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TransLink – Procurement Department
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Attn: Claude Hewitt

Re: Transport 2045 Foundation Research Professional Services, Reference No. Q11-031

Please find attached a proposal for consulting services for the Transport 2045 planning process. This proposal is for a single proponent, Bryn Davidson, and focuses on the following work areas:

2	Modeling
3	Strategic Framework
4	Setting the Context
5	Land Use
10	Goods Movement
15	Behaviour Change

Bryn's proposed consulting services draw upon extensive work, over the past decade, in the emerging field of *energy-transition planning*; a new multi-disciplinary field studying the potential combined impacts of both global climate change and global oil depletion (peak oil). Central to this work is the practice of *scenario planning*, which uses both narrative and numerical scenarios to expand the context for decision-making at the city, regional, and national level.

Bryn's work brings together the fields of architecture, urban planning, and economics – but has particular relevance to the realm of transportation and land-use planning as it posits a world where declining supplies of affordable fuel and increasing carbon constraints redefine the role of transportation in the future city.

Together, the combined forces of climate change and peak oil may create a forced 'energy-transition' with profound impacts on personal transportation, goods movement, regional economic growth, and the resiliency of our key social systems such as food, health and housing.

There are a multitude of uncertainties which bound discussions of future energy supplies, but the 'business as usual' model of long-term stable growth is becoming increasingly implausible in the face of emerging research on both climate change and global oil depletion. Likewise, transportation and infrastructure models which tacitly accept steady growth as *the* de-facto future are increasingly likely to be erroneous or misleading.

Given the scale of the uncertainty, and the scale of potential impacts, it is critical – then - that all long-term infrastructure and transportation decisions be more broadly contextualized. The 'business as usual' assumptions and models need to be complemented by models and narratives of a future impacted by peak oil and climate change.

The following work areas are proposed as a means to increase TransLink's organizational energy literacy with regard to oil depletion and climate change and to provide a broader, scenario-based, approach to infrastructure and land use planning.

Work Streams: Proposed Areas of Study

Proposed work to be undertaken by Bryn Davidson and/or additional TransLink staff or consultants as required.

2 Modeling

1. Develop a regional fuel supply model 2011-2045, based on assumptions for underlying global oil depletion rates, rates of declining 'net exports' from oil producing nations, rates of economic and technological substitution, and rates of demand-side adaptation.
2. Develop alternative transportation demand scenarios based not on extrapolations of past trends, but upon scenarios for available transportation energy. Variables to be included in the narrative and numerical demand scenarios include assumptions about broader migration of climate refugees and the economic impacts of shortages, recessions and/or transient fuel rationing.
3. Develop a fuel-cost sensitivity analysis for TransLink's funding mechanisms such as the gas tax.
4. Develop 'reference shocks' for key indicators like fuel price or unemployment. Reference shocks should indicate a magnitude of impact and duration.

These reference shocks can be used to stress-test the resiliency of TransLink's regional assets and organizations. A comparable analogy would be the '100 year' flood or earthquake that is used as a benchmark for testing a region's emergency-response system.

3 Strategic Framework

1. Define "Resiliency" in the context of urban and regional planning as having two components:
 - a. *Resilient Infrastructure Investments* (i.e. investments that retain their value across multiple futures – including a future defined by peak oil and climate change impacts)
 - b. *Resilient Systems* – Systems that remain functional, and fair, through transient energy, economic, and climate shocks.
2. Create a methodology by which 'resiliency' can be considered as a key indicator in all of TransLink's decision making (including infrastructure plans, organizational structure and revenue planning).
3. Create communications tools through which TransLink's work on resiliency and transition scenarios can be disseminated to other organizations (Metro, local munis, the Province, and beyond).

4 Setting the Context

1. Develop a background study / document and or web-page on global oil depletion including potential timelines, impacts, and uncertainties. Make explicit the various depletion-related assumptions that go into developing the regional fuel supply model.
2. Develop a background study on likely energy transition shocks, including; price spikes, recession, rationing and transient shortages. Provide case studies from historical precedents.
3. Develop a background study on likely climate shocks that would influence transportation and land use planning during the reference time period to 2045. Examples include sea level rise, immigration / migration, and changes in carbon pricing or restrictions.
4. Set up an outline for internal and public forums with global experts on the combined impacts of peak oil and climate change.
5. Create a background paper and literature review on informal, ad-hoc, or non-technological responses to transition shocks (including fuel price spikes, recession, fuel rationing or long term fuel shortages) that have been employed by individuals and communities.

5 Land Use

1. Develop an overview of the potential energy and climate impacts that might redefine current transportation and land-use assumption in the reference period to 2045 (i.e. fuel costs/shortage, increased in-migration, or increases in the cost of heating and fueling different building types).
2. Create a resiliency indicator (similar to the petroleum price vulnerability 'viper' analysis used in Australia) that illustrates the vulnerability/resiliency of different neighbourhoods in the region based on their land use patterns, access to transit options, and income levels.

10 Goods Movement

1. Create a background paper and literature review on the 'energy productivity' (i.e. kg/\$ of energy, or \$ of goods per \$ of energy) of various goods-movement transportation modes, including current, historical, and proposed methods of goods movement.
2. Based on the regional fuel supply model developed earlier, create alternative demand scenarios for different modes of transportation using assumptions about rates of technology switching within the goods movement sector.
3. Illustrate case studies of alternative forms of goods movement relative to the de-facto North American model (using just-in-time freight trucking for consumer goods, and rail for bulk commodities).
4. Create a resiliency indicator for various types of supply chains.
5. Create a resiliency indicator for the regional economy (as a benchmark against other competing regional economies). Indicator to include goods-movement resiliency, and the resiliency of both employee and consumer mobility.

15 Behaviour Change

1. Create a background paper and literature review on rates of behavioural change in response to either policy interventions (i.e. California's approach to electricity demand side management) or via energy and economic shocks (i.e. reductions in vehicle travel due to gas price spikes).
2. Model behavioural responses, and ad-hoc adaptive responses, to the 'reference shocks' defined earlier in the work plan that might unfold in the region.
3. Identify capacity-building projects that might increase the response time and effectiveness of ad-hoc responses to transition shocks (i.e. identify ways to increase the ability of the region's populace to rapidly scale-up informal car-pooling in response to transient fuel shortage or price spikes).