SOLAR PV VERSUS OIL

saved as 'Oil to PV Solar 1 2017'

Data Used											
	One barrel=	159	litres						Useful energy used driving petrol and diesel vehicles		installed PV required to replace a barrel of fuel per day
	One Mj =	0.278	kwhrs								
Energy Content of Petrol	33.5	Mj/litre	9.313	kwhr/lt	1480.767	kwhrs/brl	349.461	kwhrs/brl	87.365	KWp/brl
Energy Content of Diesel	40.3	Mj/litre	11.203	kwhr/lt	1781.341	kwhrs/brl	504.119	kwhrs/brl	126.030	KWp/brl
Energy Content of Crude Oil	29.5	Mj/litre	8.201	kwhr/lt	1303.959	kwhrs/brl	369.020	kwhrs/brl	92.255	KWp/brl
Energy Content of Bunker 6 fuel oil			11.760	kwhr/lt	1869.840	kwhrs/brl	529.165	kwhrs/brl	132.291	KWp/brl
Fuel to wheels for Petrol Vehicle	23.60%	See	4	kwhrs	is average daily output from 1000 watts of installed PV for Auckland					
Fuel to wheels for Diesel Vehicle	28.30%	sheet 2			(Using NREL PV watts calculator)					

NEW ZEALAND FUEL CONSUMPTION
From MBIE 2017
And the installed PV required to replace this fuel use.

	10^6bl/yr	10^3bl/d	% Total	PV installed to cover 2017 fuel use	
(Private) Petrol	20.668	56.625	48.556	4,947,028	KWp
(Business) Diesel	21.897	59.992	51.444	7,560,755	KWp
Totals	42.565	116.616	100	12,507,783	KWp

So a TOTAL of 12.5 GWp oF installed PV panels would provide enough power to drive electric vehicles performing the same duties as the current Petrol and Diesel vehicles using their relatively inefficient internal combustion engines.

BUT
Private transport should rely on PV mounted on domestinc houses as the petrol car fleet is replaced with EVs. While the business van and truck fleet would rely on PV mounted on or at business premises. Sept 2017 census estimates: there were 1,849,000 private dwelling houses in NZ. Assume 1,479,200 (80%) would be suitable for PV. Likewise, NZ Stats 2017: There were 563,300 Commercial Enterprises in NZ.

		PV per roof	
Houses	1,479,200	3.34	KWp/house
Businesses	563,300	13.42	KWp/bsness

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YEARLY COSTS OF FUEL		$/lt	$/barrel	B$/year
Cost of fossil fuel	petrol tax	0.67129		
Petrol cost per liter/per barrel	petrol cost	2	211.26	4.366
Diesel cost per liter/per barrel	diesel cost	0.93	147.87	3.238
			Total B$/yr	7.604

PETROL FUEL AND PV COSTS AND PAYBACK TIME		$ cost/Wp	GWp(H16)	B$		payback time	
Cost of installed PV and payback time		2.28	4.95	11.28		2.58	years
				$			
Installation cost per house	(M26)	3.34	KWp	7,625	Cost/House	No of 300w pnls	11.15

DIESEL FUEL AND PV COSTS AND PAYBACK TIME		$ cost/Wp	GWp(H17)	B$		payback time	
Cost of installed PV and payback time		2.28	7.561	17.24		5.32	years
				$			
Installation cost per business	(M27)	13.42	KWp	30,603	Cost/Busnes	No of 300w pnls	44.74

How much better off will NZ be after getting Solar PV installed on their roofs and Electric vehicles in their garages?

			B$/year	Annual saving	
For petrol driven vehicle > EV	Number of houses	(L26)	1,479,200	4.366	2,951.88	$/household/yr
For diesel driven vehicle > EV	Number of enterprises	(L27)	563,300	3.238	5,748.11	$/enterprise/yr

SUMMERY
Orange input cells can be updated at any time to reflect changing conditions.
Green cells represent outputs and shoild not be changed.
Blue cells represent intermediate calculations to show how results are obtained. Do not change.
Red cells are explanatory comments.

So total costs break down as follows:
Total annual cost to the public for buying petrol and diesel is B$ 7.604 (if cells D33-35 represent average prices for the year).
The one-time costs of purchasing and installing Solar Panels is for petrol, B$ 14.84 and for diesel, B$ 22.68, and will not need to be repeated for up to 30 yrs. Total PV panels required is 12.5 GWp

And from this last box the amount of money that is saved by each house with solar panels on their roof and an EV in their garage is shown. Currently nearly $3000 per annum with 11x300w solar panels installed after the 2.58 year payback time.
Business enterprises install more panels with a longer payback time, but on average the saving is $5,748 dollars per year, after a payback time of 5.32 years.

Notes: This Spreadsheet is an exploration into the feasability of transitioning from fossil fuel to renewable (Solar) fuel for domestic private/business transport.
A house with 11.15 300 Wp panels on its roof or 3.34 KWp produces 13.36 KWhrs of power in Auckland per day.Enough to drive a Nissan Leaf 95 kilometers.
An average business enterprise with 45 panels would generate enough power to drive 4 cars 96 kms per day (assumes 0.14 KWhrs per kilometer of travel)
Each house or business equipped with solar panels can be seen as a power generator and a local area of such generators is seen as a network connected to the Grid, but sharing power between others in the network for the local benefit of its members. Vector has had research done that shows the network can be stable and acceptable to the main grid if each network generator is equipped with sufficient battery storeage and approved grid tied inverters.
Battery storeage at this time would perhaps double the intallation costs and the payback times per house/enterprise. But these costs could be reduced significantly by bulk buying and in any case are decreasing significantly with time.