



Solar Energy for Water and Wastewater Utilities: Step-by-Step Project Implementation and Funding Approaches

*Presented by the US EPA
October 11th, 2012*

Moderator

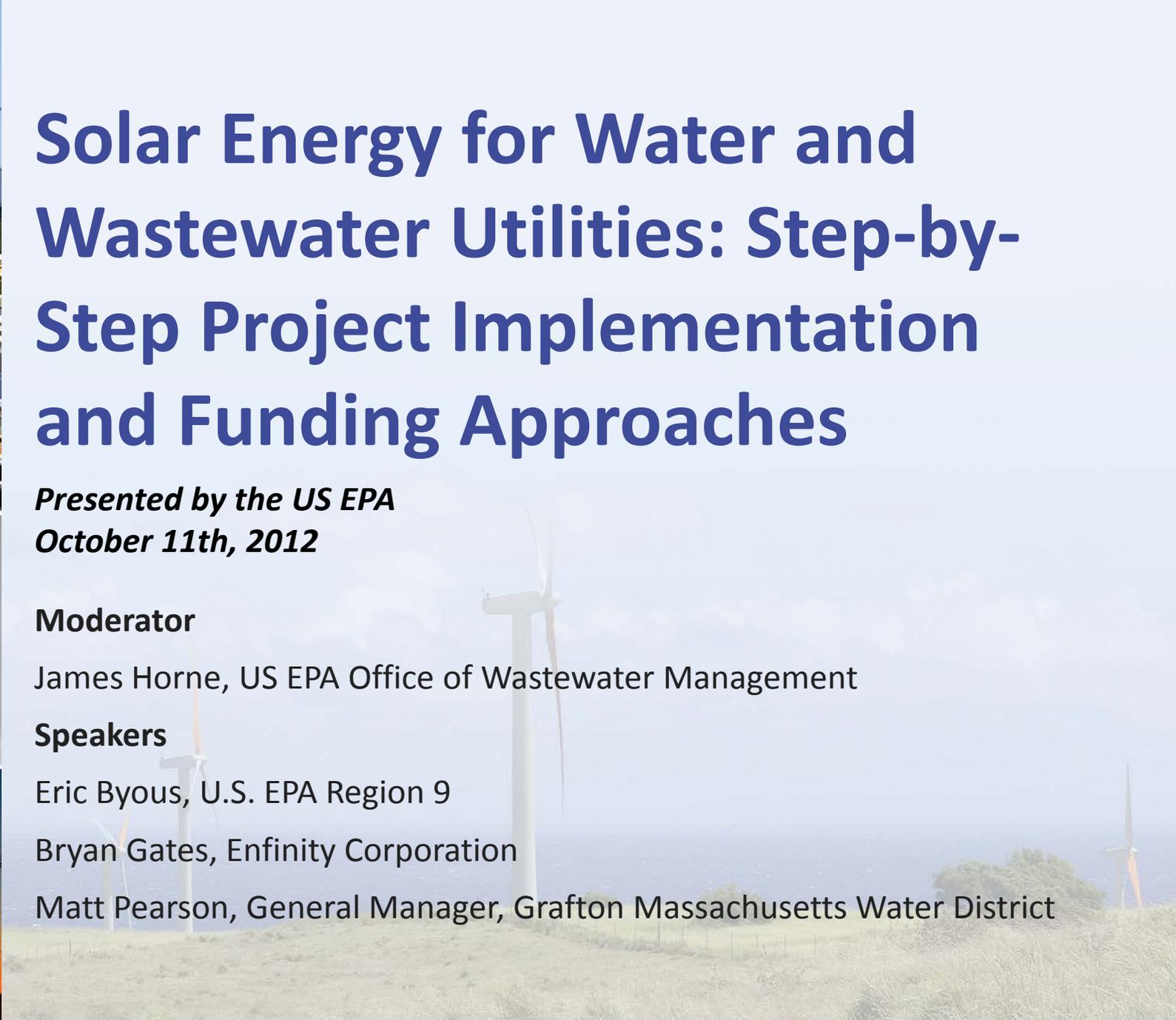
James Horne, US EPA Office of Wastewater Management

Speakers

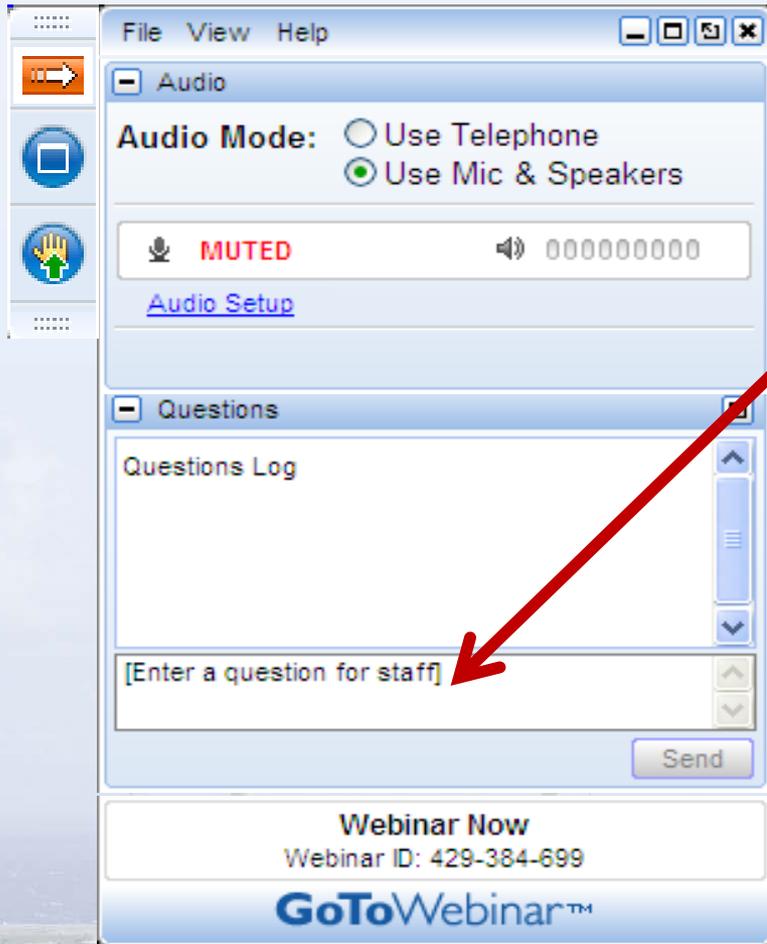
Eric Byous, U.S. EPA Region 9

Bryan Gates, Enfinity Corporation

Matt Pearson, General Manager, Grafton Massachusetts Water District

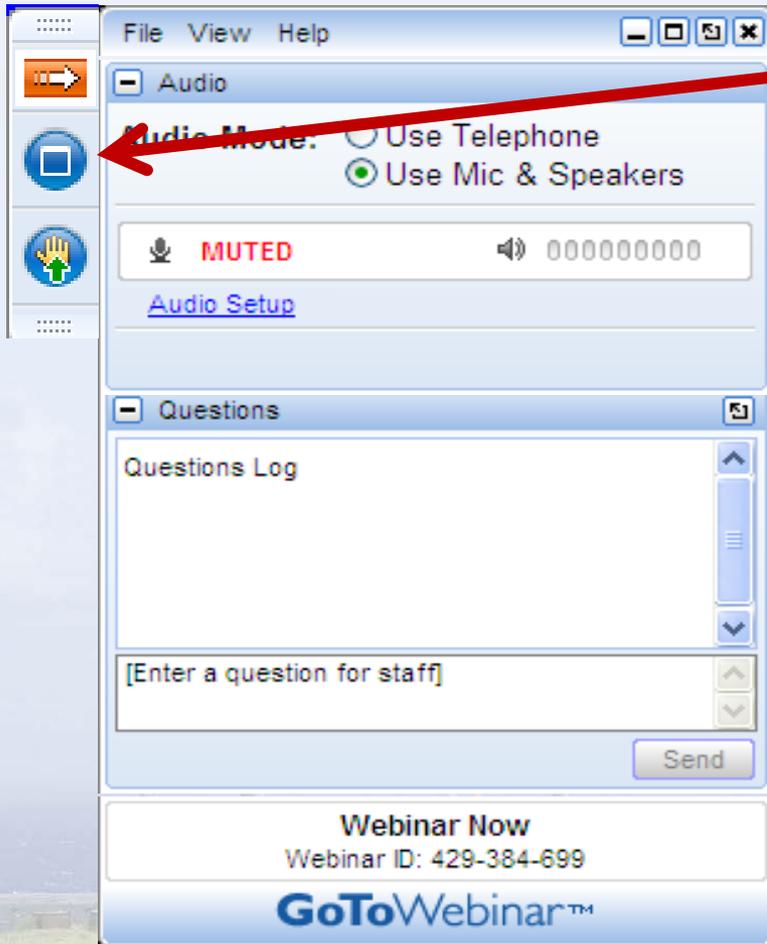


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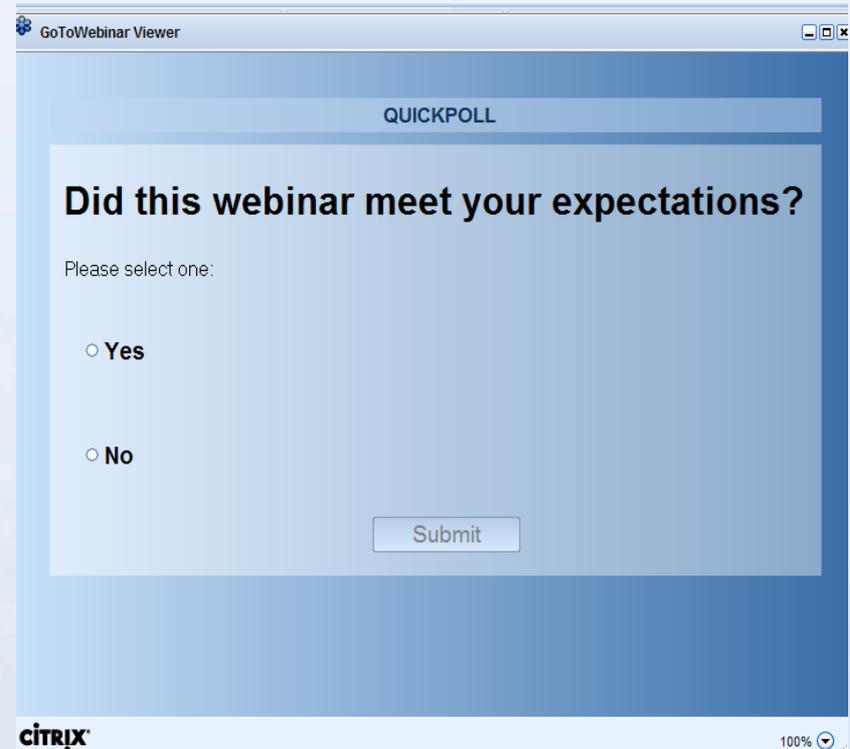
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Poll Question

- Polls will be launched throughout the presentation
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Quick Poll



Today's Agenda

- Background on energy use and management at water utilities
- Solar Energy Project Implementation and Funding Approaches
 - Eric Byous, US EPA Region 9
 - Bryan Gates, Enfinity Corporation
- Solar Power Purchase Agreements: What Every Utility Should Know
 - Matthew Pearson, Grafton Water District
- Q&A Time

Energy Use and Water Utilities

- Water and Wastewater treatment represents about 3% of the nation's energy consumption
 - About \$4 billion is spent annually for energy costs to run drinking water and wastewater utilities
 - Equivalent to approximately 56 billion kilowatt hours (kWh)
 - Equates to adding approximately 45 million tons of greenhouse gas to the atmosphere
 - Electric use for moving and treating water often represents 25-30% of O&M costs
- Energy consumption and costs will continue to rise
- Energy represents the largest controllable cost of providing water and wastewater services to the public

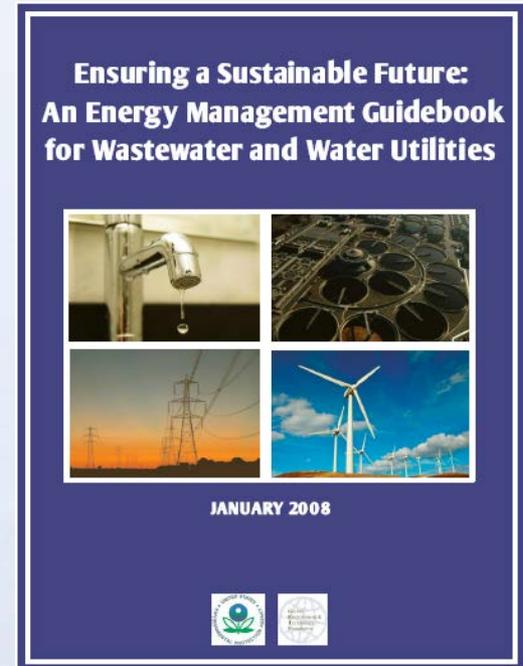
Managing to Maximize Energy Efficiency

Designed to help utilities:

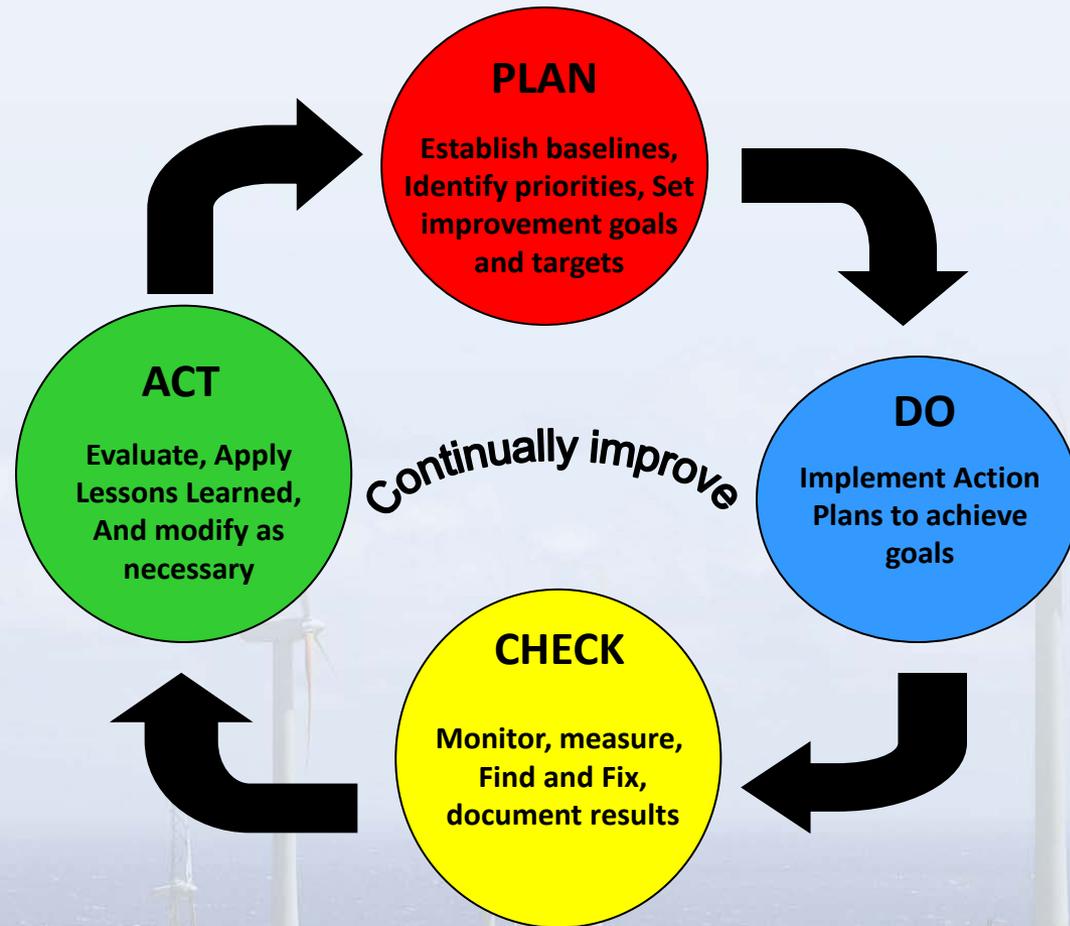
- Systematically assess current energy costs and practices
- Set measurable performance improvement goals
- Monitor and measure progress over time

Uses a management system approach for energy conservation, based on the successful Plan-Do-Check- Act process [based on Environmental Management Systems (EMS)]

http://water.epa.gov/infrastructure/sustain/cut_energy.cfm



The Plan-Do-Check-Act Approach



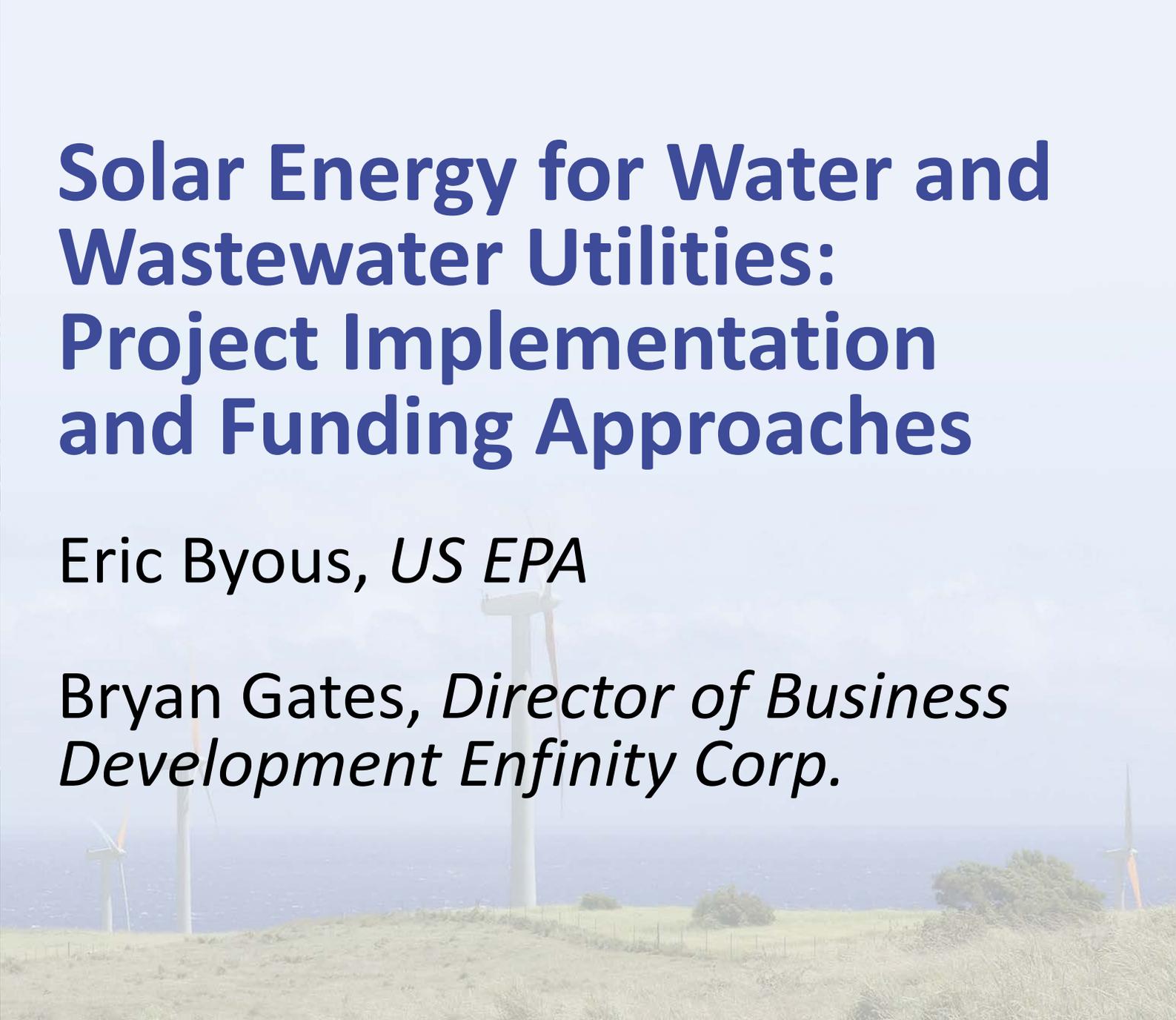
- Allows utilities to systematically assess and manage energy opportunities and take action
- NOT a project—a system to manage for the long haul



Solar Energy for Water and Wastewater Utilities: Project Implementation and Funding Approaches

Eric Byous, *US EPA*

Bryan Gates, *Director of Business
Development Enfinity Corp.*



Solar Energy for Water and Wastewater Utilities: Step-by-Step Project Implementation and Funding Approaches

OCTOBER 11, 2012

Eric Byous, USEPA (byous.eric@epa.gov)

Bryan Gates, Director of Business Development Enfinity Corp.



Energy Self Sufficiency and Beyond

- USEPA believes water sector is the foundation to a sustainable future for the U.S.
- Water and wastewater utilities have the potential to become net energy generators
- This can be accomplished by maximizing efficiency and adding renewable energy (solar, biogas, wind, and/or hydropower)



Energy Challenges Are Increasing for Water Sector

- Drought and irregular rainfall/snowpacks (storage)
- Sea level rise and increasing severe storm events (protect assets, salt water intrusion, siting)
- Increased energy use (ground water mining, increased treatment)
- Overall cost to industry estimated at \$448 to \$944 billion through 2050 (NACWA and AMWA 2009 report)



Energy Efficiency First!

- With your own capital, it's best to maximize cost-effective energy efficiency opportunities before purchasing renewable energy (RE)
 - Public-Private Partnerships/Power Purchase Agreements can present no upfront cost opportunities that we'll detail later
- EPA's Energy Management Guidebook can help get you there
- USEPA presented two previous water sector energy efficiency webinars this year
 - Available online at <http://water.epa.gov/infrastructure/sustain/energyefficiency.cfm>



Energy Efficiency First!

- EPA Region 9 Energy Audit Pilot Project
 - 15 energy audits of water & ww utilities
 - An average \$1.4 million/yr cost savings with a 4.5 yr payback (16% Return on Investment, or ROI)
 - 6,900 megawatt hours/yr reduction
 - An average 26% savings in energy costs identified



Benefits of Solar

- Potential energy cost savings
- Energy cost security for capital improvement and rate structure planning
- Long-term, safe, tangible investment



Good Timing for Private Sector Funding

- Bond market is not as lucrative or dependable as it's been historically
- Large retirement funds looking for good yielding, safe, long term investments
- Water sector provides ideal opportunity with capital improvement and renewable energy projects
- Explore opportunities available through public-private partnerships



Bryan Gates

Director of Business Development
Enfinity Corp.



Solar Today

- Prices significantly reduced over the last 4 years.
- Multiple financing options available; financiers and banks well acquainted with financing options for PV projects.
- Fed ITC remains in place until 2016.
- Post Senate Bill 1603 Treasury cash grant has caused a reversion to a more limited number of financiers in the market.
- More states adopting solar programs, incentives continually evolving.



Solar Technologies

Solar Types

- PV
- CPV
- Thin film
- BIPV

Mounting Types

- Rooftop
- Ground mount
(Fixed, Tracking)
- Carport / Canopies
- Building integrated



City of Parlier, 490 kWp





How to Start a PV Project

- Largely dependent on the procurement laws that govern your district.
- Local laws will impact how the system or energy is likely purchased / financed.
- District will need to determine a process that is most conducive to their laws and needs.
- *What are the various procurement methods?*



Direct Negotiation, Sole Source 4217

- In CA, using Government Code 4217 a public entity can procure a solar system from a sole source.
- Benefits include:
 - Eliminate the cost associated with contracting a consultant to run the RFP process.
 - Timing: faster project completion which results in quicker realization of the savings value.
 - Avoid possible loss of available incentives.



Direct Negotiation, Sole Source 4217 (continued)

- Disadvantages include:
 - More difficult for the buyer to ensure they are getting a competitive quote.
 - May lose other vendor interest if they feel sole source scenario likely to persist.
 - If real problems or significant shifts occur within that vendor, project can get stuck or face other risks.
- If not in CA, consult your state's sole source process.



Request for Proposal (RFP)

- Contract with owner's representative (consultant) to run competitive bidding process.
- Or, run the RFP in-house.
- Benefits include:
 - Broad competitive reach.
 - Ability to review qualifications of many respondents.
- Disadvantages include:
 - Upfront cost and length of time to procure and implement solar system.
 - Solution is predefined; the RFP becomes the "customer," and price outweighs execution.
- First level feasibility study recommended.



Request For Qualifications (RFQ)

- A request for qualifications, but not for a specific project proposal. Run in-house or by owner's representative, shortlist of qualified vendors gathered and choice made from there.
- Owner's rep can bring a solar company in if they have that relationship.
- Benefits include:
 - Compares qualifications and track record of vendors well.
- Disadvantages include:
 - Non project-specific. Adds extra step to the process.



Funding Approaches

How does your district look at capital projects?

- **Capital purchase:** Water agency owns the system outright and receives simple payback, ROI. Agency responsible for O&M.
- **Lease purchase:** Municipal leases. Rent payments over time, tied to installed system cost. Agency responsible for O&M.
- **Power Purchase Agreement:** Buy kilowatt hours at specific price over certain term. Power Provider responsible for O&M.



Appetite for Risk

Questions to ask when performing a risk assessment:

- **What access to capital do you have? Keep the project on your balance sheet, where it would count as an asset and/or liability?**
- **Is an early purchase option right for you?** With some PPAs at the end of the sixth year, you can purchase the system at a discounted rate after the system owner has monetized the tax credits and passed those benefits through to the customer. Additionally, you will have gained experience with the system, its O&M requirements and production profile, thereby making a more informed buying decision.
- **What is the loss of anticipated benefit based on system underperformance?**
With a PPA you only pay for kWh generated. With cash purchase (or a lease), if system underperforms, you lose incremental value of the electricity that you have already purchased, but would be receiving free energy going forward once the system has paid for itself. as well as any incremental rebate incentive value.
- **At end of the term, will you extend the Agreement , have the system removed, or purchase at discounted rate?**



City of Taft, 737 kWp





The Benefits of PPAs

- The most popular procurement method today.
- A solar company takes the upfront cost responsibility owning and operating generating system.
- Water entity pays only for kilowatt hours, typically at or below current cost of energy.
- Insulation from volatile and rising energy prices.
- Can be cash positive on day one.



The Benefits of PPAs (continued)

- Monetization of the Federal Investment Tax Credit of 30%; as a public entity a water agency cannot take direct advantage of this credit.
- Local incentives are a big factor, engage with your utility directly and investigate any municipal solar incentives available.
- Some local muni utilities are currently developing programs, some of which are only open with limited time availability to help certain types of customers. Look into the incentive programs that are *not* broadly advertised.
- If a PPA doesn't work, create recurring revenue through a land lease.



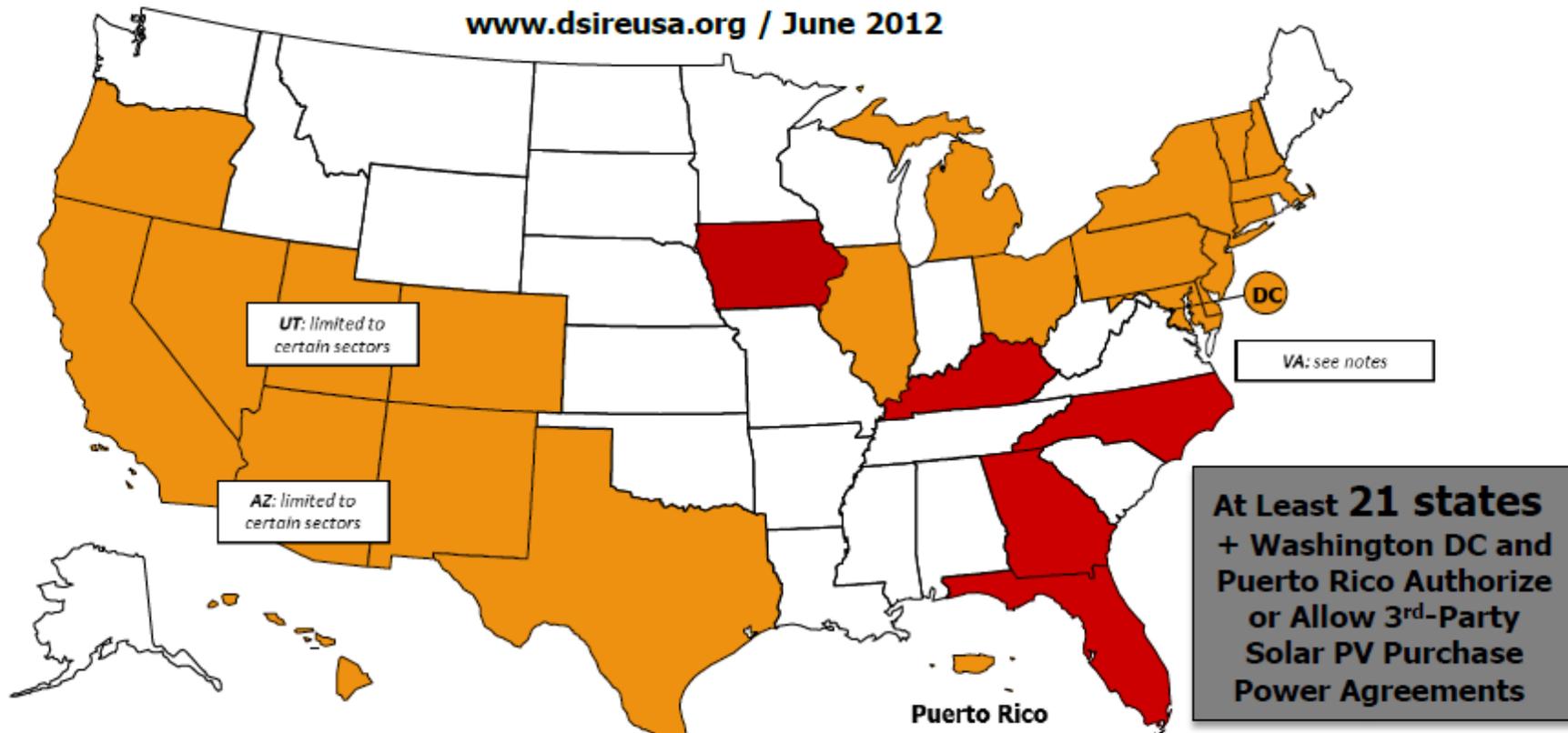
PPA Challenges

- Challenging to reach positive economics if your utility has electricity rates that are substantially lower than the amortized cost of installing solar.
- Third party legal review of contracts typically recommended to make sure there are no unknown negative outcomes.
- There may be private use restrictions if bonds have been used to fund your utilities.
- Most attractive in states with pro-solar rebates and incentives:
 - Check Database of State Incentives for Renewables and Efficiency (DSIRE):
www.dsireusa.org



3rd-Party Solar PV Power Purchase Agreements (PPAs)

www.dsireusa.org / June 2012



- Authorized by state or otherwise currently in use, at least in certain jurisdictions within the state
- Apparently disallowed by state or otherwise restricted by legal barriers
- Status unclear or unknown

Note: This map is intended to serve as an unofficial guide; it does not constitute legal advice. Seek qualified legal expertise before making binding financial decisions related to a 3rd-party PPA. See following slides for additional important information and authority references.



Site Conditions

- Most will be ground mount installations.
- 5-6 acres needed per MW (nameplate rating).
- Flat land, over 5% slope tilted panels can shade one another. Site may need grading.
- Adjacent to load, as close as possible to tie-in point.



Ramona WWTP, 530 kWp





Resources/Implementation Ideas

- DSIRE website for rebates/incentives
<http://www.dsireusa.org/>
- EPA-NREL Solar Decision Tree
- Federal Funding Opportunities for Solar



EPA-DOE NREL Solar Decision Tree

- A preliminary screening tool that helps you decide if solar warrants further investigation for your facility
- Provides specific criteria & information to help users assess, for example:
 - Useable space for solar, accessibility to grid, rooftop and contaminated site readiness and viability, adequate electricity costs to justify solar, onsite energy demand economics, etc.
- Posted on EPA's RePowering America website
http://www.epa.gov/renewableenergyland/docs/solar_decision_tree.pdf



Funding Programs

- Clean Water and Drinking Water State Revolving Fund Programs
- Bureau of Reclamation WaterSMART Program
- US Department of Energy EERE Program
<http://www1.eere.energy.gov/financing/>
- Sign up for announcements on Grants.gov



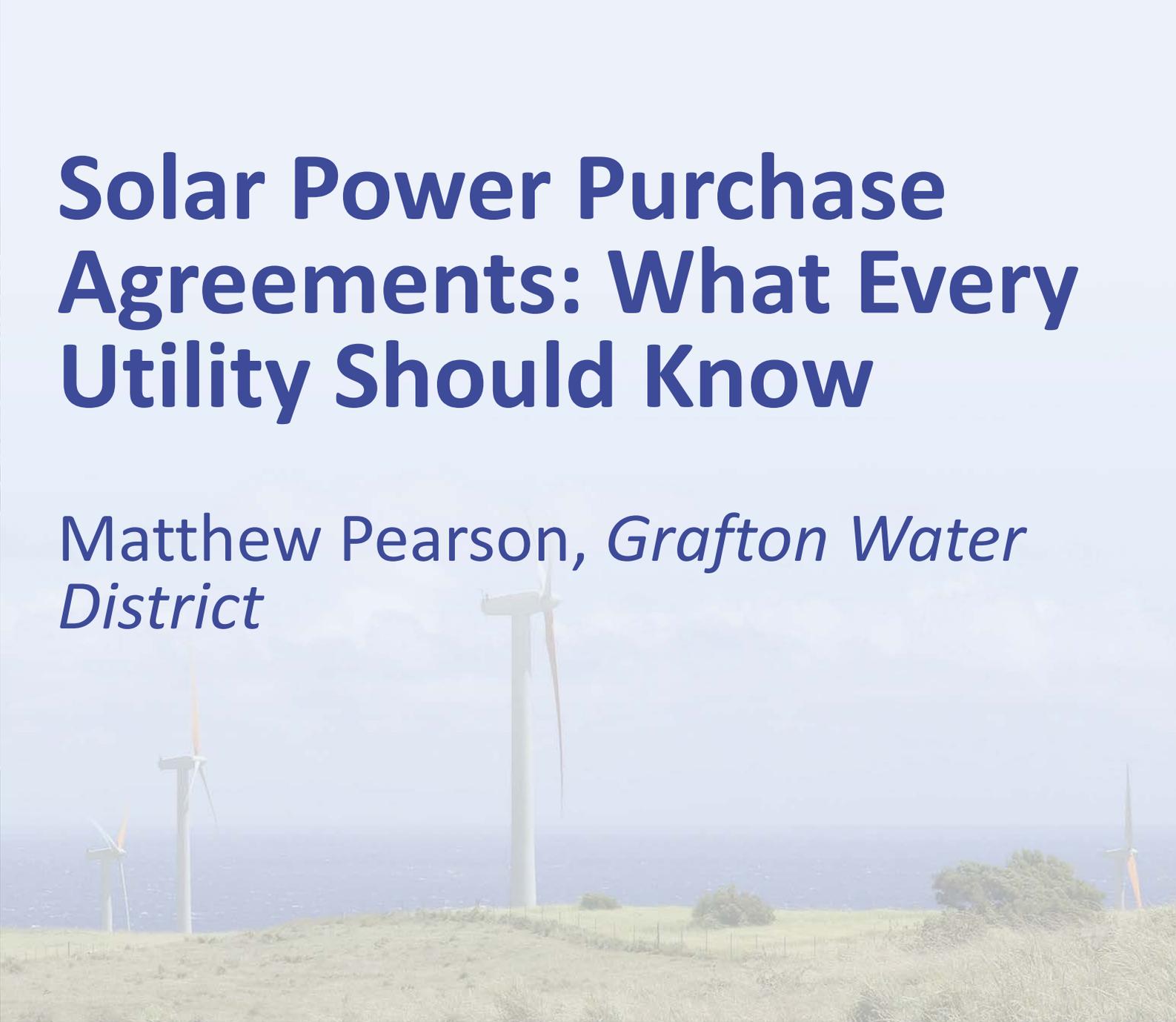
Who will be the champion to investigate solar for your facility?





Solar Power Purchase Agreements: What Every Utility Should Know

Matthew Pearson, *Grafton Water District*



Solar Power Purchase Agreements

What Every Utility Should Know

Presented by:

Matthew Pearson
Grafton Water District



Presentation Outline

- **Solar PPA for municipalities**
- **Grafton Water District overview**
- **What is a PPA**
- **Regulations, requirements and procurement**
- **The solar developer's role**
- **Implementation in Grafton**

Disclaimer

- **We are providing a general overview of the options that municipalities have to develop renewable energy facilities and the specific approach of the Grafton Water District**
- **Consult legal counsel to determine specific procedures, approvals and procurement processes**

Solar PPA for Municipalities

- **Solar Power Purchase Agreement is long-term agreement between an energy developer and a customer to provide solar electricity at guaranteed long-term rates**
- **Developer provides design, financing, maintenance and support for all elements of the solar electricity system**



Grafton Water District Overview

- **Water System originally owned and operated by Massachusetts American Water Company**
- **Grafton Water District was formed in 1984 and took over operations in 1988**
- **Service population of approximately 10,000**
- **Supplies consists of 4 gravel packed wells**
- **One water treatment plant (East Street WTP) treats 2 wells**
- **3 water storage tanks**

Electrical Usage



- **District uses approximately 1,000 MWH per year**

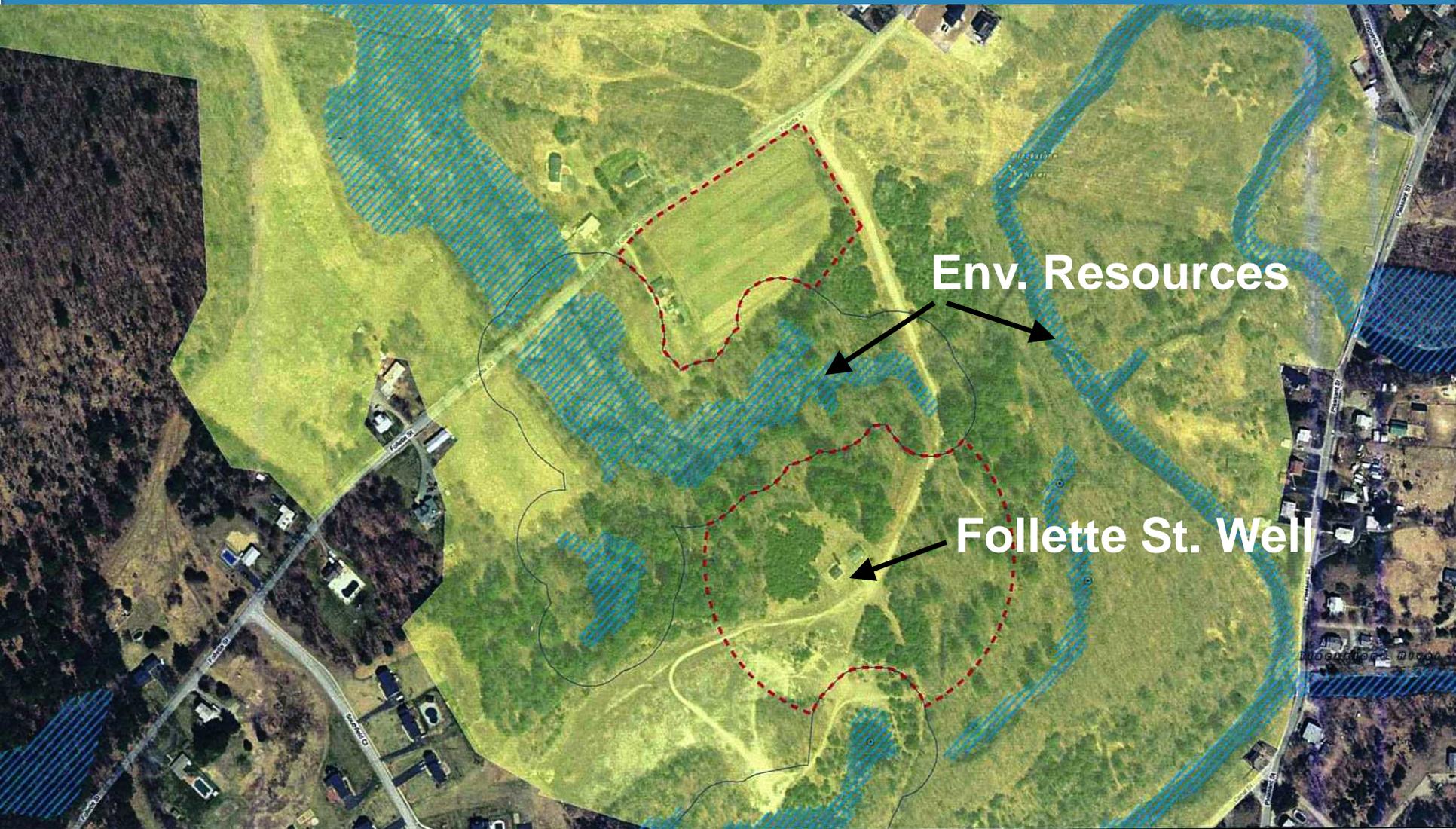
2010 Power Usage by Location

Location	Total Usage (kWh)
East Street WTP	508,600
Brigham Hill Road Standpipe	1,704
District Office	11,837
Worcester St Well	134,184
Pigeon Hill Tank and BPS	24,855
Follette Street Well	315,000
	996,180

Follette Street Well Site

- **Selected site based on open space (Zone I) in old gravel pit**
- **Zone I is owned by Town and leased to GWD**
- **Wetlands and Riverfront area impact development of site**

Follette Street Well Site



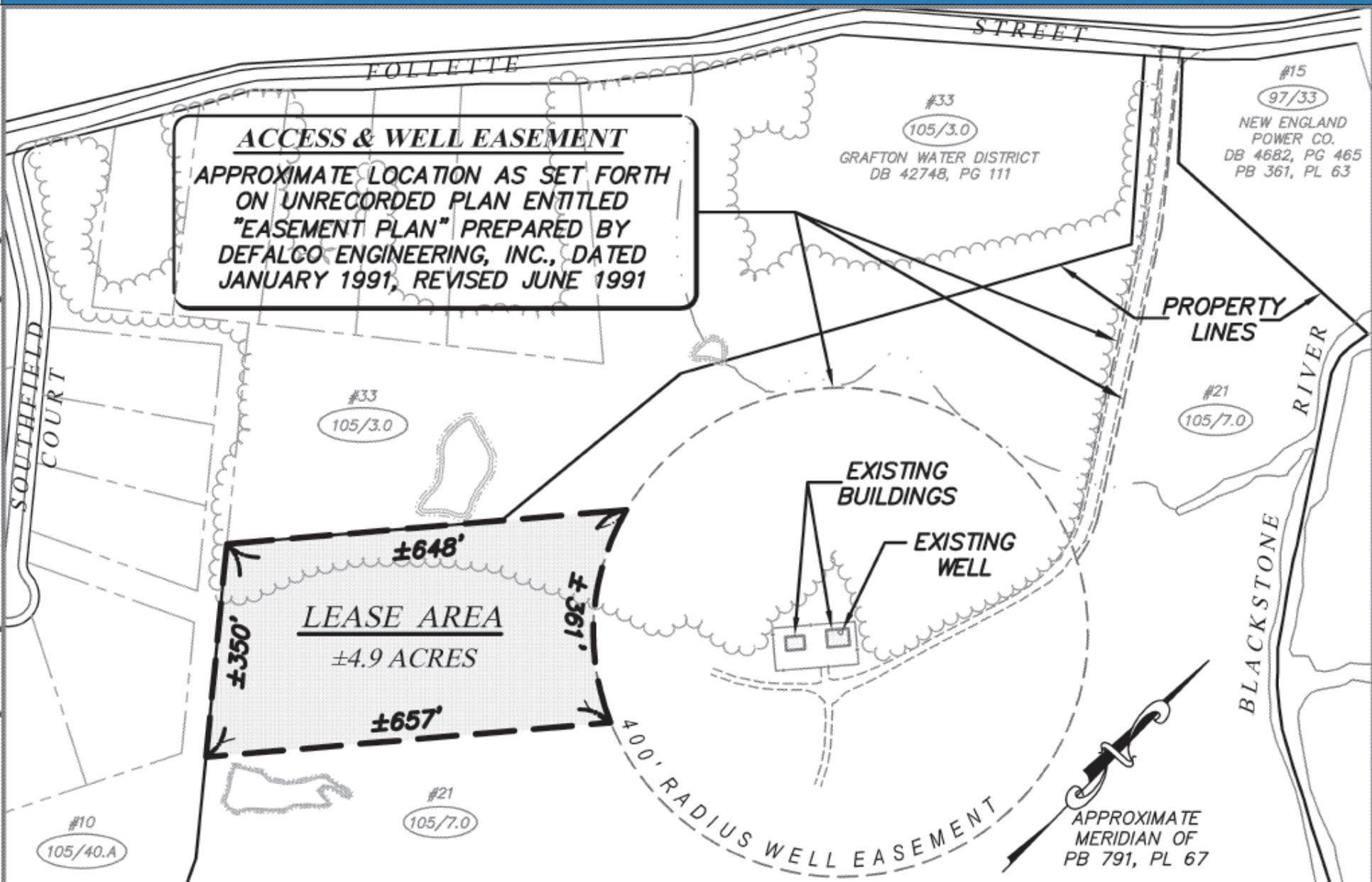
Env. Resources

Follette St. Well

Town Coordination

- **Required new lease agreement with Town**
- **Project was expanded to include additional 4.9 acres Town owned land**
- **Town of Grafton will benefit with net metering credits through agreement with GWD**

ACCESS & WELL EASEMENT
APPROXIMATE LOCATION AS SET FORTH
ON UNRECORDED PLAN ENTITLED
"EASEMENT PLAN" PREPARED BY
DEFALCO ENGINEERING, INC., DATED
JANUARY 1991, REVISED JUNE 1991



APPROXIMATE
MERIDIAN OF
PB 791, PL 67

Massachusetts Solar Development

- **Governor Patrick's goal – 250 MW by 2017**
- **Commonwealth Solar II (Rebates)**
- **Solar Renewable Energy Certificates (SRECs) to support solar development & financing**
- **Net metering**
- **Federal Government tax incentives**

Benefits of Third Party PPA

- **No up-front cost**
- **Predictable cost of electricity over 15–25 years**
- **No need to deal with complex system design and permitting process**
- **No operating and maintenance responsibilities**
- **Net metering credit for electrical use at off site facilities**

PPA Issues

- **Market subject to change (renewable incentives, equipment costs, policies)**
- **Solar development cost / feasibility depends on Federal and State incentives**
- **Net metering limited to investor owned utilities**
- **Provisions for allocation of net metering credits to other entities**
- **Land lease costs**

Regulations

- **MassDEP**
- **Wetlands permitting**
- **Local zoning and permitting**
- **Storm water management**
- **Procurement process**
- **Net metering / interconnection process**

MassDEP Policy BRP- 2011-1

- **Wind and solar projects in Zone I**
- **Public water supplier must demonstrate in writing that the installation will not have an adverse impact on water quality and operations**
- **Submittal for approval includes site / project design, construction and post construction operations**

Net Metering

- **Allows eligible facilities to run meter backwards and accrue credits for that power from utility.**
- **Each State has specific laws, regulations and limitations**
- **Massachusetts Net Metering Legislation:**
 - **Class I - up to 60kw**
 - **Class II - 60-kw- 1 MW (solar, wind, farms)**
 - **Class III – 1 -2 MW (solar, wind, farms)**
 - **10 MW for municipality or governmental entity**
 - **Can apply credits to other electric bills in service territory or transfer to other entity (Town)**

Procurement

- **Select procurement path**
- **Issue solicitation**
- **Select developer**
 - **Quality**
 - **Experience**
 - **Cost Savings**

RFP

- **Two sections- Technical and Cost**
- **Specify requirements for**
 - **Insurance and bonds**
 - **Property lease terms**
 - **Net metering and output guarantees**
 - **PPA Agreement**
 - **Termination payment schedule**
 - **Price proposal**
 - **Buy-out provision**

Technical Proposals Should Include

- **Experience and Qualifications**
- **Financial Capacity**
- **Description of proposed project**
- **Approach to**
 - **Engineering**
 - **Construction**
 - **Service and Maintenance**
- **Schedule**

Price Proposals Should Include

- **Electricity price (\$/KWH)**
- **Annual price increase factor**
- **Maximum price**
- **Bond amounts**
- **Land lease amount**
- **Termination schedule**
- **Buy-out provisions /costs**

System Assumptions

System Size (DC)	796.80 kW
System Size (AC)	694.26 kW
Year 1 Production	996,000 kWh
Annual System Degradation Factor	0.50%

Utility Assumptions

Annual Utility Escalation Rate	5.0%
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PPA Terms

PPA Starting Rate	\$0.06750
PPA Annual Escalation Rate	0.00%
PPA Agreement Term	20

Ave 1st Year Utility Savings per PPA kWh Produced \$0.155

Financial Return

Net Present Value of Investment at 5%	\$1,999,384
30 Year Cumulative Cash Flow	\$3,547,851

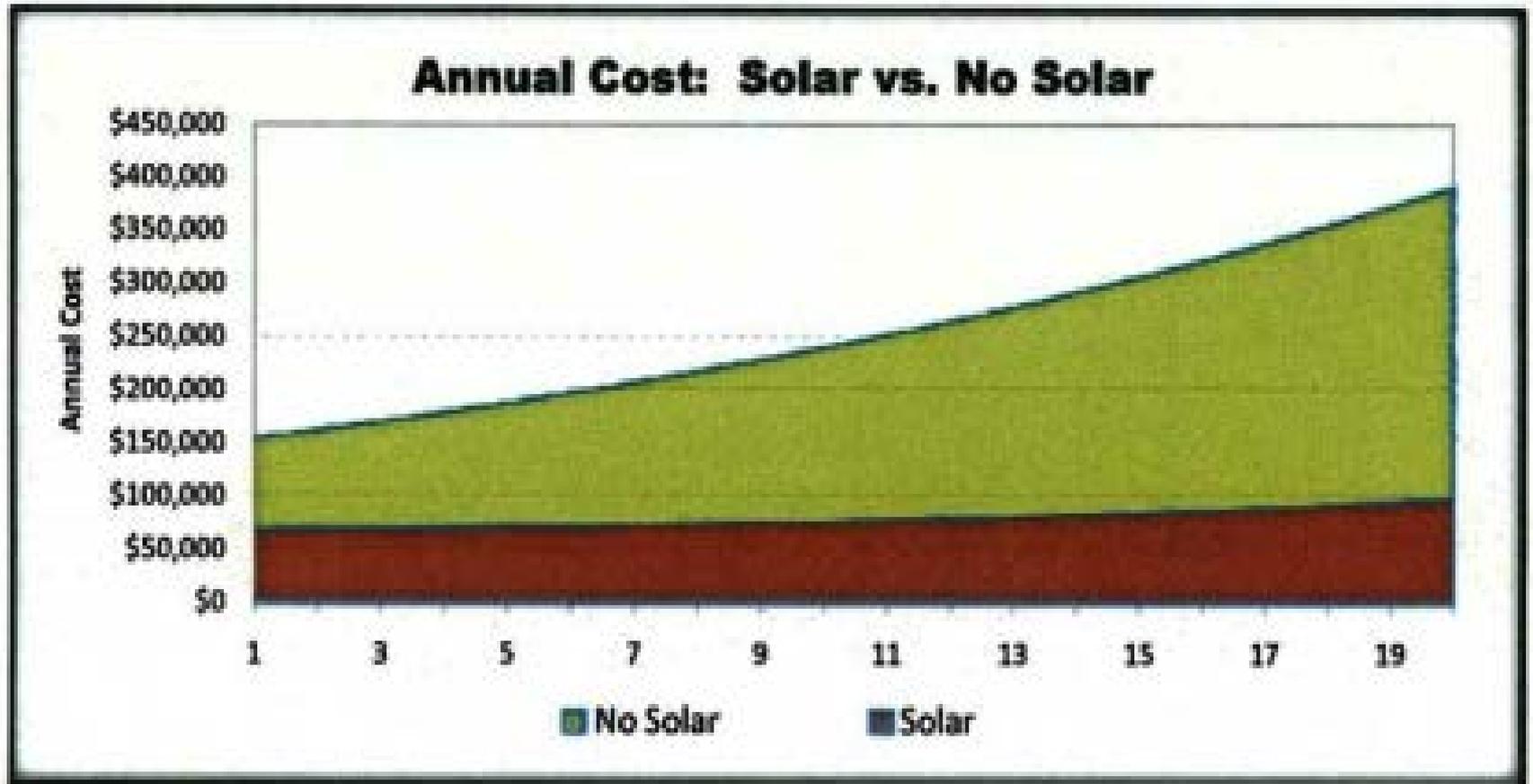
GWD Process

- **Developed RFP and advertised in Central Register**
- **Solicited proposals**
- **Evaluate proposals and “short list”**
- **Requested follow-up information**
- **Interviewed**
- **Selected IESI**
- **Execute PPA (in progress)**

GWD Procurement

- **GWD sent out over 50 RFPs**
- **Received 4 proposals**
- **Interviewed 3 developers**
- **Proposed project sizes ranged from 764 KW to 2,400 KW**
- **Proposed rates ranged from \$0.035 / KWH to \$0.122 / KWH with annual increase factors**
- **20 year cost savings approx \$3.5M**

Original Projected District Cost Savings



Final System Design

- **System increase to include capacity for Town of Grafton**
- **Capacity of installed system will be 1.7 MW**
- **Estimated cost savings (District and Town) \$160,000**
- **System online in January 2013**

The Developer's Role

- Developer is responsible for:
 - Financing the project
 - Take advantage of the tax and depreciation incentives
 - Financed with debt and equity
 - Able to monetize the Solar Renewable Energy Credits (SREC)
 - Have a long term tenant/owner that is credit worthy
 - This allows all environmental attributes to be taken advantage of then passed on to the host in price of power.

The Developer's Role

- ❑ EPC – Engineering, Procurement, Construction
 - ❑ Engineering
 - ❑ All site issues
 - ❑ Geo technical
 - ❑ National Heritage – Endangered species
 - ❑ Wetlands
 - ❑ Access to utility lines for interconnection
 - ❑ System design
 - ❑ Single line drawing for interconnection application
 - ❑ Site plan with layout of panels
 - ❑ System design with racking, panels, combiners, inverters and data acquisition systems

The Developer's Role

□ Procurement

- Specify, source, procure and store all products for project
- Grafton project approximately \$5 million worth of material
- Schedule with vendors so that construction schedule can be achieved.

The Developer's Role

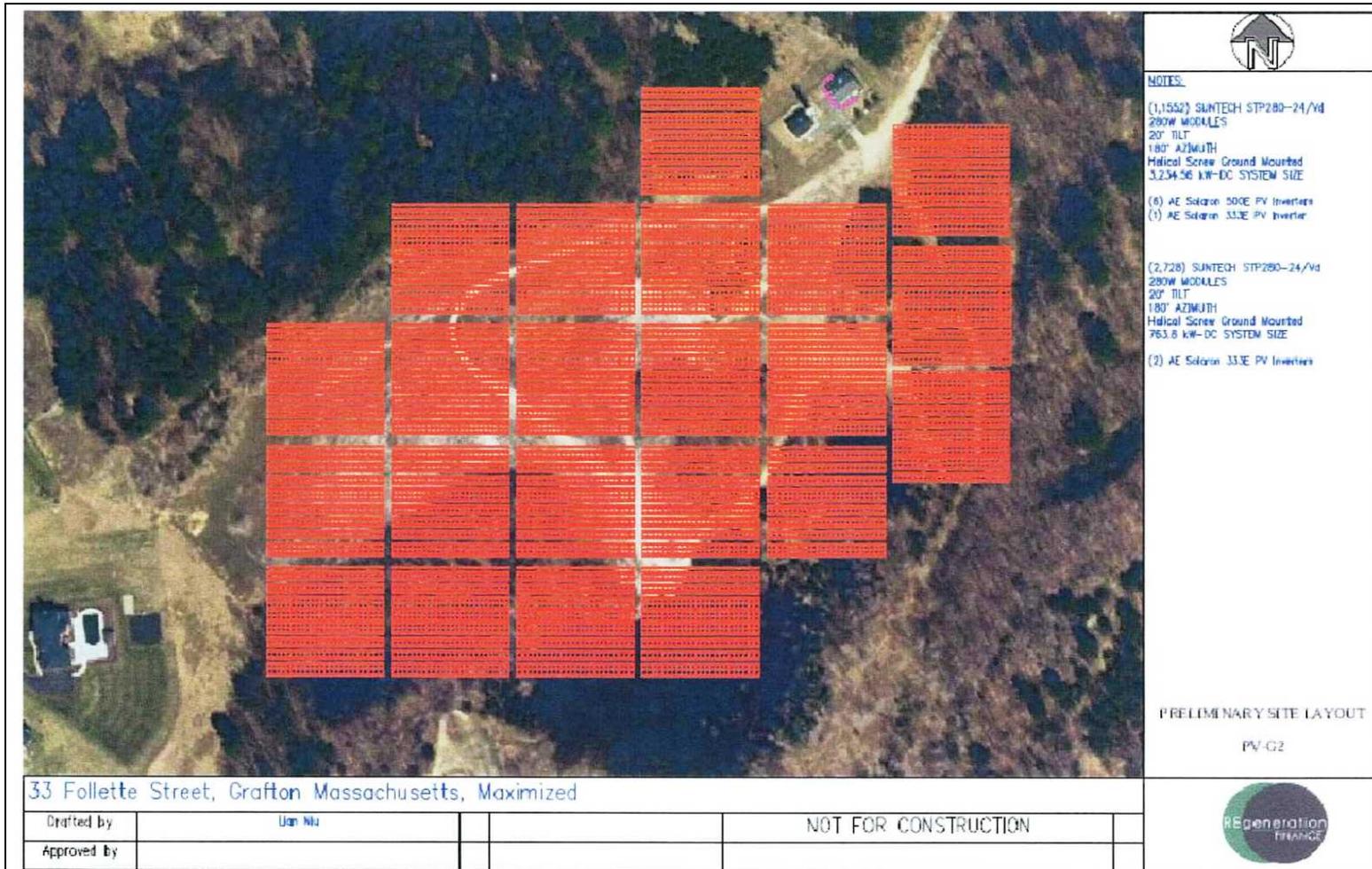
- Construction
 - Install racking system
 - Ballasted or pile system
 - Install panels
 - Wire panels to inverters
 - Connect inverters to the grid
 - Commission the system

The Developer's Role

□ Operation and Maintenance

- Is the system delivering the output it is intended to
- Preventative maintenance
- Web based monitoring
- Billing

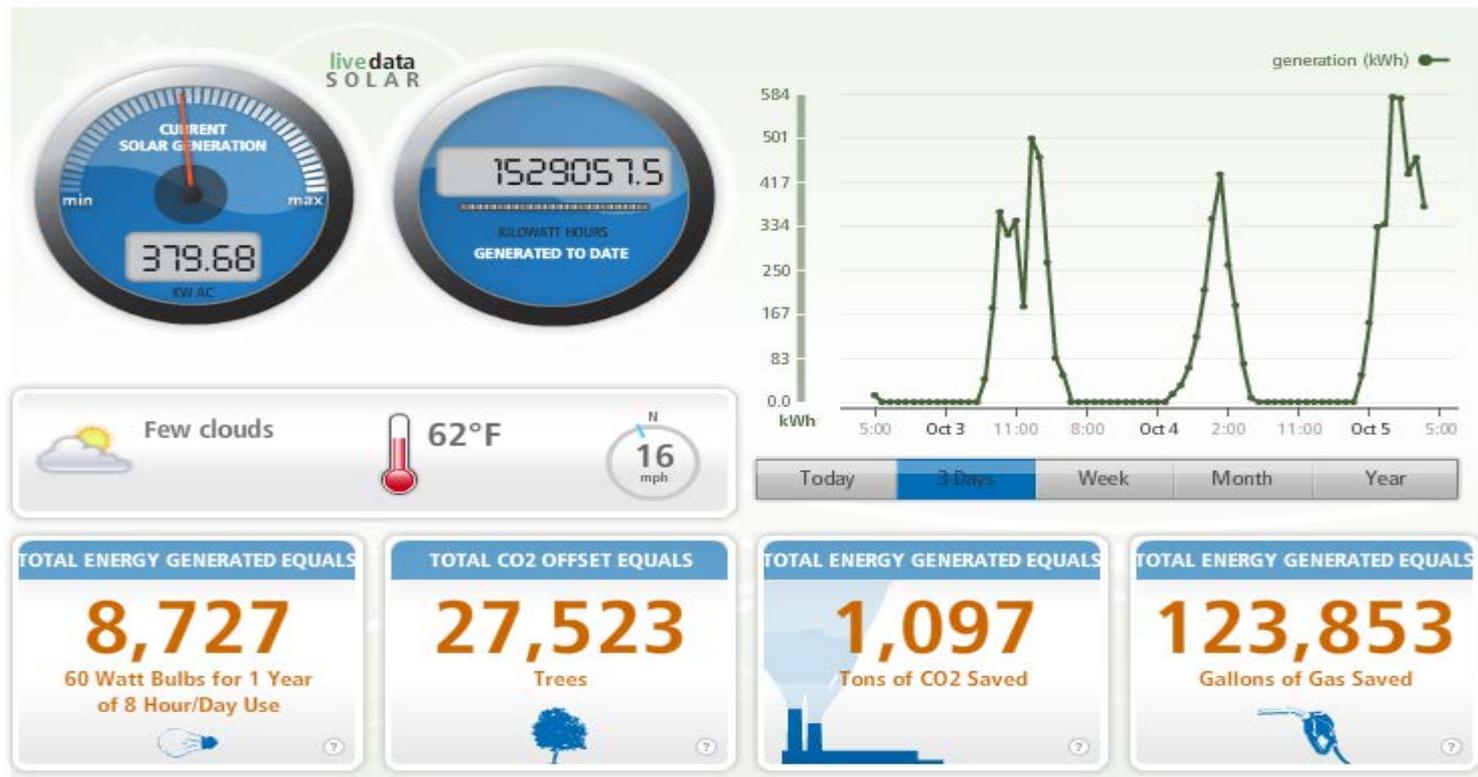
Implementation in Grafton



Example of PV Array



Web Based Monitoring



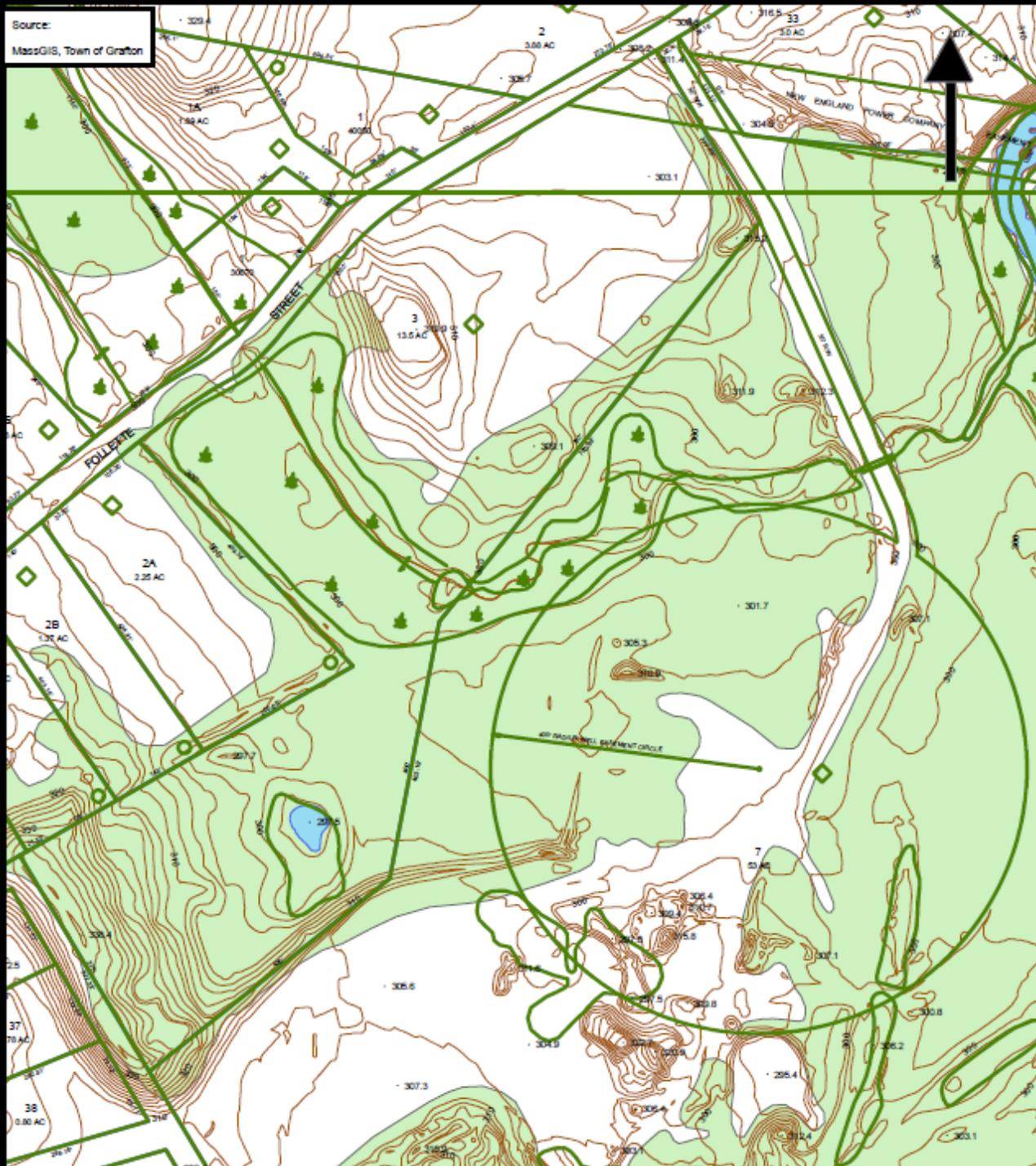
O & M



Questions

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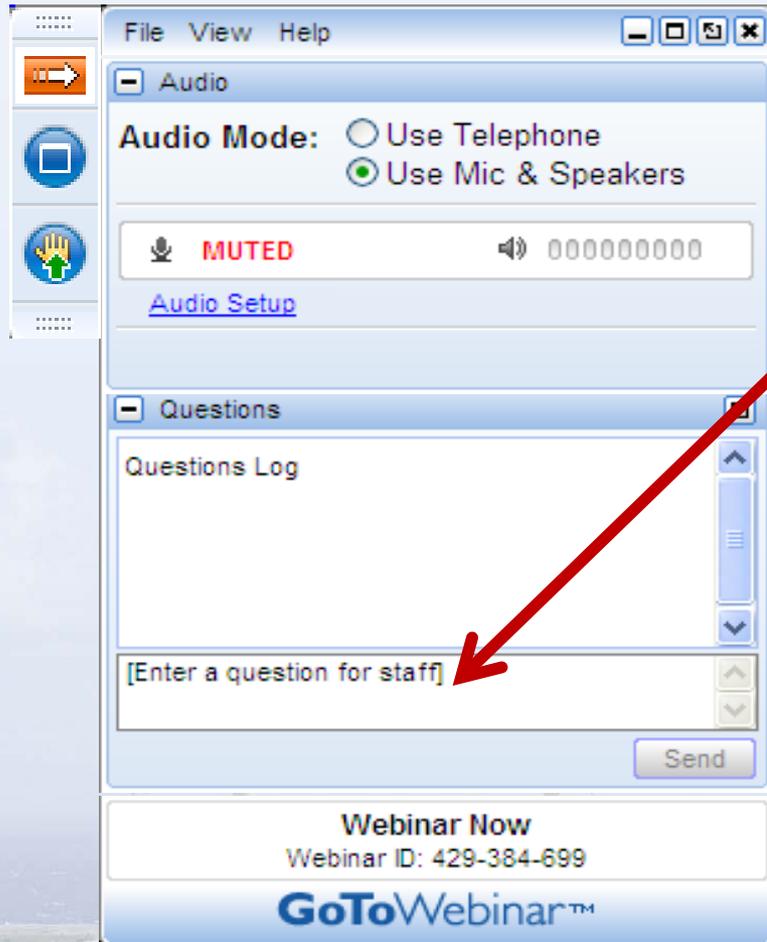
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MassGIS, Town of Grafton



Questions



Questions & Answers



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Survey

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