RP2011- THE PRECINT INFROMATION MODEL PROJECT

AN INFORMATION MODELLING APPROACH TO IMPROVE ENERGY MANAGEMENT IN SMART PRECINCTS

The research develops an innovative information modelling approach to improve demand side energy management in smart precincts.

Research Questions

- *What collaborative energy management practices will lead to an improved performance of smart precincts?*
- *What digital information is required for managing energy efficiently in smart precincts?*
- *What information models will support energy management decisions?*

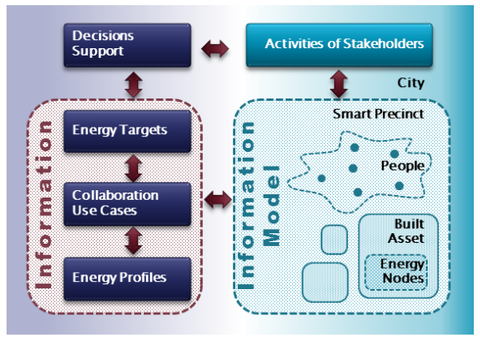

Figure 1: A diagram showing the research context

The research is currently in progress and is focussed on identifying strategic energy management activities by stakeholders. These activities are supported by a digital information model of a smart precinct and information about the energy targets of stakeholders, collaborative use cases and the usage profiles of energy Nodes which are building assets or equipment that apply energy [Fig 1]. Improving local power consumption (demand side) is common for many high performing smart precincts and is also the most cost-effective. It includes shifting peak demand or reducing the overall use. Currently, smart meters are being trialled to control energy use with mixed results internationally. The information given to end-users and the amount of data being produced are either too little or overwhelming. In Australia, renewable generation is increasing, energy prices are on the rise and electricity demand is declining.

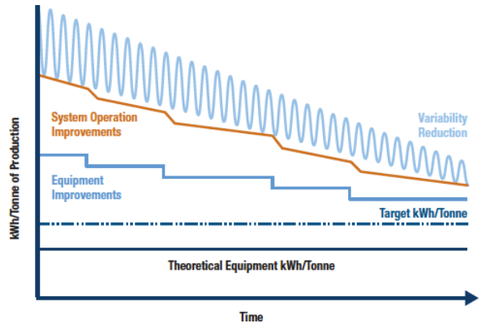

Figure 2: Energy saving through smart energy management. Source: Energy Management Information System (EMIS) Manual, the Government of Canada (2013).

Meanwhile, to avoid blackouts, grid supply is maintained close to the historic peak usage that is very rarely reached, expensive, wasteful and likely to become unsustainable long term. Also at this level CO2 emission from producing energy is the highest. Figure 2 shows the benefits of addressing continuous improvement in energy operation and smoothing out peak demand. My argument is that both can be achieved through collaborative action between stakeholders.

Research Plan

The following activities are designed to answer the research questions:

- Review the literature, select case studies and survey stakeholders to identify collaborative energy management practices.
- Analyse the survey results to identify: the digital information required to guide efficient energy management, the alternative decision paths and the information exchanged.
- Generalise the outcomes and structure the information into an open and shared data model that can hold that information to support stakeholder collaboration.
- Implement a proof of concept based on the Precinct Information Model schema.
- Validate this proof by checking whether it allows stakeholders to adopt improvement in collaborative energy management practices.

To leverage an information model for energy management Figure 3 depicts an innovative way in which usage can be structured. As for enabling the support for better decisions, I will look at a broader timeframe than what is typically used for operational improvement. This will be necessary to allow for the potential of time lags in information exchange that may happen between stakeholders and to collect data under various conditions.

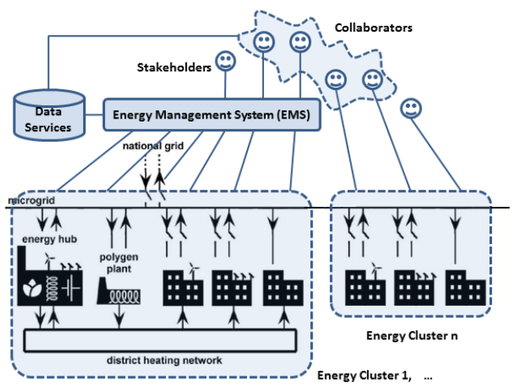

Figure 3: This information model of managing energy collaboratively applies some ideas of the EEPOS project to smart precincts.

Literature Review

The literature review is in progress and has identified exemplars that will be investigated in more depth: Helsinki in Finland and Langelfeld in Germany target energy positive neighbourhoods where participants adjust their energy behaviour through a smart feedback process. In Fujisawa, Japan the municipality, local developers and an industry sponsor work together to reach aspirational targets. A need for a better feedback based on a common understanding and a better coordinated repository can be inferred from those and other high performance cases. However, many results are inconclusive or interim at best. The literature demonstrates that there is an opportunity to take a more rigorous approach with regards to information modelling.

"Better collaboration will improve the management of energy and lower the carbon impact of precincts.

Conclusions

From the literature review, there seems to be supporting evidence that energy management through collaborating end users will improve results at a precinct scale. An understanding of the built information exchanged that is shared between stakeholders can add an important dimension to those outcomes.

Anticipated impacts

The research is expected to improve energy management and contribute to further research through enabling comparable evidence in:

- *End-user engagement*
- *Standards for open information modelling*

Further information

http://lowcarbonlivingcrc.com.au/research/program-2-low-carbon-precincts/rp2011-pim-open-digital-information-standard-throughout

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