NSERC SMART MICROGRID NETWORK

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Project 2.1

Cost-benefits framework - secondary benefits and ancillary services

Greg Young Morris (McGill University)
Dr. Chad Abbey (Hydro-Québec)
Dr. Steven Wong (CanmetENERGY)
Prof. Géza Joós (McGill University)

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Problem

- There is currently a great barrier in developing Microgrids in Canada since it is very difficult to justify its implementation and operation costs.

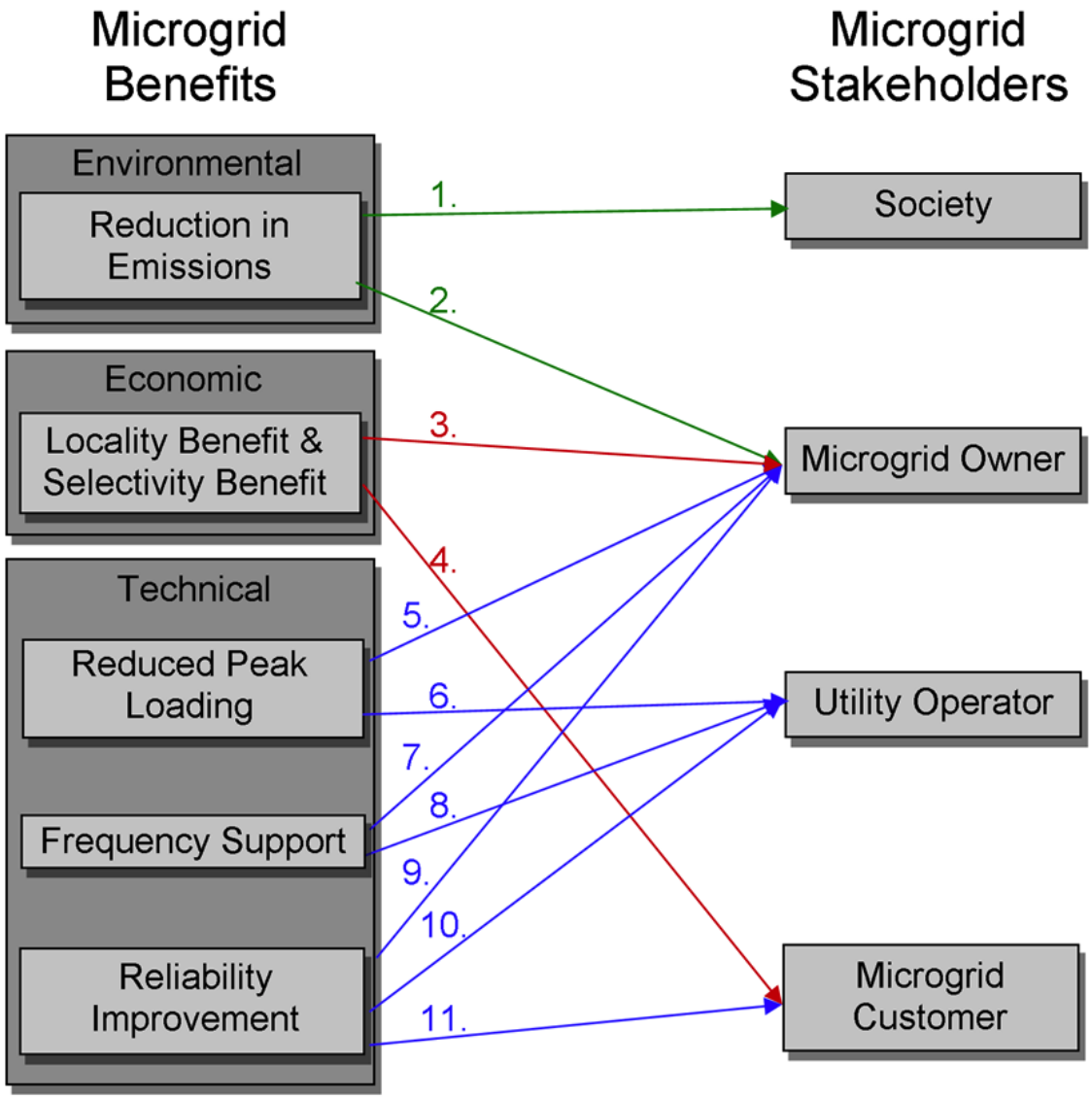
- Why would we want to implement a Microgrid, what are all the benefits it can bring, and to whom will these benefits accrue?

Solution

- Develop a framework that can be used to evaluate Microgrid projects to justify its implementation
  - Every system is different and the motivation or business case of implementing a Microgrid is different

- Create business cases for Canadian systems based on benefits that a Microgrid can bring to the stakeholders of the system
  - If benefits are valued by a stakeholder, it can be quantified and monetized

Analysis framework - proposed



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Typical results - quantification

Parameter	Value
Utility Value of NDE	1500 $/MWh$_{NDE}$
Amt. Paid to IPP for Avoided NDE	750 $/MWh$_{NDE}$
Spinning Frequency Reserve Contract	4 $/MWh
Cost of Carbon Emissions	10 $/t
PCC Transformer Rating	3.5 MVA
Cost of Transformer Upgrade	$280,000
Deferral savings shared with IPP	50%

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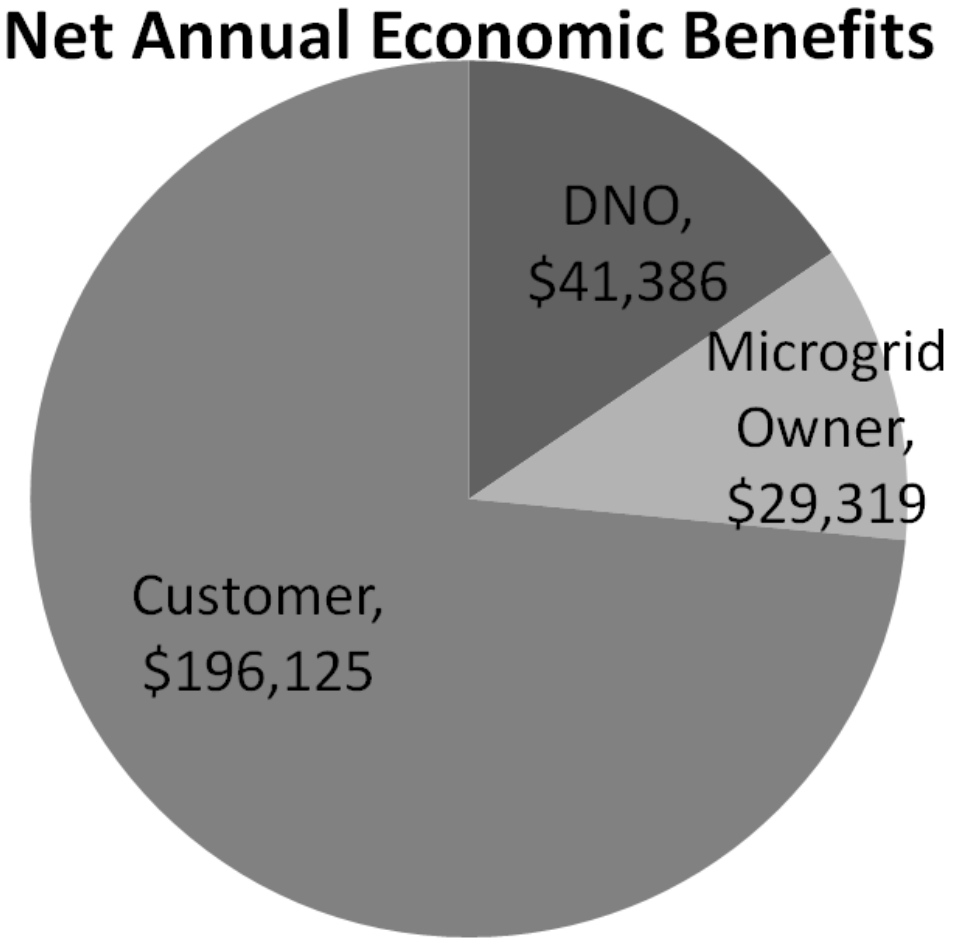
Typical results – presentation of benefits



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Outcomes of project

- This project will:
  - Identify all stakeholders that are affected in some way by Microgrid implementation
  - Develop benefit functions that quantify the Microgrid impacts
  - Provide a clear framework that demonstrates how each Microgrid impact affects different benefits and all stakeholders in various case studies
  - Formulate a methodology for evaluating business cases based on cost-benefit of implementing technologies and operation strategies

Partnerships with Canadian industry

- Collaboration on this project thus far from:
  - Dr. Chad Abbey, Hydro-Québec
    - Application of the use case paradigm
  - Dr. Steven Wong, Natural Resources Canada
    - Data on Canadian Microgrid implementations for case studies

Future work & potential collaboration

- Collaborations with the following projects will enrich the quality of the deliverables:
  - Project 1.1 to apply the framework to remote Microgrids
  - Projects 1.2 and 1.4 to create operational strategies to maximize the identified benefits
  - Project 2.2 to create business cases for systems that have low energy security or reliability
  - Projects 2.3, 2.4 and Theme 3 to determine accurate technology capabilities, costs, and functionalities