Incenting Clean Household Transportation

A Legislative Concept

An Independent Report to the
Technology, Energy & Communications Committee
WA State House of Representatives
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economic and environmental sustainability in Washington

Executive Summary

Most economists are keenly aware that the US economy is entering a period of time wherein major business sectors are de-leveraging due to declines in corporate investment. A means to increase sources of State and Federal tax revenue, while not discouraging business, offers renewed support for essential Government services infrastructure presently under duress.

Homeowners and businesses can opt for property improvements to generate local electricity by employing photovoltaic (PV) panels. Electric vehicles (EVs) charged from these sources consume energy as fuel. This renewable fuel costs $0.02/mi as compared with over $0.10/mi for conventional drill-refine-burn auto fuel.

By legislating a primary incentive for distributed energy systems that connect PV supply to EV demand, over and above the secondary PV and EV incentives, transportation costs are reduced by the same solution that creates local jobs, increases energy security, reduces U.S. dependence on foreign energy, and benefits air quality and climate relief.

Washington State Energy

In the Pacific Northwest, we have an energy policy that acknowledges multiple values. We ensure our energy system meets the needs of citizens, especially vulnerable populations, while reducing dependence on fossil fuels. Washington State's policy is to improve the efficiency of transportation energy use. Washington also builds on its clean electrical grid to meet greenhouse gas (GHG) limits and environmental requirements. Attention is focused on transportation efficiency and technology.
http://www.futureenergyconference.com/2010/FECWA-Presentations/1A_Hammerschlag.pdf

Under Washington State Senate Bill 6001 (WA SB 6001), reduction in the state's GHG is targeted to fall to 25% below 1990 levels by 2035.

Energy Solutions for Washington State

How this is to be accomplished is problematic. We know the Federal Government has been unable to directly intervene to solve climate change for two reasons: (1) the US is not the only source for atmospheric carbon concentration, and (2) the costs appear to exceed current available, and politically conceivable, budget authorizations.
http://climatesolutions.org/events/americas-energy-challenge-steven-koonin-dr.-steve-koonin-department-of-energy

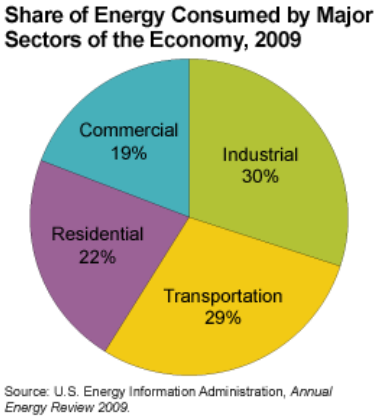
Where, then, can we turn? The current daily US demand is for the use of 19.5 million gallons of carbon-based fuels. Relief appears achievable through intervention by industry (given sufficient regulation or profit incentives), or local Government and utilities. Many political and business consensus activities take substantial time and resources. Private property owners who favor making more immediate energy decisions can initiate their own energy mitigation in the use of fossil carbon fuels.

A Look at Residential Energy

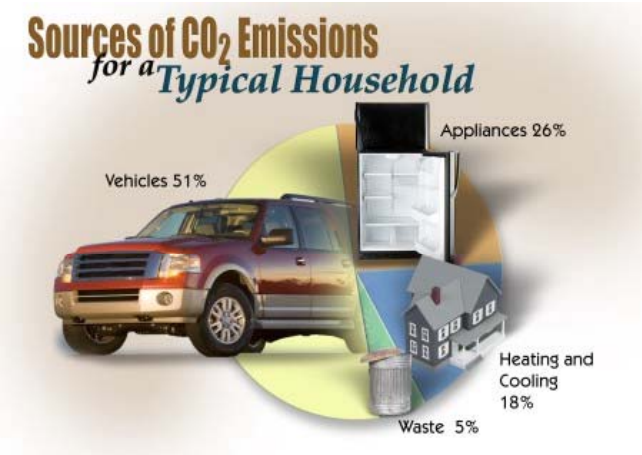
When considering all US energy demands, we find that residential consumption is 22%. However, households also consume energy for transportation.

Energy consumed in the transportation sector consists of 28% for cars and 30% for light trucks, or 29% as shown in the figure to the right. Since the commercial and industrial sectors also consume energy from the transportation sector, the household use portion is estimated to be approximately 9%.

As a consequence, the national household share of total US energy consumed, including home and car, is about 31% (22% + 9%).
http://www.eia.doe.gov/energyexplained/index.cfm?page=us_energy_use



The US Department of Energy (DOE) has compiled emission sources per household.



Surprisingly 50% of household carbon emissions are due to transportation. It should be noted that each pound of gasoline converts to 3 pounds of CO_2 during combustion. With an average of about 2 cars per family in 2009, it's easy to recognize that (on average) half of our household energy is used for personal transportation.

In multiple car households from 1990 through 2009, the average travel per driver per year was about 12,000 miles. In 2009 alone, the average miles traveled per family were 22,000. (See T 8.7, http://cta.ornl.gov/data/chapter8.shtml)

DOE link: http://www.fueleconomy.gov/feg/climate.shtml

The Household Energy Question

When searching for effective ways to reduce overall household energy consumption, we recognize that our homes are remodeled or rebuilt somewhat infrequently. Our vehicles are replaced with far greater frequency. These facts are pivotal to understanding why the kind of energy we use for transportation is so important. An individual's choice of vehicle can help reduce the total energy consumption used for transportation.

Manufacturers are offering more vehicles to the petro-fuel vehicle owners that achieve higher miles per gallon (mpg) ratios. In addition, one can leave the gas pump forever and simultaneously save energy consumption per mile and reduce carbon in the environment by changing to renewable fuel energy.

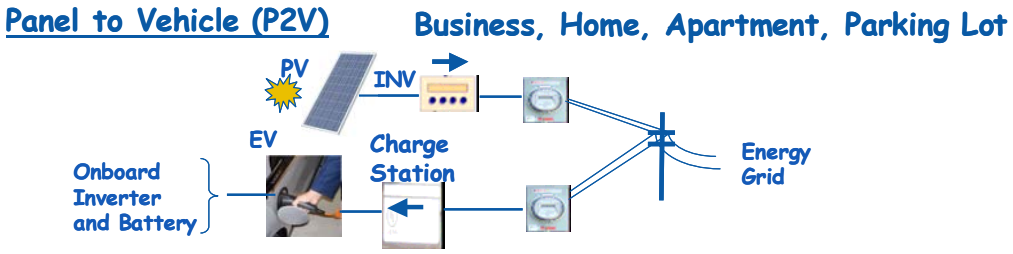
Home Generation – A Climate Solution

We've known for 100 years that electric motors are 3 times more efficient in producing emotive force than are internal combustion motors. For the electric vehicle, this efficiency reduces energy demand by a factor of 3, while limiting carbon release to that of the utility supply source. We can calculate the energy in a gallon of gasoline to be 36.6 kWh. When replacing a 30mpg motor, we achieve 30 miles of travel with 1/3 of this energy (12.2 kWh).

To assure this is clean energy, this amount of 12.2 kWh is within the practical range of home rooftop solar power, or Photovoltaic (PV), daily generation. An electric vehicle (EV) traction battery becomes a solar renewable gas tank. This configuration offers an option to dramatically cut carbon and other emissions, while using zero net energy from the electricity grid. According to DOE figures, replacing one gasoline or diesel vehicle with an EV charged from home-generated renewable energy (such as PV) is an energy-leveraged climate solution that reduces carbon energy and carbon release by 25% per household. Coincidentally, this is the target posed by WA SB 6001. In addition, replacement of the second fossil burning vehicle achieves a "50% climate solution" for the household, exceeding the goal set by Clean Energy 2030 for 38% reduction in transportation oil consumption.

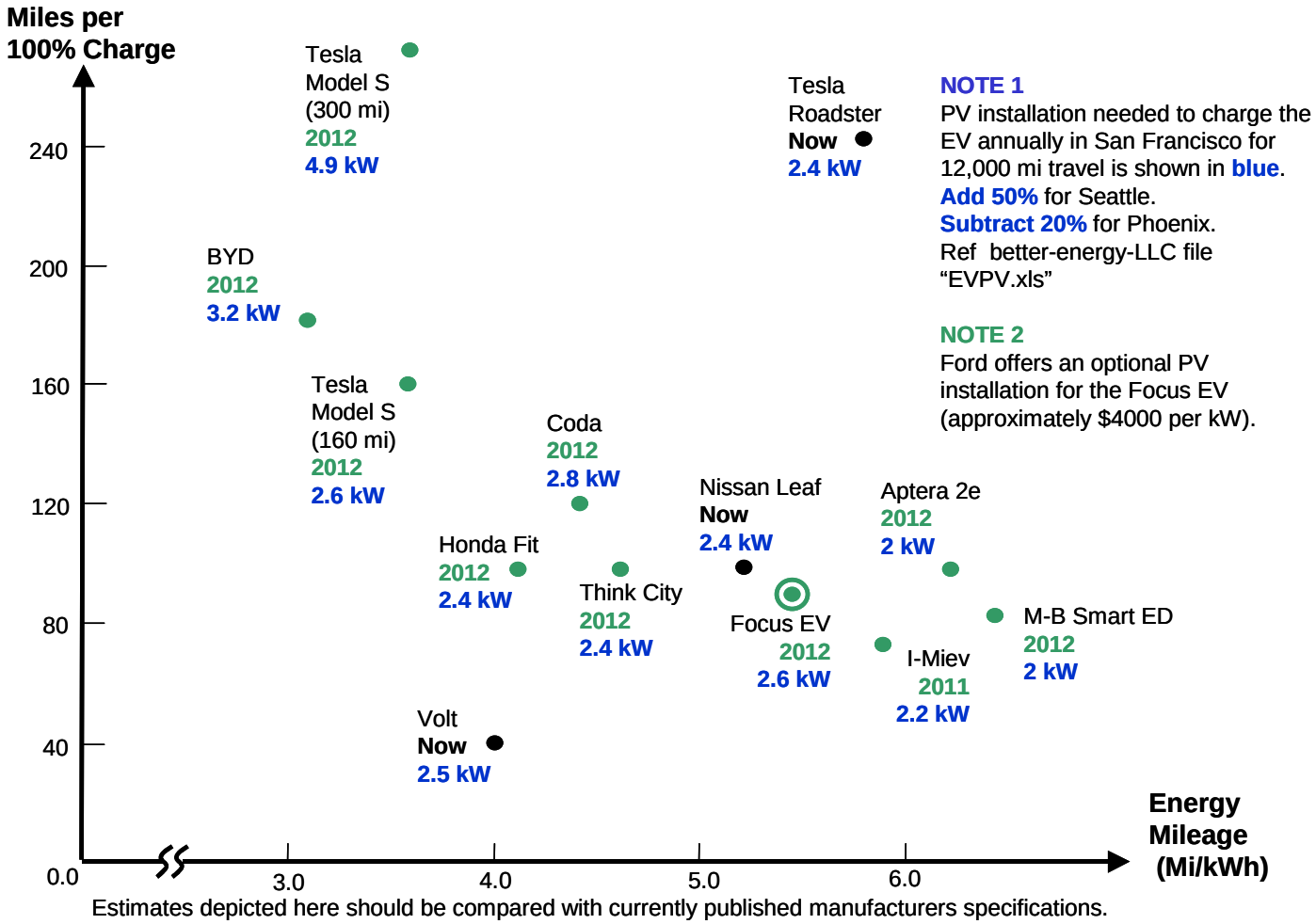
http://www.treehugger.com/files/2008/10/google-clean-energy-2030-renewable-energy-climate-change-plan.php

This solution is not just a forecast for the future. It is not dependent on transportation advances or energy technology breakthroughs in the future. It is not dependent on political and business consensus. This can be done now.



If adopted on a large scale, this solution will relieve the steady increase of carbon concentration in the atmosphere as well as carbon-caused acidification of the world's ocean food source.

Electric Vehicle Energy Needs

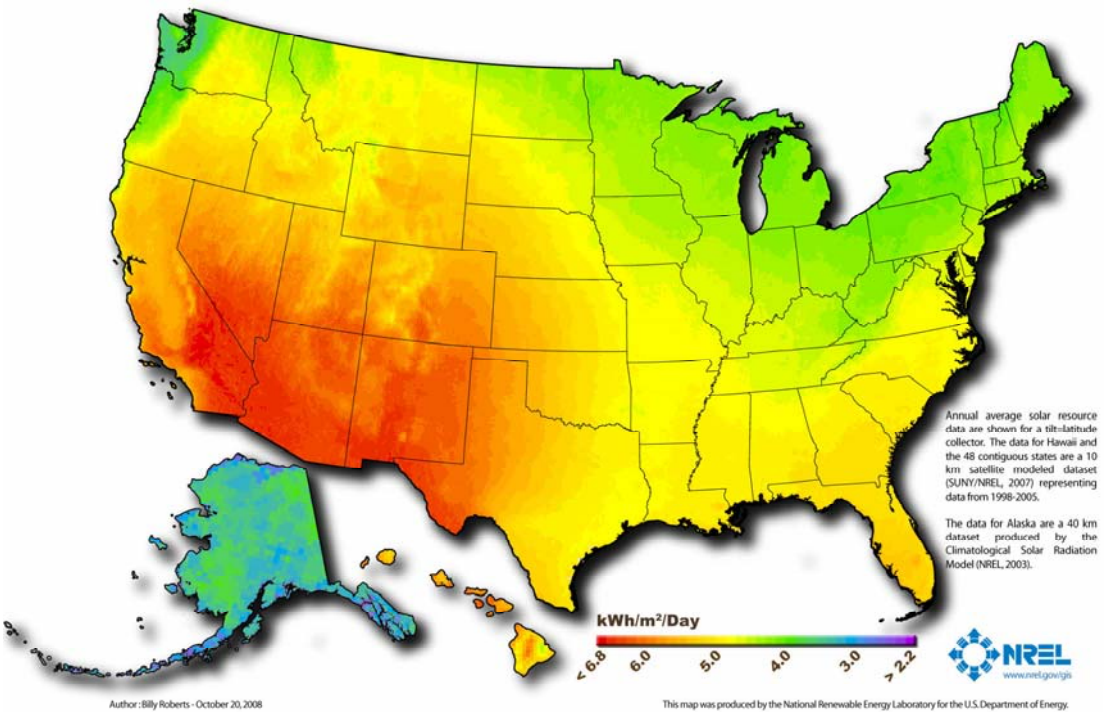


Estimates depicted here should be compared with currently published manufacturers specifications.

Energy Leadership in Washington

There is growing recognition that this household option is inherently viable in the Northwest region. A climate solution in WA, consisting of electrified transportation supplied from renewable solar energy, is easily recognized as more viable in most other States because …

- solar resources are more abundant at lower latitudes;
- electricity costs are generally higher; and
- electric utilities are more dependent on coal generation.



Policy Recommendation

A "primary" energy system incentive for property owners, when they supply distributed energy to the grid AND use it for personal or business EV charging, will create an improved market environment for both PV installations and EV sales. Beneficial attributes from both products are lagging despite existing incentives, because the benefits accrue from scale, and the scale of adoption is a negligible fraction of local and national energy and transportation.

One possible primary incentive is to increase the WA performance-based production payment by $0.30 for a total of $0.84 per kWh under SB 5101 (WA manufactured PV and power inverter), payable annually when a utility customer pays the annual EV license tab renewal. The annual incentive cap of $5,000 would be increased to $10,000. (This stands in opposition to the concept of levying road use taxes on EV owners, which imposes a penalty for relieving climate stress, improving air quality and reducing energy dependency, even after depreciation is dis-allowed). A means of correlating WA DoR certifications with DoL license tabs can hopefully be devised by the Dept. of Commerce.

If the primary incentive is capped at he first 100,000 property owners to qualify, it would have the effect of stimulating employment in the PV sector and increasing tax revenue in the EV sector. After the cap is reached, PV tax revenue to the State is likely to increase due to declining cost of installed PV and its effect in broadening the market on both sides of the Cascades.

	Accountant's line items	Annual credits toward PV payback	Annual Total	$15,750 Break-even after …….
1	WA Feed-in Tariff (Current SB 5101)	$1,200	$1,200	13.1 years
2	Plus WA savings from solar fueling	$1,620	$2,820	5.6 years
3	Plus WA "Primary" incentive (to-be-ammended SB 5101)	$900	$3,720	4.2 years
4	Minus cost of 4% financing for capital cost of PV	-$630	$3,090	4.8 years

Impact on Washington State economy: TBD [Need WA State Revenue/Jobs Forecast]

Tax treatments that allow homeowners to depreciate PV energy and EV purchase costs will offer the same advantage now only permitted for business improvements, accelerating homeowner investment, expanding job creation, adding air quality protection, as well as providing CO_2 stress relief for climate and oceans.

At Scale

In King County Washington, the total number of owner-occupied homes in 2009 was 425,000. After reducing this number by 50% for those not having favorable roof profiles (212,000), and by a further 50% for the remaining homes with tree shadows or needing roof replacement (costs competing with PV panels), approximately 100,000 PV candidates remain. For net zero energy with EV charging of 1 car, a 3 kW panel installation is typical in King County to charge a 24 kWh battery overnight.

The resulting total renewable energy capacity for household EVs in lieu of gasoline is 300 megawatts (MW), assuming all candidates choose PV installation for EV charging. Even in Western Washington this power capacity produces 300 million kilowatt-hours (MkWh) of energy per year, meaning 25 million EV trips of 30 miles. This would prevent the combustion of 25 million gallons of gasoline per year, eliminating the creation of 500 million lb of CO2.