Incenting Clean Household Transportation

An Independent Report to the
WA State Senate
Legislative District 46
Senator David Frockt

1 December 2011

Possible amendments to WA SB 5101 renewable energy incentives that can sustain declining sales tax revenue by enabling households to invest in clean, low cost energy for transportation - their largest source of carbon emissions (51%)

About this presentation

Content is credible because every message statement is independently verifiable

- by calculations you can perform on your own
- by access to open source internet hyperlinks

designates a message chart

designates a verification chart

NOTE: Hyperlinks are active in the "Slide Show" mode

WA low cost grid power can increase State revenue

Sales tax from Electric Vehicle purchases

- Grid cost is $0.02/mi (otherwise $0.10-$0.15/mi)
- EVs offer load growth for excess generation
  - Max wind gen is at night, EVs charge at night

Sales tax from homeowner Photovoltaic installations

- Distributed gen produces during daytime peak loads
- Local, clean energy for energy security
- No need for standby-peak power plants

Increase State revenue with an energy incentive for homeowner grid-connected PV and EV charging

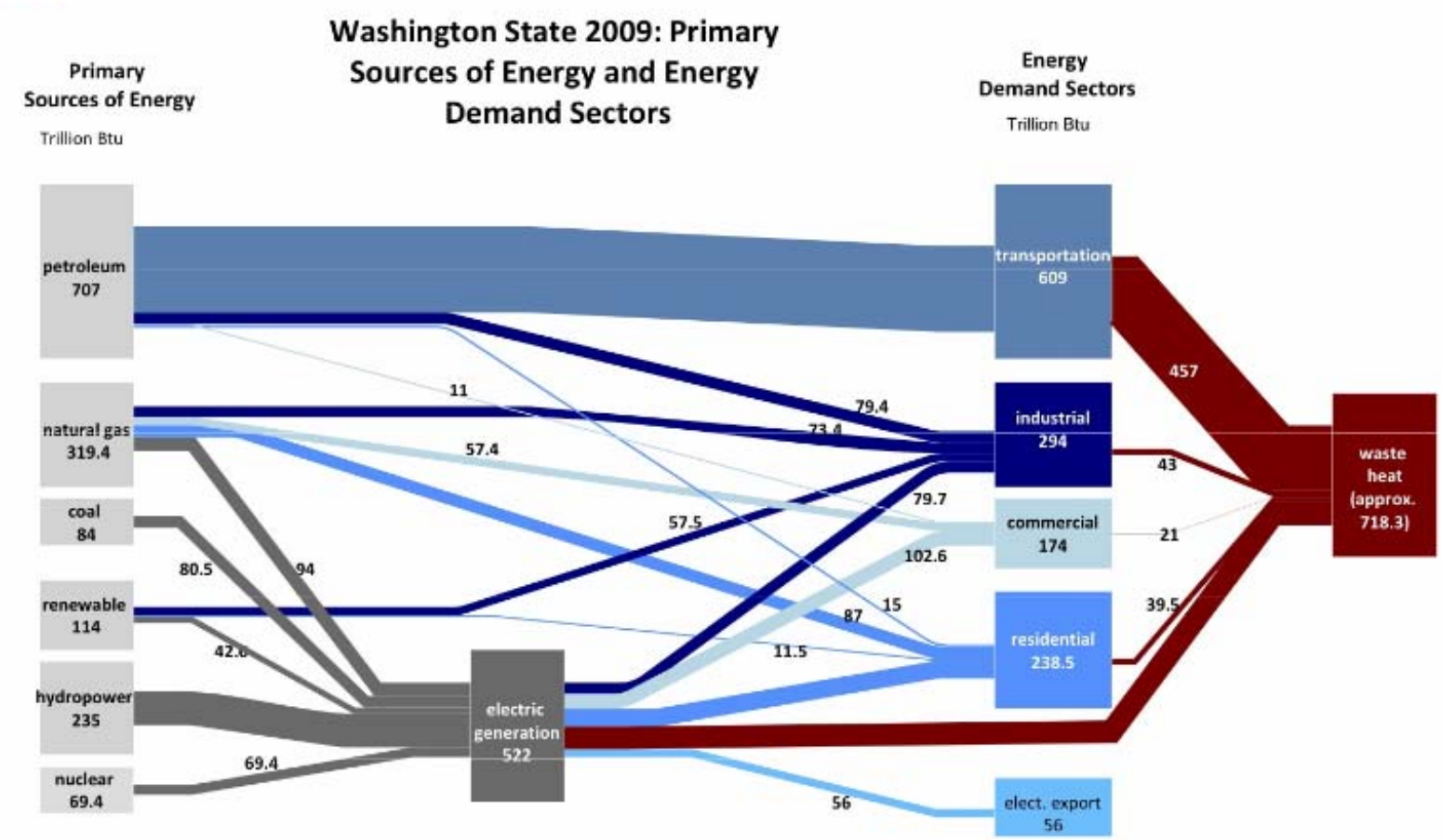
WA low cost grid power can generate State revenue

This new incentive answers multiple problems

- Declining WA Sales Tax Revenue
- Creates distributed generation on grid
- Provides for wind power load matching
- Provides Clean energy for low-cost transportation
- Assures Energy Security
- Generates local clean energy jobs
- Large scale climate relief in WA
- Unburdens the largest user of fossil energy in WA

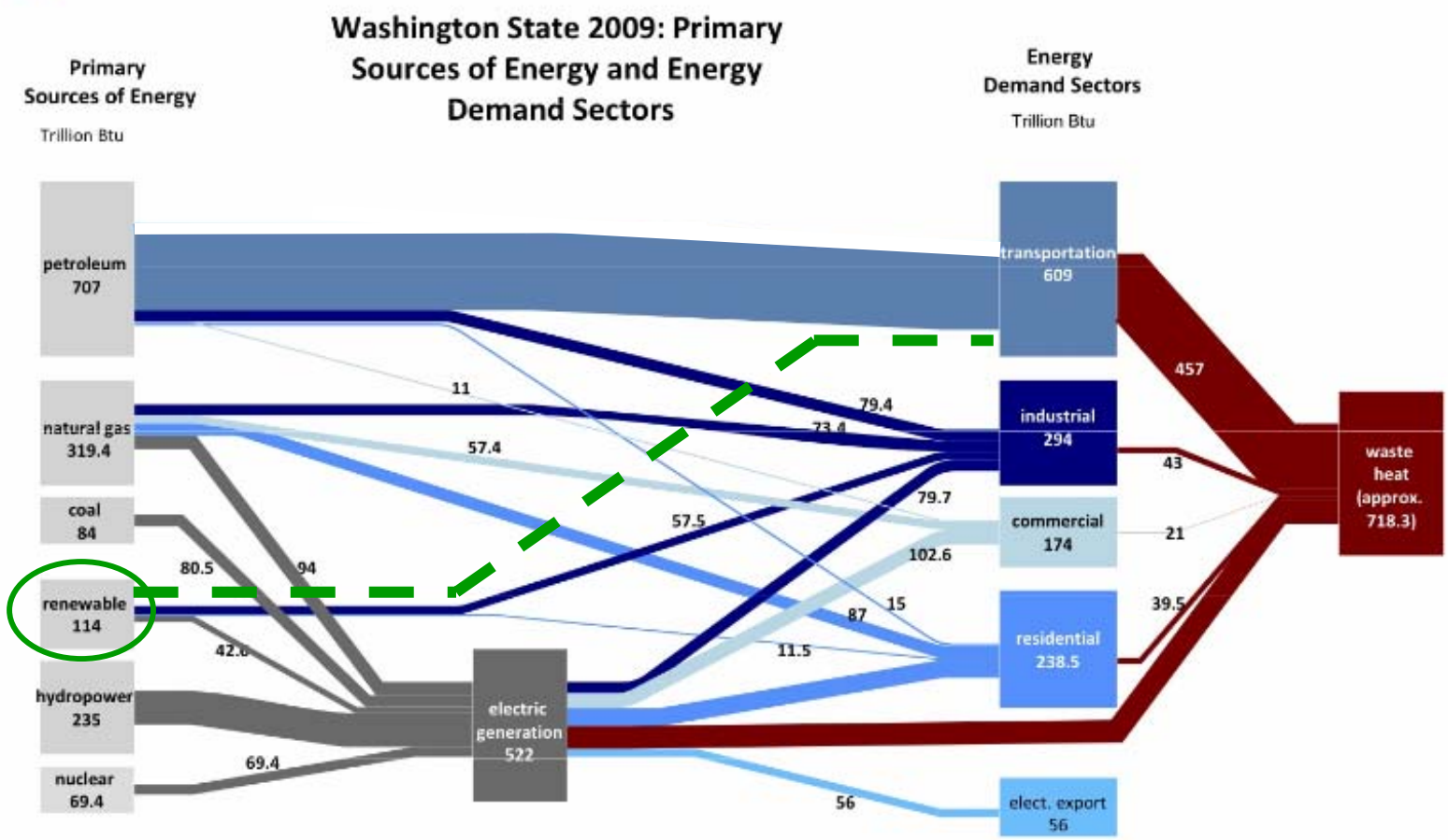
How often does one solution answer 8 problems ?

Energy supply and demand in WA



Economic design for renewable fuel

Low energy cost with addition of renewable energy incentive can change the WA energy picture



Incentives Don't Last Forever

WA Sales Exemption – PV (WA SB 6170)

100%

75%

WA Sales Exemption – EV (WA 2SHB 1481)

Federal Credit

30%

WA Feed-in Tariff (SB 5101)

Incenting Clean Household Transportation

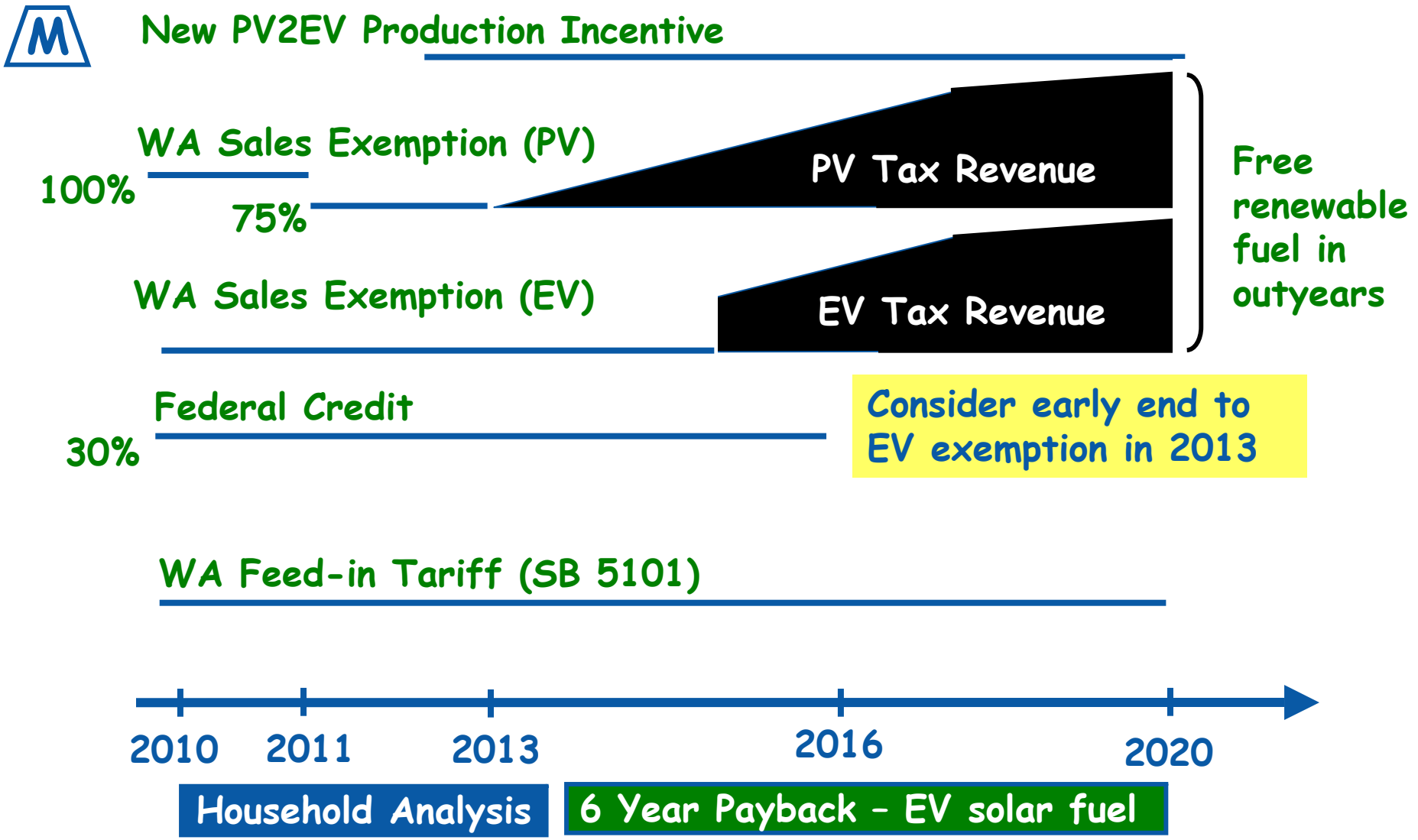
Additional work needed:

What is accumulated tax expenditure cost from SB 5101 Feed-in Tariff payments to PV owners from DoR, in 2011 ?

This can suggest the tax expenditure cost of a new PV2EV production incentive.

Tax benefit should exceed current tax expenditure since PV and EV sales are evident without the new incentive.

Anticipated WA Sales Tax Revenue



Advantages of "Panel to Vehicle"

Once the homeowner transitions to EV transportation, many economic and environmental advantages are achievable

- Clean energy for up to 79% of annual household energy needs
- No Petro fuel consumption - or cost
- "Refuel" from home anytime
- No Petro CO2 footprint – reduction of 6 to 9 tons of CO2 per year (50% of household footprint)
- Isolation from Petro fuel cost increases
- Isolation from utility rate increases (not serious in WA)
- Utility re-sells PV energy
- Energy Feed In Tariff pays off home PV install costs
- Petro fuel cost savings pay off home PV install costs
  - Payback after 4 years
  - Panels last 30 years: 20 years of free clean fuel
  - Return on net assets is very favorable
- Uses standard Charge Station

Verification

Distributed Energy – Household Transportation

Washington enjoys the lowest electric utility rates in the US

The advent of Electric Vehicles and West Coast charging infrastructure can substantially reduce transportation costs, making a strong market for EVs

- **Cost per mi for EV:** $0.02 (Electricity @ 8 c/kWh)
- **Cost per mi, gasoline:** $0.12 (30 mpg @ $3.50/gal)

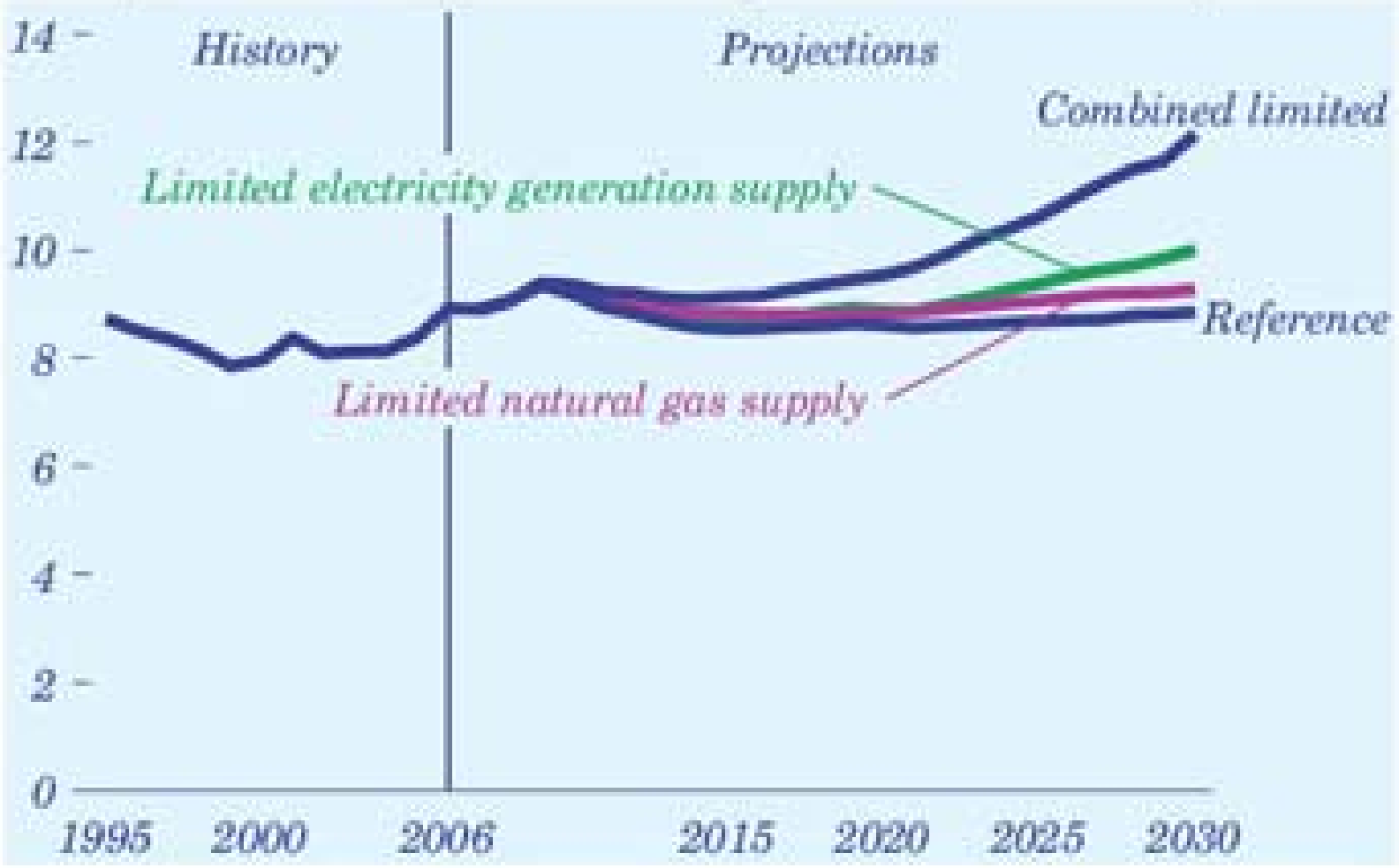
Buyers of newly available EVs gain lower cost of household transportation, while yielding WA sales tax revenue

Slow sales indicate that Federal incentive of $7,500 per EV is not sufficient to motivate many EV buyers

Nissan Leaf production in 2011: 20,000
Chevrolet Volt production in 2011: 10,000
http://www.cleanfleetreport.com/clean-fleet-articles/top-electric-cars-2011

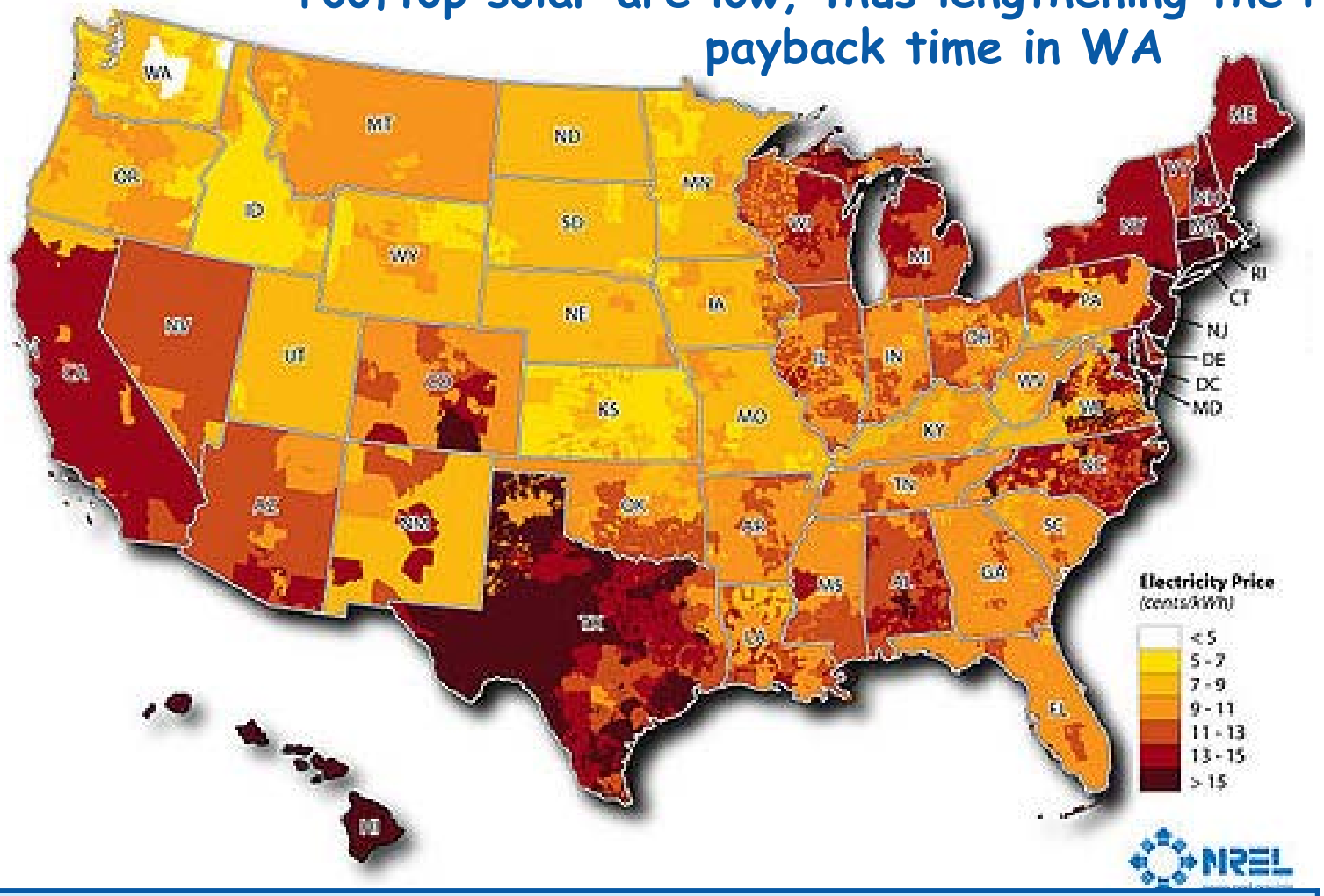
US Energy Information Administration

Figure 20. U.S. average electricity prices in four cases, 1995-2030 (2006 cents per kilowatthour)



Electricity Price Map

Low cost of electric power means that power savings from rooftop solar are low, thus lengthening the PV payback time in WA



Low cost of electric power means low cost transportation

Leveraging Energy Cost

Low cost of electric power means low cost "fuel" for Electric Vehicles

Fuel savings achieved from EV ownership contribute to earlier rooftop Photovoltaic (PV) payback time

- Since households have never been able to depreciate the cost of household vehicles, EV's should not now suddenly be expected to achieve payback for EV cost

After PV payback, "fuel" is free for at least 20 years

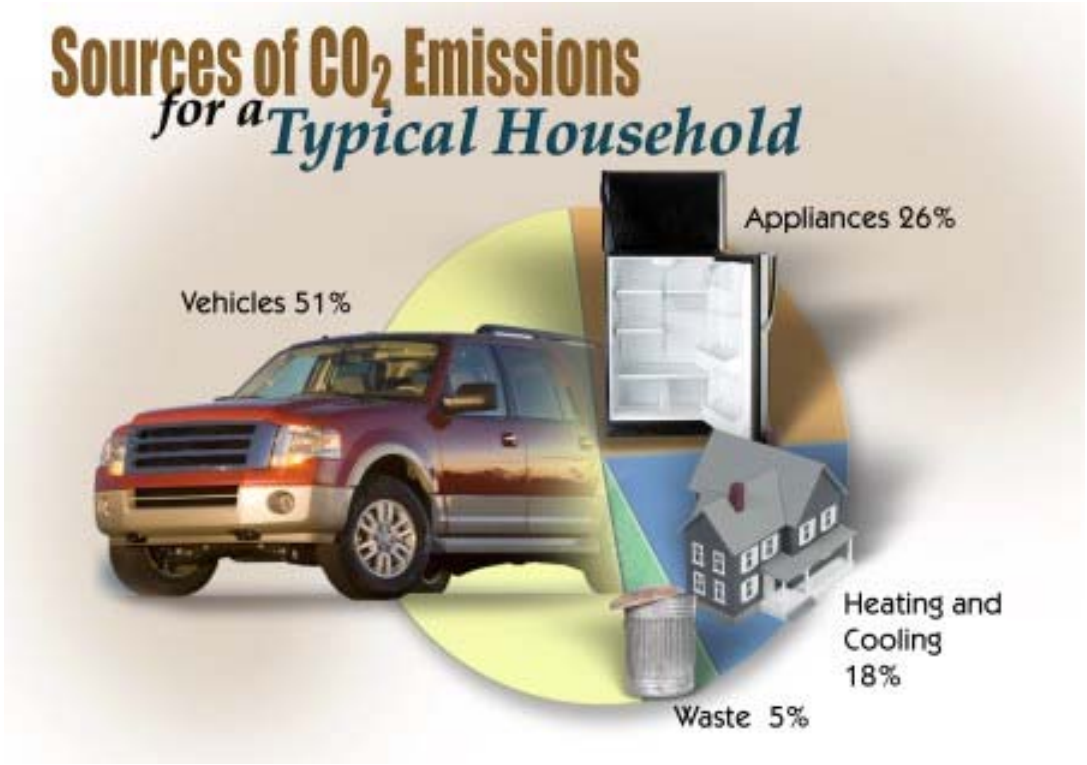
Increases disposable income to stimulate State economy

Assures energy security, clean city air, climate relief, and can be designed for zero grid energy annually per EV

Household Carbon for Transportation

Household carbon footprint for Transportation is 51%

- Solution - Transition to an Electric Vehicle



Source	%
Appliances	26
Heat & Cool	18
Waste	5
Total	49

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

Household Energy for Transportation

Average Home consumes 11,000 kWh per year.
http://www.eia.doe.gov/emeu/reps/enduse/er01_us_tab1.html

Additional energy is consumed for household transportation

National average is 2 household vehicles, 25 mpg each, for 25,000 total annual miles traveled.

Fuel needed: about 1000 gal for 2 cars

US average for 2 cars/household: 1,158 gal total

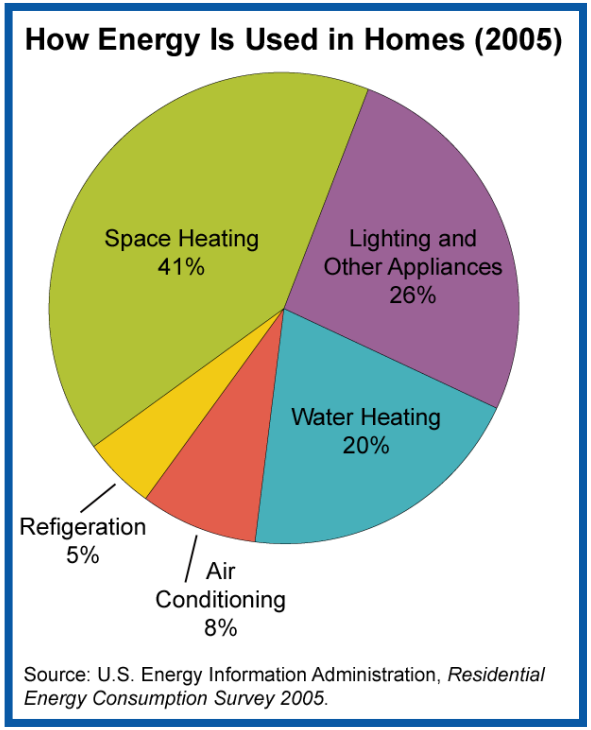
See Report Table 5.50 at
http://www.eia.doe.gov/emeu/rtecs/toc.html

Energy in 1 gal gasoline is 125,000 Btu

At 3413 Btu/kWh, 1 gal gas = 36.6 kWh

Annual transportation energy is

1,158 gal x 36.6 kWh/gal = 42,383 kWh



http://www.eia.doe.gov/kids/energy.cfm

Household Energy for Transportation = 79%

Average Home consumes 11,000 kWh per year
http://www.eia.doe.gov/emeu/reps/enduse/er01_us_tab1.html

Annual Household transportation consumes 42,383 kWh on average

Total annual household energy

11,000 kWh consumed in the home

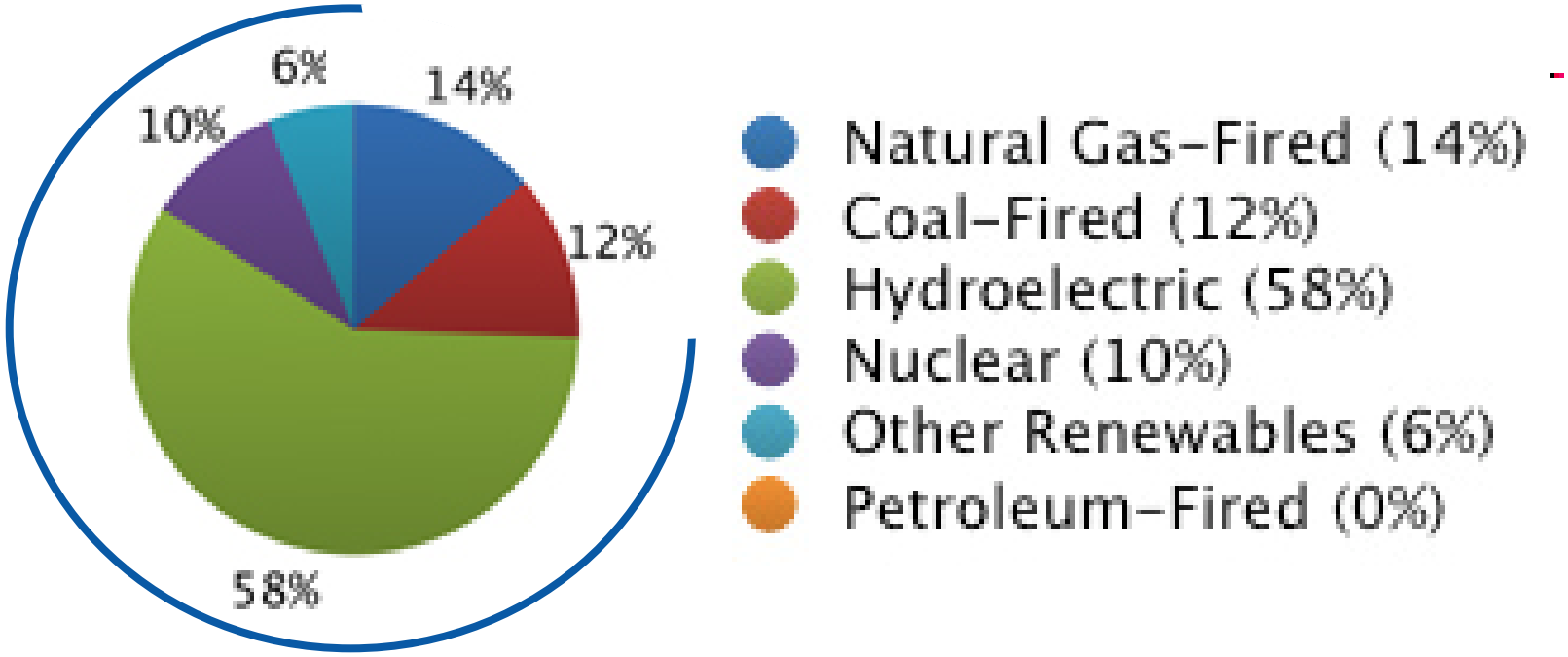
42,383 kWh consumed by transportation

53,383 kWh household total

Transportation energy makes up 79% of household energy consumption on average, per year

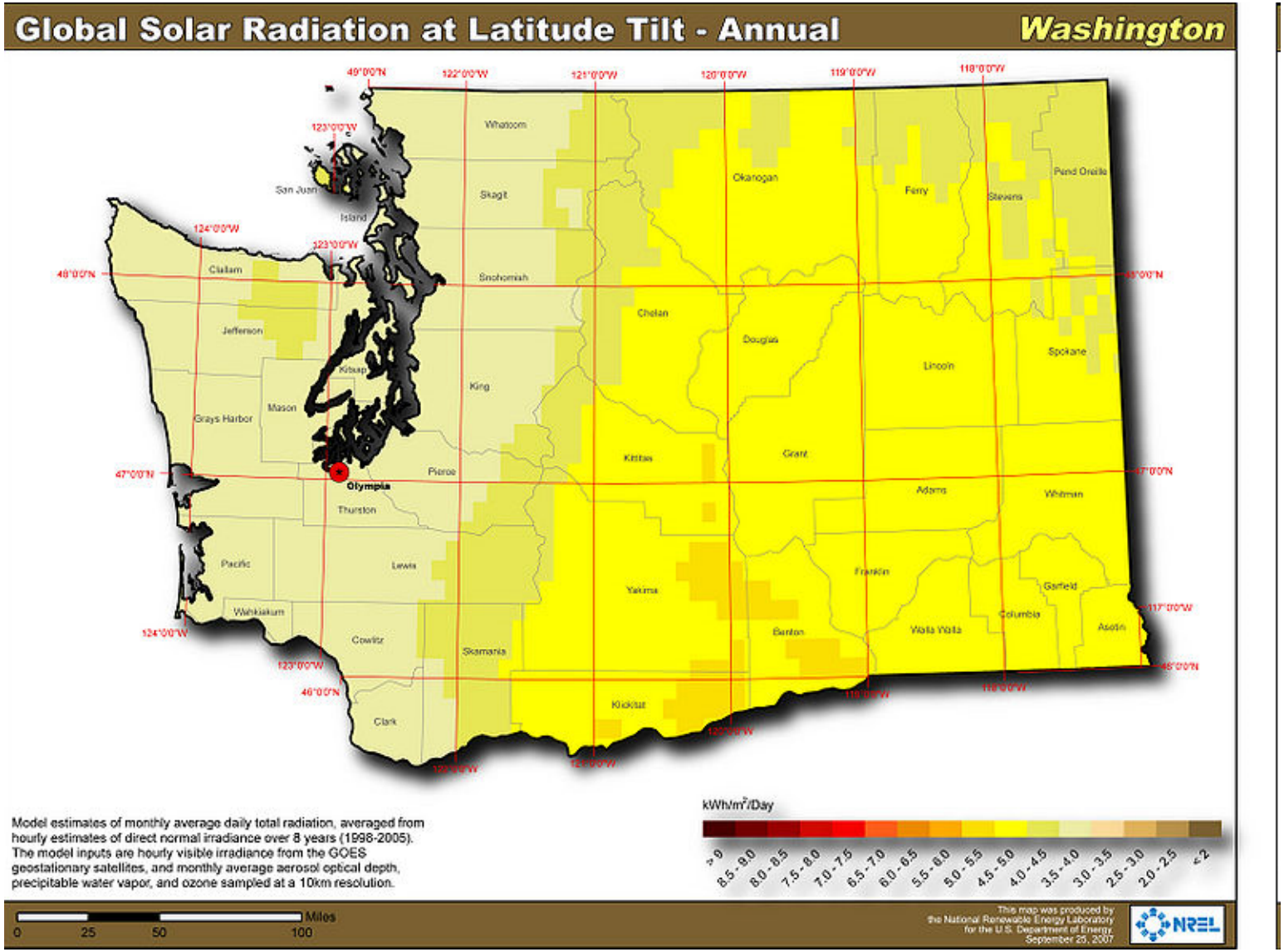
The transition to clean energy is most effective starting with transportation first

Washington's Electricity (2010)



74% Non-carbon Energy

WA Solar Productivity



Household Distributed Energy

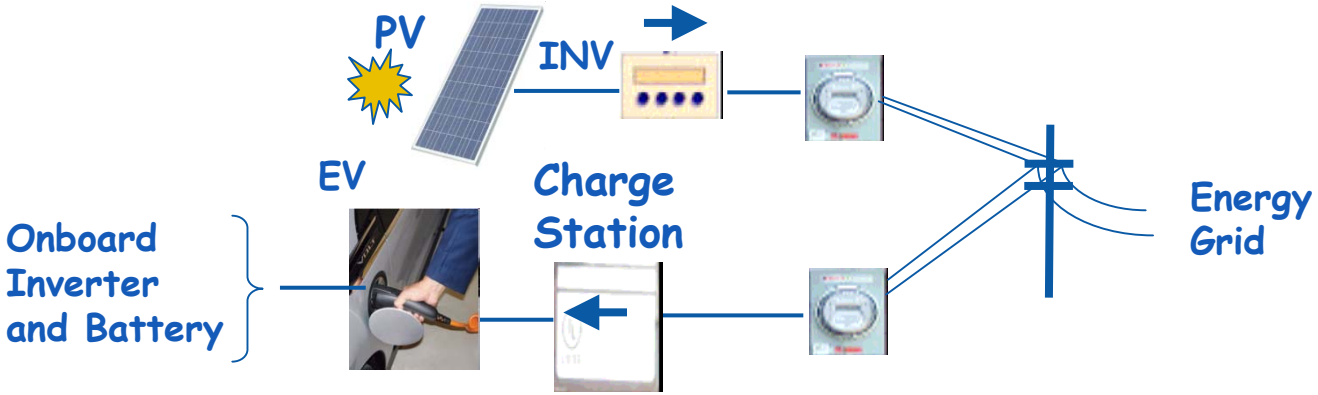
The need for peak-load power generation can be eliminated when distributed energy is employed on a large scale

- Homes, buildings, businesses

Production of clean renewable energy from Photovoltaic panels, then used to charge EVs, presents a near-term solution for clean, economical transportation as well as distributed energy

Panel to Vehicle (P2V)

Home, Apartment, Business, Parking Lot



Household Distributed Energy

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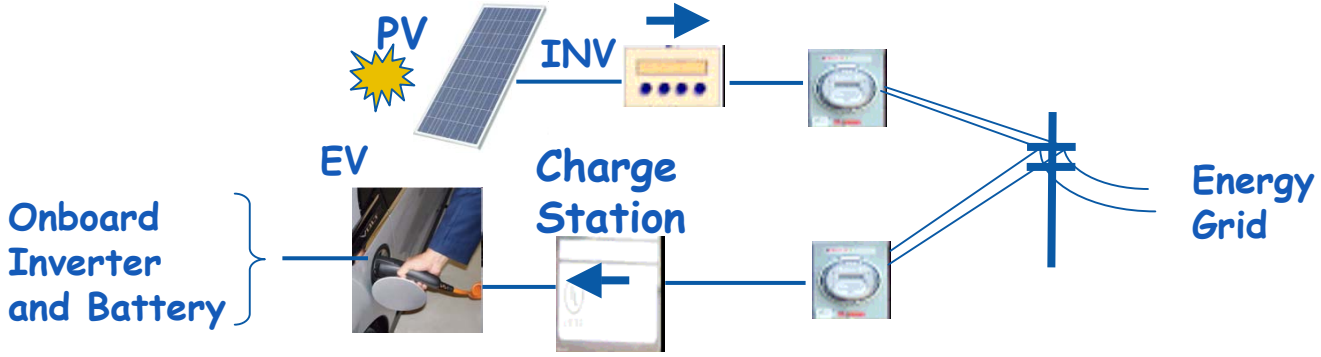

- Clean energy
- No fuel cost (after PV payback)
- Charge anytime from grid
- Isolated from utility rates
- Utility uses PV energy
- Energy Feed In Tariff pays off home PV installation costs
- Fossil fuel cost savings pays off home PV installation costs
- Uses standard Charge Station
- No Petro CO2 footprint

What the "Primary" Incentive will do

Current SB 5101 incentive awards homeowner $0.54 /kWh for energy generated and sent to the energy grid

- Solar PV panels are manufactured in WA ($0.36 /kWh)
- Rooftop power inverter is manufactured in WA ($0.18 /kWh)

What Feed-in Tariff is generated from annual charging of an EV?

- EVs achieve 4 mi/kWh
- For 12,000 miles annually, energy consumed is 3,000 kWh
- When produced by the rooftop*, earnings are $0.54 /kWh and homeowner receives $1620 annually (zero grid energy annually)

With the "Primary" incentive in place, adding $0.30 /kWh for PV producing grid energy for an EV, total earnings are $0.84 /kWh and homeowner earns an additional $900 annually

*In Seattle, a 1 kW PV panel produces 970 kWh so the EV needs a rooftop installation designed to produce 3.1 kW

Typical Payback in Seattle

- At $6 /watt installed, homeowner investment for 3.1 kW installation depends on PV design point.

  - Assume energy delivery from rooftop to grid is 90% efficient
  - PV design point becomes 3.1/0.9 = 3.5 kW

Total rooftop cost is 3,500 x$6 = $21,000.
Cost of power inverter is $1,500, for total of $22,500
With 30% tax credit, expense is $22,500 x0.7 = $15,750

PV Payback

Current earnings from SB 5101 feed-in tariff: $1,620
Savings of $0.12 -$0.02 = $0.10 x12,000mi = $1,200
Annual cost recovery $2,820

Years for PV payback, $15,750/$2,280 = 5.6 years

Early Payback with Primary incentive

- At $6 /watt installed, homeowner investment for 3.1 kW installation depends on PV design point.

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PV Payback

Increased earnings from SB 5101 feed-in tariff:	$2,520
Savings of $0.12 -$0.02 = $0.10 x12,000mi =	$1,200
Annual cost recovery	$3,720

Years for PV payback, $15,750/$3,720 = 4.2 years

Early Payback with Primary incentive

Energy loans are broadly available for projects with a 4 year payback

Financing PV capital adds cost, which adds a delay in reaching cost recovery.

With a 4% clean energy loan, payback is still under 5 years

	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

Incenting Clean Household Transportation

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Better Energy LLC

Mission:

Advocate for early adoption of clean energy and sustainable transportation for homes and businesses. Assist evolution of solar economy by researching cost models for early payback.

www.better-energy-LLC.com