PHEV2007: Arne Elias, Closing Talk

At the cutting edge of our knowledge of transportation and electricity grids are two converging technologies that operationalize and extend the core ideas of V2G and intelligent grids to provide a powerful vision of an integrated future energy system.

There are many challenges to developing both these technological groups. Developing the cluster of technologies around micro-grids, smart metering and network operations with a high renewables component to a commercially operated intelligent, co-generation, distributed grid are neither trivial nor cheap. From the PHEV side it’s clear that inexpensive, long lasting batteries with suitable energy and power density and robustness - to name a few critical elements, require significant research support to become mass market commercial.

On one side there are micro-grids and a range of associated technologies that make possible the concept of intelligent grids. On the other are PHEVs and EVs that support sustainable transportation and optimize our use of the electricity grid while supporting it directly, minimizing additional infrastructure and providing ancillary services.

Together the growing integration of much of the transportation fleet into the electricity grid has many significant technological and cultural barriers. Not only must the technologies be much better - we have to change many of the ways we are doing things from building vehicles to operating electricity networks. Sometimes the cultural change is the bigger problem even when the benefits are clearly great.

However, at present, I argue, this is the best identified strategy to solve our energy crises if it is appropriately developed and designed. The PHEV is a seminal concept in that it is ready at a prototypical level today and can be gradually commercialized through extending electric only range, as advanced batteries become commercially viable.

We can see gradual penetration of PHEVs into the market similarly to how hybrids have entered the market – but arguably at a much more rapid rate even with just today’s batteries and the technologies we know are in the pipeline.
We know PHEVs provides all of the benefits of ordinary vehicles and several important additional features, currently at a premium on first cost but at a discount on a lifecycle basis. The first adopters and early adopters will reap considerable cost, emission and risk aversion benefits and this is likely to continue for some time until market penetration levels dictate a change in policy. Simply one can save money, feel good about driving and protect themselves from much of the price risks and fluctuations of transportation fuels.

However the party cannot last once significant market penetration occurs – which we believe will happen within a decade or so. The implications of large potential savings for consumers mean that there is a profit over existing costs which can also produce another benefit for all. PHEVs allow us do one other very important thing. They allow the gradual development of premium pricing for road services, electricity and transportation fuels without unduly penalizing vehicle operators.

It can be argued that this in fact has to happen for transportation sustainability to occur. It will not be possible to have a large part of the population driving around in incredibly cheap vehicles. In China and India this would lead to unconscionable congestion. In North America we can expect gridlock and congestion that cannot be built out of - or at least congestion that we should not attempt to build out of.

If we want to move towards sustainability – universal mobility over the long run – we have to understand that there is a hierarchy of transportation modes. Active Transportation – walking, cycling and other physical forms, where possible offer the greatest benefits in terms of emission savings, travel costs and personal and ecosystem health. Each of those savings is enormous as there are no real emissions or fuel costs and large benefits to health and to health care budgets associated with Active Transportation. The only costs are the relatively low investments in infrastructure that can have multiple uses for human access.

Transit, car pooling and other shared usage strategies deliver the next level of benefits, particularly if these strategies involve grid tied transportation or future EV, PHEV or hybrid vehicles. Single occupancy vehicles (SOV) offer the least emissions reductions but even they can be competitive in scenarios where PHEVs and EVs are utilized, and where flexible applications for
multiple destinations or for trip chaining are needed, or where routes are unserviced. However SOVs tend to have a larger footprint on roads and with the lure of cheap to run vehicles and growing populations we could expect widespread congestion nightmares beyond Mexico City traffic jams on a regular basis.

We will need to eventually price private vehicle operation in urban areas particularly to shift use to the top of the mode chain. The same analysis can be done for heavy duty vehicles. What makes this possible is the significant potential savings from PHEVs and EVs. The mechanisms for pricing may vary by purpose, jurisdiction and time - and we are already starting to think this through. They include a range of road pricing and pay as you drive strategies, time of day and service type electricity pricing, carbon pricing, fuel pricing and tax and financial mechanisms.

The key benefit of the cost reduction that PHEVs offer can then be shared appropriately using pricing mechanisms and signals. Such significant added benefit from premium pricing can be allocated on a shared basis between consumers, utilities and transportation infrastructure builders and transit authorities.

Very low cost travel derived from the PHEV path can be regulated to share the wealth, to be put into those areas of sustainable transportation that have so far been under-funded yet can deliver – if the service model is developed to meet consumer wants – significant cost, emissions and fuel supply benefits.

Travelers can continue to drive at a reasonable cost when needed and where conditions warrant as in rural and low density areas. They can access high quality, timely and comprehensive transit where it is available and this can spur node and corridor development and transportation oriented design for our cities. They can also access a wide range of walking and cycling infrastructure. Kids can perhaps be able to walk to school again – something they want to do.

There is enough synergistic support with renewables to also divert what is necessary from these premiums collected from PHEV cost savings to fund extensive research development and commercial generation of renewables. Perhaps, as a last resort these premiums can even extend to help fund clean
coal plants if such can be developed and built as an intermediate measure to replace existing dirty infrastructure.

The cost savings are from the widespread implementation of PHEVs and eventually EVs will be significant and they can be utilized to pay for a sustainable transportation and energy future. But it will take public awareness and political will and understanding to move on even this—a clear and compelling road map to an achievable and integrated sustainable energy system. What is necessary is a common vision of how to proceed, as outlined in this talk, and the leadership to finance sustainability from the profitability that PHEVs can initiate.