



Plug in

out!*

Plug-in Hybrid Electric Vehicles (PHEVs) & reducing greenhouse gas emissions

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3 April 2008

* Apologies to Timothy Leary

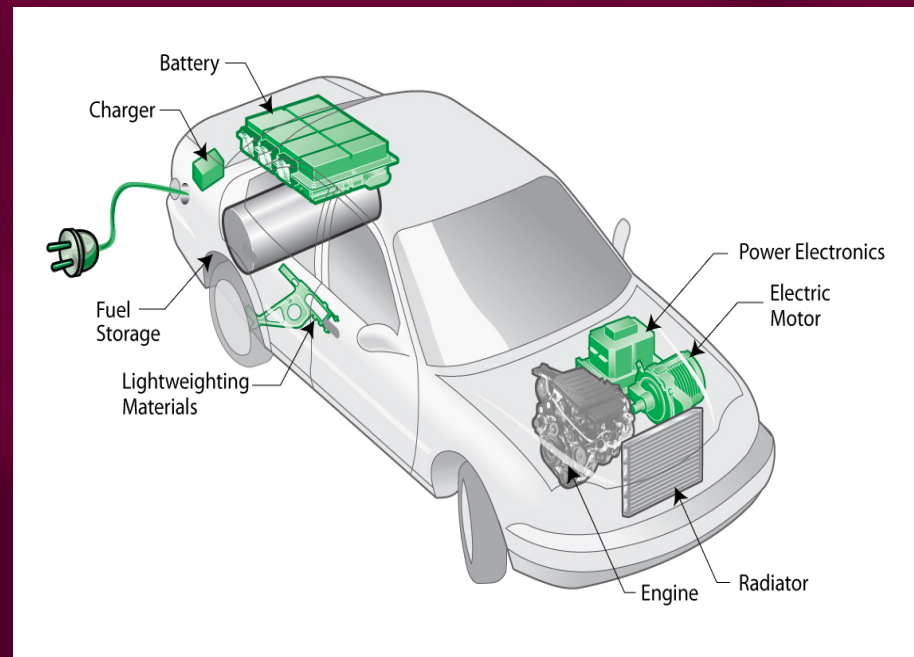
1. Plug In

What's a Hybrid Electric Vehicle (HEV)?

- > Has both petrol engine *and* electric motor and battery
- > Still runs on petrol only, but much up to 50% more efficient
 - Engine does not idle, recovers braking energy, smaller capacity engine,
 - Reduces emissions
 - Reduces reliance on (imported) oil

What's a **Plug-in** Hybrid Electric Vehicle (PHEV)?

- > Bigger Battery
- > Socket & Charger to charge off electricity grid
- > Reduce greenhouse emissions
 - (*if* renewable powered)
- > Reduces urban pollution
- > Much lower running costs
 - (but high battery costs)



Why PHEVs?

More oil use

Peak Oil

Conventional vehicle

- ✗ petrol fuel
- ✗ ~20% efficient

Hybrid Electric Vehicle (HEV)

- ✓ ~40% efficient
- ✓ Long range, quick refuel
- ✗ petrol fuel

Volvo C30 PHEV Concept Car

- Flex-fuel -up to 85% ethanol
- 0-100km/h in nine seconds
- Battery only range of 100km

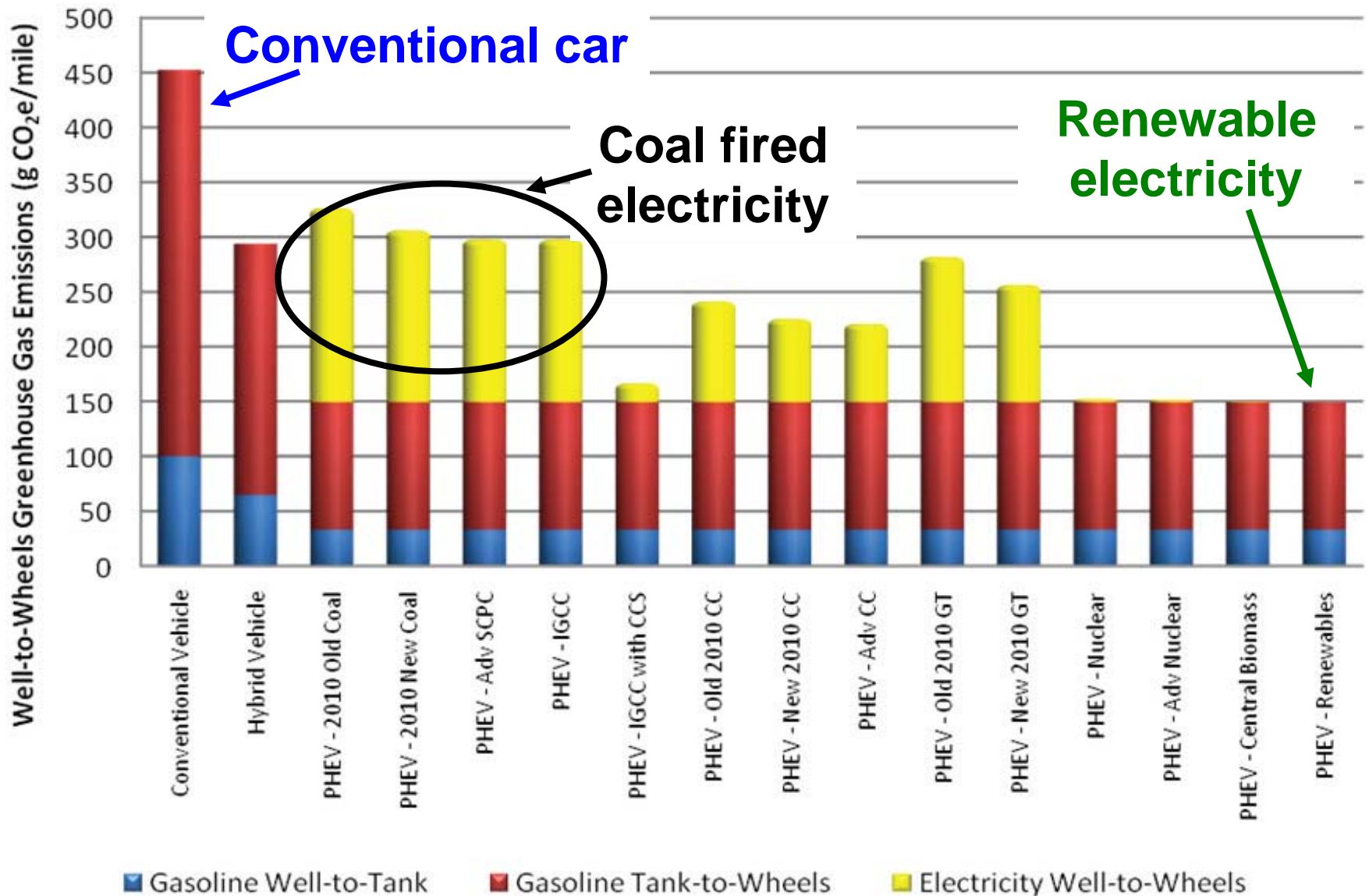


Global Warming

More greenhouse emissions

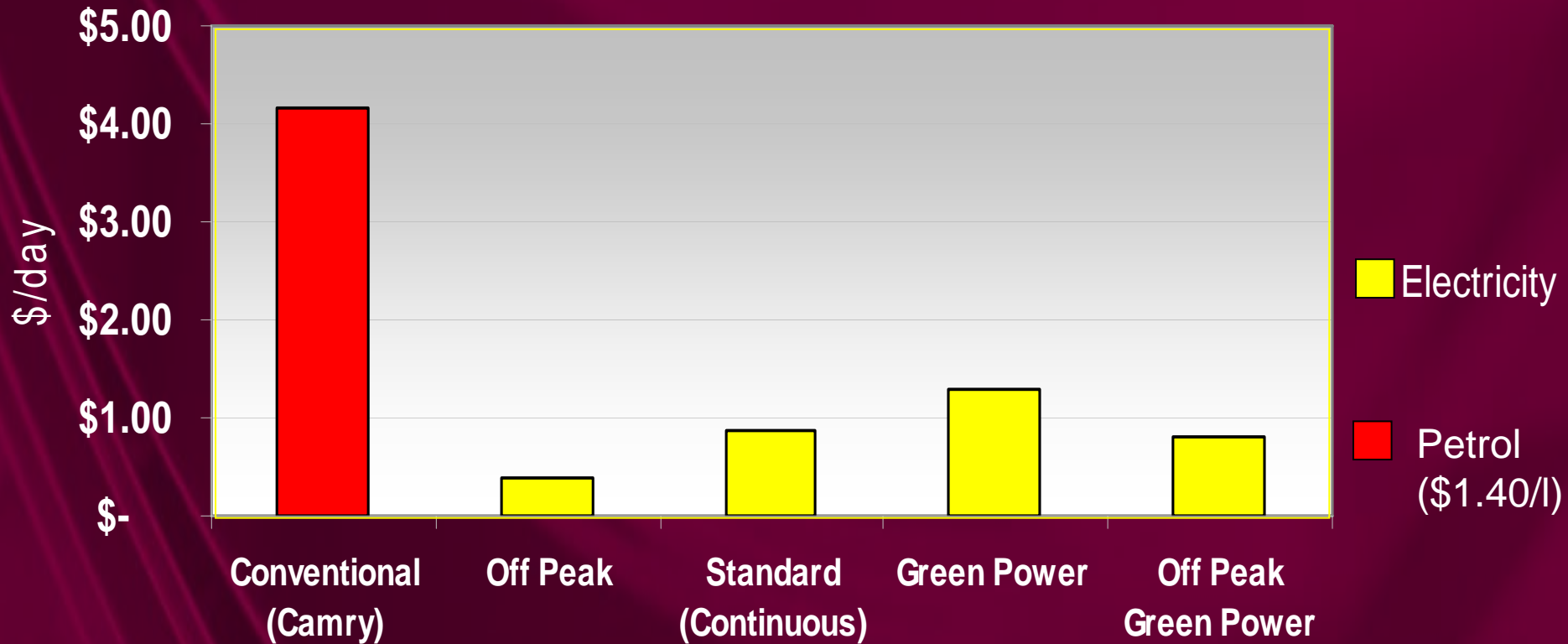
PHEV Greenhouse Gas Emissions

Comparison of PHEV emissions charged from various power stations types
(Year 2010, 19,300 km per year, 30km electric range)



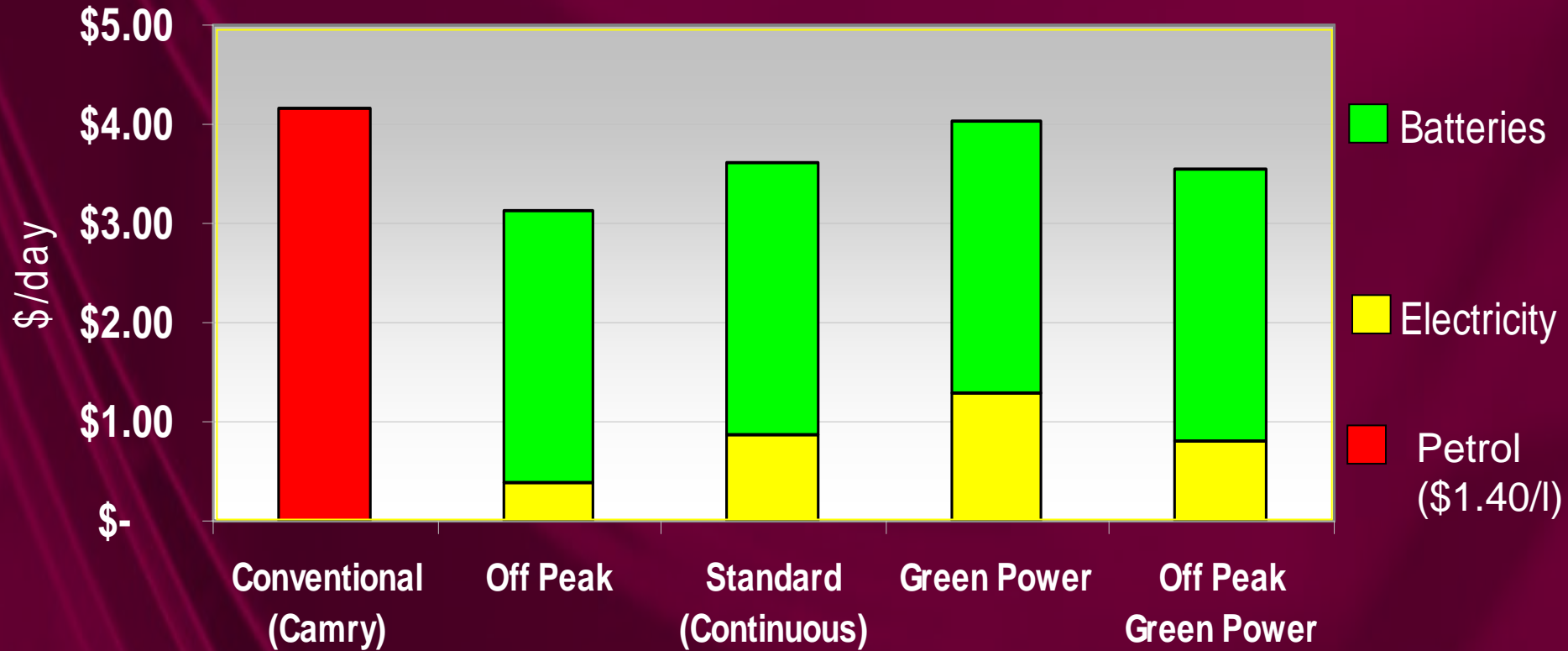
Fuel Cost Comparison

(per day for 30km commute)



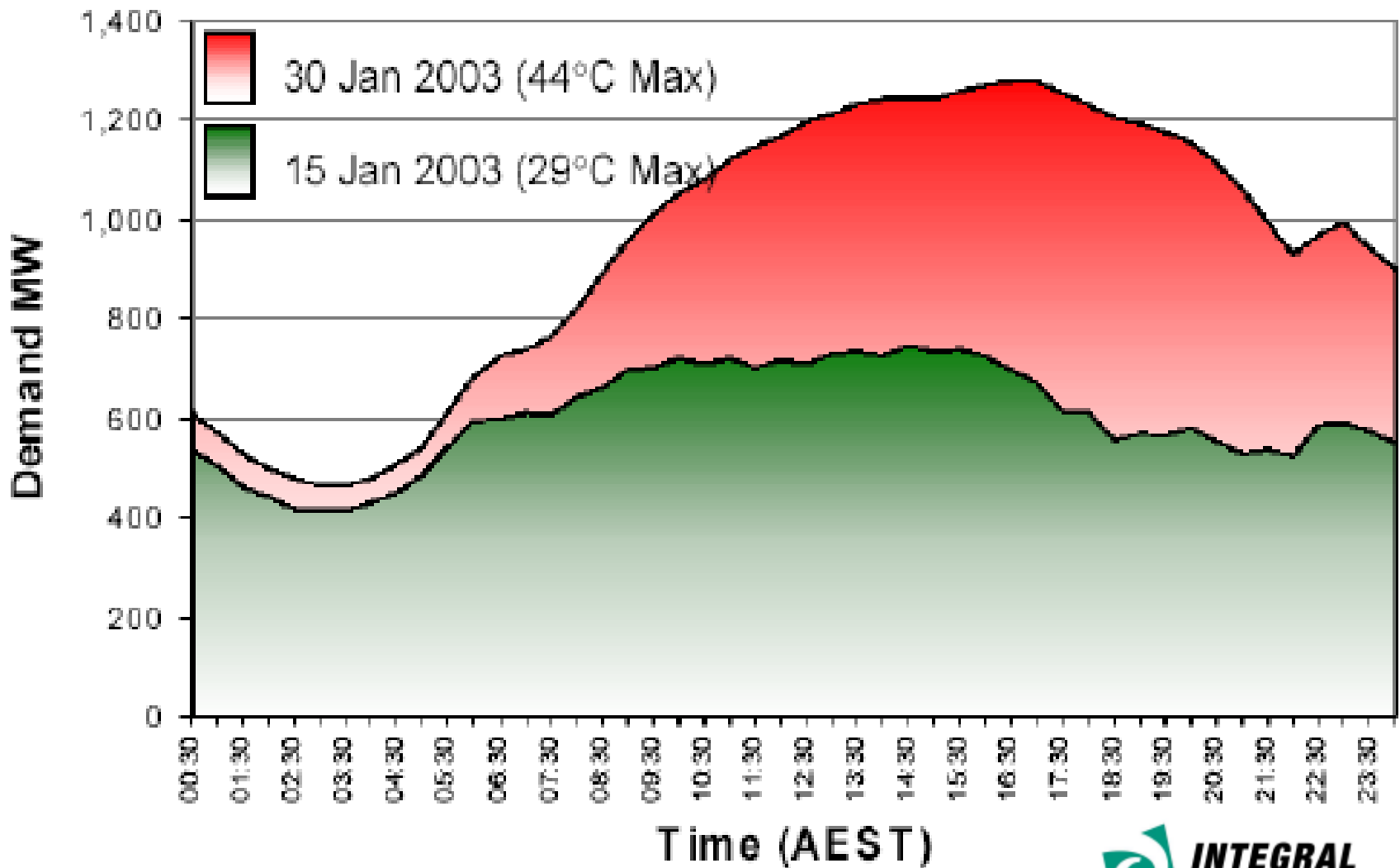
Fuel Cost Comparison

(per day for 30km commute)

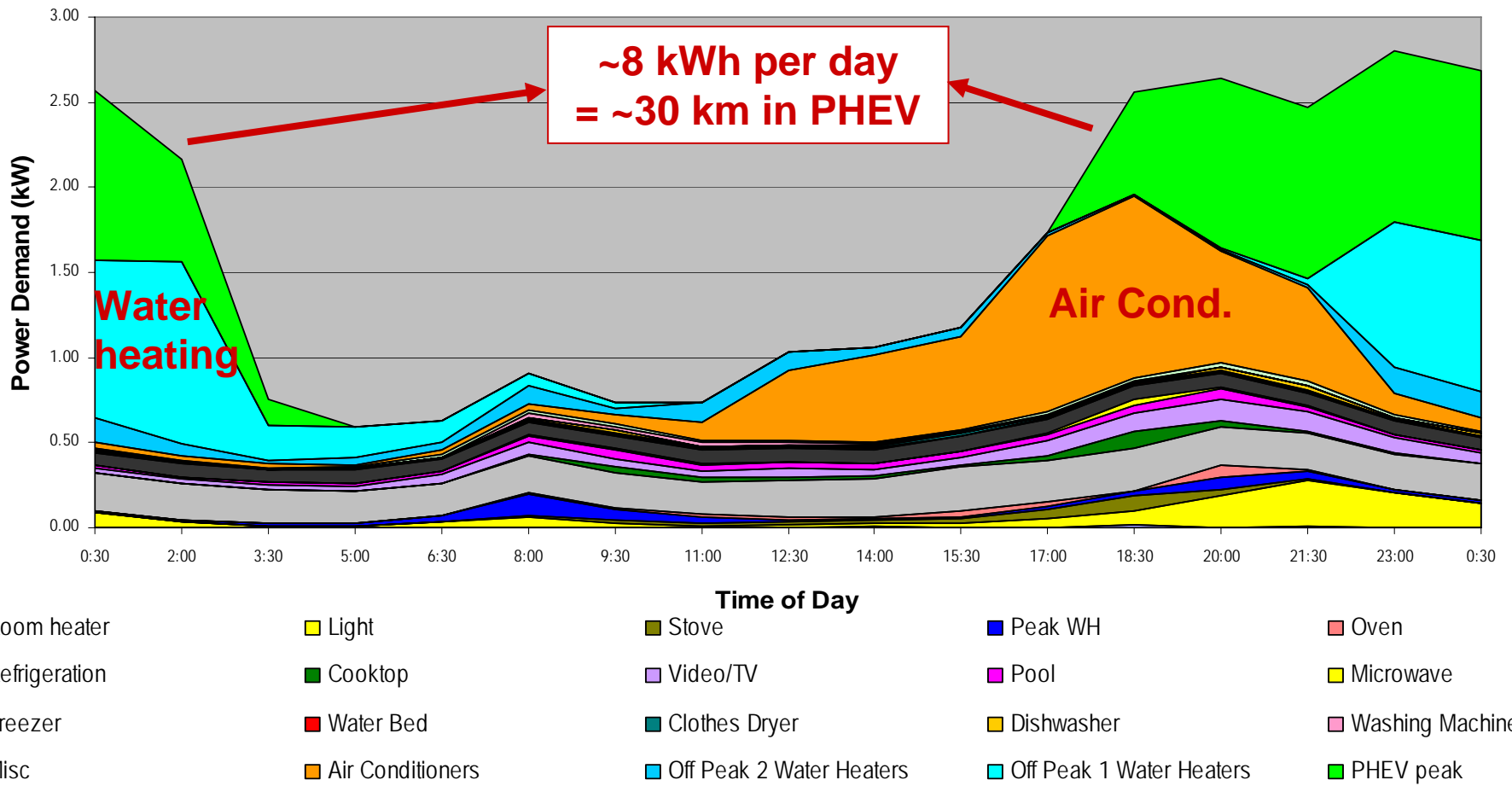


Summer Load Profile: Peak day vs typical day

(Sydney West Bulk Supply Point)

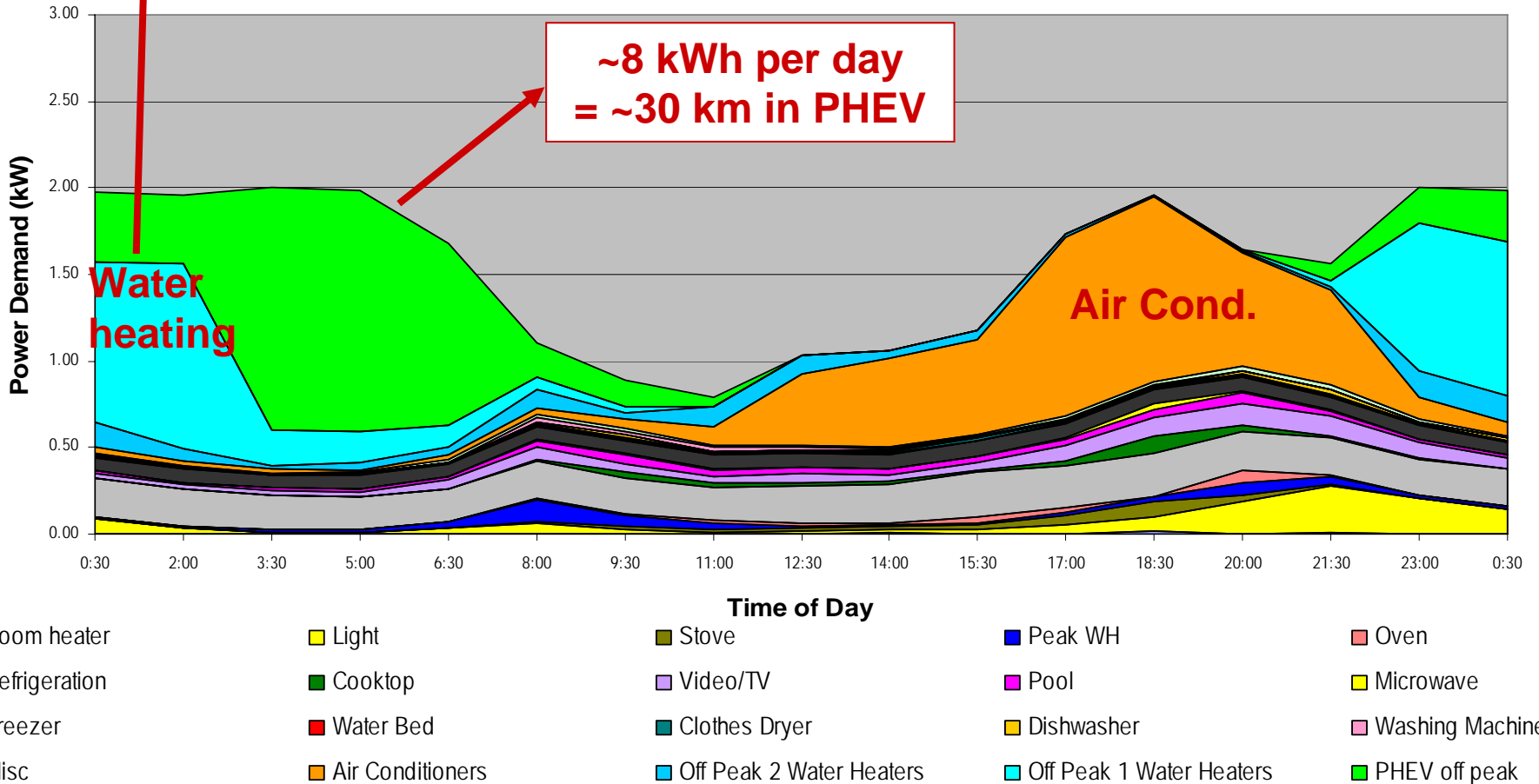


Typical NSW Residential Power Demand (Summer Peak) Plus uncontrolled PHEV charging





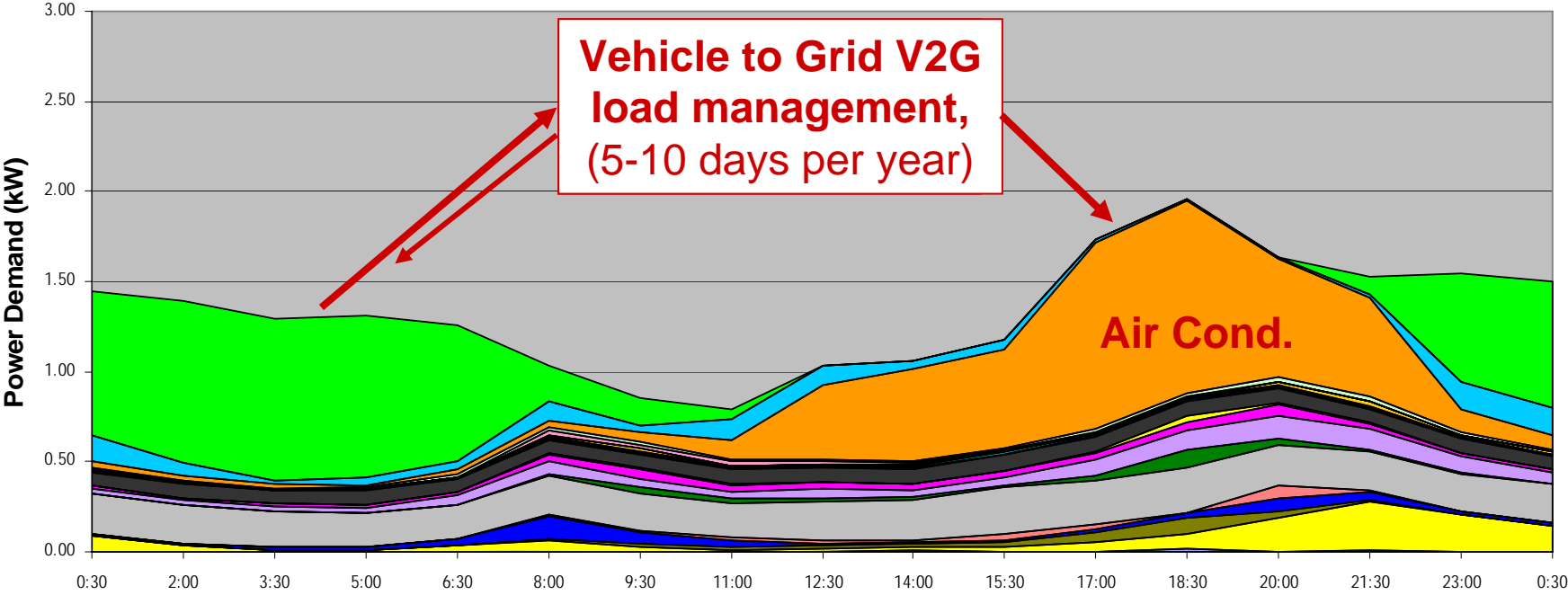
Typical NSW Residential Power Demand (Summer Peak) Plus controlled PHEV charging





Typical NSW Residential Power Demand (Summer Peak)

**Off peak hot water to solar or gas
PHEV displacing hot water load**

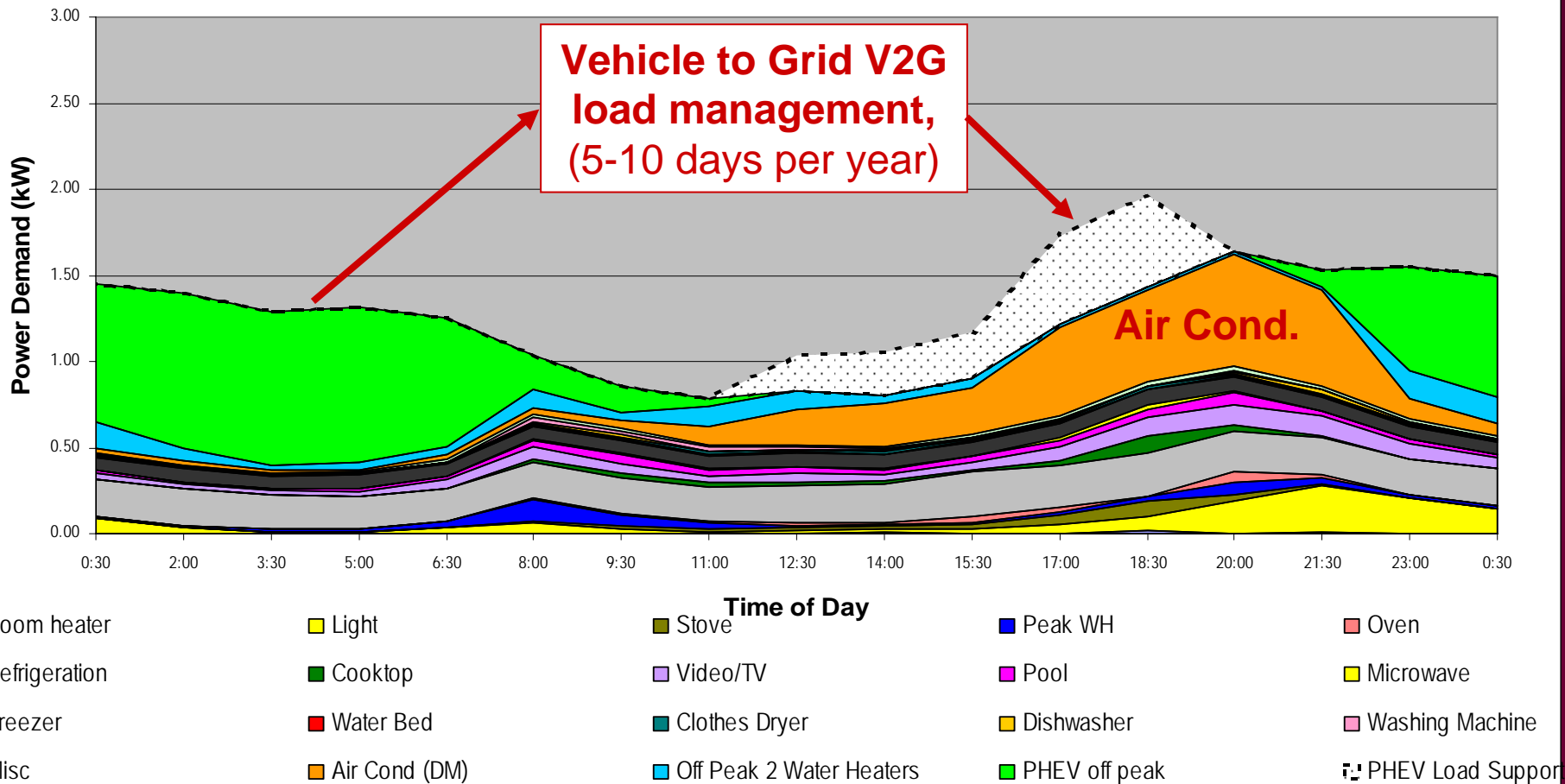


- | | | | | |
|---------------|------------------|--------------------------|---------------|-----------------|
| Room heater | Light | Stove | Peak WH | Oven |
| Refrigeration | Cooktop | Video/TV | Pool | Microwave |
| Freezer | Water Bed | Clothes Dryer | Dishwasher | Washing Machine |
| Misc | Air Conditioners | Off Peak 2 Water Heaters | PHEV off peak | |

Typical NSW Residential Power Demand (Summer Peak)

PHEV V2G

Reducing air conditioning demand



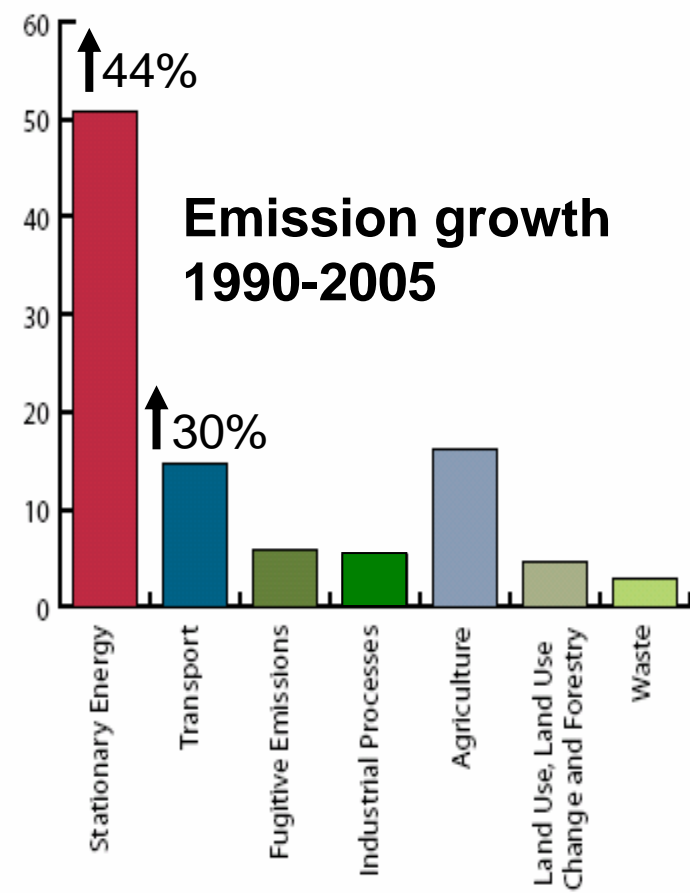
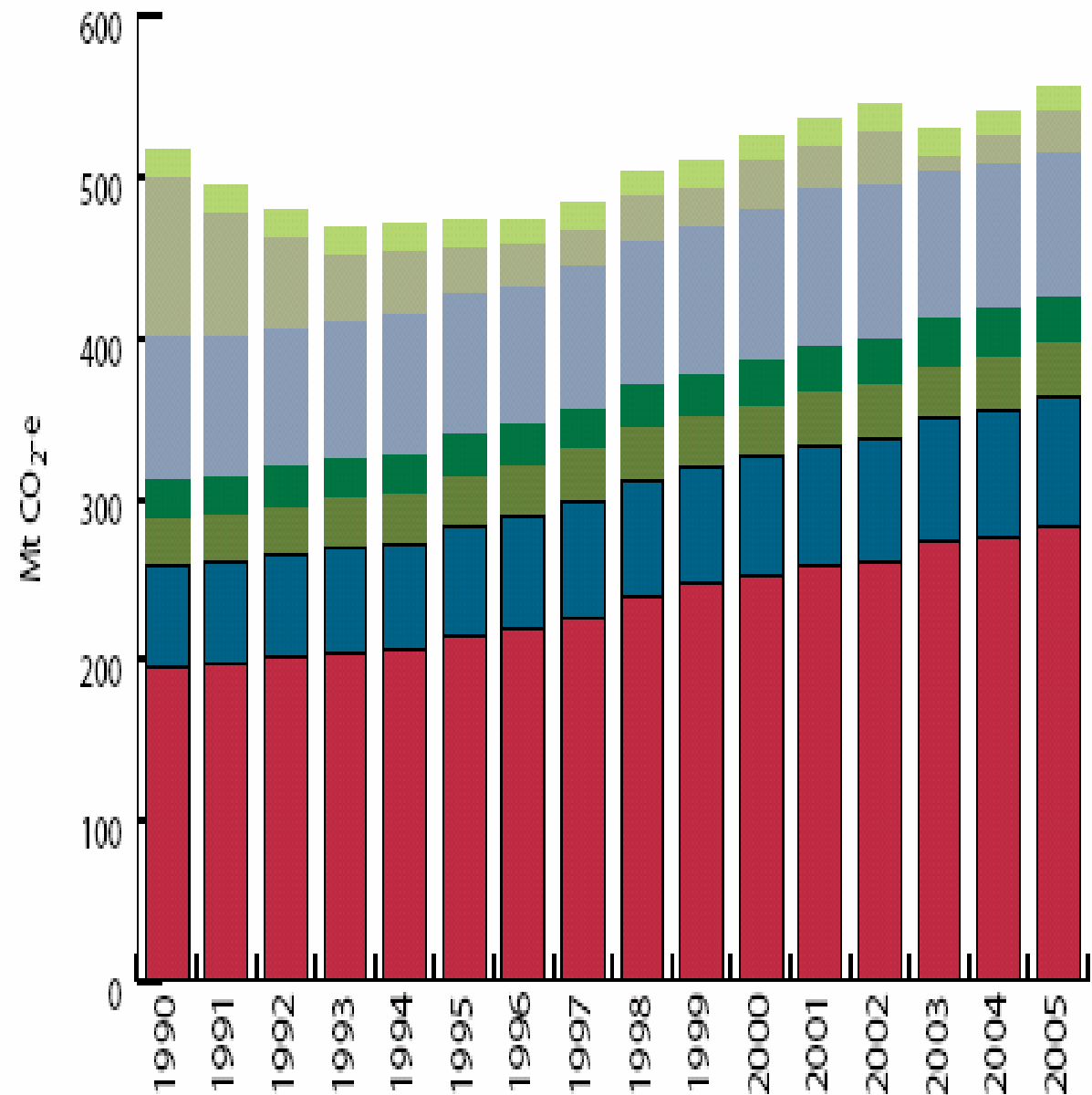
2. Turn on: **Vehicle to grid (V2G)**

- > Reduces need for more power stations and poles and wires
- > Provides more secure local power
- > Changes the centralized power paradigm
- > Makes clean energy options more attractive and viable

3. Chill out: PHEVs and reducing GH emissions

- > PHEV battery storage facilitates renewable energy
 - supports variable output renewable like wind and solar
 - “soaks up” any generation surplus to feed back on peak
 - finally kills off the “Base Load Power” myth
 - i.e. we don’t need any more coal fired power stations
- > PHEV battery storage capacity facilitates energy efficiency
 - Energy savings anytime become more valuable in reducing peak demand
- > Off Peak PHEV charging displaces off peak electric hot water
 - makes solar and gas water heating more competitive
- > Even “dirty electricity” powered PHEV is cleaner than a petrol car

Australia's
Greenhouse Gas
Emissions:
**Cars a problem;
Electricity a bigger
one.**



What's next?

- > Hybrid vehicles sales growing by 30% per annum
 - 500,000 p.a. in US alone in 2007
- > Toyota plans to have only hybrid cars by 2020
- > Toyota to sell PHEVs by 2010
- > Other car makers not far behind (incl China and India)

- > What about Australia?
 - \$500m Green Car Fund (...starts in 2011)

... and at UTS : Australia's first PHEV!

The Partnership:

szencorp

sustainable development

(Will own and power the PHEV using solar panels on Melbourne head office.)



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Watch this space...

What PHEVs don't do:

- > Reduce congestion (but it would be less smelly)
- > Avoid road trauma (but might reduce it)
- > Reduce car dependency
- > Create more efficient transport mode share

The End



(of the beginning)

Thank you.

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