



Friday, 24 August 2018

**To: The Honourable George Heyman
Minister of Environment and Climate Change Strategy
Government of British Columbia**

To: Climate Solutions and Clean Growth Advisory Council (Climate Advisory Council)

To: Climate Leadership Team
clean.growth@gov.bc.ca

**Re: 'Intentions Paper: CLEAN, EFFICIENT BUILDINGS'
Commentary and recommendations in support of Geoexchange technology**

Dear Minister Heyman,
Dear Climate Advisory Council,
Dear Climate Leadership Team,

We at GeoExchange BC (British Columbia's geoswaps industry association, established in 2002) wish to congratulate you for embarking on this critical effort to prepare for our province's economic and environmental future. It will take great courage and vision to implement the policies and initiatives currently under consideration, and even more wisdom to continue adjusting your course in favour of the feedback you receive from experts in the economic, environmental and energy disciplines. The Intentions Paper entitled 'Clean, Efficient Buildings' is a positive and important signal of your intentions to take imminent much-needed action.

Notwithstanding, we must say that we were somewhat surprised and disheartened to read in the Intentions Paper entitled 'Clean, Efficient Buildings' that Government staff **have altogether omitted the term 'Geoswaps' from the document**, and have practically also omitted to include the term 'heat-pump' other than to extol the less efficient air-source version.

Geoswaps heat pump technology, inarguably the highest efficiency space and water heating standard known, is altogether proven, available, reliable, and it can serve to achieve a tremendous portion of the climate change goals that Government has set as it relates to clean and efficient buildings, addressing both energy efficiency and carbon emissions objectives more effectively than any other technology on the market.

Accordingly, we kindly invite you to give pause and contemplate the important analyses provided in the 'Discussion' section of our response, as well as to consider – in the spirit of progress and change – the tremendous gains achievable by implementing a maximum number of the 'Recommendations' also contained herein (28 recommendations in all).

(A) Advantages

Following are the **Advantages** of geoexchange technology, advantages which should carefully be included (where applicable) in the updated 'Clean Growth Strategy report' resulting from this public consultation. As explained here, geoexchange provides the most direct path to achieving the Government's stated energy and climate objectives regarding clean and efficient buildings.

- Advantage 1:** **Geoexchange is proven, reliable, and firmly in the mainstream.** Ground-source heat pumps used by geoexchange systems are nothing novel and have been in use since the 1940s, performing the very same function as the common refrigerator: they simply move heat from one space to another. For geoexchange, this means moving existing heat provided by the sun rather than burning fossil fuels to create new heat. There are many tens of thousands of geoexchange system installations currently operating in Canada, with B.C. most actively employing geoexchange technology in the institutional sector and in new buildings, and with recent and notably large installations serving as the energy plants for neighbourhood energy utilities and for large-scale commercial buildings.
- Advantage 2:** **Geoexchange provides the absolute highest efficiency of any space and water heating technology, bar none.** So efficient in fact, that instead of measuring 'percent efficiency', geoexchange heat pumps deliver 'coefficients of performance of 3 to 5', which is many multiples greater than the best natural gas-fired condensing boilers which only achieve performances of '0.98' at best. Although it is worth noting that sister-technology air-source heat pumps are definite improvements over natural gas-fired systems, air-source heat pumps provide *lower* efficiencies in colder environments than geoexchange ground-source heat pumps which still remain unchallenged as the best-in-class.
- Advantage 3:** **Geoexchange also provides hot water and space cooling, and is designed to be easily reversed from heating mode to cooling mode at the flick of a switch.** Although cooling systems currently play a smaller role in home energy use in B.C., they may become more important over time as summer peak temperatures increase due to global climate change. Geoexchange cooling currently delivers the highest efficiencies in commercial applications.
- Advantage 4:** **Geoexchange is the common sense tool-of-choice to enable B.C.'s fuel-switching transition and enables the clean electrification of heating.** Only the highest efficiency electricity-powered building energy systems such as geoexchange are able to leverage all of the most beneficial present day conditions. By carefully tapping B.C.'s renewable electricity grid (used sparingly), heat-pumps serve to simply transfer large amounts of idle and renewable heat energy left by the sun (in great supply), resulting in an end-to-end 'renewables-over-renewables' process which is unparalleled in the space heating industries. In concert with building envelope performance improvement initiatives underway, the clean electrification of space and water heating is altogether within our immediate reach.

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- Advantage 5:** **Geoexchange is a force multiplier and provides the smartest load growth for B.C. Hydro.** Due to the stellar success of demand-side management conservation programs, and due to additional electricity supply expected to come online in a few short years, B.C.'s clean power resources have never been more abundant. Although this confluence of circumstances further bolsters the urgent call to immediately begin our transition to the *electrification of heating*, simply proceeding with cheap-to-install but poorly performing baseboard electric installations does not serve the long-term best interests of British Columbians. Only geoexchange, with its unmatched coefficients of performance (up to five times better than baseboard electric), can provide the force multiplier required to squeeze every efficiency out of our valuable renewable electricity supply.
- Advantage 6:** **Geoexchange is 100% renewable and potentially makes the deepest cuts in building carbon emissions.** Geoexchange is altogether unique in that it is the only 100% renewable energy technology which has the potential to largely replace natural gas-fired systems as a viable building energy supply source in both the warmer and colder climates across B.C. Accordingly, geoexchange alone has the greatest potential for long-term carbon mitigation against natural gas-fired systems, far outpacing the emissions reductions of even the latest and most efficient natural gas-fired technology.
- Advantage 7:** **Growth of the geoexchange industry creates jobs in B.C. and supports economic diversity and competitive advantage for our province's workforce and businesses.** From the geological and water disciplines, to the environmental and engineering disciplines, to the building and climate sciences, our industry employs drillers, mechanical engineers, ground loop designers, coordinating professionals, construction workers, architects, researchers, consultants, developers, manufacturers, distributors, contractors, installers, trainers, and supports small and medium business owners. Geoexchange professionals and trades people represent a tremendously broad section of the workforce in B.C., and of the larger economy, delivering a very dynamic and valuable array of skills and capabilities.

(B) Discussion: A caution about unintended policy implications

Following is a brief discussion of the Intentions Paper ‘Clean, Efficient Buildings’, and of Government’s strategy to achieve its stated goals towards a Clean Growth Future. The analysis contained in this section is intended to provide context for the subsequent recommendations provided in this larger response, and provides a few cautions against using the single word ‘efficiency’ to describe different building envelope and energy system goals.

When using the same catch-all phrase to describe different challenges, and when omitting important qualifiers and descriptions to contextualise exactly what type of ‘efficiency’ a particular policy is attempting to address, there is always a risk of inadvertently convoluting the necessary actions to meeting those challenges. Following is a brief point-form summary of some considerations which Government may wish to review in favour of further clarifying the overall objectives of the Clean Growth Strategy.

Caution 1:

- **Defining what we mean:** If by describing a building’s ‘efficiency’ we are *solely* talking about the ‘building envelope performance’, then efficiency (by this definition) is a critically important point of focus and has the potential to achieve important gains in reducing carbon emissions.
- **A caution:** Setting this metric as the *sole* immediate goal as it relates to ‘efficiency’ is an incomplete policy however. By setting building efficiency goals only in terms of building envelope performance, we arrive at a situation whereby Government may proceed with the Energy Step Code as the standalone measure for achieving carbon reductions goals in the short and medium term, altogether omitting opportunities offered by the energy supply plant.
- **Unintended implications:** It has been shown that such a policy may actually serve to *increase* carbon emissions in certain cases, since the Energy Step Code does not address energy supply plant fuel emissions directly, as published by a group of researchers (Morrison Hershfield, E3 Eco Group, Integral Group) who have analysed the Code on behalf of BC Housing.

Caution 2:

- **Defining what we mean:** If by describing a building’s ‘efficiency’ we are *solely* talking about the ‘energy supply plant’ and we are extending this to include all technologies, then (by this definition) we have used a single undiscerning criteria to equalise fossil-fuel-polluting energy supply systems with those that use 100% renewable resources, thus stripping away the beneficial attributes of the more environmentally beneficial technology.
- **A caution:** Setting this low bar and using this broad metric – to ‘improve’ efficiencies – can work as a counter-productive measure, since it potentially serves to stretch out the path to achieving a clean growth future. By allowing small changes in carbon-emitting energy systems to qualify as ‘improvements’, the goal of ‘improved’ efficiency can be met constantly, and the overall objective of achieving meaningfully deep cuts in emissions and beginning the work on phasing out fossil fuels can be pushed out indefinitely.
- **Unintended implications:** Proceeding on this basis can have the unintended consequence of making renewable energy technology appear like overkill in a policy environment which is only

seeking minimal improvements over time, thus supporting the misnomer that renewable energy systems should remain 'on hold' to solve the problems of tomorrow rather than those of today.

Caution 3:

- **Defining what we mean:** If by describing a building's 'efficiency', we are *combining together* the two concepts of 'building envelope performance' *and* the 'energy supply plant' as the Government has done in its Intentions Paper, then the objective becomes even more confused.
- **A caution:** By using the single word 'efficient' – as in 'Clean, Efficient Buildings' (the title of the Intentions Paper; and the same language that carries throughout its pages) – it can appear to policymakers that action on one, or action on the other, is tantamount to the same. This concept is afforded further refuge in the Intentions Paper by not authoring separate sections examining the carbon emissions available via either method. Here, the Zero Emissions Building Plan is identified as a superior standard to the Energy Step Plan since it addresses *both* the energy plant *and* the building envelope themes in parallel and sets targets to achieving both by 2030, smartly linking what is being measured with what is being targeted: Climate Action!
- **Unintended implications:** Allowing the single word 'efficiency' to propagate as the fuzzily-defined unifying concept, the theme of fuel switching is altogether passed over, even as a point of discussion, since the mixing of the above two themes (the sufficiency of envelope improvements, plus the sufficiency of natural gas combustion improvements) together serve as the necessary impediments to developing a more progressive discussion about our low-carbon future.

(C) Barriers and Recommendations

Following are the **Barriers** to large-scale deployment of geoexchange technology (albeit manageable ones), along with some immediately actionable and sensible **Recommendations** to address those barriers. These important recommendations should carefully be included (where applicable) in the updated 'Clean Growth Strategy report' resulting from this public consultation.

Barrier 1: **The comparably high cost of electricity versus natural gas makes the current business case for geoexchange challenging for investors with short- to medium-term financial objectives.** When competing economically against natural gas-fired systems, the unmatched coefficients of performance offered by geoexchange technology allows for geoexchange to consume far less resources. One would therefore expect that the operating costs for geoexchange systems be many multiples lower than for its carbon-emitting competitor. However, due to the tremendous imbalance in the comparative rates set by the B.C. Utilities Commission on natural gas (rates are very low, due to oversupply) versus the cost of electricity (rates are much higher and still escalating), the energy efficiency advantages provided by geoexchange's superior technology are not being realised on a cost basis.

Recommendation 1A:

- (ref. Intentions Paper section '3.2 Financial Incentives'; Answer to online discussion-5 question: "What types of incentives...would best encourage investments...?")

Financial incentives must be provided which strongly favour fuel-switching away from natural gas-fired technologies and onto electrically-powered systems for space and water heating, and only for those technologies which best align with the Government's stated efficiency goals. Government funding must not be allocated to programs that encourage the retrofitting of marginally improved fossil-fuel-polluting technologies, since doing so would squander financial resources to the detriment of technologies which can truly make the biggest impact on climate change objectives. Incentive program budgets and corresponding dollar amounts per-installation must be staged/tiered in the order of their respective potential contributions towards meeting the dual goals of carbon emissions reductions and electrical efficiencies. Only incentives which support the electrification of heat are truly visionary, as this is the only path to immediately beginning to imbue the necessary next-generation energy infrastructure into our building stock.

Recommendation 1B:

- (ref. Intentions Paper section '3.2 Financial Incentives'; Answer to online discussion-5 question: "What types of incentives...would best encourage investments...?")

Geoexchange grants (for retrofit and new build) in the form of a significant-dollar-value 'cash back' program must be provided by Government in order to cover a large portion of heat pump and other associated mechanical equipment costs, easing the fuel-switching transition for middle income families. To assure the quality of installations, geoexchange systems receiving equipment grants must have their service providers qualified and their installations certified by/or through GeoExchange BC.

Such a capital injection into our province's collective energy infrastructure will help with important capacity-building and will spur local capabilities development and market growth within the local ground-source heat pump distribution supply chain (for additional incentives also see Recommendation 2A).

Recommendation 1C:

- (ref. Intentions Paper section '3.2 Financial Incentives'; Answer to online discussion-5 question: "...your experience accessing home renovation incentives?")

Government must design incentives with longevity and with performance of systems in mind (and not just uptake) so that the full potential of the renewables industry can be brought to bear on the Government's stated climate action goals. When evaluating the last available incentives for geoechange systems ('*Natural Resources Canada ecoEnergy Retrofit Homes*', Apr 2007 to Mar 2012), the market-disrupting spike in support at the time – followed by federal government neglect for a decade – ultimately served to weaken the geoechange industry from a capacity-building perspective (e.g. viability recognition, skills training, supply chain efficiency, performance standards development, etc.). New geoechange incentives must be designed in consultation with GeoExchange BC to ensure that they are aligned with the Government's objectives and that their execution will achieve the Government's desired results in the medium and long term.

Recommendation 1D:

The B.C. carbon tax must be increased even further to continue outpacing the federal tax rate. This must be done in order to maintain a competitive advantage in the clean economy over other provinces in areas such as skills training, innovation, equipment manufacturing and supply chain capacity. By allowing the B.C. carbon tax to become aligned with the federal tax, B.C. will be losing the head start required to maintain economic and trade advantages over competing laggard provinces who will themselves be generating a demand for clean solutions (which B.C. will have already tackled first). Allowing carbon tax parity will mean that B.C. will lose the important opportunity to export knowhow and other value-added products and services during the country's 30-year drive to achieving clean prosperity.

Recommendation 1E:

The higher Step-2 electricity rate must *not* be charged to heat pump system owners such as those employing geoechange technology. Alternatively, the Step-2 must be altogether abolished for all ratepayers. Government must aggressively intervene to disallow the B.C. Utilities Commission from continuing to structure electricity rates which dis-incentivise consumers from employing the most efficient and cleanest energy systems available.

Recommendation 1F:

Lower electricity rates for all ratepayers in B.C. must be quickly prioritised, most likely requiring re-capitalisation of B.C. Hydro. In keeping with climate change goals, the

cost to ratepayers of B.C.'s near-100% renewable electricity must be lowered if clean electricity is to meaningfully compete with the natural gas suppliers (who are bragging about their lowest commodity rates in over a decade). A full re-capitalisation of B.C. Hydro is the surest way to achieve this goal, which itself must be done in compliance with specific target financial metrics to be designed by the B.C. Utilities Commission, thus creating a deliberately reverse-engineered path to the lowering of electricity rates.

Barrier 2: **The higher installation costs of geoechange systems coupled with only gradual project returns can make it challenging to secure financing, putting geoechange out of reach for middle income families.** The higher up-front costs associated with installing a ground loop can cause financing to become prohibitive, creating collateral and valuation challenges for construction lenders as well as amortisation periods which fall outside of their usual lending parameters.

Recommendation 2A:

- (ref. Intentions Paper section '3.2 Financial Incentives'; Answer to online discussion-5 question: "What types of...financing options would best encourage investments...?")
- (ref. Intentions Paper section '(3.3.1) New Building Code commitments'; Answer to online discussion-6 question: "...best opportunities...to support housing affordability and help offset the upfront costs ?")

Geoechange subsidies (for retrofit and new build) in the form of a Government-backed financing scheme must be provided for the remaining balance of costs (after grants have been applied) for installed geoechange systems, therefore flattening out up-front costs for homeowners and project proponents. Amounts financed must include costs associated to drilling, ground loop installation, engineering, design and commissioning. This financial stimulus for our province's energy practitioners will help with important capacity-building and will spur local skills development and market growth within the local geoechange workforce. [Details: Administration of the financing scheme must be performed by the municipality in the form of a 'Local Improvement Charge (LIC)' and must be structured to be: long-term, fixed-rate, low-interest, collateralised to the building through a lien, and charged on the property tax bill bi-annually. Those municipalities wishing to participate in the pre-2030 municipal budget transfer scheme (see Recommendation 5C) must first offer LICs as part of their qualification requirements. Interest rates made available to system owners at term renewal must be pegged to the measured performance of their system, and geoechange systems receiving financing under this scheme must have their continued performance verified and assured by/or through GeoExchange BC.]

Barrier 3: **The absence of standardised energy use and utility cost data from real estate asset valuations and tenancy decisions makes the financial value of geoechange systems appear intangible.** The energy quality and quantity asymmetry of information which continues to exist between building users, buyers, sellers, builders and occupants hinders the transparency of value-based decisions between stakeholders, and serves to externalise the cost of pollution, hence further propagating it.

Recommendation 3A:

- (ref. Intentions Paper section '3.1 Energy Labelling Requirements'; Answer to online discussion-4 question: "How valuable would energy labelling be...?")

Energy labelling must be prioritised; a single standard which is MLS-friendly and also BOMA-compatible must be the goal. This is a quick win and is amongst the measures with the fewest barriers to implementation. Energy labelling is critical to motivating financially sound and environmentally sustainable decisions, and its importance cannot be overstated. Rolling out this initiative swiftly will enable the market itself to create a desirable early multiplier effect in support of the climate change initiatives that are underway.

Recommendation 3B:

- (ref. Intentions Paper section '3.1 Energy Labelling Requirements'; Answer to online discussion-4 question: "How should that information best be presented...?")

Carbon emissions, annual energy cost, and energy source type data must be published publicly for every mailing address in B.C., based on standard use (not actual use). Only by publishing this data can people then project what their operating expenses will be as the cost of emitting carbon increases (therefore allowing the market to predictably disfavour carbon-emitting technologies). This must be done on a pro-rated basis for apartments in residential buildings and for offices in commercial buildings. Specifically, the labelling must include:

- an 'annual carbon emissions' value (Tonnes); [essential]
- an 'annual energy system operating cost' value (Dollars); [essential]
- an 'energy from carbon sources' value (Percent); [essential]
- an 'energy efficiency' value (Percent). [optional]

Additional note: Scotland's Energy Performance Certificates (referenced in the Intentions Paper) do *not* form a good basis for B.C.'s proposed energy labelling system since their objective is merely to rate a building's efficiency while using carbon-emitting sources, while B.C.'s climate goals require a much bolder transition to renewable energy. Providing a single letter rating that represents both the energy and the environmental characteristics (like the Scottish system) would demonstrate a fundamental misunderstanding of our two-part challenge.

Recommendation 3C:

- (ref. Intentions Paper section '3.1 Energy Labelling Requirements'; Answer to online discussion-4 question: "...separate approaches for homes and large buildings?")

Large and single family buildings must all be energy-labelled using the same universal units and criteria. Emissions are emissions, and reducing them is the goal irrespective of their provenance. Using prorating per-square-foot for offices and apartments is appropriate, and allows for crucially valuable comparisons between (say) single family homes and multi-unit residential buildings. Only by imposing respective 'ownership' of the carbon emissions attributed to common areas in commercial spaces and residential buildings, will stratas and commercial property managers be forced (by their occupants) to take responsibility for those shares of the energy and carbon. Single family home

owners will also be under pressure to ‘compete’ with the economies of scale enjoyed by those occupying denser housing forms.

Barrier 4: **The Government’s longstanding siloed approach to the energy and environmental files has severely disadvantaged the geoexchange industry (i.e. treating efficiency and climate considerations in a disjointed fashion).** While the former Climate Action Secretariat under the purview of the Ministry of Environment sought a reduction in carbon emissions (which are quickly achievable using geoexchange), B.C. Hydro under the purview of the Ministry of Energy and Mines sought an overall reduction in electricity consumption (which necessarily *excludes* fuel-switching to geoexchange from natural gas-fired systems). This working at cross purposes within Government has resulted in an overall policy environment which has been very inhospitable to the geoexchange industry. One of many examples highlighting this unintentional policy failure becomes apparent when observing that the two-tiered electricity rate structure regulated by the B.C. Utilities Commission actually serves to *penalise* geoexchange ratepayers who have selected the highest efficiency zero-emissions energy system for their homes.

Recommendation 4A:

A fundamental restructuring must take place within B.C. Government in order to bring the Ministry of Energy, Mines & Petroleum Resources under, and answering to, the Ministry of Environment & Climate Change Strategy. Alternatively, both must be brought under a newly empowered Climate Action Secretariat. With a strong global consensus firmly in agreement about the direct causality between the delivery of resources and the corresponding dramatic effects on our living environments, continuing to allow these two Ministries to maintain equal sway over environmentally sensitive policy matters will not produce expediency on climate change. Priorities must be made clear from the top, and accordingly, ‘Energy’ must learn to begin operating within the reasonable confines provided by ‘Environment’. Proceeding with such a restructuring would be revolutionary.

Recommendation 4B:

The Government must work towards the ‘electrification of heating’. Once mandated to electrify all building heating applications in B.C., the unintended impact of current-day climate-affecting energy policy would be mitigated from the start, resulting in a clearer and more self-correcting system. Under this scenario, energy policymakers would solely be seeking efficiencies in clean electricity terms and no longer in terms of marginally improved fossil-fuel-polluting technologies.

Recommendation 4C:

The B.C. Carbon Tax must no longer be ‘revenue neutral’ and must immediately be amended (along with the province’s budget and fiscal plan) to allocate all carbon tax revenues solely to budgets funding initiatives which will demonstrably reduce B.C.’s carbon emissions. This will create the necessary positive feedback loop required to

jump-start the many initiatives required to achieve the Government's Clean Growth Strategy goals.

Barrier 5: **Well-meaning but non-technical policymakers are 'measuring the wrong thing' by supporting efficiency frameworks which can serve to *increase* greenhouse gas emissions.** The technical nature of dual energy and environmental objectives has resulted in the adoption of the B.C. Energy Step Code by two B.C. municipalities based on its 'efficiency' face value, without recognising the complete absence of greenhouse gas intensity performance metrics. Researchers analysing the Energy Step Code (*'Metrics Research Full Report'*, ESC, September 2017) identify fundamental policy failures within the Code itself, warning of "the unintended outcome whereby even higher steps of the Step Code can result in GHG increases. Findings indicate that buildings can achieve Steps 3, 4, and 5 while increasing GHG emissions, rather than decreasing them and contributing to the Province's GHG reduction targets, whereby the increase in GHGs is attributable to a fuel-switch from electricity to natural gas for space heating and/or domestic hot water." As seen here, methods which use 'energy efficiency' as a proxy for 'emissions reductions' lend credibility to the contrary notion that meagre improvements in fossil-fuel energy systems are bringing us closer to combating climate change. Other common errors like confusing the thermal energy demand 'efficiencies' of building envelopes with the supply-side energy delivery systems 'efficiencies' can confound public discussions about optimal goals and objectives. Using the current version of the Energy Step Code as the sole standard will allow for the continued installation (with meagre changes proposed for 2022 and 2027) of carbon-emitting energy supply systems that will cripple our building inventory for another generation.

Recommendation 5A:

- (ref. Intentions Paper section '3.3.1 New Building Code commitments')

The Energy Step Code must be replaced by a more robust standard, since it is insufficient as a tool to achieve the Government's goals. Alternatively, the Code must be largely amended such that it compels building designs which achieve carbon emissions reductions by using greenhouse gas intensity as a key performance metric, rather than continuing to only promote building envelope 'efficiencies'. In its current form, the Energy Step Code "charts a course to a future in which all new construction across the province is *ready* for net-zero energy by 2032." Note that 'net-zero *ready*' is altogether different from 'net-zero *achieved*'. Accordingly, the focus of the Energy Step Code is the building envelope only, leaving the energy supply system as a barely perceptible future goal to be addressed sometime after 2032. This stands in stark contrast to the immediate gains which need to be made and represents a sluggish sequential approach, serving to ensure minimal short-term emissions reductions while at the same time plaguing our new buildings stock with more fossil-fuel-polluting energy supply systems for the next 15 years.

Recommendation 5B:

- (ref. Intentions Paper section '3.3.3 Regulating GHG emissions intensity')

Government must unambiguously put into law a 'Zero Emissions' building standard which ramps up to full implementation by 2030/2032 (instead of the Energy Step Code), a common-sense approach which directly targets what Government is actually trying to achieve. This will immediately send a strong message to all B.C. municipalities to avoid *only* using building envelope performance standards as the sole measure to achieving overall performance. Only by directly regulating the necessary deep cuts in carbon emissions through policies like the City of Vancouver's Zero Emissions Building Plan (which puts a regulatory cap on greenhouse gas intensity), can outcomes be most predictable and goals be met most effectively.

Recommendation 5C:

- (ref. Intentions Paper section '3.3.3 Regulating GHG emissions intensity'; Answer to online discussion-6 question: "How can the provincial government help support...local governments as they transition...?")

Government must pay municipalities to voluntarily adopt the Zero Emissions building standard into law before 2030/2032 and maintain its adoption, insofar as these bylaws serve to reduce carbon emissions. Theoretically, the City of Vancouver should receive the largest municipal budget transfers from the Government if their Zero Emissions Plan starts reducing the most carbon first, with transfer amounts to be designed based on tonnes-of-carbon-abated (using accepted 'additionality' principles to determine annual payments). In this way, the Government will be creating what can analogously be thought of as a form of carbon offset market for municipalities (non-trade-able), overcoming the decade-long bulk aggregation challenge faced when trying to account for large numbers of discrete systems. Who better than publicly scrutinised municipal governments which have the technical capabilities as well as the administrative capacities to manage such a program? Funding for this municipal incentive program must be drawn from income generated by the provincial carbon tax, creating a positive economic feedback loop from carbon polluters to carbon abaters.

Barrier 6:

The bar is set unnecessarily low for Equipment Standards in the B.C. Building Code due to the incumbent natural gas lobby (representing the fossil fuel industries) which dominates our public discourse and has set the agenda. Longstanding colloquial talk of 'improved efficiencies' has served to stall the biggest gains in energy and climate change policy by providing the necessary social and political cover for the concept that the road is terribly long, and that small percentage improvements in fossil-fuel-polluting technologies are sufficient for now, which has resulted in delaying what is otherwise a tremendous appetite for change in B.C. Delaying improvements to the B.C. Energy Efficiency Standards Regulation and pushing heat pump technology standards regulation out until 2035 (as proposed in the Intentions Paper) is a form of inaction, since doing so effectively throws out the best tool in our technology toolbox. The smartest economies in the world have altogether leap-frogged intermediate (a.k.a. 'bridge') technologies, and as a result have wasted little effort and squandered little momentum on gradual improvements, enjoying incomparably tremendous gains to their great benefit (see China's strategic deployment of solar panels).

Recommendation 6A:

Government must launch an aggressive publicity campaign to re-educate the public that reducing carbon emissions is the new goal. Yesterday's blanket term 'efficiency' (which can mean many things) is not a useful goal anymore. Imprudently allowing the goal to remain 'high-efficiency heating systems' will inevitably continue to include energy systems that employ slight improvements or variations of carbon-emitting fuel sources, serving to undermine the long-term objectives of the Government's climate change strategy. This necessary step-change in mentality (carbon reductions being the new goal) is the only path to breaking away from natural gas-fired polluting technology, and making the much-desirable 'electrification of heating' achievable in the medium-term.

Recommendation 6B:

- (ref. Intentions Paper section '3.3.2 Increased energy efficiency standards for equipment')

B.C. Building Code Equipment Standards Regulation requiring coefficients of performance over '1' must be introduced within any new Zero Emissions building standard to ensure continued compliance with efficiency objectives once electricity pricing has been normalised. Such a regulation is recommended simply as a safeguard to ensure that cheap-to-build and inefficient-to-operate baseboard electric heating systems and boilers are not the unintended consequence once Zero Emissions objectives have been met by developers and builders. Note that an *earlier* adoption (circa 2023/2025) of heat pump equipment standards is of paramount importance in the event that Zero Emissions building standards are *not* adopted by Government, to mitigate for the emissions problems which are inherent in the Energy Step Code (see Recommendation 5A).

Barrier 7:

Geoexchange as a concept has not been able to firmly establish itself in the public consciousness as a technology that is commonplace and that is well understood, partly owing to the fact that it performs quietly and resides out of sight. In comparison, shiny solar panel installations which are mounted on the outside of buildings have the benefit (beyond their obvious utility) of providing social status and much recognition to home and system owners, and also the benefit of being year-round visual demonstration projects for all passers-by. This large and easily discernible visual presence serves to provide constant public reminders of social responsibility themes and of the omnipresence and competency of solar panel technology. Remarkably, solar panels have enjoyed widespread brand recognition, despite the general public's inability to explain the technical functionality of the elements that make it work (such as the role of inverters or the reactions within a photovoltaic cell), which itself does not appear to be a barrier to adoption. **The term 'geoexchange' is also often confused for 'geothermal', or is not recognised at all, resulting in an adverse social construct whereby people disengage with geoexchange as a concept, for fear of appearing uninformed or technically incompetent.** The term 'geoexchange' has for years been used interchangeably with the term 'geothermal' in B.C., admittedly also by some industry practitioners, resulting in a widespread lack of public engagement with a

technology which does not even present itself with a consistent handle. The absence of a true geothermal (electric-power-producing) industry in B.C. has further allowed the frequent lazy verbal equivalency of these altogether non-equivalent terminologies. GeoExchange BC is attempting to eradicate the use of the term 'geothermal' in B.C. (for low temperature systems), and also eradicate the use of the old term 'geothermal heat pump' by strongly promoting the correct use of the appropriate optional terms 'geoexchange heat pump' or 'ground-source heat pump' in its place.

Recommendation 7A:

Geoexchange must feature predominantly as one of the promising technologies which could serve to meet our province's building energy needs in the 'Clean Growth Strategy report' resulting from this public consultation. This must also be the case in all future Government publications which discuss the range of technologies to be used in achieving the Government's climate change goals. Although Government staff authoring the Intentions Paper omitted to provide geoexchange with due credit as a prominent technology with big solutions to offer, the resulting 'Clean Growth Strategy report' must surely rectify this omission. Even the authors of the Energy Step Code ('Design Guide', ESC, March 2018) which was featured prominently in the Intentions Paper themselves have said, "Of all mechanical space-conditioning systems, heat pumps generally do the most effective job of lowering total energy use intensity", and have gone on to even list "geoexchange" as the first such technology.

Recommendation 7B:

Government must commit to *only* using the term 'geoexchange' (and *not* 'geothermal') in all of its communications and literature about low-grade heat / low temperature earth energy systems, as well as the term 'ground-source heat pump'. Furthermore, Government must *not* classify geoexchange as a *form* of geothermal energy, as this simply feeds the confusion amongst ordinary consumers, preferably referring to each of the two technologies as different types of earth-energy systems using different qualities of earth-energy resources.(i.e. one is not a subset of the other).

Recommendation 7C:

Government must embark on a publicity campaign geared toward raising awareness about renewable energy installations throughout our province. Additional physical signage (large Government-certified monikers) out front of buildings which display the employed renewable energy fuel source(s) are essential and will motivate the fastest voluntary transitions to renewable sources. This initiative must be coordinated in consultation with GeoExchange BC and must be a component of the larger Energy Labelling initiative (see Recommendations 3A, 3B, 3C).

Recommendation 7D:

Government must provide funding for the development of a new centralised provincial geoexchange systems registry. This, as a means of tracking geoexchange systems' installed capacity and performance, and as means of quantifying the real

contributions that geoexchange makes to our province's energy infrastructure. This database must be administered with support from GeoExchange BC, and must be rolled out in concert with the moniker program (see Recommendation 7C). This initiative must also be coordinated as a component of the larger geoexchange grant program (see Recommendations 1A, 1B, 1C).

Barrier 8: **The contraction currently being experienced in the geoexchange industry due to economic factors, including unfavourable energy rate conditions and other barriers listed in this document, has not permitted the continued and necessary investments to occur in areas of research and development, training of skilled professionals and trades people, communications of the latest standards of practice, engagement with government and other stakeholders, and general capacity-building within the industry.** As a result, there is significant work required to properly prepare the geoexchange industry so that it is ready to answer when called, as Government prepares the policy environment for a transition to a clean energy economy in B.C. Following are the remaining initiatives requiring support from the Government for an altogether successful large-scale deployment of geoexchange systems in our province under the new Clean Growth Strategy.

Recommendation 8A:

- (ref. Intentions Paper section '3.5 Training and Certification'; Answer to online discussion-8 question: "What gaps...in current training...to support...shifting to high performance buildings?")

Government must provide funding to perform necessary updates to the standards of practice contained in the GeoExchange BC Professional Guidelines, a unique resource in Canada and in North America. As a package, the GeoExchange BC Professional Guidelines set comprises over 250 pages of detailed, purpose-written literature and documentation, collectively written by 20+ active industry experts with review and editing by over 40 expert industry panellists.

Recommendation 8B:

- (ref. Intentions Paper section '3.4 Low Carbon Buildings Innovation Program'; Answer to online discussion-7 question: "...best way to engage research institutions and professionals on...low carbon building innovation?")

Government must provide funding for a Geoexchange Performance Survey of installed systems in B.C., representing very important research and development work that has not been completed due to financial constraints. This will allow for the collection and analysis of much-needed baseline data to inform likely innovations awaiting us, such as local adaptations of optimal geoexchange configurations which are unique to B.C.'s climate and ground conditions. This research must be project-managed by GeoExchange BC, and must be rolled out in concert with the geoexchange systems registry (see Recommendation 7D).

Recommendation 8C:

- (ref. Intentions Paper section '3.5 Training and Certification'; Answer to online discussion-8 question: "What gaps...in current training...to support...shifting to high performance buildings?")

Government must provide funding to develop necessary local adaptations to standard accredited geoexchange training programs, in consultation with GeoExchange BC. Due to the uniqueness of variations in ground conditions and climate conditions across geographies in British Columbia, the amendment of standard training materials to include the addition of special local considerations and adaptations is severely required.

Recommendation 8D:

- (ref. Intentions Paper section '3.5 Training and Certification'; Answer to online discussion-8 question: "What gaps...in current training...to support...shifting to high performance buildings?")

Government must provide funding to allow the continued vetting by GeoExchange BC of geoexchange drillers through the program administered by the Industry Training Authority under the instructions of the Minister of Environment and Climate Change Strategy. Resources expended by GeoExchange BC to create this new certification path for geoexchange drillers in support of the Ministry (under the new Water Sustainability Act) have caused an undue financial burden on GeoExchange BC and its members.

Recommendation 8E:

- (ref. Intentions Paper section '3.5 Training and Certification'; Answer to online discussion-8 question: "What gaps...in current training...to support...shifting to high performance buildings?")

Government must provide funding to perform necessary updates to the EGBC (formerly APEGBC) Professional Practice Guidelines 'Mechanical Engineering Services for Building Projects', in consultation with GeoExchange BC. Authored *in the year 1993*, the Mechanical Engineering Services for Building Projects and corresponding Letters of Assurance which are referenced in the B.C. Building Code effectively serve as the legal basis for engineers and geoscientists to perform their duties as practicing professionals in our province. These sorely need to be amended due to the obvious changes that have taken place in building energy systems over the last 25 years.

Recommendation 8F:

- (ref. Intentions Paper section '3.5 Training and Certification'; Answer to online discussion-8 question: "What gaps...in current training...to support...shifting to high performance buildings?")

Government must provide training program subsidies to allow the geoexchange industry to engage in significant workforce proficiency enhancements. Designed in consultation with GeoExchange BC, this must include skills readiness training, standards review seminars, certification refresher courses, and industry best practice workshops for the broad array of disciplines which are represented in the geoexchange industry.

Thank you for this opportunity to comment. Please feel free to contact our team for further clarifications or for support on any of these important recommendations that have been made here.

Our future depends on your bold and progressive leadership,
Sincerely,

GeoExchange BC



David Cookson, B.Eng., MBA
Projects Director



Jeff Quibell, P.Eng.
Board Chair

