The car after the storm

- potential wind energy and electric vehicle synergies

SEF EV Seminar
Wellington
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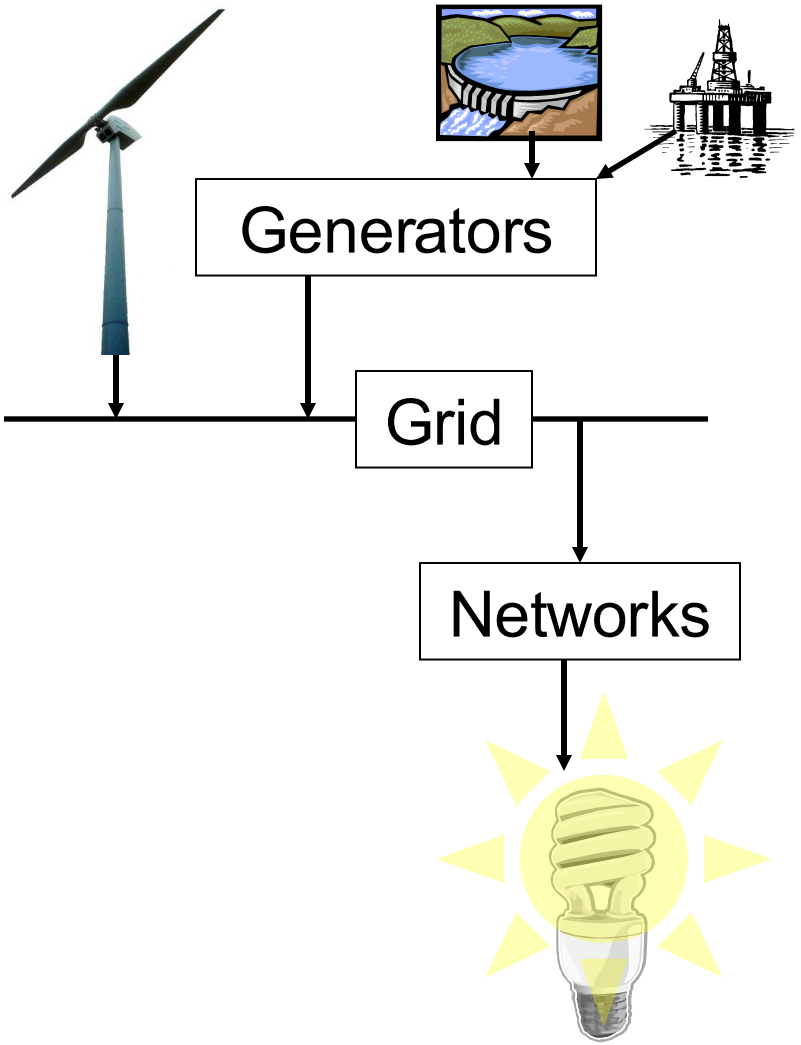
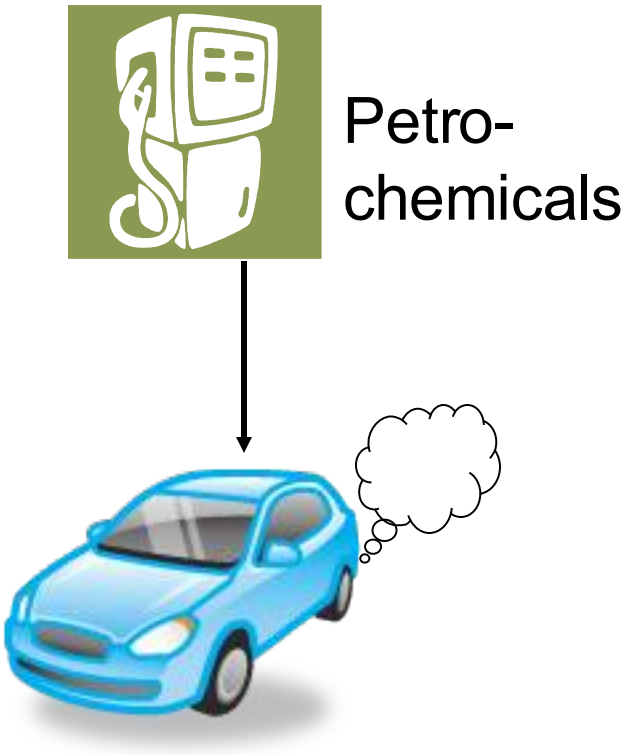
WIND - NEW ZEALAND'S ENERGY

Energy Conversion Systems





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‘Back of an envelope’ System Comparisons

	Electricity Generation	Transport
No. of units	60+	2,100,000
Average Unit Power	-	100 kW
Total System Power	9 GW (5 GW peak demand)	210 GW
In use	54%	< 5%
Response time *(off to full power)*	Minutes to hours	Seconds
Capital cost	$ thousands/kW	$ hundreds/kW
Design lifetime	Approx. 100 – 200,000 hrs	Approx. 3,000 hr

The light vehicle fleet has a total power capacity about 20x that of the entire electricity generation system

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Can these energy systems cross-over?

Driver wants sufficient energy available to make next journey

Typical use maybe 1 hr/day (i.e. <5%)

Energy stored for remainder of day

Variable output

Operates 95% of time
(@ 40% capacity factor)

How do we accommodate peaks and troughs?

A high capacity energy storage system available 95% of the day

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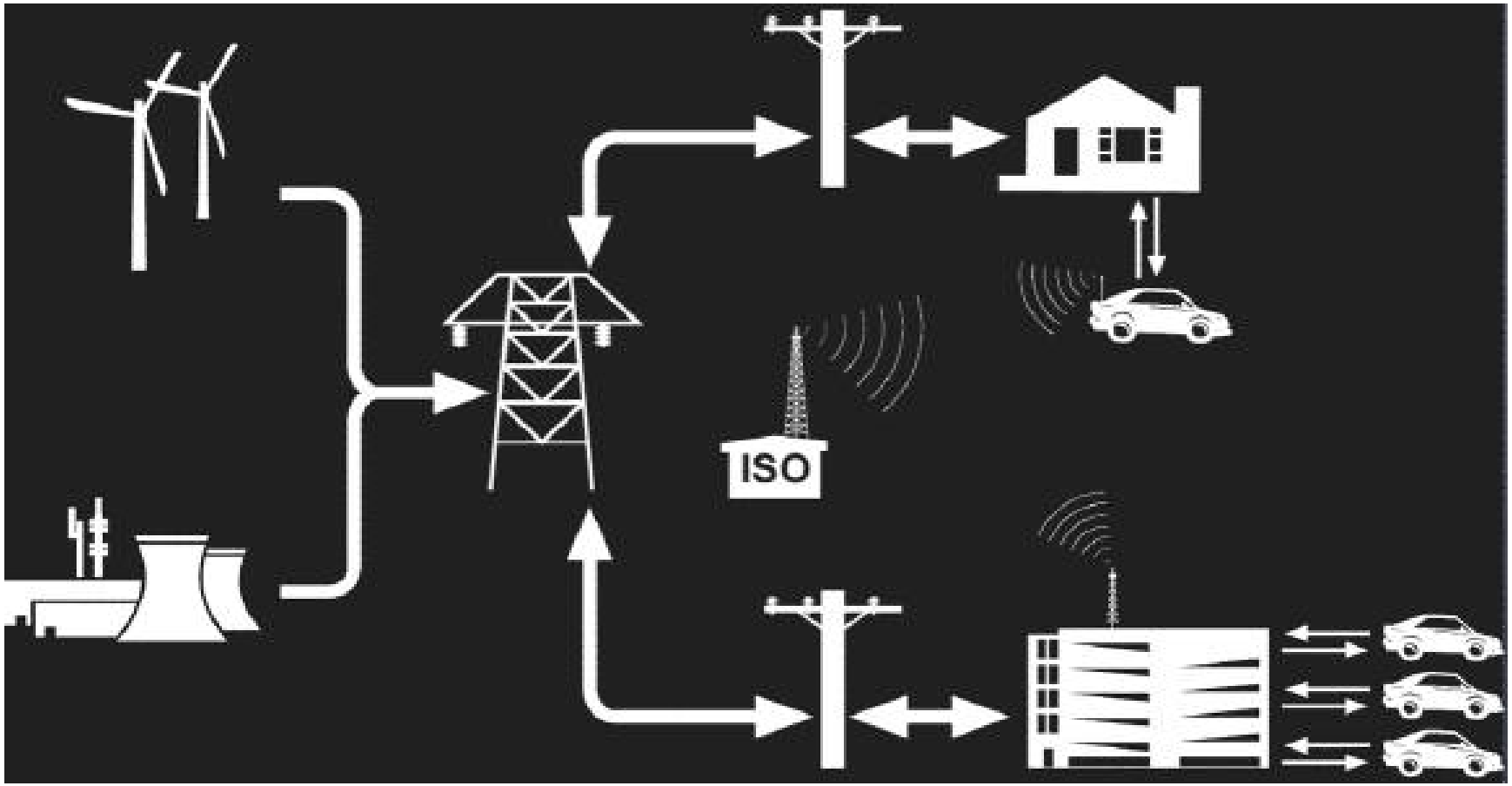
Vehicle to Grid (V2G)



From W. Kempton's presentation to UWIG, March '06

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What sort of contribution could this make?

	10% of vehicles as electric
No. of units	210,000
Average Unit Power	15 kW
Total System Power	3.2 GW
In use	< 5%
Response time *(off to full power)*	milliseconds to seconds

Electricity Peak Demand: 4.6 GW

Potential functions:

- System regulation (voltage and frequency)
- Instantaneous reserves
- Capacity firming
- Storage (e.g. increasing over-night demand)

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Some investigation is underway overseas

Estimates made for the USA:

- 3.2% of vehicle fleet as battery with 50% availability could provide all ‘regulation’ requirements
- 38% of vehicles as battery, or 34% as PHEV with 50% availability could provide all fast reserve requirements

Utilities in the USA such as PG&E, AEP are actively investigating the concept

In Germany, turbine manufacturer Enercon is operating a battery-powered Audi A4.

Study underway in Sweden involving Volvo & Saab.

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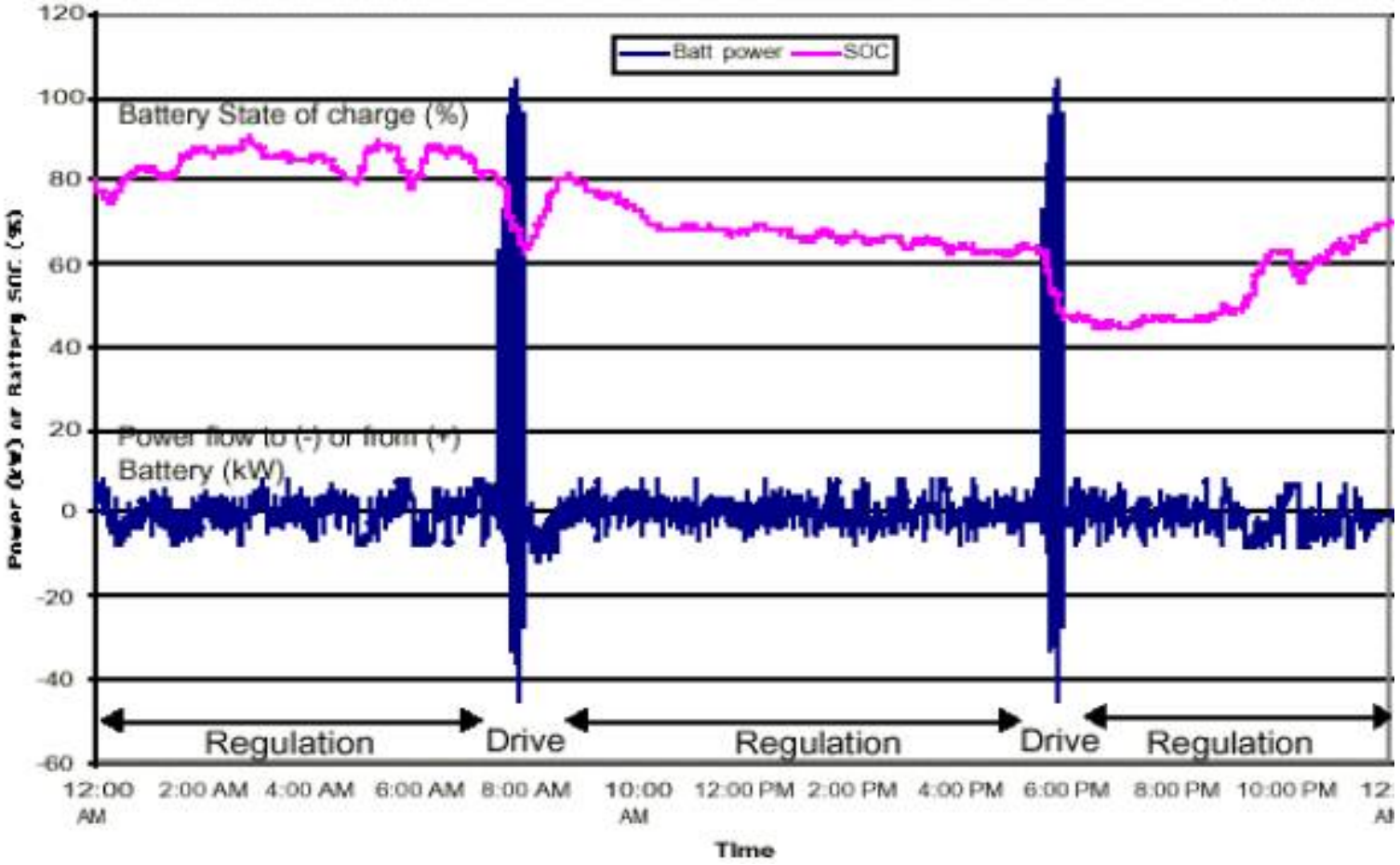
Some testing has already been undertaken



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See http://www.udel.edu/V2G/ for more info.

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Thank you

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