
Microgrids in Remote First Nation Communities

Multicorners meeting

August 2017

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Request

- The Ministry of Energy (ENERGY) is ~~returning to Cabinet~~ reporting to the Ministers' Table on Climate Change (MTCC) in accordance with the CCAP minute, and is seeking approval to:
 - Begin targeted engagement with First Nations and First Nation organizations, in coordination with MIRR and MOECC, to design and deliver a targeted program that would seek to reduce diesel use in the four First Nations where transmission connection is not an economically viable option.
- ENERGY is seeking approval to request funding from the Ministry of the Environment and Climate Change (MOECC)'s Greenhouse Gas Reduction Account (GGRA) to support outreach with First Nations during program development, and for program delivery.
- ENERGY is also seeking approval to request additional staff resources to support engagement, program design and implementation.

Policy Direction

The request responds to the following policy direction:

Climate Change Action Plan Cabinet Minute sets the following direction:

- ENERGY and MIRR work with MOECC to develop and report back in 2016 on an implementation plan to work with First Nation governments and organizations to develop a program for low or no carbon energy powered microgrids and other alternative energy projects, with diesel use reduction targets of 50% in 2018 and 100% in 2020, unless a First Nation community identifies they are not willing to implement these projects in their community.
- \$45-55M in funding was earmarked within the CCAP funding envelope to support this work.

The Climate Change Action Plan states that:

- Where community support exists, Ontario would work with First Nation organizations to develop advanced microgrid solutions in First Nation communities.
- These projects would support economic growth by reducing reliance on diesel fuel and enabling stable, predictable sources of power. Projects would focus on renewable energy such as biomass, solar, and waterpower.
- In the future, these projects could be connected to the provincial grid to enhance the reliability of the new transmission line and to diversify clean sources of energy for communities.

Context – Remote Communities

- There are 25 remote, diesel-reliant First Nations in northern Ontario. For 21 of those communities, the Independent Electricity System Operator (IESO) has identified that grid connection is the most economic option for reducing diesel dependence.
 - Ontario is in intense negotiations with the federal government to reach an agreement on a fair cost-sharing arrangement to support transmission connection costs.
- There are four communities that are not economically feasible to connect to the grid: Fort Severn, Weenusk (Peawanuck), Gull Bay, and Whitesand.
 - For these four communities, IESO studies conclude that renewable generation is an economic way to reduce their diesel reliance.
 - The microgrid program will support projects that will enhance or maximize diesel reduction in these four communities.
 - GHG savings from microgrid projects supported through this program are anticipated to be 86,422 tonnes of CO₂e (approximate) over the estimated 20 year useful life of the assets.
- Some communities that are or will be connected to the grid have also expressed an interest in pursuing renewable energy systems as a way of advancing energy independence and environmental/ sustainability goals as well as reducing electricity costs.
 - ENERGY is pursuing transmission connection as the largest single opportunity to reduce greenhouse gas emissions in remote communities and may make a subsequent request for GGRA funding for this and other initiatives in remote, northern First Nations.

Remote First Nations in Northwestern Ontario



Context – Opportunities and Challenges

Benefits of microgrids for communities that are not economic to connect:

- Advanced microgrids will reduce the communities' reliance on diesel and contribute to community well-being, energy independence and provincial GHG reduction targets.

Challenges with microgrids

- Technical: intermittency of renewable generation (ie. solar and wind) can be challenging, and most storage devices only have the ability to store power day-to-day or hour-to-hour, rather than seasonally.
- Costs: cost of energy storage and transporting and maintaining the systems in remote, harsh climates can be prohibitive.
- The reality for most communities, is that full reliance on a renewable microgrid would be impractical, technically unfeasible and more expensive than relying on grid power.
 - Even in those communities where there is a business case for renewable microgrids, reaching 100% diesel reduction in some communities may not be feasible.

Context - Ongoing Initiatives

Remote Communities - by the numbers:

- 25 remote First Nations in Ontario are reliant on diesel fuel for electricity
- At least 15 of the 25 communities have existing small-scale solar PV projects.
- 11 remote First Nations are developing community energy plans
- 16 communities are part of an ongoing grid connection project
- 4 communities cannot be economically connected to the grid
 - 1 community is developing a ~~bio-mass~~ biomass project
 - 1 community has been approved for SGF funding for a solar microgrid project
 - 1 community is in the process of developing a microgrid project partially funded through Northern Ontario Heritage Fund Corporation and NRCan
 - 1 community is still exploring options

Other programming (see background for additional detail):

- NRCan announced funding through Budget 2017 to support diesel reduction
- GreenON has the ability to support efficient infrastructure development
- NOHFC has been supporting small renewable/microgrid projects

This is a crowded policy space and our program goal is to be nimble, allowing us to fill the gaps and complement ongoing projects/programs rather than duplicate existing efforts.

Recommendation Summary

Recommendation:

- Proceed with engaging directly with First Nations and organizations to develop and deliver a targeted \$50 million program designed to support advanced microgrids in the four remote First Nations where grid connection is not viable.
- Rather than an open call for proposals ~~(which was an option considered)~~, ENERGY will work with the four communities that are not economic to connect to identify projects with high potential for diesel savings, and will work closely with them to support projects that align with community plans and priorities. A targeted approach will help to manage community expectations.
- ENERGY will coordinate with MIRR and MOECC on the engagements; ENERGY will be responsible for program implementation and delivery.
- Projects would focus on community-led advanced microgrid initiatives (storage and/or renewable generation such as wind, solar, biomass, or waterpower using smart control systems) that would be integrated into the existing distribution systems.
 - Projects are expected to be in the ~\$10-15M range, but could vary depending on the existing systems, any initiatives already underway and size of the community.

Other Options Considered

1. ~~Open program with broad eligibility (ie. all remote communities or province-wide)~~
 - ⊖ ~~An open, call-for-proposals approach would place the onus on communities to design project proposals that demonstrate high impact, where ENERGY would select projects that best meet program goals.~~
 - ⊖ ~~This approach would distribute the available funding more broadly across interested communities and likely result in a greater number of lower impact projects.~~
 - ⊖ ~~This approach is not recommended because:~~
 - ~~the province is actively taking steps to advance the connection of the majority of remote First Nations. Support should not be provided to projects that could jeopardize the business case for connection or that would be viewed as contrary to the province's priority of grid connection;~~
 - ~~it has the potential to favor communities with the highest capacity to put forward a strong application, rather than communities with the highest need or projects with the highest potential for diesel offset and GHG reduction.~~
2. ~~Use of the Smart Grid Fund, an existing ENERGY program, to deliver the program~~
 - ⊖ ~~The Smart Grid Fund, or other program, could be used to deliver the microgrid program and flow funding.~~
 - ⊖ ~~However, the primary objective of the Smart Grid Fund is to support technology demonstration and commercialization projects and includes highly specific guidelines and parameters that would not meet community needs.~~
 - ~~The structure of the Smart Grid Fund did not work well for flowing previous GIF funding for First Nation microgrid projects (only 2 of 4 moving forward).~~

Engagement and Feedback to date

First Nation engagement

- Feedback heard at the First Nation Long Term Energy Plan (LTEP) engagements highlighted strong interest in renewable energy projects for energy independence and resiliency/reliability and for environmental reasons.
- First Nation leadership and the Chiefs of Ontario have been advised of the CCAP commitment and proposed programming through MOECC's meetings with the First Nation Political Confederacy.
- Further engagement with First Nation communities and organizations, in coordination with MIRR and MOECC, will inform detailed program design and help to determine the allocation of funding to Indigenous activities under CCAP.

Engagement and Feedback to Date – cont.

Inter-ministerial

- In addition to ongoing working-level engagement on this initiative, ENERGY ~~has~~ coordinated three director-level meetings as we worked to refine the approach to delivering on this CCAP commitment.
- Meetings were held in late 2016 into mid-2017 to discuss findings and analysis, including jurisdictional scan and preliminary options. ENERGY made a request for GGRA funding in 2017/18 which was ultimately not supported, and ENERGY has been directed by MOECC to re-submit the request for the 2018/19 fiscal year.
 - ENERGY has been working with MOECC to identify whether there might still be an opportunity for an in-year funding allocation for this initiative.
- Feedback from MIRR and MOECC has been incorporated in the submission;-
 - MOECC suggested that the distribution of GGRA funding among First Nations across the province as a consideration, as well as the need for alignment with other GGRA programming
 - MIRR reinforced the need for a sustainable, long-term approach that considers the ongoing operation and maintenance costs for these systems
- ENERGY will coordinate with MIRR and MOECC on the engagement with First Nations and organizations.

Federal-Provincial Coordination

- Diesel reduction is a shared priority between Ontario and the federal government, and costs for electricity service in remote First Nation communities is a shared responsibility between Ontario and the federal government, as defined in historic agreements.
- Diesel reduction projects have the potential to benefit both governments, and Ontario will seek to work collaboratively with the federal government to support diesel reduction initiatives.
 - Ontario has been working with federal colleagues to support grid connection (eg. recent Pikangikum announcement), and has also reinforced the importance of collaborative action to support the communities where grid connection is not an option.
- NRCan recently announced programs to support diesel reduction. ENERGY participated in engagement sessions as the programming was being developed, and will continue to work with the federal government to align our programming.
- Understanding the impact of projects on communities' operating funding from the federal government will inform program design, and federal involvement in the ongoing maintenance of the energy systems. An agreement will need to be reached that ensures the long-term operation and maintenance of these new microgrid systems.
- Ontario's goal is to work collaboratively with the federal government to ensure that energy needs are being met in a way that recognizes community preference, builds community capacity and implements sustainable solutions for long-term benefit to the communities.

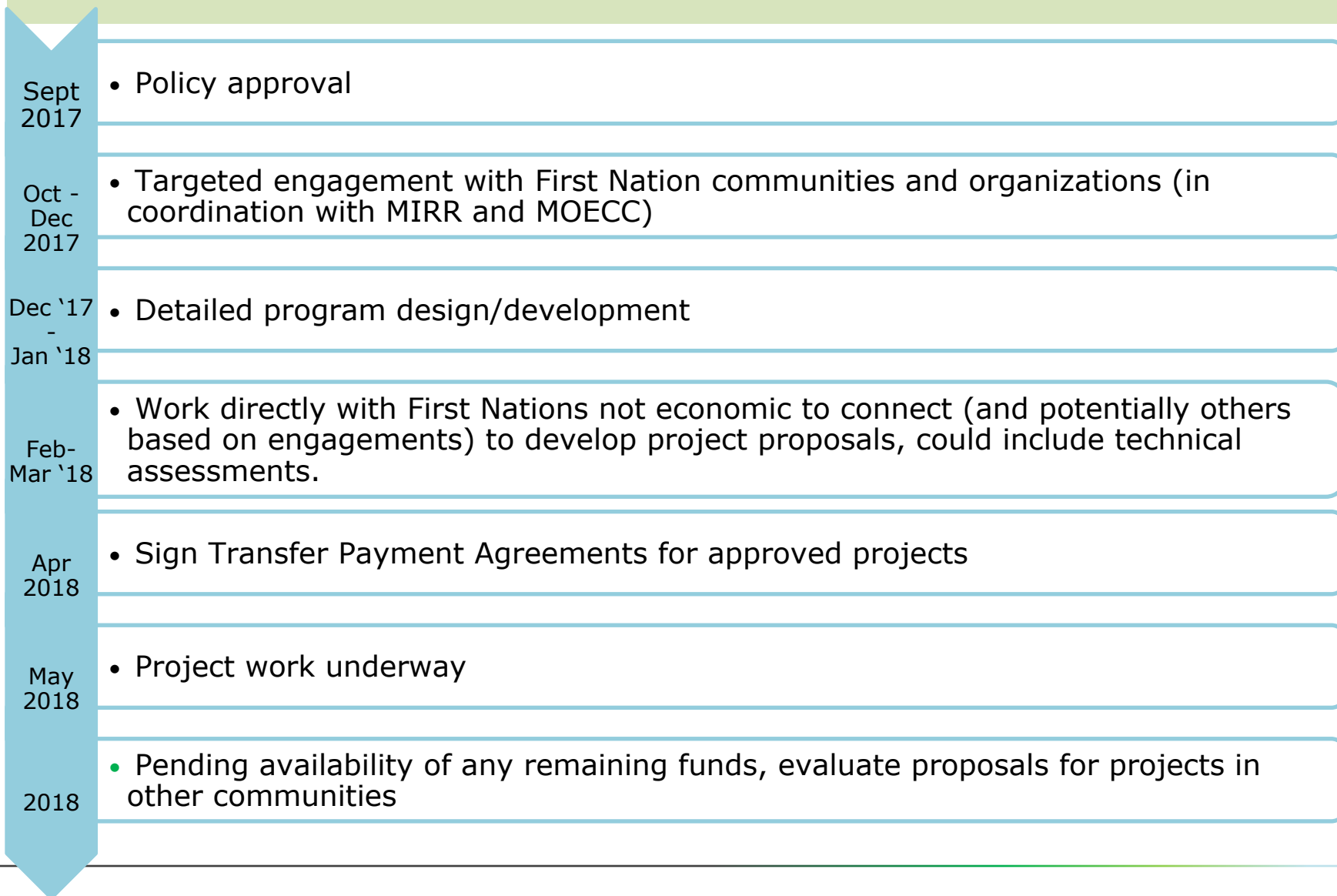
Risk Assessment and Mitigation

Key Risks	Likeli-hood (L/M/H)	Impact (L/M/H)	Mitigation Strategy
Given broad interest in microgrids and renewables, communities are likely to be disappointed by the limited eligibility, particularly since this funding represents over half of the CCAP funding directed to Indigenous community programming.	H	H	Involve MIRR and engage First Nation representatives as we work towards finalizing recommendations on program design and delivery. Develop communications strategy. Continue to support grid connection where it has been identified as the most economic way of reducing diesel reliance, including working with the Matawa communities to identify a grid connection project that meets their needs.
Program does not receive approval	L	L	Limit outreach to First Nations and stakeholders until greater certainty about program approvals.
Risk that low community capacity impacts participation.	M	M	Mitigate through program design (provide funding for full project costs, and consider staged application process with funding available to design full solution).
Risk of technical failure of systems or poor interoperability with existing diesel.	L	H	Ensure partners with technical expertise are engaged in developing the solution, local distribution company is involved, and engage technical advisor in application review.

Proposed Cabinet Minute

- Cabinet agreed that:
 1. The Ministry of Energy (ENERGY) work with the Ministry of Environment and Climate Change (MOECC) and the Ministry of Indigenous Relations and Reconciliation (MIRR) to:
 - Develop a program to reduce diesel use in remote First Nation communities with the highest potential for diesel reduction and greenhouse gas reductions;
 - Prioritize diesel reduction projects for First Nations where connection to the provincial grid is not economically viable; and
 - Engage with appropriate First Nations and First Nation organizations to inform program design.
 2. ENERGY seek necessary Treasury Board/Management Board of Cabinet approvals, including for:
 - funding from the Greenhouse Gas Reduction Account (GGRA) to support outreach with First Nations during program development, and for program delivery;
 - funding from the GGRA to support projects achieving diesel savings; and
 - 1.5 FTEs to support community engagement, program design and implementation for the duration of the program.
 3. ENERGY work with the Premier's Office and Cabinet Office on an integrated communications strategy.

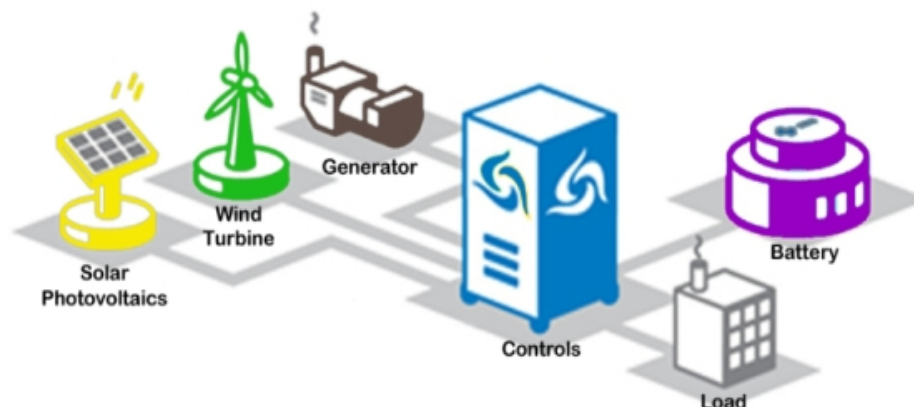
Proposed Implementation Plan



BACKGROUND

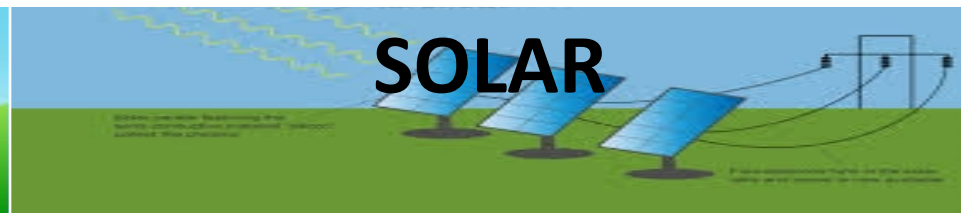
Understanding Microgrids

A **microgrid** is a power grid that can operate independently or in conjunction with the area's main electrical grid.



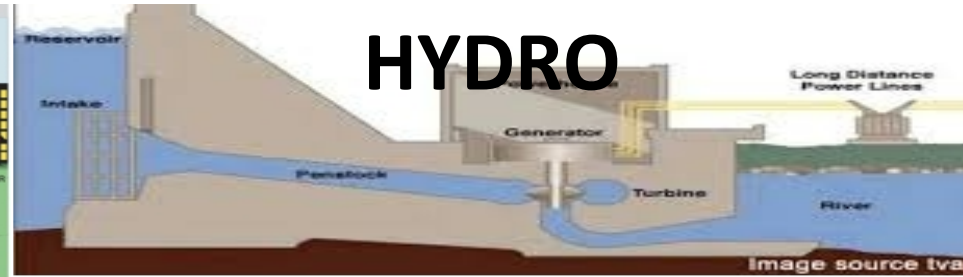
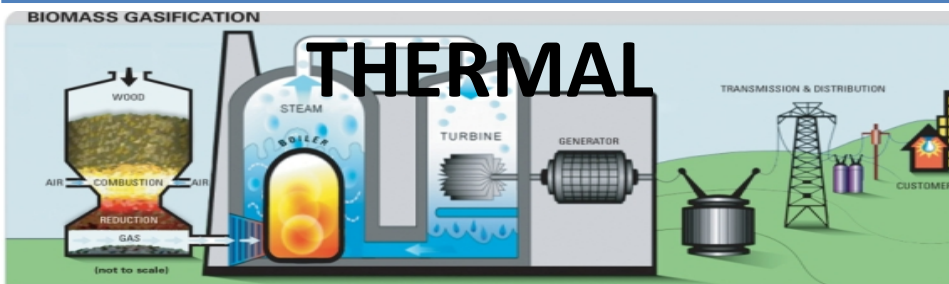
- Within an advanced microgrid, you will find distributed generation sources, load (such as critical infrastructure, households, industrial customers, or businesses), and a smart control system, which combined form a whole system that is greater than its parts.
- An advanced microgrid may also include energy storage.
- Remote communities are already very basic, isolated microgrids using diesel as their fuel source

Renewable generation options



- Wind can generate relatively good amounts of energy
 - Northern Ontario has especially good potential
- Wind on its own would not be a reliable source of supply due to minute-to-minute and hour-to-hour swings in output
- Construction and maintenance may be difficult and costly with limited road access
- Solar PVs are modular and relatively easy to install in communities on a small scale
- Solar on its own would not be a reliable source of supply
 - Not available at night, reduced energy output on cloudy days
- Solar provides most energy in the summer with very limited output in the winter
- 100 kW of installed solar would take up about half an acre of land.

Renewable generation options



- Thermal energy sources are those that use heat or combustion to generate electricity
 - Not many opportunities to reduce cost
 - Diesel is one of the most energy dense fossil fuels and is relatively easy to transport
 - Biomass is a more environmental option, but supply of fuel needs to be considered
- More efficient and cost effective on a large scale (between several communities), but generally a very expensive option.
 - Low water years may be difficult to predict which could impact reliability of output
 - Lead times for development are very long, generally 10+ years

Existing/Complementary Programming

- **NRCan** - the federal government announced new funding through Budget 2017 to support diesel reduction. The programming is being delivered by NRCan, and could be leveraged to jointly support microgrid projects in remote communities. NRCan is currently seeking proposals for projects across Canada.
- **GreenON** - the Green Ontario Fund, is a new program being developed by MOECC, which will support Indigenous communities and households to increase the effectiveness of their facilities and housing to improve energy efficiency and lower use and emissions. It may offer an opportunity to make early investments in solar ready and battery-equipped infrastructure that could later be tied into a community microgrid for broader community benefit.
- **Northern Ontario Heritage Fund Corporation (NOHFC)** - the NOHFC is an agency of the Ministry of Northern Development and Mines mandated to promote and stimulate economic development in Northern Ontario. The Corporation has seven funding programs which provide financial assistance to projects, big and small, that support and diversify economic growth and job creation in the North.
- **Small Communities Fund (SCF)** – in 2016, the SCF awarded approx. \$5 million to four First Nation communities to develop solar-powered microgrids. The SCF is a joint funding program with the Federal and Provincial governments each providing 1/3 funding to support infrastructure projects in municipalities and First Nations under 100,000 in population.