Power.House Hybrid

alectra
GRE&T Centre

Helping single family homes transition to net-zero

Spurred by consumer appetite favoring sustainability, increasingly affordable solar technology and updated building codes there is an increasing need for housing solutions to address climate concerns. Although residential decarbonization technology is rapidly becoming cheaper and more common, many homeowners remain hesitant to commit due to unfamiliarity and uncertainty!

What if existing single-family homes were fitted with proven technologies that enable households to generate clean energy and minimize greenhouse gas (GHG) emissions without sacrificing their level of comfort. What if this was done in a way that also helps decarbonize the local grid?

Alectra's Power.House Hybrid pilot enables the movement towards net-zero energy emission homes by integrating a hybrid set of electrical and thermal equipment into a virtual power plant platform.

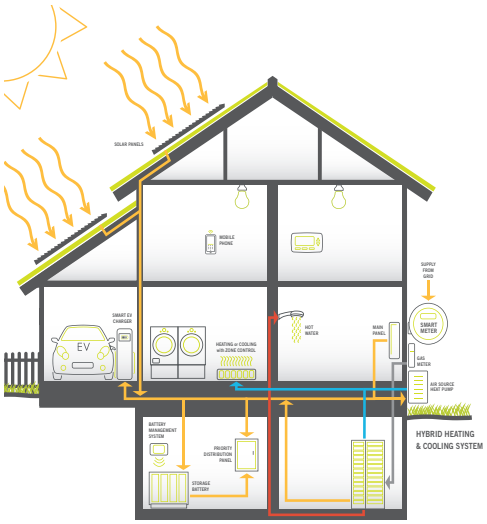
The Challenge

Residential use of clean distributed energy resources (DERs) such as solar panels, air source heat pumps and other clean energy technologies are individually insufficient to meet community GHG reduction targets. Primary challenges include: 1) optimizing household energy usage to lower carbon footprint of homes while still meeting all energy needs; and 2) improving the sustainability, and resilience of the power grid using home-based renewable DERs.

The Solution

Power.House Hybrid pilot shifts energy generation from large centralized GHG emission-intensive sources to decentralized, cleaner generation using solar panels, battery storage, hybrid heating (gas and electric), and combined heat and power (CHP). Operation of these electrical and thermal technologies is optimized using advanced control algorithms, and grid data. Any electricity not used by an individual home is fed into the local grid to power neighboring communities with clean energy.

A cluster of 10 homes in Markham, Ontario was retrofitted with advanced electrical and thermal technologies, and control systems to reduce pressure on the grid during periods of peak demand. Together these homes act as a localized virtual power plant (VPP), leading the shift from large, centralized power generation. Smart EV chargers were installed to move EV charging load to off-peak times.

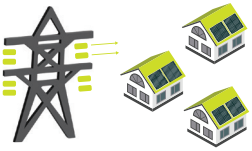


— Electrical Network
— Hot Water
— Space Heating and Cooling

How Power.House Hybrid works

Energy Efficiency: Battery usage and EV charging behaviour are managed to ensure efficient use of clean energy

Decarbonized Heating: Smart hybrid heating system dynamically switches to lowest emissions source to provide heating, hot water, and cooling



Resilient Grid: Advanced control system aggregates storage and generation capacity of individual homes into a localized Virtual Power Plant

Benefits of Power.House Hybrid

Cost savings resulting from energy efficiency

Reduction in local and residential GHG emissions

Enhanced protection from power outages

Older-built homes are empowered to contribute to grid services

Fosters building of net-zero energy emissions communities

In Collaboration With

Natural Resources Canada | Ressources naturelles Canada | ENBRIDGE Life Takes Energy | MARKHAM | Toronto Metropolitan University – Centre for Urban Energy, Faculty of Engineering & Architectural Science

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alectra GRE&T Centre
395 Southgate Drive, Guelph, ON N1G 4Y1
519.822.3010 | GREAT@alectrautilities.com
alectra.com/innovation-alectra

@AlectraNews