

## Re: The future of hybrid cars

**Source:** <http://sci.tech-archive.net/Archive/sci.energy/2004-10/0925.html>

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**Date:** 10/18/04

Date: 17 Oct 2004 18:48:25 -0700

alexterrell@yahoo.com (Alex Terrell) wrote in message  
news:<d81e59c9.0410120101.478557f9@posting.google.com>...  
> *Thanks for this – great info – see comments.*  
>  
> *eunometric@yahoo.com.au (Eunometric) wrote in message*  
*news:<e935396a.0410111821.5ab6c126@posting.google.com>...*  
>  
>>> *– Increased battery storage to enable 1 hr, or about 30 miles of*  
>>> *running*  
>>  
>> *Quite, but this is somewhat dependent upon battery or hopefully*  
>> *hyper-capacitor evolution. Deeper discharge while maintaining battery*  
>> *life is one area.*  
>>  
>> *Hypercapacitors that do not require expensive metals (mass production*  
>> *can do nothing about cheapening materials such as nickel).*  
>>  
> *The battery type for regenerative braking and for plug-in charge types*  
> *would be different. I wonder if it would make sense to have "hybrid"*  
> *energy store. ie, NiMH to provide 10KWhrs for driving, and either,*  
> *Lead Acid, a Flywheel, or the capacitors to provide the regenerative*  
> *braking, where only 0.05 KWhrs is needed.*

Such cars have been built. The Australian CSIRO in conjunction with General Motors Holden built a Hybrid that used an advanced lead foil battery (40% discharge in first 5 minutes) and a hypercapacitor.

The hybrid achieves its advantages by using the electric system to keep the thermal engine running in optimal conditions or even switching it off. The Hypercapacitor helps operate a battery efficiently and keeps its life high under momentary heavy loads.

>  
> *snip*  
>  
>>> *– Plug-in capability – to recharge the batteries from a domestic power*  
>>> *supply.*  
>>>

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- >>> *I estimate that 10 kWhrs should be enough to run a mid-sized car for*
- >>> *an hour, or 30 miles. Most cars, most of the time, do less than this*
- >>> *in a day. So owners would charge the car at night, on cheap*
- >>> *electricity, and do all day's runs on electric power only. Only for*
- >>> *long journey's would they use the high efficiency generator.*
- >>
- >> *Your estimate is about right. Typical energy consumption of an all*
- >> *electric is 10Kw.Hr per 100km per ton of car. A Prius weighs 1.3 ton.*
- >
- > *Better than I expected. 10KWhrs is more than enough for a useful plug*
- > *in.*

In Europe/Australia 240VAC x 10 amperes is easily available from any house so 10kw charge can be provided in 4 hours.

- >
- > *A 1 ton hybrid (a city run around) might get away with 5KWhrs*
- >>
- >> *Problem is that for a 4 seater car of 1 ton perhaps only 330kg of lead*
- >> *acid batteries can be carried and this limits range at 50% discharge to*
- >> *about 80km. This is at modest performance. (max speed 120km/hr or*
- >> *70mph)*
- >
- > *Daimler Chrysler's test sprint vans have 14 KWhrs weighing 360kg, so*
- > *10 KWHrs would be about 240kg.*
- >
- > *My computer battery (Li-ion) has 64 A-hrs, and weighs 500g, so in*
- > *theory 10KWhrs would weigh 80kg.*

Lead Acid: 45 watt hour/kg. 1600 cycle life to 50% discharge.

Advanced Lead Acid 65 watt hour/kg.

NiMH 65 watt hours 1000 cycle life to 85% discharge.

Li-Ion 85-100 watt hours/kg.

li-Polymer 110-200 watt hours/kg

Li-Li metal metal around 300-800 watt hours. (these tend to ignite at present)

- >
- > *However, I'm not sure what amount of the energy is recoverable.*

All of it if you aren't concerned with battery life. NiMH however can be discharged to 85% and still have 600 cycles life whereas Lead Acid tend to fall off very rapidly below 50% discharge

- >
- >> *Longer ranges or higher speeds lead to an exponential growth in car*
- >> *mass so you can end up with a two ton car for a 120km range.*
- >>
- > *So target the majority of days for most cars, where mileage is a few*
- > *10s of km.*

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However although 80% of people probably do no more than 60km/day for 80% of their journeys occasionally they may want to do more. This influences their purchasing decisions: if you don't have the range to visit your grandparents every second weekend the electric car will miss out unless it is only a second family car.

I believe if we reduced the speed of traffic that electric cars had to keep up their range would go up and their costs would come down dramatically. Are we prepared to trundle along at 40km/hr ((25mph) in a glorified golf cart?

I think if that's what it came down to: yes.

> > >

> > > *At night time rates, 10 KWhrs costs 25p or 40c. This would replace a gallon of petrol (~£4 in the UK, \$2? in the USA). This would make it very attractive for consumers.*

> > >

> > > *As most charging would be done at night, there would no need (initially at least) for extra distribution or generation capacity. In time, unused cars could even become standby generators to sell electricity at high rates back to the grid.*

> >

> > *The plugable hybrid in which a percentage of the cars travel can come from a simple domestic charge has potential as it won't tax the electricity network or require heavy duty wiring, plugs and sockets.*

> >

> > *(note 1.5 sq meter of solar cell will provide about 1.1kw.hr of energy: enough for up to 11km of driving) Some people will be able to drive to work on an electric charge and drive home on a solar charge.*

> >

> *Not today in England it won't. This could be an attractive option for sunny locations though. It won't be cost effective against mains power, but probably is against fuel taxed at European rates.*

Solar Cells will produce 22% of their power in even the most overcast days since they work of diffuse light. Snow actually improves them!

Because of overcast whether and shortened winter days you might expect 1.1kw.hr in summer and only 0.11 on the shortest most overcast winters day.

>

> > *I also think that parking meters can be made power outlets as well.*

> >

> *Or even power inlets! Both ways will require some simple car to socket communications and authorisations and payments.*

Yes, quite easily in a technical sense.

> > >

> > > *Comments?*

> >

> *snip*

> >

> > *I also think that the 'light hybrid' in which an enlarged combined*

> > *starter alternator can allow engine stoping and starting at lights and*

> > *a small amount of regenerative braking combined with lean burn or HCCI*

> > *technology is more likely to succede than more conventional 'heavy'*

> > *hybirds as it is affordable.*

> >

> > *For instance a HCCI engine with a 'light hybrid' may achieve a 40%*

> > *saving at a much lower price than the Prius.*

> >

> *Good for longer distance drivers, but for short distance drivers a*

> *plug in is a real winner.*

> >

> > >

> > > *Also, is electricity currently wasted at night? I think some*

> > > *generators (gas, hydro) can turn off to reduce supply. Lower prices*

> > > *can encourage demand. Pumped storage can store energy. Is this enough?*

> > > *What is the CO2 impact of increasing night time electricity load.*

> >

> >

> > *Load levelling is always usefull however in some cases it is already*

> > *levelled!*

>

> *It is still a problem for utilities. Even gas turbines don't like*

> *being shut down at night, and coal and nuclear are running 24 by 7.*

Also note that it isn't necessarily the generator that needs load leveling, part of the distribution network need it also. All those windfarms place a huge burden on the transmsion infrastructure at points.