



Managing Municipal Renewable Energy Assets

28 October 2020

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Municipal Electric Utility – Historical Context

- Purchase and/or self-generate wholesale electricity
- Own the powerlines and infrastructure to supply customers inside the municipal boundary
 - Powerline technicians, management and administrative staff
- Municipal electric utilities have advantages
 - Provide revenue stream to the Town
 - Offer lower power rates than investor-owned electric utilities
 - Ability to make local decarbonization and energy poverty decisions
- Most NS municipalities have sold their utilities to NSPI or its predecessor, except:
 - Lunenburg
 - Mahone Bay
 - Riverport
 - Antigonish
 - Berwick

Municipal Electric Utilities are Businesses

- Businesses must address customer demands to remain relevant
- Electric utility customer expectations circa 2014
 1. Keep customer rates affordable
 2. Supply cost-effective clean energy
- Mahone Bay, Riverport, Antigonish and Berwick decided they could not rely on NSPI to deliver these expectations



Antigonish



Berwick



Mahone Bay

Alternative Resource Energy Authority

Municipal corporation (2014) owned by
Antigonish, Mahone Bay and Berwick

- Councils and Chief Administrative Officers realized working collaboratively in good faith creates greater opportunities than working individually
- Riverport also a key customer

Wind farm provides municipal utility customers

- price predictability
- carbon risk mitigation

Wind farm provides municipalities

- new, long-term, stable revenue streams
- economic development
- citizen participation in cleantech

- 23.5MW, 10 Enercon turbines, \$51 million cost



AREA's video

<https://vimeo.com/185553831/7eabcfd702>

Accomplishments to Date

AREA initiatives are aligned with provincial Sustainable Development Goals Act

We are a trusted partner in delivering economic and environmental results in Nova Scotia



Wind

AREA customers are the only utilities to meet the provincial 2020 RES of 40%.

Wind farm is municipally financed, debt secured by the power purchase agreements (PPAs).



Solar

Project managed over 1.5MW of solar for 11 NS municipalities, generating >\$300k/yr profit for NS municipalities.

Developing 9MW of community solar gardens in ownership towns. Target online next fiscal.



Imports

AREA secures cost-effective and cleaner wholesale electricity supplies.

>80% non-emitting electricity supply to customers in our towns.



Electric Vehicles

Partnered with municipal electric utilities in PEI and NB to secure federal funding for EV charging infrastructure. >100 charging points to be installed by June 2021.



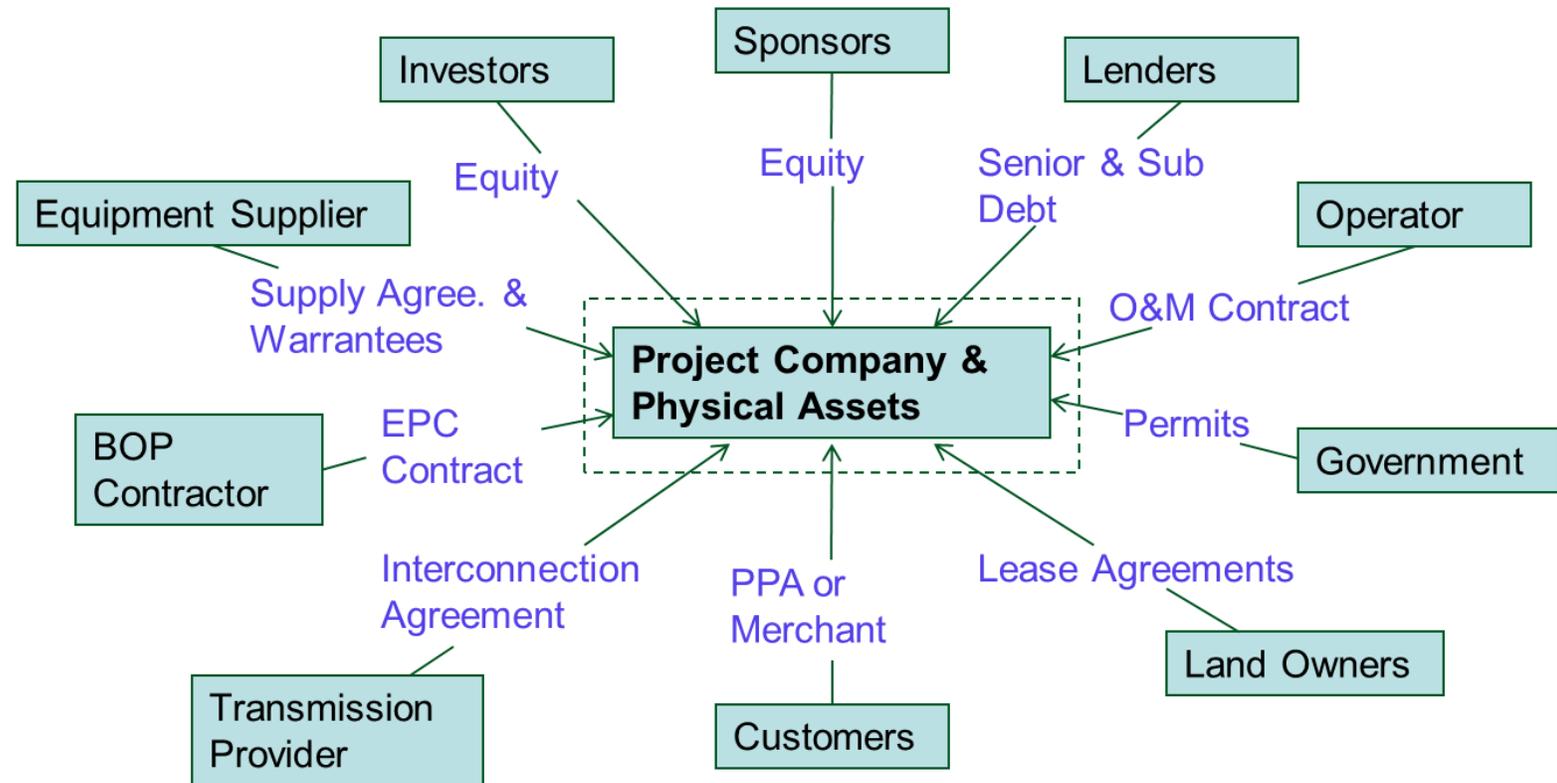
Heat Pumps

Turnkey heat pump program offering low cost customer financing, program administration, installation and ongoing customer care. Launched early Oct 2020.

Asset Management Starts on Day 0

- AREA distinguishes between development and operational assets
- Development asset management strategy – same as private industry, minor adjustments

Project Finance Defined: Schematic





AREA's "Development Asset" Management Strategy

- Can we secure the benefits of renewable energy assets without the regular ownership risks?
 - Low risk threshold with municipal ownership
- What were the *real* risks of our development asset?
 - Environmental and municipal permitting
 - Achieving commercial operations (Equipment Supplier)
- Place *real* risks with industry, self perform the rest to save \$
 - Overall developer (Minas Energy) managed the permitting.
 - Negotiated with Enercon so that wind turbine purchase payments occur once commercial operations achieved.
 - Self managed contractors to build roads, substation and power lines.
- Each Muni developing a renewable energy asset should perform the same assessment based on its circumstances

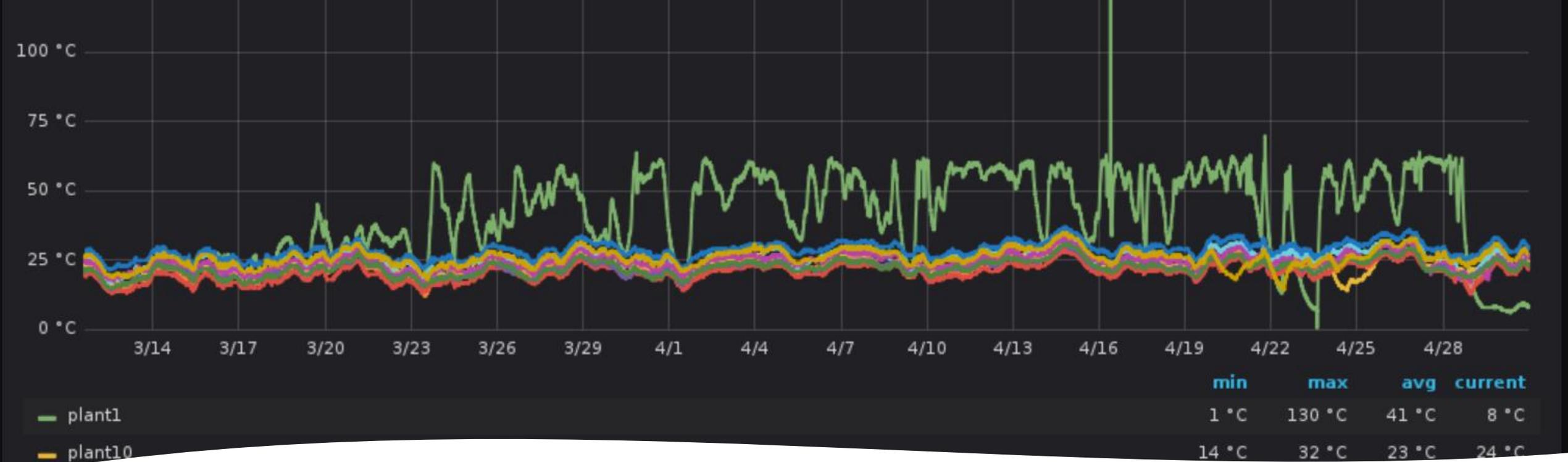
Operational Asset Management

- Which operational risks are outside municipal comfort zone?
 - Fixing utility-scale wind turbines (the O&M spoke on previous schematic)
 - Solution: long-term, defined price contract, uptime guarantee from reliable technology provider – Enercon (industry standard)
- What about wind resource risk?
 - AREA stress tested the investment decision financial model: we can handle the downside
 - If a municipality was uncomfortable doing so, you can purchase “wind risk” insurance for \$\$\$\$\$\$
- Straightforward aspects of this asset management strategy:
 - Manage vegetation growth around powerlines
 - Keep roads in good shape
 - Have an electrical engineer create a periodic testing and maintenance plan for substation. Then fund it!



Challenging Aspects of Asset Management

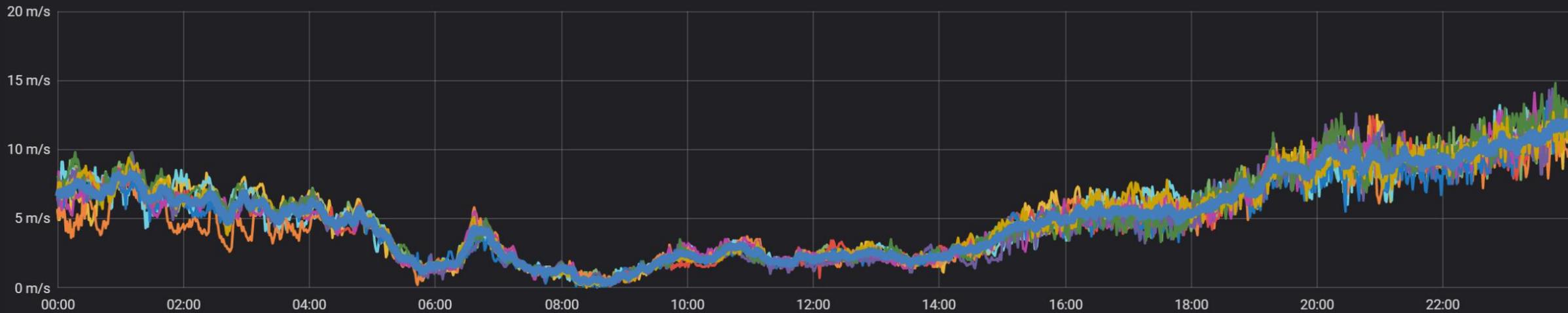
- Administering the O&M contract with wind turbine supplier
- Monitoring the health of the substation (69kV 20MVA transformer, for example)
- AREA's operational asset management philosophy
 - Lots of development assets required to achieve decarbonization – requires staff focus
 - Continual investment in automated, robust monitoring systems relieves staff requirement
 - Sometimes O&M company is non responsive: configure alarms to avoid emails from people
 - Once alarm triggers, send data to 3rd party expert to investigate.
- Capture and store all the data that is available. Cheap. Valuable.
 - If you have expensive estimates from consultants, keep looking – you will eventually find one that works
 - Do not host your own code or have consultant host. We run custom-built systems using “dockers” with “managed Kubernetes” on Amazon. Set it & forget it.
 - Enables us to argue with O&M provider and to proactively address all issues.
 - I can see all our data streams on my phone. Easy to send to 3rd party expert to investigate.



Temperature of Rear Bearing

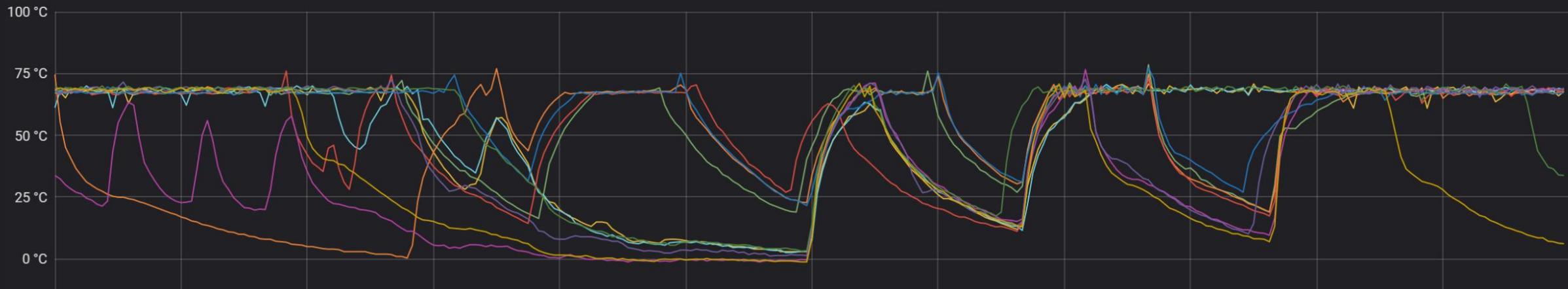
- O&M service provider is reactive – waited 10 days to order replacement, ran it for 28 days in risky condition.
- We want them to be proactive – day 2.
- Owners cannot administer contract without these dashboards.

Wind Speed



plant3	0.10 m/s	14.00 m/s	5.05 m/s	12.90 m/s
plant4	0 m/s	13.60 m/s	4.81 m/s	12.30 m/s
plant6	0.20 m/s	14.10 m/s	5.10 m/s	12.00 m/s
plant7	0.10 m/s	14.40 m/s	4.96 m/s	13.10 m/s
plant8	0.20 m/s	14.80 m/s	5.25 m/s	12.50 m/s

Blade A temperature



See the below graph which charts each turbine's production (heavy blue line is the average of all turbines) and notice that even after the manual blade heating interventions, many turbines had their production drop to zero. By midnight, 8 of the 10 machines resumed continuous operation and 2 other joined the fleet around 2pm. Turbine 4 struggled to operate (due to ice) and you can see its 2-hour

Our Conclusions for Munis Intending to Own Renewable Energy Assets

- Consider development and operational assets differently
- Development:
 - What are the risks that you can handle?
 - Which industry players will offer a reasonable price to manage the remaining risks?
 - Push for payments weighted towards commercial operations
- Operations:
 - Invest in reliable and robust technology (generation equipment and monitoring systems)
 - Push for long-term, performance based O&M contracts with reputable service providers
 - When you're negotiating the purchase of the equipment during the development stage!
 - Send your data to 3rd party experts when you have a problem