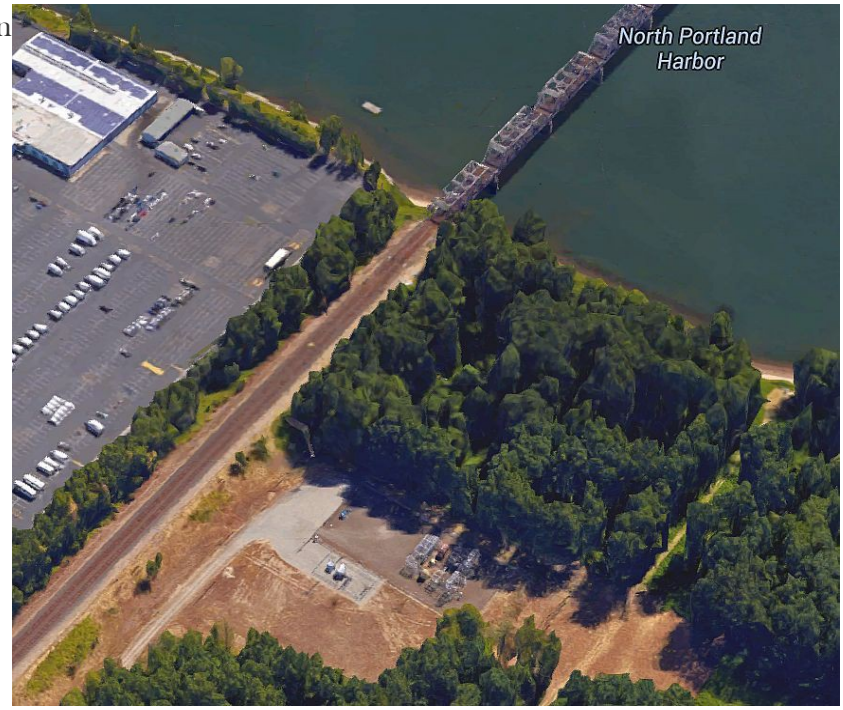
Electrical Resiliency for Hayden Island

by Sam Churchill, Hayden Island (schurchill@gmail.com)

Introduction:

This paper proposes that PGE's substation on Hayden Island adopt a "microgrid", to provide limited local power to island residents in the event that transmission lines crossing the Columbia topple during an earthquake.

A BPA study found the big 115KV transmission lines crossing over West Hayden Island may topple due to liquefaction. Hayden Island might be without power for months.



Cascadia earthquake studies indicate that BPA's main grid would require between 7 to 51 days to make repairs to the transmission line.

Bonneville Power Administration (BPA) maintains a 115 kilovolt, three phase overhead transmission line, running north to south, in the middle of West Hayden Island.

Pacific Power and Light also owns an overhead 115 kilovolt line that crosses the island 450 feet east of BPA's line.

Portland General Electric (PGE) maintains Hayden Island's substation, located just west of the Burlington Northern Railroad. That substation is fed by an overhead 115 kilovolt, three phase line which taps into BPA's line. Without power from the overhead lines, Hayden Island may be without power for months. A "microgrid" could provide Hayden Island with power during an emergency. A source for that emergency power may already exist on Hayden Island at Manheim.

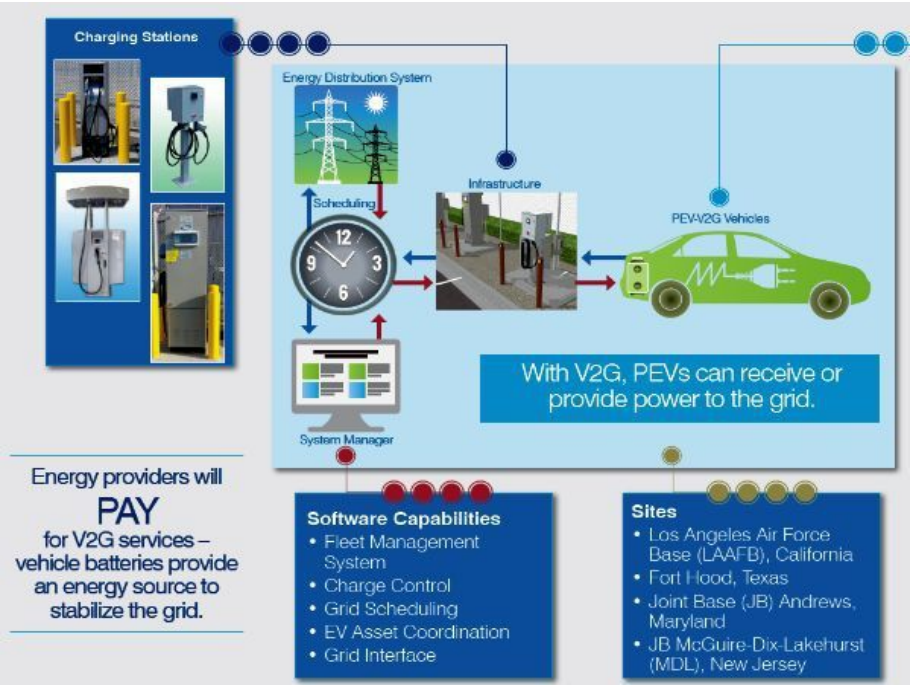
Distribute locally generated power, locally

The power grid is moving away from a 1-way centralized delivery. Today, two-way power grids allow solar panels to generate and feed power back TO the power company. Microgrids can provide local power within a neighborhood. Solar, wind and battery power, available within neighbor hoods can now serve those same neighborhoods if the main power grid goes down. The rest of the time these "microgrids" can serve as capacity,

frequency, demand response and other services that benefit all ratepayers.

Manheim's 200 KW solar array on Hayden Island

Manheim's installation covers 16,500 square feet and generates 200 Kilowatts. It's within a few hundred feet of the Hayden Island substation. Spokane's $7 million "smart city" project includes a microgrid system and an electric "vehicle to grid" system for energy storage. Spokane's Microgrid system might be a model.



Manheim's auto auction facility generates 200 kilowatts of solar power, but the power is not stored locally. It's sold back to the power company. Manheim's solar power normally goes back into the grid. Manheim doesn't store electricity at their facility. But they might.

If their 200 kWatt solar array charged 20 cars (x 50 Kwatt/hrs each), that's 1 MegaWatt. It might provide local power in an emergency. Electric vehicles could store electricity far cheaper than a multi-million dollar dedicated battery facility. Their juice would be fed back into the local Microgrid for island distribution or energy arbitrage. Perhaps there is a collaborative strategy could make good economic sense to ALL stakeholders.

Electric Vehicles

Manheim installed solar panels because they make money reselling their power to PGE. They don't store electricity.

But they could using electric vehicles. It's all about the cost of storing electricity

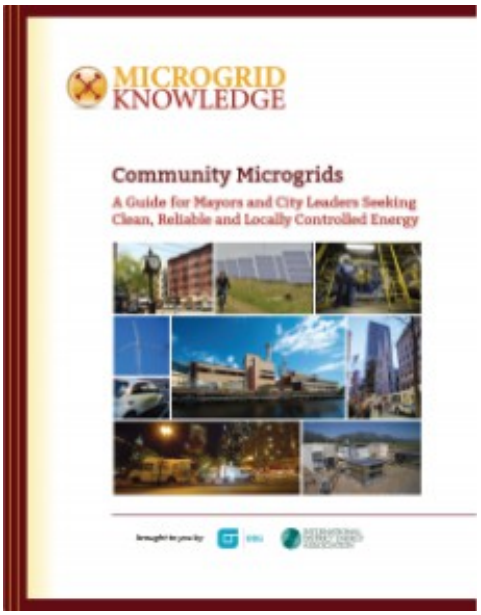
Storing elecricity in vehicles is cheaper than a dedicated battery storage facility that might cost $3 million dollars.

Columbia Treatment Plant: 2 MW of Power, no gas

In addition, The Columbia Wasterwater Treatment plant, about a mile south of the Hayden Island substation (map), produces 600 million cubic feet of biogas every year. It is used to run two 850 kilowatt generators with a total capacity of 1.7 megawatts. Those generators supply about 40 percent of the plant's electrical needs.

Columbia also has a 200 kW fuel cell running on anaerobic digester gas. Diesel generators offer high power and efficiency for micro-grids, but expensive generators are wasteful if not used...and require fuel.

Electric cars, on the other hand, need to be charged. They may generate (free) revenue for organizations like Manheim. The infrastructure is already built. Combine Manheim's 200kW of solar, and Columbia Wastewater's 850 Kilowatt generator running on biogas. That's enough to keep the island running indefinitely.



If the overhead transmission lines go down, the power from Manheim's arrays or Columbia's generators is not going anywhere. If those sustainable power sources were connected to the Kenton or Hayden Island substations, it could be used locally using Microgrids. Funding opportunities might be available. Everyone wins. Portland General Electric is interested in smartgrid projects for disaster recovery and PGE's Mark Osborn is a leader in microgrids.

Summary

The Utility of the Future is distributed. Micro-grids provide neighborhood distribution when the main grid goes down. Manheim's solar array could be grid-tied through electric vehicles for electrical resiliency. Normally connected to the main electric grid, microgrids can operate autonomously "islanding" from local energy sources.

About the author:
Sam Churchill is a Hayden Island resident and a Neighborhood Emergency Team member. He is NOT an electrical engineer. His views are stictly those of a consumer, who seeks electrical resiliency for Hayden Island.

(http://www.hayden-island.net/wp-content/uploads/2015/12/microgrid_proposal.pdf)
(http://www.hayden-island.net/utility-disruptions/)