

Okanagan Valley Electric Regional Passenger Rail (OVER)

Strategy to Build a Valley-wide team towards action

Gord Lovegrove, gord.lovegrove@ubc.ca, <http://engineering.ok.ubc.ca/faculty/gordonlovegrove.html>

If OVER is a vision for our future, what should be the first steps towards making it a reality?

FOR PUBLIC DISCUSSION



A. WHY: To protect our Quality of Life via an Okanagan Valley Electric Regional Passenger Rail (OVER PR)

Through various legislative and community initiatives, our Federal, Provincial, Regional, and local leaders have successfully taken leadership on our behalf in the areas of water supply and quality, cleaner air, safer roads, and healthier more active citizens – the quality of life we now enjoy today in Canada, and in our beautiful Okanagan Valley. While we enjoy this enviable quality of life, we must also take steps to preserve it for our future generations, and to leave a legacy that we can be proud of. To that end, this document is a start, a discussion paper in pursuit of planning and (re-) introducing clean, green, quiet, electric regional passenger rail here and across Canada.

BC's Road Safety and Healthy Communities Strategies, together with Canada's Towards Zero Road Safety Vision and Paris Climate Change commitments, set the policy context for promoting and supporting Safer & Healthier BC Communities. We all move about differently at different times of the day, year, and our lives – crawling, walking, biking, bussing, driving, shuffling, wheeling, stumbling, or otherwise. But have we ever considered the health and safety and economic and environmental benefits of regional passenger rail? Moreover, think about the concept of transportation equity in our auto-oriented society, where not everyone can afford to own a car. Cars cost on average \$10,000 per year (Canadian Auto Association). Cars are relatively unsafe (over 10 fatalities / 100,000 residents, and 3,000 injuries/year in BC alone, ICBC Statistics), stressful, and polluting (air, noise, water, congestion, space), compared to riding on a bus and/or passenger railways (compare to the Netherlands, with less than 2 fatalities/100,000 residents, and only 40% drive!). Moving forward into our future, our leaders have initiated several transportation planning exercises:

- Gateway Transportation Study – YLW Airport, Kelowna, Hwy 97, UBCO
- Okanagan Valley Transportation Planning Study – Highway 97
- Imagine Kelowna 2040 – City of Kelowna
- And others . . .

Our leaders are planning for our future, for travel by air and highways and buses, its time to introduce and integrate regional passenger rail into the discussion, for the benefit of the entire Valley, and future generation, and visitors, and our neighbors.

Population segments that we must think about in our future include:

- Tourists flying into and moving about our Valley – and contributing a significant portion to our cities and Valley economy
- Youth - our next generation – not yet of driving age that need access; and, young adults who choose not to own nor drive a car, a downward trend over the last 10 years (US DoT statistics)
- Seniors and health compromised individuals who must give up their driving license – risking depression and other chronic illnesses due to social isolation without reasonable alternatives – this has been a major BC political issue, how to address an aging population in a compassionate, equitably manner, maintaining their access while addressing safety concerns to the wider population.

Real, equitable, affordable, non-auto travel modes and mobility will be needed in the Okanagan Valley for us baby boomers, our youth, and our guests, especially as fiscal and sustainability pressures mount regarding energy supply and prices, aging and congested road transport infrastructure, and climate change economic impacts.

What can be done for non-drivers in the long term to get up and down this beautiful valley, as well as maintaining personal mobility and accessibility to the rest of the Province, the country, the world? The cost of building more and/or widening BC highways is prohibitive (\$20+ million/mile) in the sense of its indirect costs and externalities, impacts on the rest of the Province – in congestion, in human lives, in maintenance, in climate change consequences. Building more roads will lead to more traffic deaths and injuries (Lovegrove & Sayed, 2007). A lower cost, longer term sustainable solution (< \$5 million/mile), including construction and operating costs, is to build a north-south, all-electric passenger railway connecting Okanagan Valley to the rest of BC, Canada, and the USA. Electric passenger rail could work in BC:

- Planned, built, and operated similar to what has existed in Europe (e.g. Dutch railways) for decades;
- Locally planned, designed, built, and operated;
- All-electric, on-board, made-in-BC fuel cell/LNG technology
- Runs non-diesel, so quieter (no diesel engine), greener (only emits H₂O), non-vibrating (lighter)
- Connected in the south to the USA Amtrak passenger rail network at Osoyoos, just over the border from an existing rail stub in Orville, USA;
- Connected in the north to Canadian VIA passenger rail networks at Kamloops via Vernon.

Is electric passenger rail possible in this valley? A rail connecting from Orville and US railway networks in the South - could bring \$ millions to grow and support our local economy through our Okanagan Valley:

- a. Eco-friendly tourists, students, and seniors from across the USA and Canada
- b. Reciprocally, OK valley seniors and students that cannot drive, and have no other way to travel longer distances except by expensive taxi rides and/or flights (~\$200 +), (Greyhound at ~\$100 + is gone as of November 2018)
- c. Commuters, and others would no longer have to drive long distances from Penticton to Kelowna and Vernon and beyond – reducing congestion for local and industry travellers, and saving lives in reduced crashes (HDR Study, City of Kelowna, 2010; Lovegrove & Sayed, 2007).
- d. Connecting our entire Okanagan Valley, serving as a backbone for a Valley-wide public transit system to integrate and connect the now disparate city bus systems and routes.
- e. Light-weight local delivery courier/local business freight deliveries and services might even benefit shipping to and from the US via the OVER, reducing costs for micro-freight shipments, a benefit to many of the Valley's service industries and technology innovators
- f. This OVER PR rail line, built to standard NA rail gauge, would also stimulate local and BC technology research and development sectors. It would demonstrate proof-of-concept as one of the first on-board, all-electric passenger rail in NA, and, provide a rail test bed for conventional freight locomotives that UBCO and BC industry researchers are retrofitting to all-electric, on-board BC fuel-cell, battery hybrids.
- g. The current Summerland Historic KVR Steam Railway, a very popular Okanagan tourist attraction, could be connected to and operate along this same line where grades permit (no steeper than 4%), allowing for connections to bring tourists to downtown Penticton and points south as well.

Technology and engineering standards: The OVER PR would run on conventional railway operating infrastructure and running gear, typically beside the highway (or in the highway median), at highway speeds between cities (up to 110 km/h, averaging 50 km/h with stops). It would run at city speeds within cities, thus reducing its cost to less than \$2 million/mile to build (Cariboo Railway Contractors). OVER PR is NOT the same technology as the \$150 million/mile Vancouver Skytrain passenger rail (externally powered by electric third rail). It is not even the same as the Toronto Go Train technology (diesel-electric; although there are rumors of an all-on-board electric locomotive demonstration project in discussions for Go Train, subject to a design that replaces two diesel electric 2,700 HP locomotives with one 5,400 HP on-board fuel cell/battery hybrid electric locomotive). What we at UBCO STS are designing is an on-board, all-electric power with proven lithium-ion, rechargeable battery technology (UBCO, 2016), augmented by on-board made-in-BC fuel cells (BC Ballard Fuel Cell Technology or equivalent).

This is proven technology: Alstom (France) already runs electric passenger rail, two-car trains with this technology, called the Coradia IInt Regional train (see alstom.com, the screen shot below, and U-Tube for more information: <https://www.youtube.com/watch?v=O3bUE9uHkqM>). Others also have similar configurations on the market, including

Bombardier's German plant, Siemens, and others in Europe and China.

www.alstom.com/products-services/product-catalogue/rail-systems/trains/products/coradia-ilint-regional-train/

UBC Websites UBC The University of Briti TRB Standing Commi TransBase: Linking Tr CSCE 2017 Conf Adm New Tab UBC EVISION

Press | Investors | Candidates | Suppliers | Services customers

ALSTOM Change Language Search

Home About us Products and services Brochures Worldwide Contact

Trains Products Coradia iLint regional train



Coradia iLint regional train

Coradia iLint is an advanced full emission-free train solution for passenger rail transportation. It is based on Alstom's successful Coradia Lint regional platform. The traction system of Coradia iLint is using fuel cells which produce electricity by combining hydrogen and oxygen to water.

The fuel cells used in this train come from one of two Canadian sources, the Hydrogenics (Ontario) or the Ballard Fuel Cell (BC) plants, the most mature, advanced, and economic fuel cell technology in the world. This is existing, proven technology (termed Hydrail when fueled by Hydrogen) that could be implemented at relatively low cost in the Okanagan Valley (relative to building more and/or widened Highway 97 for growth over the next 30 to 50 years) with high ridership attractiveness. The hydrogen tanks are on the roof, the fuel cell keeps batteries charged (or flash charging is another option at each station stop). Hydrogen would come from track-side LNG conversion/filling stations located in the OVER's rail yard at the start of each day.

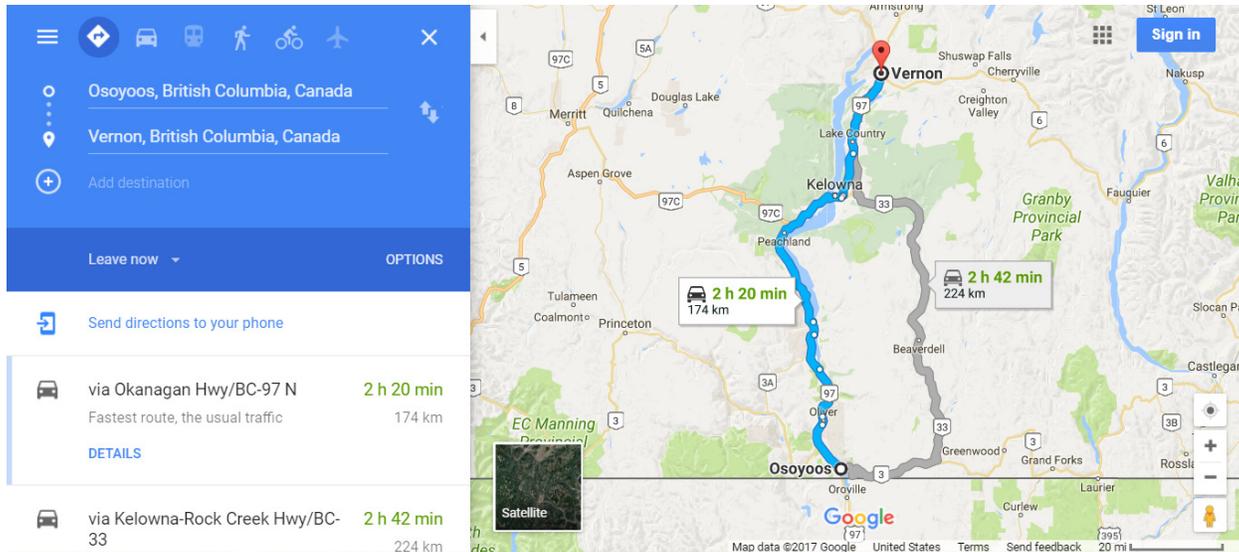
The other way to provide on-board, all-electric passenger rail is to use retrofitted, conventional diesel-electric freight locomotives, which has also been done in North America (see Green Goat demonstration battery-powered locomotive, used as a yard switcher, short duty cycles with frequent battery recharges). A standard freight locomotive running over approximately 200 kilometers, pulling two or three passenger cars is not a new concept, but retrofitting it to provide regular passenger service with hydrogen fuel cell/battery hybrids over a 200 kilometer route, averaging 30 to 50 kms between stops would be relatively new. Although technically and economically feasible, this technology and configuration is not as efficient as existing 'off-the-shelf' technology (e.g. Alstrom Ilint), so would not be the first recommendation for passenger rail; however, it would have significant value as a research demonstration project to convert the NA freight locomotive fleet. China has just launched an on-board, battery hybrid, all-electric freight locomotive (May 2017) as a demonstration project; time is of the essence if BC and NA industries wish to keep at the forefront of Fuel Cell/LNG innovation.

Where is Canada in all this Clean Rail technology? Fortunately, Transport Canada have initiated programs to support UBCO research in this direction. Over the past several years, we have been awarded \$75,000 from NSERC and Transport Canada to partner with Southern Railway of BC in research and development of a locomotive that could be used in both passenger rail and freight operations, in the Lower Mainland, Vancouver Island, and potentially, the Okanagan Valley.

OVER PR Routing is NOT a show stopper: Where an Okanagan Valley electric passenger railway line could run is a topic for future discussion, but some initial thoughts are offered, as follows:

- a. In more rural areas, as it is electric, OVER PR could run on virtually any hills on which Highway 97 runs, including the existing Bennett floating bridge. Thus it could easily parallel and/or run on (or in the median) of any of our Okanagan Valley road right-of-ways, including Highway 97, Chute Lake Road (Penticton to Kelowna), the former CP/KPR abandoned ROW, the former KVR RoW, etc. This flexibility would maximize route choices, and would help reduce property impacts, costly negotiations and delays.
- b. In more urban areas, OVER PR low speeds and surface stations would allow for its integration with and access by local transit, bicycle/pedestrian routes, and businesses and tourism attractions. Transport Canada has in place all requirements that would be adhered to, those same standards that have made transport by rail the safest mode of transport for all trips, especially for long distance trips.

- c. Most importantly, route discussions will be public. This is why it is critical to begin planning now for what will almost certainly involve 20 or more years to implement successfully. An inclusive public process about OVER PR is required throughout this valley, to determine levels of support, and to provide maximum opportunity for accessibility, mobility, equity, and economic spin-offs. This Valley-wide engagement and discussion will seek to hear all viewpoints, and to identify and address all issues that are raised. This OVER PR process and product is doubly important, as it may indeed be the template to re-introduce regional passenger rail across Canadian communities. It is acknowledged that there will likely be negative impacts of OVER, but a successful public discussion will plan and design an OVER that maximizes opportunities and benefits for our Okanagan Valley, and minimize if not mitigate most issues. To be successful, this discussion may take decades, but protection of our quality of life is worth this investment of time and effort. We must take a long-term, stewardship view if we are to be successful; a strong sense of community is the key.



Financing (Planning, Approvals, Property, Construction, Running Stock, Operation, Maintenance): We estimate that this is a \$1.5 Billion, 130 mile, 5 to 10 year construction project (after completion of planning over 10 to 20 years), including:

- Track (excluding property acquisition): ~130 miles x \$ 5 million/mile = 650 million
- Stations (Osoyoos to Vernon, possibly Kamloops): 12 x \$20 million each = \$240 million
- Running Stock (Alstom Coradia iLint or equivalent 3 to 4 car self-powered units: 25 units needed to provide 15 to 30 minute headways on an 8 hour round-trip) @ \$2 to \$5 million each = \$50 to \$125 million
- Service Yard – maintenance, storage, refueling, inspection, shed: \$70 million
- Property: TBD depends on route, but expect minimal if run along existing road /rail ROW – station properties, and, most importantly, up-zoning in station areas to be provided as in-kind funding (in lieu of cash) by each community to the P3 partner (who relies on property value increase/redevelopment profits, along with fare revenues as part of return on up front system construction & operating investments); Region could possible seek gas tax authority from Provincial government to fund any initial/on-going operation top-up subsidies to P3 partner(s).
- Okanagan Lake Floating Bridge retrofit: \$150 million
- Engineering & Contingency @ 20%: \$245 million
- Operation & Maintenance: TBD, part of a 30 year contract via P3 (e.g. SNC Lavalin)

Most of that cost would be spent on local, in-community, valley jobs in railway and station construction and locomotive retrofits, providing long-term BC technology and energy sector benefits. This magnitude of investment in local jobs and BC technology and industry sectors, \$150 million per year and its direct spin-offs during construction, not to mention the boom in increased tourism and safer, cleaner travel in following decades, has the potential to sustain our Valley's beauty and allure for decades to come and future generations. This \$1.5 Billion is not likely possible from local or regional governments; it would require provincial and federal participation, as well as private sector partners across all Valley

communities for a project this big spanning the entire Valley. There are many precedents in BC, in Canada, the USA, and across the world, some initial ideas include:

- b) “Last Spike” model – Design-build-operate – Let private industry finance and build and operate the OVER for 30 years (e.g. CP, 1885; Alberta Public Employee Pension Fund, Peruvian Toll Hwy, 2005; Okanagan Floating Bridge, 2008, SNC Lavalin) in exchange for rights to the land (ownership and/or increase in rents/land value realized due to the railway) around each station. BC Motor Carrier Commission to govern passenger rates, as per WestCoast Express
- c) A 20 to 30 year operating contract would require the private partner to provide a specified Level of Service in return for fare revenue (government to pre-approve and/or set rates and rate increases, at agreed upon ridership forecasts), with risk sharing via supplemental revenues from governments beyond some threshold as needed to provide a minimum viable cash flow and RoR (IRR) for the private partner.
- d) The Randstadt (The Hague, Amsterdam, Rotterdam) formed a regional government association and created an arms length subsidiary (like the GVRD and TransLink?), wherein the government owns the land, the railway, and the running stock, but the operating company contracts to operate it at a specified level of service.
- e) The Brightline in Florida, USA, connecting Miami to Orlando, is run by a private consortium, wherein a real estate firm financed and assembled the RoW, a railway infrastructure firm financed the railway construction, and an operating company runs the passenger rail Until recently (it was bought out by Parametrix, sp?) created, financed, built, operated by a three party consortium consisting of a Real estate company (Fortress Investment Group), a rail infrastructure company, and an operating company. Their hope is to have this short 150 mile passenger rail line to Amtrak, building a station at the end of its line, where they’connect with Amtrak. They are recovering their costs via fare revenues, and redevelopment/land price increases around stations.
- f) In Hong Kong, MTR – a worldwide realty company that may have interest/connections already to the BC/Vancouver/Kelowna markets – is financing and doing something very similar to Brightline

B. WHAT: Objectives

- a) To sustain the quality of life (QoL) we cherish living in the Okanagan Valley, in Canada, while at the same time recognizing that we are expecting upwards of 1 million residents over the next 30 years. OK Valley ‘quality of life’ needs definition, and means different things to different folks. Various community surveys suggest that it arises from the following factors:
 - a. Its natural setting and beauty – lake, land, water, climate, bio-diversity – carbon-based energy sources will put all this at risk
 - b. Its tourism - eco tourism, fishing, camping, urban vibrancy, beaches – next generation will expect more focus on sustainable choices; as our natural settings go, so will our tourism industry – the future 60 km trail on the old KPR (Kelowna to Vernon) will help, as has the 20 km trail in Canmore, and the Galloping Goose trail in Victoria
 - c. Its economic prosperity – government, tourism, agriculture, technology, health care, education – high quality of life attracts young people, tourists and technology start-ups, cornerstones of our economy; however, traffic congestion, noise, and pollution will put all these at risk
 - d. Its healthy life style and regional health centres – KGH, Cancer Agency – attracts many wealthy retirees and summer home owners – this is good in economic terms but is creating pressure on rental vacancies and affordable housing
 - e. Its small town feel, yet with big city services and attractions – growth and development will need to be managed carefully to maintain this feel without experiencing big city problems – crime, congestion, affordability
- b) To support the maintenance of our QoL through sustainability-oriented land use and transportation planning and development designs that focus future population growth and supporting services into mixed-use, higher-density, ‘new towns’ or ‘complete communities’ via the following factors:
 - a. SMARTer Growth Grid neighborhoods of 25,000 to 50,000 residents, arranged roughly in 4 x 4 km area of varying densities
 - b. Central market square where services provide local groceries, schools, health, retail commercial, and recreation

-
- c. Located roughly 7 km away from other urban areas (i.e. NOT on the city edge), which is a distance conveniently travelled by high quality bike routes and transit services
 - d. Green space, roughly 1/3 of the area, and laid out such that no front door is longer than a 1 minute stroll from a green space
 - e. Reduced car travel distances and car use frequency are the intended benefits
- c) To support the maintenance of our Okanagan Valley QoL by providing high quality, affordable, equitable, all-electric passenger rail (as the backbone and integrated with community transit) access to tourists, community youth, and aging baby boomers throughout our Valley. This passenger rail would be clean and green, and support BC Industry and local jobs, as follows:
- a. Central Stations - Passenger rail station areas within a 10 minute walk would facilitate re-development opportunities, and, be located to support walking, biking, and local community planning of SMARTer Growth Neighborhoods – retail and service commercial, along with higher density residential would allow for mutually beneficial support of jobs, amenities, and services close to home, high quality rail transport for longer Valley trip making choices, and visitor (tourist?) access.
 - b. Made-in-BC Electric Passenger Rail Technology - Clean, green, electric rail powered by on-board BC Fuel cell and battery technology, fueled by BC natural gas would be cheaper than third rail and/or overhead wire. Moreover, it could be retrofitted into current North American railway locomotives, allowing the Valley rail link to connect passengers all over North America, to railway networks across the US and Canada seamlessly. Thus, the Okanagan Valley Electric Regional Passenger Railway (OVER) could become the first all-electric rail demonstration project of its kind in North America, using made-in-BC technology, fuel, and research that could be marketed to create further economic spin-off opportunities.

C. HOW: It is time to Start a Valley-wide Discussion . . .

1. Contact local connected people in each Okanagan community (tourism, industry, business people, politics, wineries - influential, live there, can drum up support and speak to naysayers) - form an OVER PR working committee to maintain momentum and community discussions
2. Begin the planning in each city
3. Begin the public discussions
4. Raise the level of discussion to evidence-based using rigorous research and expert analysis
5. Seek leverage and buy-in from the Okanagan Sustainability Leadership Council and other influential community leaders