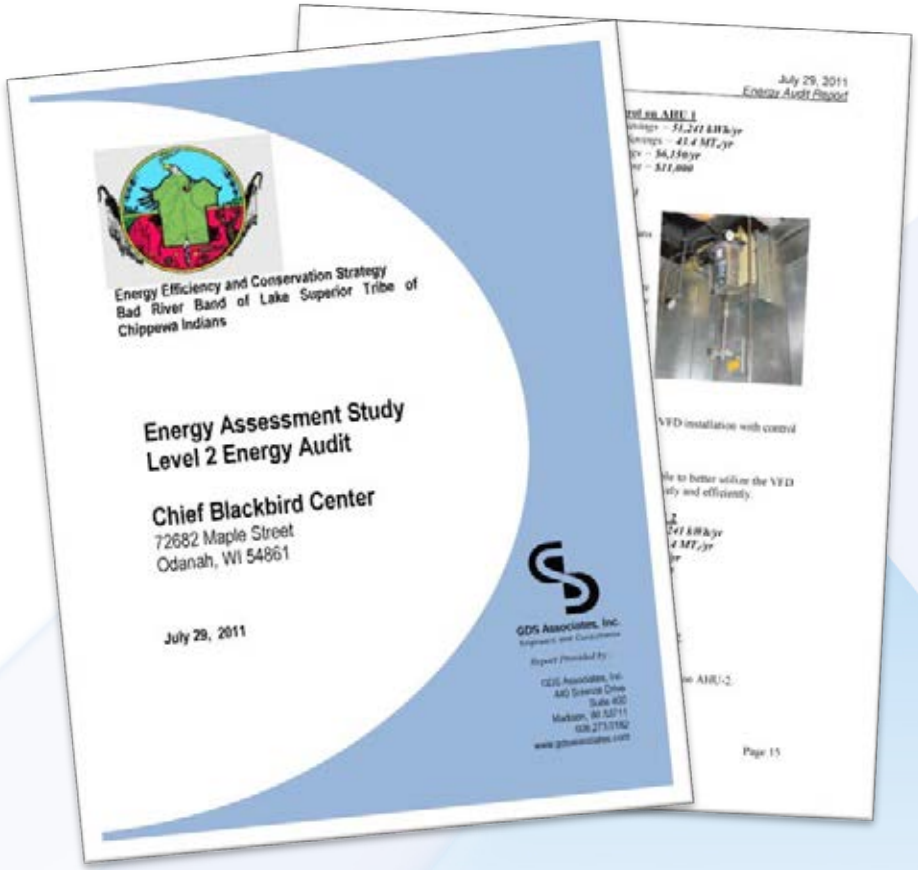
Feasibility Studies

Purpose

- Value-added Feasibility/Planning
- Take Energy Audits Results and Make Them More Usable
- Factor in prior Experience



SEH

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Feasibility Studies

Site Inspections – Space, Infrastructure and Other Existing Characteristics

Identify Performance Criteria for Life Cycle Costing Analysis – Operational and Energy

Develop Concepts to Optimize Performance Criteria

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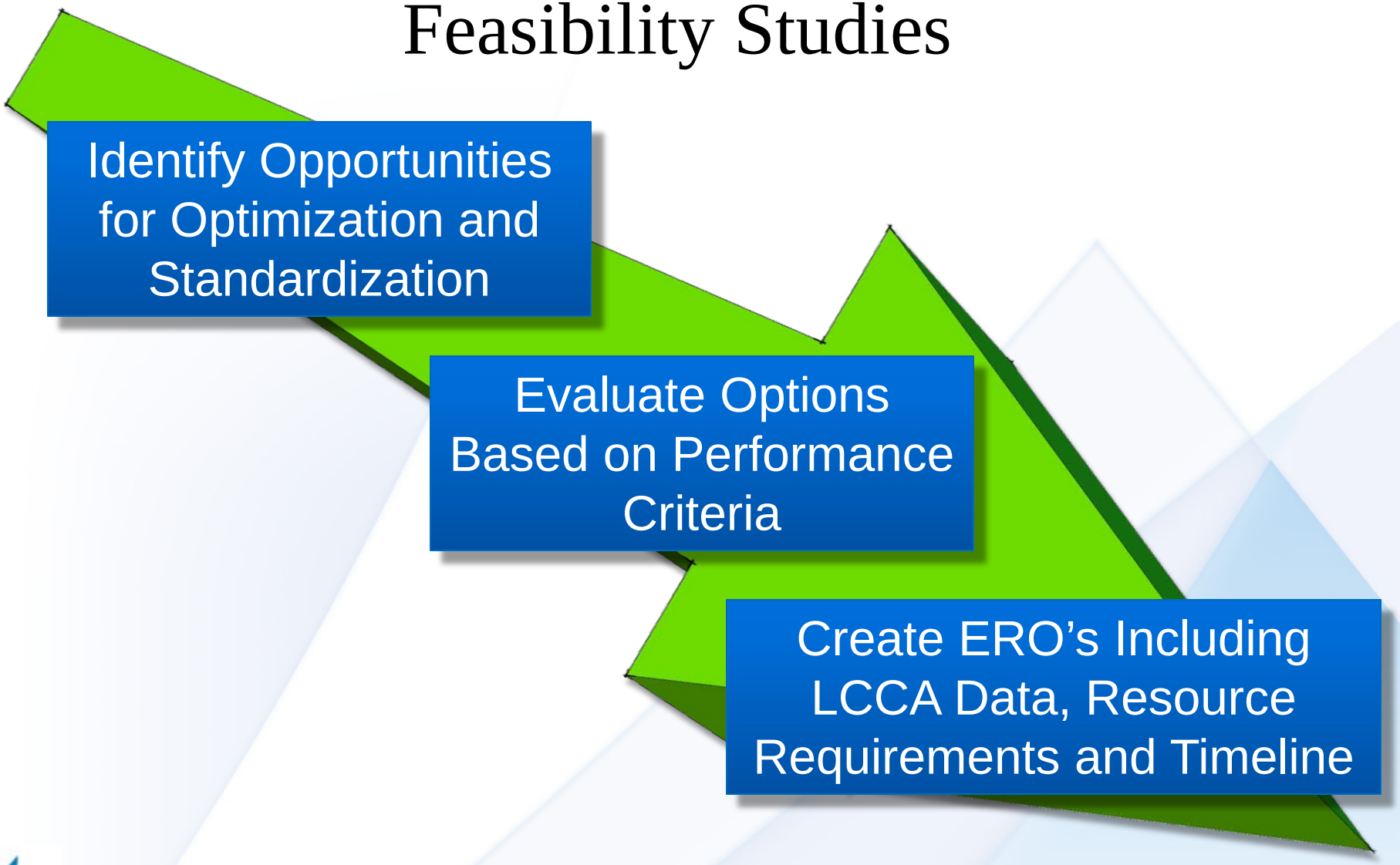
Feasibility Studies



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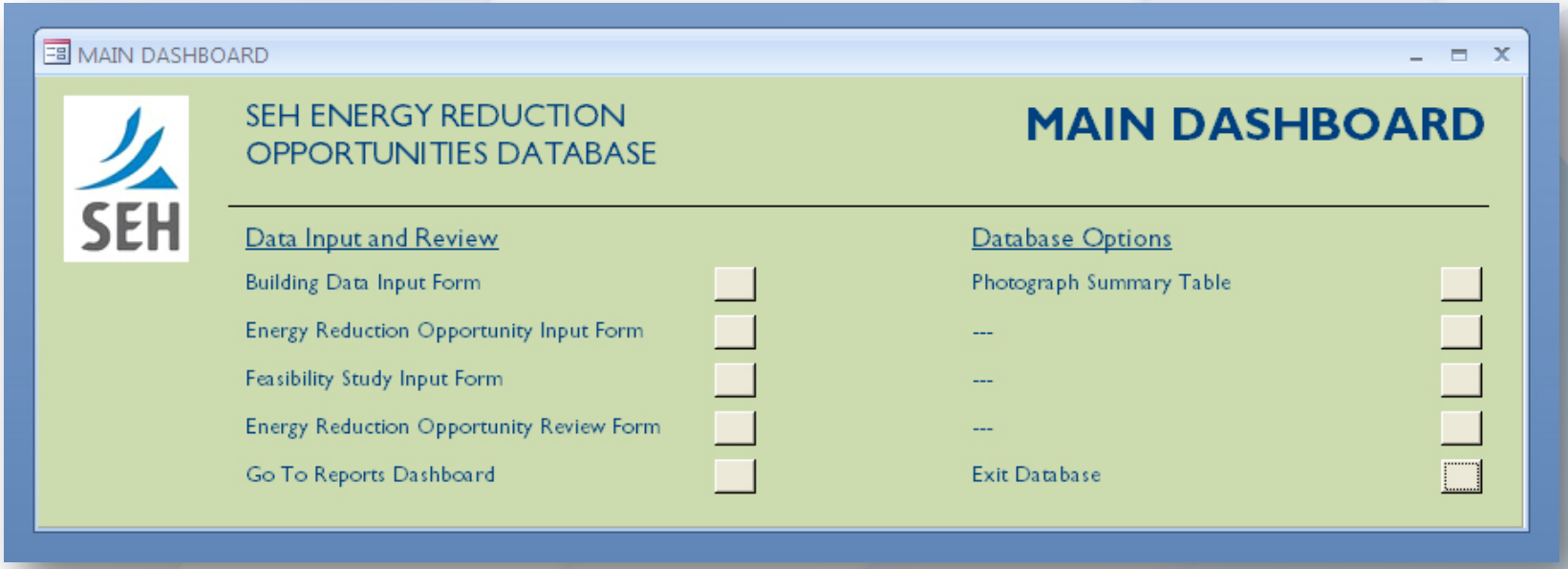
Feasibility Studies

Outcomes – User Friendly Database

Translating data into a format that together we can update, sort and use.



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EXIT


ACSM
GUIDELINE
Magnum
SCIFIT


NATION


NATION

Activities to Come
Audits of Buildings

- Phase 2 of energy audits occurring currently with boilers firing up for cold weather: Combustion tests, Infrared camera, and building envelope assessments
- List of high priority ECMs (Energy Conservation Measures) generated for possible bond funding
- Integration of utility records into the new database
- Obtain water bills/records

Lessons Learned
Audits of Buildings

- Good communication with subcontractor essential (schedule, task list, reporting)
- Need to improve controlling access between conditioned and non-conditioned areas (adding doors or other barrier for energy savings)
- Lighting continues to be a relatively easy and cost-effective area of needed improvement
- Automatic controls (occupancy sensor lighting and temperature set-backs) easy and efficient
- Compiling data (and pictures) *tells your story*, which helps save energy, money, and protects the environment

ONEIDA

ENERGY TEAM

Energy Strategies for Our Community

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Yaw^ko!
(Thank you)