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Electrification Considerations for EM's Efficiency Plan

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January 14, 2020

Energy Futures Group

Areas of Expertise

- Energy efficiency
- Demand Response
- Renewable energy
- Electrification
- Building Codes
- Integrated Resource Plans
- Non-Wires Alternatives

Clients

- Government
- Advocates
- Regulators
- Utilities



Projects in 36 states, 7 Canadian provinces, & overseas.

Presentation Summary

1. Electrification of buildings essential to addressing climate change.
2. EM's Efficiency Plan could advance electrification by promoting heat pumps while:
 - A. meeting savings targets at lower cost than Manitoba Hydro; and
 - B. better serving low income customers.
3. EM's Efficiency Plan does relatively little to support efficient heat pumps – and almost nothing to support new cold climate air source heat pumps.
4. EM's proposal for counting fuel-switching impacts towards savings goals could create perverse disincentives to pursue electrification (at least in the long run).



Importance of Building Electrification

Building Electrification Essential to Addressing Climate Crisis

- At least 80% CO₂ reduction required by 2050
 - Even greater reductions if only 1.5° C degrees warming is acceptable
- That requires decarbonizing buildings
 - Documented in numerous Canadian and other studies
- Only realistically option (at scale) is electrification
 - Documented in numerous Canadian and other studies
- We cannot wait to get started
 - It will take decades to transform building stock

“Electrify Just About Everything”

David Suzuki Foundation, “Zeroing in on Emissions: Canada’s Clean Power Pathways – A Review”, 2019



Relationship of Electrification to EM's Plan

Electrification Can be Supported By EE Programs in Several Ways *(not just through actual electrification investment/fuel-switching)*

1. Electrification as efficiency

- Heat pumps are more efficient than any gas, propane or oil furnace

2. Some electric efficiency measures enable future electrification

- Heat pump market likely limited today
- Heat pumps are more efficient than electric resistance heat
- Promoting heat pumps as electric efficiency helps develop market for future

3. Some gas efficiency measures support future electrification

- Building envelop improvements reduce future heat pump capacity needs/cost

Electrification and EM's Goals

- EM's savings goals are paramount
- But many program and measure combinations can meet savings goals
- Choosing *which* programs/measures requires consideration of other objectives
- Lots of other objectives – some related to electrification
 - Minimizing cost
 - Maintaining cost-effectiveness
 - Ensuring all Manitobans can participate
 - Serving low income customers
 - Supporting private sector delivery capacity
 - Greenhouse gas reductions
 - Promoting new technology (enable future savings)
 - Others
- Some objectives can pull in different directions – requires balancing

	type of dollars	Total Plan Spending		Acquisition Cost per kWh	
		MH 2015/16	EM 2020/2023 Annual Average	MH 2015/16	EM 2020/2023 Annual Average
Manitoba Hydro					
Total	Nominal	\$76.4		\$0.21	
Total	Real 2019	\$82.0		\$0.23	
EM Plan					
Total	Nominal		\$69.9		\$0.12
Total	Real 2019		\$67.2		\$0.12
EM Plan Relative to MH Actuals					
Total	Real 2019		-\$14.8		-\$0.11
Total	Real %		-18%		-49%

Room for Increased Spending on Heat Pumps

While still being lower cost than Manitoba Hydro's EE programs

(i.e. consistent with Minister of Crown Services' directive)

Many Manitobans Use Very Inefficient Electric Resistance Heat

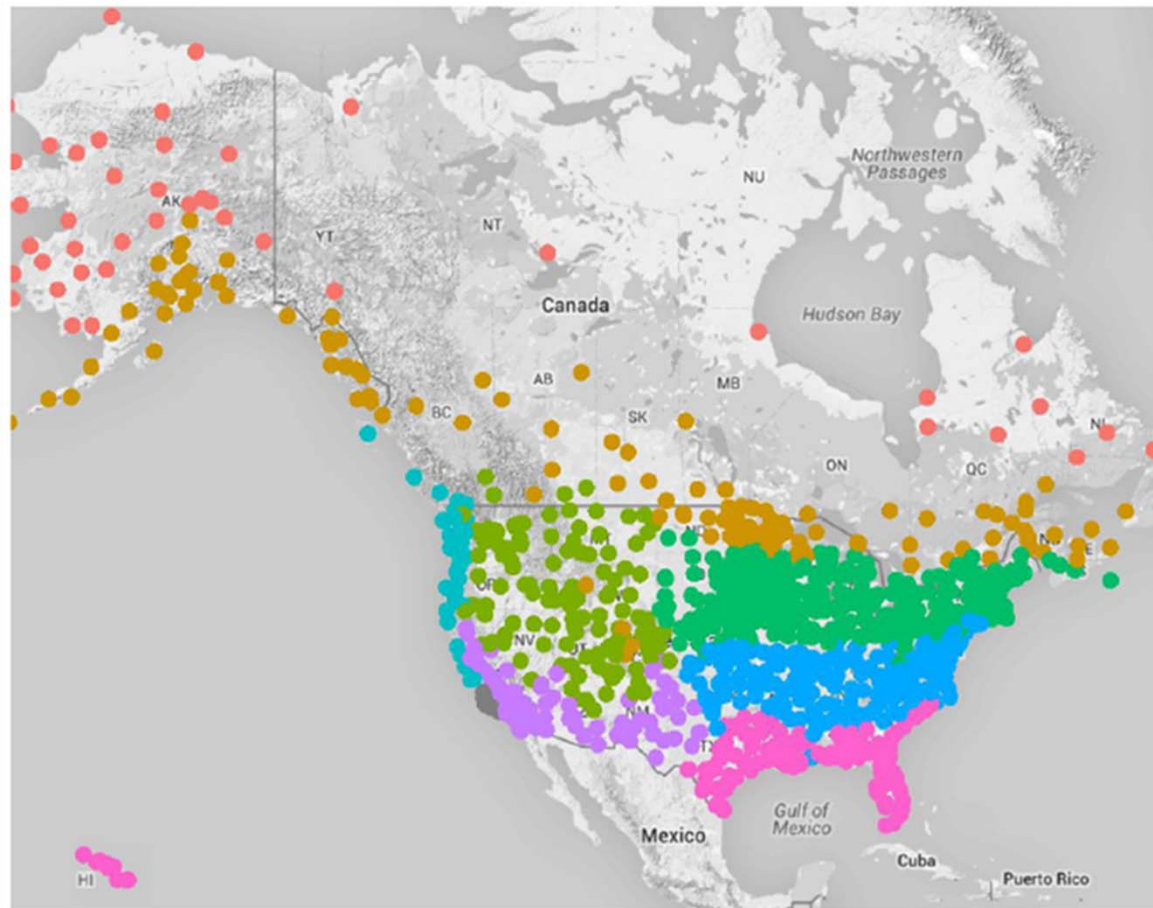
	By Income Level					Total
	<\$25k	\$25k to \$50k	\$50k to \$75k	\$75k to \$100k	>\$100k	
% of Customers w/Electric Heat	52%	47%	38%	37%	25%	40%
% of Elec Heat that is Inefficient	97%	96%	97%	92%	89%	94%

Notes:

1. Data from Manitoba Hydro 2017 Residential Energy Use Survey.
2. Low income households are more likely to use electric heat than higher income households.
3. Low income households are most likely to have inefficient electric resistance heat.
4. Almost all First Nation on Reserve homes (96%) use electric heat; almost all of them (95%) are inefficient electric resistance.

Heat Pumps as Electric Efficiency Measures in Manitoba

- Vast majority of Manitoban electric heat is inefficient electric resistance
- Ground Source Heat Pumps an option
 - Very efficient
 - But also costly
- Air Source Heat Pumps now also an option
 - Technology and understanding of performance still evolving
 - Manitoba market will require effort & focus to grow
 - Less expensive than GSHP for many homes
 - New technology enables performance down to $\sim -25^{\circ}\text{C}$
 - Likely requires back up heating (e.g. electric resistance)
 - But still very large potential savings – $\sim 50\%+$ – over entire winter



zone

- Subarctic
- Very-Cold
- Cold-Dry
- Cold-Humid
- Marine
- Mixed-Humid
- Hot-Dry
- Hot-Humid

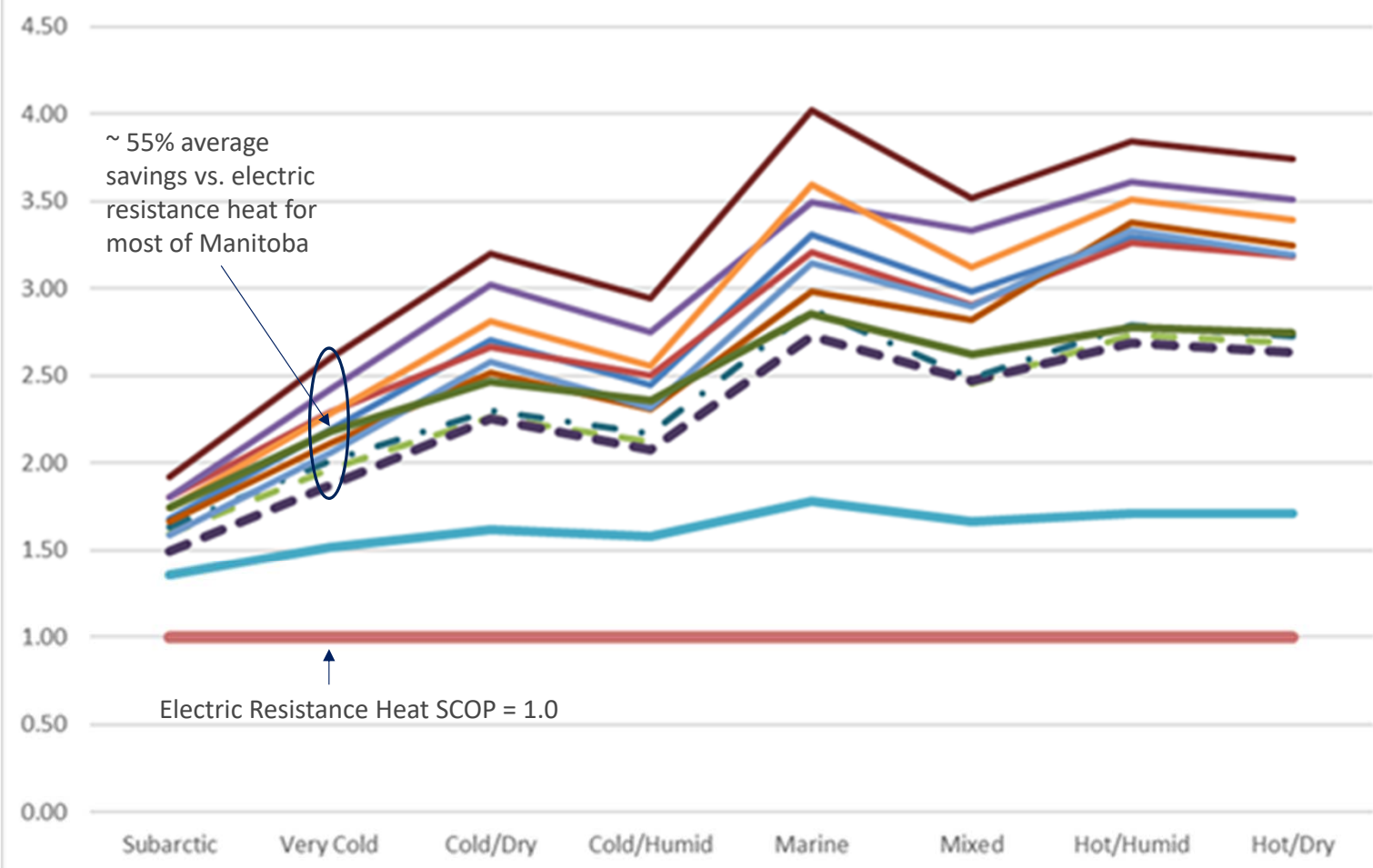
Climate Zones for Air Source Heat Pump Efficiency Tests

For Canadian Standards
Association Draft
Testing Procedures

Harley, Bruce and Christopher
Dymond, *EXP-07 Preliminary
Results*, presentation to the
Northwest Energy Efficiency
Alliance, November 26, 2019.



Heating SCOPs by climate zone for 13 Heating Tests



Air Source Heat Pump Heating Efficiency by Climate Zone

Per Recent Tests performed in accordance with draft Canadian Standards Association Testing Procedures

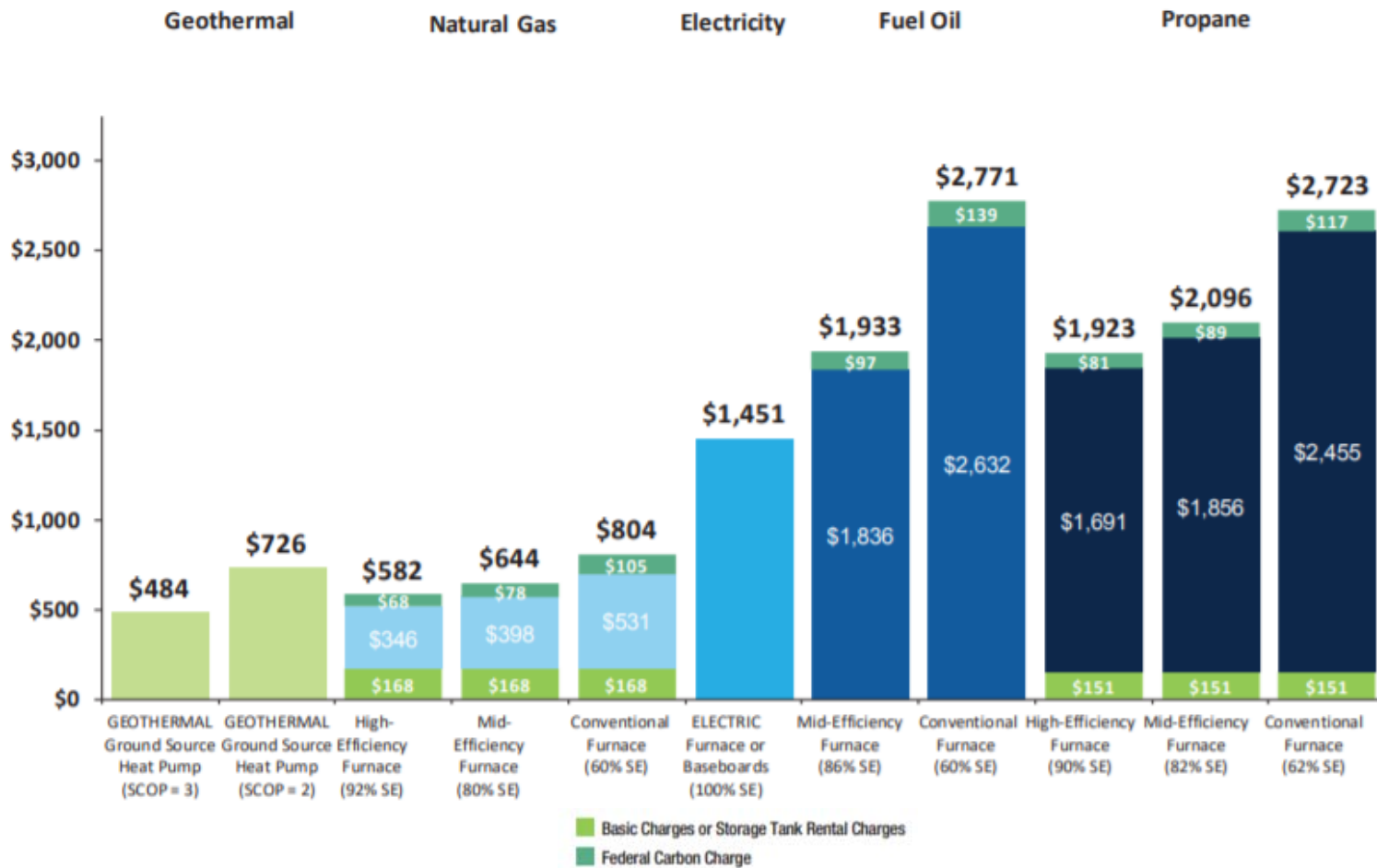
Harley, Bruce and Christopher Dymond, *EXP-07 Preliminary Results*, presentation to the Northwest Energy Efficiency Alliance, November 26, 2019.



EM's Plan Unlikely to Materially Advance Air Source Heat Pumps

EM's Plan and Direct Electrification

- Virtually no planned electrification
 - Only 9 ground source heat pumps – only 3 of them are Residential
- **Biggest missed opportunity: low income customers on oil/propane**
 - Over 3200 customers w/incomes <\$25k heat with oil or propane
 - EM allowed to support low income fuel-switching from oil or propane
 - 62%-82% savings possible
 - But not being offered



Annual Space Heating Costs by Fuel/System

For the Average Single Family Residence

From “Wondering about your energy options for space heating?” on Manitoba Hydro’s website.

EM's Plan and Heat Pumps as Residential Electric Efficiency

- Limited number of homes addressed with ground source heat pumps
 - 365 GSHPs over 3 years
 - 135 planned in Home Renovation Program
 - 230 homes treated through Community Geothermal Program
 - No heat pumps in low income program
- Virtually no air source heat pumps
 - Only 7 ASHPs over 3 years in Home Renovation Program
- Not clear whether ductless ASHPs were even considered
 - Most cold climate ASHPs are ductless
 - Likely best option for at least electric baseboard homes

EM's Rationale for "Limited" Promotion of Air Source Heat Pumps

- EM's stated concerns:
 - Manitoba network of installers/maintenance contractors "does not yet exist"
 - Long-term reliability in Manitoba's extreme climate not established
- EM says "limited program" needed to test technology, inform future plans
 - Assess reliability and product life
 - Quantify savings, peak impacts, economics, etc.
 - Engage contractors, gain insights into market barriers
 - Build foundation for continuous improvement

Response to EM's Concerns

- EM correct about some performance uncertainty for Manitoba climate
- But concern about inadequate contractor capacity is speculative
 - No documentation of number of qualified contractors
 - A manufacturer told me they have 30 certified residential contractors in Manitoba
 - Even if that wasn't the case, capacity will not grow if technology is not promoted
- EM's "limited program" will not enable ASHP assessment before next plan
 - Next plan to be filed Summer 2022
 - EM only plans to install 3 ASHPs by then
 - ...and maybe not even have a full winter of data for those
 - ...and not clear any of those would be ductless systems
- Other jurisdictions facing performance uncertainty launched programs
 - Only way to better understand market, get performance data, inform future programs



Accounting for Electrification Impacts in Savings Goals

EM's Approach to Counting Electrification Towards Savings Goals Can Create Perverse Incentives/Disincentives

- EM's proposal
 - 100% of reduction in fuel displaced counts towards gas savings goal
 - 100% of increased electricity consumption treated as “negative electric savings”, making that goal harder to achieve
- Potential for Perverse Incentives/Disincentives
 - If behind on electric goal and on target for gas goal, disincentive to pursue electrification, even if it was otherwise good to do
 - If ahead on electric goal and behind on gas goal, incentive to pursue electrification projects that otherwise may not make sense

Alternatives to Counting Electrification Impacts

1. Restate goals in fuel-neutral terms
 - Presume this would require statutory change
2. Establish separate efficiency and electrification goals
 - Presume this would require statutory change
3. Treat electrification projects in two “steps”: (A) electrification step of fuel-switch to standard electric efficiency; and (B) efficiency step of upgrade to higher electric efficiency
 - Little to no “savings” from electrification step; electric savings from efficiency step
 - Illinois and Vermont approach
4. Count site G_j reduction in kWh equivalents – electric savings only
 - California approach



Recommendations

Summary of My Recommendations

1. Consider long-term climate & electrification needs when designing and implementing programs.
2. Increase emphasis/rebates for ASHPs in Home Renovation Program
3. Offer heat pumps as an electric efficiency measure to Income Qualified Program.
4. Include heat pump incentives for oil/propane heat customers who qualify for Affordable Energy Fund.
5. Count impacts of electrification towards savings goals consistent with Illinois and Vermont approaches.
6. Consider providing feedback to legislators on either establishing savings goals in fuel-neutral way, or having separate savings and electrification goals.

What I Am Not Recommending for this EM Plan

1. That electrification become the primary goal of EM's work
 - I only suggest that it be treated as one of several secondary objectives
2. That EM invest in fuel-switching away from natural gas
 - I only suggest a focus on fuel-switching for low income customers with oil/propane heat
3. That EM make air source heat pumps the central focus of its plan
 - Even dedicating 3-5% of the portfolio budget to ASHPs – primarily as electric efficiency measure – would go a long way to advancing that market.
 - (see my response to EM I-6)
 - My proposal is conceptually consistent with Dunsky recommendation to Government



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