June 22, 2009

Environmental Protection Agency
Attention: Docket EPA-HQ-OAR-2009-0171

CETA appreciates EPA's efforts to regulate GHG emissions, and offers this comment:

We invite your attention to the following words on page ES-2 of the *Technical Support Document* (April 17, 2009) for Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Clean Air Act:

> "Greenhouse gases, once emitted, can remain in the atmosphere for decades to centuries, meaning that 1) their concentrations become well-mixed throughout the global atmosphere regardless of emission origin, and 2) their effects on climate are long lasting."

In recognition of this truth, it's very important to emphasize in the final statement of the forthcoming findings that the impact of GHG emissions are cumulative, because this characteristic must influence the choices to be made in the development of solutions to the problem of climate change.

In other words, a solution to reduce GHG emissions that saves one billion tons of CO2 emissions in the decade of the 2020s and none later, is not good if it requires emitting two billion tons of CO2 in the 2010-19 period in order to provide the solution. Emissions into the atmosphere are cumulative.

Generally stated, the cumulative impact of GHG emissions makes life cycle analysis of solutions important. This in turn means, for example, that the impact of the development, production, implementation, and operation of GHG reducing measures must take into account the GHG emissions of the development, production, and implementation of the measures, as well as their operation.

A simple example is the assessment of the cumulative GHG impact of the plug-in electric vehicle or the hydrogen fuel cell vehicle. The GHG emission impact calculations must take into account the GHG emissions of vehicle production, battery production, and hydrogen production, as well as the reduction in GHG that comes from drivers using these new vehicle types instead of earlier-vintage gasoline-powered vehicles.

A useful educational presentation on life cycle analysis of transportation choices is offered by the University of California at http://www.sustainable-transportation.com.

There is an example in the present day of ***not*** taking life cycle analysis of cumulative GHG emissions into account in the Draft Environmental Impact Statement (DEIS) for the Sound Transit East Link Light Rail Project in King County, Washington, pages attached. There is no requirement that a life cycle analysis of GHG be done, but the issue I describe in this comment is illustrated.

We take energy consumption as a proxy for GHG emissions.

c/o 4005 20th Ave West, Suite 111, Seattle, WA 98199
www.EffectiveTransportation.org CETA@EffectiveTransportation.org

The energy to construct this new light rail segment is stated in the DEIS as 6 to 9 trillion BTU total over a period of a decade. After the segment is constructed and in operation in the early 2020s, the reduction in BTU consumption because of people who are forecast to ride the train instead of drive cars is 1.5 million BTUs per day. Trillions consumed in total to build it, hundreds of millions saved annually. Under a range of assumptions and some arithmetic, the DEIS is thus implying that somewhere between 14 and 22 years of future light rail operation would be required to save an amount of energy in the long run equivalent to the construction energy consumed in the short term.

Because GHG emissions from energy consumption are cumulative, this train is not likely to be a good result for the global atmosphere, despite the rhetorical claims of the project sponsors in the local transit authority and at Federal Transit Administration.

The reason we are pessimistic about this passenger train is that future cars are likely to be far more energy efficient and less emitting of GHG through the efforts of the Obama Administration. Thus, the energy consumption and GHG emissions of Seattle's East Link light rail during construction may never be compensated by the energy saved and GHG emissions reduced from East Link light rail operation and patronage.

This particular example of GHG emissions from a future light rail phase in Seattle may be generalized to the entire national high speed rail program now under consideration by U.S. DOT. The GHG emissions to build it in the near term may exceed the GHG emissions reduced in the long run when the high speed rail network is in operation. A life cycle analysis is very important to carry out in light of the fact that GHG emissions are cumulative starting from the beginning of work on proposed solutions.

Respectfully yours,

John Niles

John Niles

Technical Chair
CETA

Attach: East Link Light Rail DEIS Energy Chapter

4.10 Energy Impacts

4.10.1 Introduction to Resources and Regulatory Requirements

Project construction activities and the operation of vehicles, commuter trains, and light rail in the East Link study area would consume large amounts of energy. This section estimates the amount of energy that would be consumed during construction of the project and the amount of energy that would be consumed by vehicles operating within the study area.

The study area for this analysis is the Puget Sound Regional Council (PSRC) four-county region, which includes King, Pierce, Snohomish, and Kitsap counties. This is the same study area used for the traffic data analysis. Some general discussion of statewide energy use and potential energy effects on local utilities is also included.

Federal and state agencies regulate energy consumption through various policies and programs. Federal guidelines such as The Energy Policy and Conservation Act of 1975 and the Energy Independence and Security Act of 2007 require minimum fuels consumption efficiency standards for new automobiles sold in the United States. The Corporate Average Fuel Economy Program was created to help manufacturers adhere to the efficiency standards. The Safe, Accountable, Flexible, and Efficient Transportation Act: A Legacy for Users (SAFETEA-LU) was passed in 2005 and promotes the reduction of traffic congestion, improving safety, and protecting air quality and the environment (FHWA, 2007).

4.10.2 Affected Environment

This section discusses the existing energy use characteristics at both the state level and in the study area. Detailed information about energy use at the project level is not available; as a result, Sound Transit used the state-level and utility service area trends to help determine energy consumption at the local level.

According to the Energy Information Administration (EIA), Washington State consumed over 2,004 trillion British thermal units (Btu) of energy in 2004, which is the energy equivalent of approximately 346 million barrels of oil. Over the last 20 years, Washington's annual per capita energy consumption has been approximately 250 million Btu, which is the energy equivalent of approximately 2,000 gallons of gasoline per person per year (Washington State Department of Community, Trade, and Economic Development [CTED], 2007).

In recent years, the increasing popularity of pickups, vans, and sport utility vehicles has reduced new vehicle fuel efficiency. Although Washington's economy is becoming less energy intensive because of improved technology and productivity increases, the state's overall energy consumption is expected to grow due to growth in population, jobs, and demand for vehicle travel. If petroleum prices remain high, growth in energy consumption may moderate as consumers purchase more fuel-efficient vehicles and change travel patterns (CTED, 2007).

The study area's electricity needs are currently served by two utilities: Seattle City Light, a municipal electric utility serving the City of Seattle, and Puget Sound Energy, an investor-owned utility that provides electricity and natural gas to communities throughout Western Washington. Table 4.10-1 lists the number of customer and generation capacity for each utility's service area.

TABLE 4.10-1
Utility Data

Utility Data	Seattle City Light	Puget Sound Energy
Number of Customers, 2006	379,230	1,027,899
Total Generation (megawatt-hours [MWh]), 2006	6,716,041	24,655,902
Btu Equivalent	22.9 trillion	84.1 trillion

Source: Seattle City Light, 2006; Puget Sound Energy, 2006.

Note: 1 MWh = 3,412,141 Btu.

Both utilities rely on their own generation sources as well as energy purchases through long- and short-term contracts with other energy producers (i.e., Bonneville Power Administration). Seattle City Light produces approximately 46 percent of its own power and purchases the other 54 percent; Puget Sound Energy produced approximately 28 percent of its own power and purchases the other 72 percent (Puget Sound Energy, 2006, p. 23). Of the total power generated in 2006 (including own generation and purchased power), hydroelectric generation accounted for nearly 90 percent of Seattle City Light's power (Seattle City Light, 2006a) and approximately 30 percent of Puget Sound Energy's power (Puget Sound Energy, 2006).

Today, the project vicinity is congested during the peak traffic periods. Excessive idling and stop-and-go traffic conditions substantially reduce fuel economy compared to free-flow conditions. Exhibit 4.10-1 shows the average miles per gallon (mpg) for vehicles traveling at speeds between 15 and 75 miles per hour (mph). As shown on the graph, fuel efficiency is greatest when vehicles are traveling between 45 and 55 mph. Because of current conditions in the project vicinity, there are often times throughout the day when the project area is congested and vehicles are operating at inefficient speeds.

Table 4.10-2 presents daily vehicle miles traveled (VMT) and energy consumption by mode for the PSRC four-county region, which includes King, Pierce, Snohomish, and Kitsap counties. According to the PSRC traffic model and the Sound Transit ridership model, the existing daily VMT for the region is approximately 71.8 million. The daily energy use by the different transportation modes is approximately 495,000 million Btu.

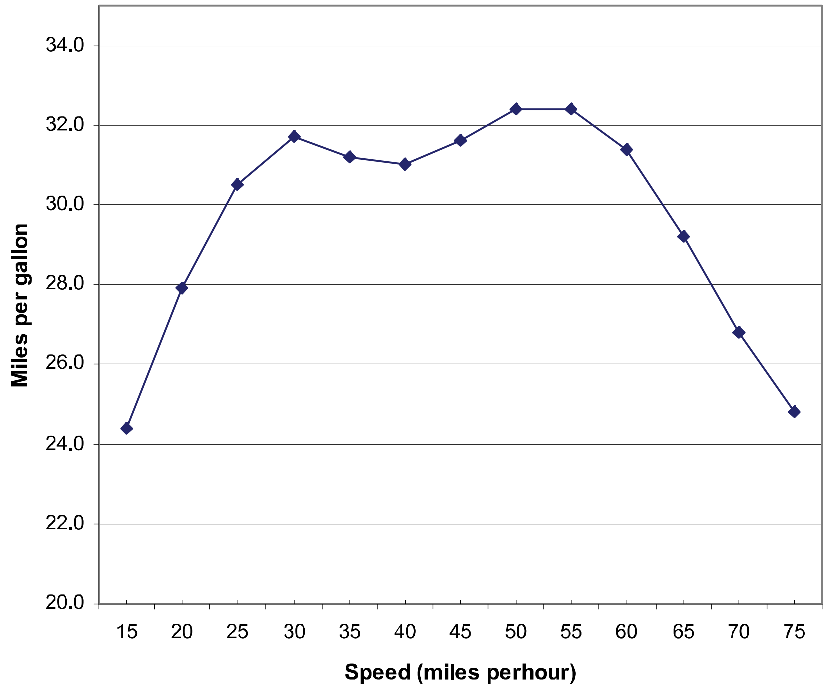

EXHIBIT 4.10-1
Average Fuel Consumption Rates for Automobiles

4.10.3 Environmental Impacts

4.10.3.1 Impact Estimating Methodology

The energy analysis evaluated operational and construction energy use by the project and the demand on regional energy supply. Sound Transit estimated long-term (operational) impacts from the VMT estimates by mode presented in the PSRC four-county traffic forecast model. The Puget Sound total VMT estimates for light rail were modeled based on the projected operations plan for the combined Link system of light rail. The four-county regional VMT was separated into passenger miles and heavy truck miles to account for differences in energy consumption levels. Passenger vehicle's VMT, which includes light duty trucks, were assumed to contribute 95 percent and heavy trucks the remaining 5 percent of the total regional VMT. All energy consumed was converted to Btu to provide a common measure among the energy sources.

The Btu for each category of VMT were obtained from the *Transportation Energy Data Book, Edition 26* (U.S. Department of Energy [DOE], 2007). The energy consumption factor for passenger vehicles includes the weighted average for cars, motorcycles, and light trucks. Energy consumption factors by mode are as follows:

- One passenger vehicle mile (includes cars, motorcycles, and light trucks) = 6,132 Btu
- One heavy-duty vehicle (trucks) mile= 20,539 Btu
- One transit bus mile = 38,275 Btu
- One light and heavy rail mile = 70,170 Btu
- One commuter rail mile = 91,525 Btu

TABLE 4.10-2
Existing Daily Vehicle Miles Traveled and Energy Consumption (2005)

Vehicle Type	Consumption Factor	Existing Conditions: Daily VMT	Existing Conditions: Million Btu
Passenger Vehicle	6,132	68,181,645	418,090
Heavy Duty	20,539	3,391,855	69,665
Transit Bus	38,275	186,342	7,132
Commuter Rail	92,739	854	79
Light Rail	62,762	0	0
Total		71,760,696	494,967

Source: PSRC Transportation Demand Model; Sound Transit Ridership Model; DOE, 2007.

During project construction, energy would be consumed during the production of construction materials and when transporting materials to the site. Operating and maintaining construction equipment would also consume resources. Construction-related impacts were estimated by applying a highway construction energy factor to the total construction cost of the East Link Project. The California Department of Transportation (CALTRANS) derived energy consumption factors for different light rail transit facilities in *Energy and Transportation Systems*, and these factors are still widely used in the industry today (CALTRANS, 1983). For this analysis, the following energy consumption factors were used to estimate the energy consumed during project construction:

- Track work: 5,044 Btu/2007 $
- Structures: 5,044 Btu/2007 $
- Electric substations: 7,752 Btu/2007 $
- Signaling: 2,122 Btu/2007 $
- Stations, stops, and terminals: 5,044 Btu/2007 $
- Parking: 6,203 Btu/2007 $
- Maintenance facilities: 5,044 to 6,203 Btu/2007 $

The consumption factors were reported in Btu per dollars of construction spending. Because the CALTRANS report was developed using 1973 construction dollars, the energy consumption factors had to be adjusted to account for the change in construction costs. The California Construction Cost Index was used to adjust the factors to 2007 dollars.

4.10.3.1 No Build Alternative

Under the No Build Alternative, the daily VMT for the PSRC four-county region would increase from approximately 71.8 million VMT in 2005 to approximately 93.6 million VMT in 2030. As shown in Table 4.10-3, this daily VMT would be slightly higher than the VMT with the East Link Project. Vehicles operating in the study area would consume 643,297 million Btu of energy in 2030. The No Build Alternative would place additional demands on energy in the region as a result of increased passenger trips, greater levels of congestion, and slower speeds when compared to the build alternatives. However, the potential demand on the electric utilities that the East Link light rail system would place on the electric grid would not occur.

The No Build Alternative also involves no construction activities related to the light rail system; therefore, no additional energy would be consumed because of construction activities under the No Build Alternative.

4.10.3.2 Impacts During Operation

The long-term direct energy impacts of the East Link Project are based on projected year 2030 regional traffic volumes and daily VMT consistent with PSRC data and the transit modeling performed by Sound Transit. Sound Transit combined one alternative from each segment to develop a "representative project" from Seattle to Redmond. The passenger vehicles VMT was then modified to reflect a high and low ridership level to provide a high and low range of operational impacts.

The VMT, energy consumption rate (Btu per mile), and total energy consumption for each mode and the high and low build scenario are presented in Table 4.10-3. When compared to the No Build Alternative, each of the build scenarios would result in a reduction of passenger and transit vehicle miles as people shift their demand to the light rail system. Overall, energy use during project operation is expected to result in approximately 0.2 percent less energy than the No Build Alternative.

Operation of the light rail system would place a demand on the local electricity utilities, Seattle City Light and Puget Sound Electric. The light rail system is estimated to use 1,330 million Btu per day, or approximately 389 megawatt hours (MWh) per day. Assuming that the light rail system would operate 365 days per year, the annual energy consumption by the light rail system would be approximately 142,000 MWh and another 5,376 MWh to operate the maintenance facility for full project build out in 2030. This represents approximately 0.5 percent of the total 2006 generation for Seattle City Light and Puget Sound Energy combined. The operation of the light rail system is not expected to have a substantial impact on the electric utilities.

TABLE 4.10-3
Daily Vehicle Miles Traveled and Energy Consumed

Vehicle Type	Consumption Factor (Btu/mile)	2030 No Build		2030 Build - High Ridership		2030 Build - Low Ridership	
		Daily VMT	Million Btu	Daily VMT	Million Btu	Daily VMT	Million Btu
Passenger Vehicle	6,132	89,188,832	546,906	88,988,548	545,678	89,015,577	545,844
Heavy Duty	20,539	4,257,715	87,449	4,245,161	87,191	4,245,161	87,191
Transit Bus	38,275	201,586	7,716	194,829	7,457	194,829	7,457
Commuter Rail	92,739	1,524	141	1,524	141	1,524	141
Light Rail	62,762	17,288	1,085	21,194	1,330	21,194	1,330
Total		93,666,944	643,297	93,451,256	641,798	93,478,286	641,963

Source: PSRC, 2005; Sound Transit Ridership Model, 2007; USDOE, 2007.

Sound Transit adopted a Sustainability Initiative in 2007 that promotes energy efficiency, minimizes waste, and implements more energy-efficient alternatives than current practices. According to the initiative, Sound Transit will integrate efficient operating practices at existing and new facilities, use energy-saving equipment to reduce energy demand, and maximize intermodal transit connections to reduce automobile VMT. Many of these practices have been incorporated in the Central Link Initial Segment planned to open in 2009. The implementation of these and other sustainability initiatives will reduce energy consumption for operation of East Link also.

4.10.3.3 Impacts During Construction

The amount of energy used during construction of a project is roughly proportional to the cost of the project. To analyze short-term energy impacts, Sound Transit estimated the amount of energy that would be consumed during construction by applying the CALTRANS construction energy consumption factor to the project construction costs. Only direct construction costs related to this project were used to calculate energy consumption during the construction period. Thus, professional engineering and right-of-way costs were removed from the analysis.

Instead of analyzing the energy consumption of each alternative within the different segments, the analysis compared the total energy consumptions for two representative projects – a high-cost alternative and low-cost alternative – which are the composites of selected alternatives in each of the segments. The alternative for each representative project is as follows:

- **High-Cost Representative Project.** This project consists of the I-90 (A1), Bellevue Way (B1), Bellevue Way Tunnel (C1T), NE 20th (D3), and Marymoor (E2) alternatives, with the SR 520 Maintenance Facility (MF3).
- **Low-Cost Representative Project**. This alternative consists of the I-90 (A1), 112th At-Grade (B2A), 112th Elevated (C7E) with connection from B2A, SR520 (D5), and Leary Way (E4) alternatives, with the SE Redmond Maintenance Facility (MF5).

The purpose was to determine the worst and best energy consumption for constructing a complete East Link Project. Table 4.10-4 lists the energy consumed during construction for each alternative. The energy consumption information presented below provides a possible range of energy consumption during construction. The estimated energy consumption for the low- and high-cost representative projects are 6.3 trillion Btu and 9.0 trillion Btu, respectively. The high-cost representative project is expected to consume approximately 30 percent more then the representative low-cost project. As mentioned previously, no additional energy would be consumed because of construction activities with the No Build Alternative.

Because the project could be phased due to funding availability, interim termini were developed that would end the project at or east of the Ashwood/Hospital Station located in Segment C. The impact of a phased approach would be to delay some of the energy consumption related to construction and possibly delay the operational savings anticipated from the project until the full line is completed.

4.10.4 Potential Mitigation Measures

Operation of the light rail system is expected to consume less energy than the No Build Alternative and is not expected to overburden the electric utilities' power availability; therefore, no mitigation is required. During final design, Sound Transit would investigate methods of reducing energy use during operations and construction as part of its Sustainability Initiative.

TABLE 4.10-4
Energy Consumed During Construction by Representative Project

	High-Cost Project		Low-Cost Project	
Segment	Alternative	Energy Consumption (million Btu)	Alternative	Energy Consumption (million Btu)
A, Interstate 90	A1, I-90	1,704,643	A1, I-90	1,704,643
B, South Bellevue	B1, Bellevue Way	890,178	B2A, 112th SE At-Grade	1,113,157
C, Downtown Bellevue	C1T, Bellevue Way Tunnel	3,362,115	C7E, 112th NE Elevated	872,733
D, Bel-Red/Overlake	D3, NE 20th	1,368,324	D5, SR 520	1,108,251
E, Downtown Redmond	E2, Marymoor	1,242,162	E4, Leary Way	1,131,022
Maintenance Facilities	MF3, SR 520	441,879	MF3, SR 520	384,819
Total		**9,009,301**		**6,314,624**
% Change from High-Cost Route				**-30.0%**

Source: CALTRANS, 1983.