REVIEWING MARKET READINESS FOR SMART ENERGY SOLUTIONS IN NOVA SCOTIA

QUEST | NS

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Executive Summary

Reviewing Market Readiness for Smart Energy Solutions in Nova Scotia gathers information and perspectives on the current and emerging Smart Energy Communities [1] marketplace, beginning with the proponents of existing Smart Energy Projects in the province.

This report is a companion to *Homegrown Success: Nova Scotia's Smart Energy Solutions Inventory* released in September 2015 by the QUEST Nova Scotia Caucus (QUEST NS), which served to document and bring awareness to local Smart Energy Solutions in Nova Scotia.

The Market Readiness report addresses the success factors and challenges associated with the implementation and application of Smart Energy Solutions [2], and includes consideration for public sector, funding bodies and educational facilities that aim to accelerate the capitalization of economic development and commercialization opportunities.

For this report, a subset of Smart Energy Projects were chosen from the S*mart Energy Solutions Inventory* based on technology type, location, size and ownership model. Interviews were conducted with Project Representatives [3] and Suppliers. [4]

The most common challenges associated with project implementation, application and commercialization included:

- The availability and timing of project financing;
- Education; and,
- Verification and monitoring (e.g., data monitoring and reporting was a topic that surfaced regularly, as many projects are not monitoring energy or cost savings)

[1]. Smart Energy Communities are currently defined by four qualifications. First, they recognize that energy efficiency is the 'first fuel'. From building automation to street lights, Smart Energy Communities take advantage of the full potential of energy efficiency and capitalizes on it. Second, they integrate conventional energy networks. That means that the electricity, natural gas, district energy, and transportation fuel networks in a community are better coordinated to match energy needs with the most efficient energy source. Third, Smart Energy Communities integrate land use and transportation, recognizing that poor land use decisions can equal a lot of energy waste. Lastly, Smart Energy Communities harness local energy opportunities.

[2]. Smart Energy Solutions are the fuels and technologies that are advancing Smart Energy Communities in Nova Scotia.

[3]. Project Representatives are Smart Energy Project owners, managers or other involved parties, not including suppliers.

[4]. Suppliers included renewable energy developers at the residential and utility scales, renewable energy consultants, architects, companies that design and install systems including wind, biomass, heat pumps, solar hot air, solar hot water and solar photovoltaic, including grid-tied and off grid systems

The most common success factors for project implementation/commercialization included:

- **Financing**
  For example, both Suppliers and Project Representatives stated that financial incentives and programs such as the Community Feed-in Tariff program (COMFIT) have a benefit for advancing the Smart Energy Solutions marketplace.
- **Education/Information**
  For example, having a Smart Meter and a Building Automation System was beneficial for identifying low cost retrofit opportunities.
- **Engagement**
  For example, extensive stakeholder engagement resulted in high project satisfaction.

When asked about the future for Smart Energy Solutions, Suppliers were positive. It was stated that the Smart Energy Marketplace is growing. There is also increased interest in larger systems and/or combined systems and scalable systems that offer flexibility. Based on the results of the research, seven considerations were developed to guide the Nova Scotia Department of Energy and the Atlantic Canada Opportunities Agency (ACOA) as well as other players in the market concerning the opportunity to advance the uptake and application of Smart Energy Solutions.

The considerations are as follows:

Expand Incentives and Funding Programs to Accelerate Smart Energy Solutions
Future incentive initiatives would focus on Smart Energy Solutions that encourage: increased efficiency, the efficient use of waste heat and other local waste resources, and projects which combine several principles, such as combined heat and power systems.

Require Data Follow up and Supply Chain Information with Funding Support
When funding is awarded by any agency or government, a condition of that funding should include the requirement for data collection and reporting, including post project collection of information on the organizations making up the Smart Energy Solutions Supplier supply chain.

Prepare a Data Workforce
There is an upcoming employment opportunity in the field of energy data collection and analysis, and collaboration between educational institutions and industry is an opportunity that would benefit both groups.

Coordinate Technology-Specific Training and Certification
It impacts the whole industry when systems are designed or installed poorly, and the Smart Energy Marketplace is lacking the proper frameworks to ensure consistency.

Offer an Energy Education Centre for the Public
The public sector should coordinate and fund a public venue where people can interact with technologies, such as solar panels and smart meters, and ask questions of experts.

Promote Recommissioning in Buildings
Large cost and emissions savings can be realized at little to no cost by changing schedules to reflect adapted occupant behavior.

Evaluate the Flexibility, Transparency and Timing of Budget Cycles
It is recommended that funding agencies reconsider metrics of project success and funding outcomes to allow for the best projects to be supported.

Introduction

The tides are changing in Nova Scotia's energy system and the Smart Energy Marketplace will be an area to watch. With the recent announcements introducing a provincial cap-and-trade system, a new equivalency agreement to reflect the accelerated coal phase-out at the federal level and the Pan-Canadian Framework on Climate Change and Clean Growth, the framework in which Smart Energy Communities are set could be radically changed. [5] In addition, the recent successful deployment of tidal technology in the Bay of Fundy, and the resulting clean electricity offers huge potential for a Nova Scotia renewable energy success story. In the midst of these changes, it is a good time to remember the lessons from One Nova Scotia's *Now or Never* Report, in particular:

"A consistent message heard in our community sessions was that, while there are lots of strengths, and many untapped opportunities, we need to be better as a province at finding them and realizing their potential".

QUEST - Quality Urban Energy Systems of Tomorrow, embodies this approach to capacity building and supporting local solutions and is building on previous work to uncover these strengths. [6] The precursor for this report was *Homegrown Success: Nova Scotia's Smart Energy Solutions Inventory,* released in September 2015 by the QUEST Nova Scotia Caucus (QUEST NS). While serving as a common resource and inspiration for the province, businesses and municipalities to draw from, there remained an opportunity to investigate successes and barriers of the projects in greater detail. This information, along with an assessment of the economic development and commercialization opportunities, could support the wider adoption and application of Nova Scotia's leading Smart Energy Solutions. [7]

This report, *Reviewing Market Readiness for Smart Energy Solutions in Nova Scotia,* gathers information and perspectives on the current and emerging Smart Energy Marketplace, beginning with the proponents of existing Smart Energy Projects in the province. The objectives of this report were to examine and document:

- the challenges experienced by the Smart Energy Solutions projects in the *Inventory* and how they were resolved;
- the critical skills and support required for project implementation and whether shortages exist in terms of knowledge and experience within the supply chain (i.e. are there missing skills, information or certifications); and
- the potential opportunities to streamline the approval process for Smart Energy Solutions.

[5]. See note 1 for a definition.
[6]. QUEST is a non-profit organization that conducts research, engagement and advocacy to advance Smart Energy Communities in Canada by working with government, utilities, the energy industry, the real estate sector, economic regulators, and the product and professional service sector.
[7]. See note 2 for a definition.

Armed with information on the success of Smart Energy Solutions and the challenges that are currently being experienced by the Project Representatives and Suppliers, the Nova Scotia Department of Energy and the Atlantic Canada Opportunities Agency (ACOA) will be able to direct support where it is needed to mainstream adoption of Nova Scotia's leading Smart Energy Solutions.[8]

[8]. See note 3 and 4 for a definition of Project Representatives (Developers) and Suppliers.

Section 1.0
Research Approach

Smart Energy Communities are where innovations are happening that make the production, distribution, and use of energy cleaner, more efficient, more affordable and more reliable. For instance, when conventional energy networks get integrated, they open the door to innovations for alternative fuel and technology vehicles, as well as energy distribution systems and energy storage.

The successful implementation of Smart Energy Communities, including Smart Energy Solutions, on any scale requires astute decision making on both the technical and policy sides. QUEST has developed the following technical and policy principles to guide decision making and provide the foundation for the evaluation of Smart Energy Solution fuels and technologies for this report. [9]

Technical Principles

Improve efficiency
First, reduce the energy input required for a given level of service.

Optimize energy
Avoid using high-quality energy in low-quality applications.

Manage heat
Capture all feasible thermal energy and use it, rather than exhaust it.

Reduce waste
Use all available resources, such as land fill gas and municipal, agricultural, industrial, and forestry wastes.

Use renewable energy resources
Tap into local opportunities for geoexchange systems, small scale hydro, biomass, biogas, solar, wind energy, and opportunities for interseasonal storage.

Use energy delivery systems strategically
Optimize use of energy delivery systems and use them as a resource to ensure reliability and for energy storage to meet varying demands.

Policy Principles

Match land use needs and mobility options
Understand the energy implication of land use, infrastructure for water and wastewater, waste management, personal mobility, goods movement, and building design decisions.

Match energy options to local context
Local climate, building on land use choices, industrial structure, availability of local sources of waste and renewables.

Send clear and accurate price signals
Consumers should see and pay full real costs, including external costs.

Manage risks and be flexible
Maintain technological and fuel diversity; pursue cost effective opportunities first and incorporate learning; assume the need to adapt quickly to market and technological surprises.

Emphasize performance and outcomes in policy and regulations
Avoid prescribing fuels and technologies.

Pursue policy and program stability
Maintain a consistent and predictable decision making environment to sustain investor confidence.

[9]. Fuels and Technology for Integrated Community Energy Solutions, 2012.

Smart Energy Communities are currently defined by four qualifications. First, they recognize that energy efficiency is the 'first fuel'. From building automation to street lights, Smart Energy Communities take advantage of the full potential of energy efficiency and capitalize on it. Second, they integrate conventional energy networks. That means that the electricity, natural gas, district energy, and transportation fuel networks in a community are better coordinated to match energy needs with the most efficient energy source. Third, Smart Energy Communities integrate land use and transportation, recognizing that poor land use decisions can equal a lot of energy waste. Lastly, Smart Energy Communities harness local energy opportunities

Smart Energy Projects are critical building blocks for the establishment of Smart Energy Communities and the Inventory was a living showcase of these projects in Nova Scotia. The Inventory captured as many examples as possible of the energy sources, and current and up-and-coming technologies that are advancing Smart Energy Communities in Nova Scotia.

Market Readiness Analysis

Homegrown Success: Nova Scotia's Smart Energy Solutions Inventory documented 88 examples at varying scales of the fuels and technologies that are advancing Smart Energy Communities in Nova Scotia.

While the Inventory served to bring awareness to local Smart Energy Solutions in Nova Scotia, this report addresses the barriers limiting wider application of Smart Energy Solutions, and offers critical insights on the economic development and commercialization opportunities.

For this report, a subset of existing Smart Energy Projects was chosen to be representative of both geography and technology. Table 1 identifies the breakdown of projects by technology in both the Inventory and this report.

The Market Readiness Advisory Committee, which consisted of project proponents, QUEST NS staff and two external experts, agreed that tidal projects and large wind projects were not relevant to the assessment for this report. In addition, bioenergy projects, biomass and biodiesel projects where the primary fuel product was exported, were also excluded from this report.

Interviews were conducted with select Project Representatives, namely project owners, managers or other involved parties. Engaging the Project Representatives provided an enhanced understanding of the project lifecycle process (e.g. from initiation, development, implementation and/or operation) for a Smart Energy Project in Nova Scotia. [10]

Table 1. Number of included projects by technology (Inventory and Market Readiness)

Energy Type	# of Projects: Inventory	# of Projects: Market Readiness
Bioenergy	11	4
Energy Effciency	19	6
Green Building	15	3
Solar	19	4
Tidal	3	0
Wind	4	1
Other (includes below)	17	3
Storage	2	0
Geothermal	9	1
CHP	1	0
District Energy	1	0
Sewage Heat Capture	1	0
Waste to Heat	1	1
Data Analysis	1	0
Renewables	1	1
Total	88	21

[10]. The list of projects can be found in Appendix 4.

Interviews were also held with Suppliers to obtain perspectives on the challenges and success factors from individuals of varied energy experience at varied stages of the project lifecycle, and to identify alignment and inconsistencies with respect to the experience of Suppliers, as well as Project Representatives.

The list of Suppliers interviewed for this report was developed by:

- Reviewing the preferred vendor lists of Nova Scotia Power, Solar Nova Scotia, the QUEST network and the Project Representatives.
- Project Representatives were asked who was used to complete their project.

The search for Suppliers culminated in a list of approximately 80, with 14 being interviewed for this report. [11] Whenever possible, Project Representatives and Suppliers were questioned about the same project.

[11.] It was important to understand the barriers and successes, both internally and externally, from the perspective of Project Representatives involved in the organization or municipality where the project took place. The list of interview questions for Project Representatives is provided in Appendix 1.

[12.] The list of Suppliers included renewable energy developers at the residential and utility scales, renewable energy consultants, architects, companies that design and install systems including wind, biomass, heat pumps, solar hot air, solar hot water and solar photovoltaic, including grid-tied and off grid systems and can be found in Appendix 3.

[13.] Supplier questions related to the general experience and outlook of the organization, rather than focusing on details of particular projects, as can be seen in Appendix 2.

Section 2.0
Snapshot of the Smart Energy Marketplace in Nova Scotia

While the marketplace for Smart Energy Solutions is continuing to develop across Nova Scotia, core elements emerged during the research which were identified as helping to define and to shape the marketplace, including Suppliers (from services to products); funding; and, informational resources (e.g., how to choose and where to purchase Smart Energy Solutions).

Suppliers
As the supply chain was being considered, there were some clear trends for the Nova Scotia Smart Energy Marketplace, in terms of Supplier size, time in business and location.

Nearly all Suppliers were Small to Medium Enterprises (SMEs), with some considered a microbusiness, with under five employees. The suppliers ranged in size from individual company owners with occasional hired help, to local companies employing up to 17 people and larger national organizations with hundreds of employees. Fifty four percent of Suppliers interviewed were founded since 2010.

All but three Supplier organizations were located in Halifax Regional Municipality (HRM), with the remaining based in the South Shore, Cape Breton and West Hants. Their employees had diverse backgrounds and certifications, including Red Seal electricians and refrigeration technicians, HVAC technicians, professional engineers, engineering technologists as well as accountants, communications, marketing and project development professionals. Graduates from the Nova Scotia Community College's Energy Sustainability Engineering Technologist (ESET) program were employed in these organizations and only one Supplier attested to having technology-specific training.

Many Suppliers received their clients from referrals, though some engaged in advertising through local publications and online.

Funding
Efficiency Nova Scotia was identified as the number one resource for both funding and information for the Smart Energy Marketplace. Specific programs identified by interviewees included the Strategic Energy Management program and core performance measures. Other funding programs referenced during the interviews included:

- Atlantic Canada Opportunities Agency (ACOA) Infrastructure Funding;
- Sustainable Development Tech Canada; and,
- Nova Scotia Government's expired Community Feed-in Tariff (COMFIT) and EcoNova Scotia for Clean Air and Climate Change programs.

Informational
There are multiple, albeit specialized, avenues for members of the public looking for information on the Smart Energy Marketplace in Nova Scotia.

- Nova Scotia Power, Solar Nova Scotia and Efficiency Nova Scotia have public lists to connect potential Project Representatives with Suppliers, including heat pump companies, solar, and residential and commercial efficiency professionals, respectively.

- QUEST profiles Smart Energy Suppliers through its Smart Energy Communities Catalogue and compiles energy-related resources on its online Smart Energy Atlas database.

- The Ecology Action Centre provides coaching to local non-profits as they work through energy efficiency retrofits through the Culture of Efficiency Project.

- The Atlantic Chapter of the Canada Green Buildings Council offers information on energy in buildings, in general, and training and certification related to the Leadership in Energy and Environmental Design (LEED) program, in particular.

- The Nova Scotia Community College Energy Sustainability Engineering Technology (ESET) program offers training on energy management, sustainable design, green technology and alternative energy systems.

Section 3.0
Key Challenges

Key challenges that were identified by Project Representatives and Suppliers as impacting the uptake and application of Smart Energy Solutions throughout the lifecycle of an energy project included funding and financing; availability of education and information; and, verification and monitoring.

Overall, the projects reviewed for this report were financially motivated, with the primary objective being to save money on operational costs. Additional motivations included making a statement about environmental sustainability and increasing energy resilience, such as the People's Place Library in Antigonish and District of Shelburne's Sandy Point Sewage Treatment Plant, respectively. Despite the primary financial motivation, the majority of Project Representatives interviewed could not quantify the project payback period, or operating cost savings upon project completion.

Smart Energy Project Representatives

Funding and Financing

Missed opportunities to take advantage of funding

This includes misalignment between funding availability and budget cycles for municipalities. Large gaps between announcements and the awarding of funding, as well as the short amount of time to spend funds once they were granted, prevented some projects from reaching their operational potential.

Lack of local capacity to take advantage of funding

Small municipalities often face a shortage of contractors, when large amounts of infrastructure funding became available with a short-time frame for the development and execution of a project.

Interconnection agreement requirements present a negative impact on project feasibility

It was noted that interconnection agreements with Nova Scotia Power could present a challenge for advancing a project and, in some cases, delayed financial returns on projects for up to two years.

Education and Information-Availability

Ineffective transfer of knowledge throughout the Smart Energy Solutions supply chain
Projects face challenges when knowledge is ineffectively transferred between contractors and installers, as well as building operators and occupants (i.e. the users of the completed projects). Interviewees also noted problems resulting from a lack of maintenance information. In multiple cases, Project Representatives were not well informed about the maintenance needs of the installed systems, causing avoidable system neglect and financial outlays.

> *"It was a steep learning curve regarding ongoing maintenance of the new environmental and energy efficient systems within the building. We still would have included them, but would have required from the building contractor, as part of the contract, a robust and detailed maintenance plan that could be put in place. instead we learned by trial and error which can be costly."*
> Eric Stackhouse, People's Place Library.

Verification and Monitoring

Lack of measurement, verification and monitoring after project implementation
While all projects stated that key project drivers centered around financial and economic benefits, very few projects are evaluated for financial payback, financial savings and greenhouse gas (GHG) emissions savings. Reasons stated for the lack of measurement, verification and monitoring include:

- Lack of data monitoring;
- Lack of expertise to calculate energy or GHG savings, or to run complicated technology;
- Lack of funding to analyze the data in a meaningful way; and,
- It was mentioned on several occasions that follow up was lacking, or continuity was broken, when the internal resource championing the project moved on, or when the government representative who had administered project funding retired.

> *"Products and equipment are only part of the solution for energy; the operating knowledge needs to be embedded with occupants/ operators to truly make a difference. If a company is selling energy efficiency, it needs to provide a commitment and support to its client so they can help make an impact, and not just a buck.this will help energy efficiency become a measurable common practice instead of a selling point."*
> Institutional Energy Manager

Smart Energy Suppliers

Financial - Upfront and Perceived Costs

- Some SMEs interviewed identified that it was difficult to cost effectively gather data to prove the economic case for their systems.
- Cost effective data solution systems were found lacking, reducing availability of actual data to prove the savings over the lifetime of a system.
- Several Suppliers expressed concern over the lack of financing to assist homeowners in reducing their long term energy costs, especially those in the low-income bracket.

Education and Information – Availability

- A large gap in training was identified by Suppliers in regards to renewable energy system design and installation. Few interviewees had formal technology specific training for the types of systems they were installing. Experience was gained through trial and error, through the knowledge of a more senior employee or adapted from formal education areas, such as electricians or HVAC technicians.
- 'Lack of understanding' was a critical takeaway referenced by most Suppliers limiting market uptake, including within sectors such as residential homeowners, building owner and operators, and architects and engineers.
- It was identified that there was no central resource for science-based information and hands-on experience with renewable energy technologies and projects. There was concern that because of this lack of understanding, renewable technologies do not get incorporated at the planning stage and can support perceptions of higher costs when included in later design and development stages.

Section 4.0
Key Success Factors

Key success factors identified by Project Representatives and Suppliers supporting the uptake and application of Smart Energy Solutions throughout the lifecycle of energy project development and implementation include, engagement and experience; access to financing; and education and information.

Smart Energy Project Representatives

Engagement & Team Expertise
Extensive consultation was identified as leading to solutions that were more comprehensive and celebrated by users. These consultations were targeted directly to different groups such as building occupants, seniors, children and neighbouring residential or retail areas. The use of an interdisciplinary team, emphasized in a few interviews, was as an important factor for the cost-effective success of a solution. Coupled with this was the recognition that a hands-on energy expert, working within a group, was critical. An example was the early and ongoing involvement of Efficiency Nova Scotia. This was an important success factor in some energy efficiency projects, but it was noted by interviewees that this could be better applied in future projects.

Similar to Efficiency Nova Scotia support, projects including multiple locations or buildings benefited greatly from centralized administration.

- A good example referenced during the interviews was the Ice Rink Energy Project, which resulted in energy efficiency upgrades in more than 60 arenas around the province. Recreational Facilities Association of Nova Scotia organized the funding, auditing and upgrades in a consistent and transparent manner. This allowed for ongoing relationships with Suppliers and enhanced experience working with energy efficiency technologies in comparable settings.

Overall, both Project Representatives and Suppliers noted that there was a high level of satisfaction with system and project performance. This was the case across technologies used, project size and type of ownership (private, municipal, institutional). Project Representatives stated that they were generally pleased with the Suppliers and local experts whom they had used for their projects.

Financial

Many of the Market Readiness projects were supported by grants or other funding programs. The availability of funding was perceived to be an integral factor for those projects. This was especially true for institutional and municipal projects.

Efficiency Nova Scotia funding programs were seen to have a large impact on the existence and success of the energy efficiency projects included.

Education and Information

Awareness of options was an important success factor for the projects examined. For example, if an organization proposing a new building, a retrofit, looking for operating cost reductions or a new revenue stream, is not made aware of the Smart Energy options, these projects are much less likely to happen.

With the majority of Suppliers being SMEs who are marketing primarily through word-of-mouth, a building owner's knowledge of options is not well informed by the marketplace.

On a related note, commissioning, and recommissioning, were recurring themes within building projects.

- Building commissioning is a verification process for new construction, to ensure that subsystems such as HVAC and lighting achieve the owner's stated requirements and adhere to engineering designs.
- Recommissioning is the methodical process of testing and adjusting the systems in existing buildings, especially after changes in usage patterns.
- It was repeatedly mentioned by interviewees that, when done properly, commissioning was an important determinant of project success.
- Recommissioning was mentioned as an important, and underused, tool to identify low or no-cost energy reduction opportunities.

On the technical side, it was also found that exhaustive research and testing were successful in avoiding project setbacks and technical breakdowns.

When projects were related to existing buildings, having a Smart Meter subscription to Nova Scotia Power, and a Building Automation System was beneficial. This baseline data allowed for the research and modelling needed to create a successful project and to track savings.

Smart Energy Suppliers

Financial

- As with Project Representatives, it was stated that incentives such as COMFIT and ACOA infrastructure funding have a notable positive impact on the industry.
- Suppliers stated it was important to make certain that clients understand the portion of the project cost that will ensure reliability and durability of equipment/material used. For example, in response to a difficulty in finding reliable materials regionally, several Suppliers import high quality parts from Europe, increasing the cost, but also quality, of their systems. Local staff and installers were then trained on the installation, integration and use of these parts or systems.
- There was a correlation between the SMEs who invested in marketing and those that were growing the most quickly.

Education

- In response to the general lack of understanding of Smart Energy systems and projects, Suppliers found that educating their clients was a very important contributor to their success.
- There was anecdotal evidence of increased business growth within Supplier organizations who are monitoring their existing systems and using those facts in their sales efforts. This was found at both the SME and micro business levels.
- There was a trend towards integrated systems, for example Solar PV and Geothermal, or Solar and Heat Pump.

> *"PV is not working in Nova Scotia, it's too cold, and there is not enough sun' is a phrase I hear often from people when they hear what I'm doing for a living. Little do they know that it is a fact that the colder the PV panels are, the higher the efficiency. So it just shows how serious education in our sector has to be taken."*
> Solar Systems Installer

Section 5.0
Next Steps and Considerations

When asked about the future for Smart Energy Solutions, Suppliers were postive.Suppliers stated that the market is growing and that there is increased interest in larger systems, combined systems and scalable systems that offer flexibility. These systems included complete mechanical room solutions, combined heat and power (CHP) coupled with solar, tiered offerings and design for net zero approaches.

Project Representatives and Suppliers both expect that the introduction of a carbon price mechanism will enhance the business case and overall marketplace for Smart Energy Solutions in the province, as well as stimulate growth in data science expertise to assist with the gap in verification and monitoring.

The following are seven considerations based on the information collected in inteviews.

Consideration 1 - Expand Incentives and Funding Programs to Accelerate Smart Energy Solutions
It was identified by both Project Representatives and Suppliers that incentives and programs, such as COMFIT, have a benefit for advancing the Smart Energy Solutions marketplace. This is especially important as many of the Smart Energy Suppliers are SMEs or microbusinesses who are delivering these services in Nova Scotia. Subsequently, all levels of government in Nova Scotia should be working together to develop incentive programs based on the 12 principles identified in Section 1.0 to drive action and foster economic development. Existing programs and incentives for SMEs should be directed at supporting Suppliers in the Smart Energy Marketplace. Ideally, future incentive initiatives would focus on Smart Energy Solutions that encourage: increased efficiency, the efficient use of waste heat and other local waste resources, and projects which combine several principles, such as combined heat and power systems.

> *"The changed regulations around carbon and coal will cause folks to look for low hanging fruit, how can we help them find and capitalize on opportunities?"*
> – Comment from Supplier interviewee

Consideration 2 – Require Data Follow up and Supply Chain Information with Funding Support

When funding is awarded by any agency or government, a condition of that funding should include the requirement for data collection and reporting, including post project collection of information on the organizations making up the Smart Energy Solutions Supplier supply chain. The request for the collection of data might result in a modest incremental cost to a project and should be offset when project funding agreements are being developed. Having access to project metrics on Smart Energy Solutions will contribute to an enhanced understanding of project outcomes and improve future funding programs and decisions. Requiring basic data will also support Consideration 7 by informing the development of superior metrics to measure funding success. Funding agencies should coordinate to ensure standardization of data collection and reporting practices.

QUESTIONS FOR FUNDERS TO ASK:

What is your baseline energy use and GHG emissions?

How will success be measured?

What is the maintenance and operations plan and associated costs?

How will information be communicated from supplier through to occupant/ user?

Consideration 3 - Prepare a Data Workforce

There is an upcoming employment opportunity in the field of energy data collection and analysis. From life cycle costing of projects to data monitoring and analysis, actual performance data is becoming more and more important. Pressure is mounting to include health costs and benefits into energy calculations as well, in recognition of the greater implications of energy choices. Increased literacy in measuring GHGs will be necessary for carbon pricing as well. Higher energy literacy and expertise will allow for the greater education of clients regarding calculating payback periods and business cases, taking the burden of client education off of SMEs.

Collaboration between educational institutions and industry was seen as an opportunity that would benefit both groups. For example, NSCC students were mentioned as a resource in several projects and local universities also have students who engage with energy issues. Governmental departments, such as Environment, Energy, Health Promotion and Protection, and Education can work together to identify key learning outcomes to serve the needs of future primary, secondary and post-secondary graduates. There is an existing Climate Jobs roundtable in Halifax which includes non-profit, educational, union and marginalized community representation and was founded following a June 2015 presentation from the Green Economy Network on their One Million Climate Jobs challenge and campaign. This group could be a resource on promoting Climate Data employment opportunities and education.

NORTH AMERICAN BOARD OF CERTIFIED ENERGY PRACTIONERS

Mention of a solar PV course in california led to a quick searchof the North American Board Of Certified Energy Practitioners. The results showed no certified solar Installers in Nova Scotia or New Brunswick.

Consideration 4
Coordinate Technology-Specific Training and Certification

"We are promoting these technologies, but have we prepared a workforce?"
Comments from Supplier interviewee

The majority of solar Suppliers, all SMEs, expressed the need for a solar training and certification program to address the gap in training and, therefore, quality of solar installations. It impacts the whole industry when systems are designed or installed poorly and the Smart Energy Marketplace is lacking the proper frameworks to ensure consistency. The North American Board of Certified Energy Practitioners could be a starting point or resource for arranging local training. The Nova Scotia Community College could be a venue for this type of training.

Consideration 5 – Offer an Energy Education Centre for the Public
The assertion that the education of clients is being borne by Suppliers, namely SMEs and microbusinesses, and taking a considerable portion of their time led to a consideration to coordinate and fund a public venue where people can interact with technologies, such as solar panels and smart meters, and ask questions of experts.

The Town of Bridgewater, as part of the Energize Bridgewater initiative, provided a staffed, downtown location called the Energy Storefront, where citizens could observe displays on renewable energy, test the insulative properties of different materials and ask questions about energy topics.

Key consideration should be given by the public sector to encourage and fund a collaboration between educational facilities such as the NSCC Renewable Energy Lab, Efficiency Nova Scotia and/or other non-profits and industry representatives to develop a temporary or permanent physical location where citizens can learn about energy technologies. The Energy Education Centre could represent a great resource for students and customers alike. A partnership with an organization such as the Discovery Centre could result in an innovative and interactive educational space devoted to renewable and distributed energy.

Consideration 6
Promote Recommissioning in Buildings

The success of recent building recommissioning projects mentioned by Projective Representatives suggests that continued support of projects would be valuable. In buildings with building automation systems, Project Representatives indicated that large savings can be realized at little to no cost by changing schedules to reflect adapted occupant behaviour.

Efficiency Nova Scotia now offers a Building Optimization program which includes recommissioning. A key consideration would be to support, expand and promote extensively, this program along with success stories, including details of energy and financial savings realized. Municipalities should be encouraged and supported to use recommissioning to lower their operational costs.

Consideration 7
Evaluate the Flexibility, Transparency and Timing of Budget Cycles

Adherence to tight funding windows was listed as an impediment to innovative projects. It is recommended that funding agencies reconsider metrics of project success and funding outcomes to allow for the best projects to be supported. If possible, relevant funding should consider municipal budget cycles and other similar limitations, such as the capacity of SMEs and micro businesses to move quickly in response to funding announcements.

Concluding Thoughts

Based on the interviews with Project Representatives and Suppliers, the marketplace for Smart Energy Solutions appears to be in its infancy with new projects being driven by word-of-mouth and by existing Smart Energy Solution projects.

An opportunity remains for early policy and program intervention that supports enhanced engagement and experience; access to financing; and education and information.

Engagement and Experience
Across Nova Scotia, the supply chain for Smart Energy Solutions is dominated by SMEs and microbusinesses with a large variety and diversity of experience and expertise. Both education and financing were identified as important areas where there is room for improvement to accelerate the marketplace for Smart EnergySolutions, especially for SMEs and microbusinesses.

Financing
Supporting the continued growth of the Smart Energy Solutions marketplace will, for the near term, hinge on funding programs such as those operated by Efficiency Nova Scotia, as well as COMFIT and EcoNova. Future funding programs should be carefully designed in order to grow the marketplace and take into consideration budget cycles, the shortage of Smart Energy Suppliers and the Smart Energy Communities Principles, while also supporting the critical need for maintenance planning, data collection and supply chain information.

Education and Information
In order for the Smart Energy Solutions to thrive, investment and support for an educated and professional workforce, as well as certification will be needed. The issue of Smart Energy Projects not monitoring cost savings or emissions reductions remains a clear gap. There is an opportunity to strengthen education on data monitoring and analysis in response to new regulatory drivers, such as carbon pricing. As well, the lack of formal training and certification of renewable energy technologies can be addressed by offering technology-specific training to support best practices within the Smart Energy Marketplace and will need to be expanded to also address design, operation, maintenance and monitoring.

There are multiple, specialized avenues for members of the public looking for information on the Smart Energy Marketplace in Nova Scotia. The fractured nature of these resources, however, makes it difficult for individuals to make science-based comparisons between technologies and understand the Smart Energy Solutions available to them. There is an opportunity to collaborate with educational institutions to fill this gap in an innovative manner, through temporary means such as well publicized open houses, or a more permanent space dedicated to open learning around Smart Energy Solutions. Education of both potential Project Representatives and Suppliers can set in motion a positive feedback loop which will expand and strengthen the Smart Energy Marketplace. Improved education can, ultimately, lead to better quality installations and better energy-savings monitoring. This, in turn, will help promote Smart Energy Solutions further into the marketplace and innovative energy saving techniques such as recommissioning in older buildings to become more prevalent.

Appendices

Appendix 1 – Questions on Project Successes and Challenges

1. Is there anything you would like to update/change from the fact sheet in the original inventory?

2. Performance outcomes: What were expected performance outcomes? Were they realistic? Were they met and on time?

3. Successes: What went well? Was the project an easy sell (in organizations)?

4. Obstacles: What challenges were encountered and how did they impact the project (for example, internal buy-in, delivery delays, product supplier challenges, reliability of products)?

5. Resources: What resources (informational, funding) did you use, or did you find lacking? Examples: Government websites, non-profit groups.

6. Measurable Benefits: What is/was the economic payback period on your project? Did you estimate or measure greenhouse gas baseline or reductions? Did this project allow/require you to hire new staff? Were there unexpected benefits (reputational benefits, increased customer base)? Did the project measure spending in the local economy?

7. Suppliers: What suppliers did you deal with? Labour or goods. Local or not.

8. Additional comments? And, if relevant, can I use your project as a case study?

Appendix 2 – Questions for Suppliers

Familiarization with company
How long has the company been around? Operating in NS, Canada and/or internationally? What is your core business? How do you market yourselves? Where do your clients come from/find you? Preferred vendor lists, referrals, internet.

Skills Identification
What are the general backgrounds of you and your staff? Education/training? (heat + refrigeration tech, plumber, electrician). What are the certifications of staff or the company to local, national, or international standards? Do you provide ongoing training for your employees?

Current Situation
What are current barriers you face in working on Smart Energy Projects? What's the number one complaint/reservation you hear? What sort of follow up do you offer to customers? What opportunities do you see?

Future Market Development
How do you see the market for cleantech/renewables/Smart Energy Projects changing over time? What policy changes, programs or education do you think could help with market development?