## AT Inherency

#### Status quo solves – Recovery Act financed 10,000 new charging sites

Kelly, ’10 – Assistant Secretary DOE, Ph.D in Physics Harvard University, (Henry, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 14)

In addition to building U.S. manufacturing capacity, Recovery Act funds support

the installation of over 10,000 charging sites for PHEVs and EVs that will serve

more than 5,000 PHEVs being tested in on-road use. This is the largest number of

PHEVs ever on U.S. roads, and the in-use, operational, and charging data gathered

in this effort will help inform how additional PHEVs and EVs can be introduced in

the future. The Recovery Act is also funding the first programs to educate first re-

sponders and emergency personnel in how to deal with accidents involving EVs and

PHEVs.

#### Status quo solves – no market failure – investments in charging infrastructure will be forthcoming

Lee and Lovellette ’11 - Jassim M. Jaidah Family Director of the Environment and Natural Resources Program within the Belfer Center for Science and International Affairs at Harvard's John F. Kennedy School of Government, Faculty Co-Chair of the Center's Energy Technology Innovation Policy project, and a Senior Lecturer in Public Policy, Belfer Center for Science and International Affairs, Harvard Kennedy School, Harvard University (Henry and Grant, “Will Electric Cars Transform the U.S. Vehicle Market”, July 2011. http://belfercenter.ksg.harvard.edu/files/Lee%20Lovellette%20Electric%20Vehicles%20DP%202011%20web.pdf)//DHirsch

Electric cars are fueled wholly or partly by electricity, which presumes access to a reliable source of power. Equipment for connecting an EV to a source of electricity is required, at home and/or outside the home. Proponents are concerned that adequate electric distribution and transmission infrastructure might not exist when and where it is needed. **This concern goes to the heart of the debate in Congress over the question of whether to subsidize installation of public charging stations** in five to fifteen EV deployment communities.30 Our initial conclusion is that a market failure justifying a strong federal presence is not evident. While there are regional differences in the adequacy of the existing electric distribution, transmission, and generating systems, there is no evidence to conclude that investments will not be forthcoming from private companies to meet those needs, if and when they manifest themselves.

## AT Heg

### Auto Industry Not Key to Heg

#### **Connection between automakers and the military is a thing of the past – defense production is too complex now**

Gold 8 – journalist for NPR (Jenny, “Automakers' National Security Claims Questioned” NPR, December 4, 2008, http://www.npr.org/templates/story/story.php?storyId=97843617)//ctc

Their arguments aren't just economic — **Ford, GM and Chrysler say the downfall of the U.S. auto industry would imperil national security**. Many defense experts, however, say this claim is dubious. 'Arsenal Of Democracy' In a Nov. 18 bailout hearing, Chrysler Chairman and CEO Robert Nardelli told a Senate committee that "the crippling of the industry would have severe and debilitating ramifications for the industrial base of the United States, would undermine our nation's ability to respond to military challenges and would threaten our national security." That sentiment has been echoed in comments by Sen. Carl Levin of Michigan and in a Nov. 21 letter to Big Three executives from House Speaker Nancy Pelosi and Senate Majority Leader Harry Reid. Retired Gen. Wesley Clark recently wrote a New York Times op-ed piece titled, "What's Good for GM Is Good for the Army." Supporters such as Clark call American manufacturing the "arsenal of democracy" and recall when automobile factories churned out tanks and bombers during World War II. But while the automakers may once have been major players in arms production, they got out of the defense industry long ago when they sold their military manufacturing units. These days, the Army does not buy any major systems from the Big Three, says retired Col. Jim Dwyer, who works in support operations at Army Material Command. The connection between U.S. automakers and national security is unconvincing, says retired Marine Lt. Col. Dakota Wood, a senior fellow at the Center for Strategic and Budgetary Assessments in Washington. "If there is a linkage or a relationship," he says, "it's extremely indirect." Wood says the Big Three have no direct involvement in the production of Mine Resistant Ambush Protected Vehicles (MRAPs), tanks, military cargo vehicles, planes, Navy vessels or even Humvees. Instead, production is done by military contractors such as Lockheed Martin, BAE Systems and Oshkosh Corp. "Defense gear has become so specialized, an entire industry has now specialized in making it," Wood notes. During World War II, "you could take a truck and beef it up," he says, but now the materials and techniques for military manufacturing are too exotic and complex for a standard auto factory.

### China Not a Threat

#### Although many Chinese companies have entered the EV market, long-term strategies have yet to emerge

**Kimble 11 -** owner of Kimble Charting Solutions(Chris, “Leapfrogging to electric vehicles: patterns andscenarios for China’s automobile industry” Int. J. Automotive Technology and Management, Vol. 11, No. 4, 2011, <http://euromed-management.academia.edu/ChrisKimble/Papers/1095263/Leapfrogging_to_electric_vehicles_patterns_and_scenarios_for_Chinas_automobile_industry> pg 320-321)//ctc

A significant number of Chinese companies have now entered the market for EVs. All the top ten automobile groups have announced EV projects and several of the smaller carmakers and component suppliers have joined them. However, carmakers in China and elsewhere are at different stages of technological and commercial development and long-term strategies have yet to emerge. Below we simply review some of the routes that Chinese companies have followed to meet their current needs in terms of the production of EVs. The vertical integration of battery and vehicle production in a single company is one route to the production of EVs in China. For example, BYD, one of the top ten Chinese carmakers, began life as a battery manufacturer in 1995. After becoming the world’s second largest producer of nickel-cadmium (NiCd) batteries and NiMH batteries, and the third largest of lithium-ion batteries, it expanded into car production. In 2008, BYD produced a prototype plug-in hybrid vehicle (PHEV) named F3DM, and followed this with the announcement of a pure EV, the E6, which is due to be released in the US in 2010. Another route to EV production is through cooperation with local and foreign battery suppliers. Foreign carmakers are reluctant to transfer cutting-edge technology for EVs, particularly for smaller companies producing local Chinese brands (Gallagher, 2006). As a result, we see the widespread development of partnerships between Chinese carmakers and local suppliers of battery systems. Several of the larger Chinese automobile groups however, have established sino-foreign joint ventures. For example SAIC, the biggest auto group in China has established a 51:49 equity joint venture with a US lithium-ion battery maker. Similarly, Geely has entered into agreements with Danish companies for the supply of key components for its vehicles. In addition to the above, China has also seen direct investment by foreign companies, such as Nissan, which have begun to build EV assembly plants in China. In November 2009, Nissan and the Dongfeng Motor Corporation signed an agreement with Guangzhou city – a metropolitan area in the south of China with a population of more than ten million – to set up a manufacturing site for EVs there. Nissan has signed a similar accord with Wuhan city, where the headquarters of Dongfeng Motors is located. 3.4 Battery technology in China Currently, battery technology is a major hurdle for the commercialisation of EVs, both in terms of cost and performance. lithium-ion batteries have been identified as the medium-to-long term solution for powering EVs. However, within the lithium-ion family, there are at least five types of batteries, each with different strengths and weaknesses. Similarly, the demands of PHEVs (mostly commercial vehicles such as buses) and ‘normal’ EVs (mostly smaller personal vehicles such as cars) differ considerably. Currently no single technology has a clear advantage in terms of both cost and performance. Most Chinese companies produce Ni-MH batteries. The technology of Ni-MH batteries is mature and the value chain for Ni-MH batteries is complete in China. Despite their poorer overall performance, the cost Ni-MH batteries is half that of lithium-ion batteries and the Ni-MH battery has been identified as the short term solution for the development of PHEV vehicles in China. Chunlan is the leading domestic company producing this type of battery. The production of lithium-ion batteries is still at a relatively early stage involving only around ten companies. BYD is one of the leaders, producing batteries for both PHEVs and EVs, and is focused on the development of lithium iron phosphate (LiFePO4) technology for the future.

### EVs Bankrupt Highways

#### EVs bankrupt highway system- evade gas taxes, lead to crumbling road infrastructure

Morrison ’12 – Reporter and Columnist for the Los Angeles Times, two Pulitzer Prizes, reporter for National Public Radio (Patt, “Will your Prius Bankrupt our Highways?,” Southern California Public Radio, February 27 2012, http://www.scpr.org/programs/patt-morrison/2012/02/27/22677/fuel-efficient-cars-leading-to-poorer-roads) // AMG

The money that funds America’s highways could completely run out by 2013. What’s the primary cause? In part, fuel efficient cars. Many owners of hybrid or electric cars, such as the Toyota Prius or the Chevy Volt, feel good about driving a modern fuel-efficient vehicle – supporting innovation, helping the environment, or reducing American dependence on foreign oil. However, what many hybrid drivers may not realize is that using a fuel efficient car could literally bankrupt the United States highway infrastructure. Federal highways are directly funded by taxes paid at the fuel pump that go into a Highway Trust Fund, so the less fuel Americans use, the less money the Federal Highway Administration has to maintain public freeways. The fact that the tax has not been adjusted for inflation since 1993 isn’t helping matters and now the White House is pushing for fuel economy standards to require cars and light trucks to average 54.5 mpg by 2035, which is a much more ambitious plan than officials anticipated. Some alternative funding systems that have been considered include taxing drivers based on how many miles they drive or tolling motorists who drive during peak hours, but Congress has yet to settle on a solid solution.

## AT Grid

#### EVs will not lead to smart grids – dumb grids sufficient, smart grids too expensive

**Motavalli, 7/8** – Journalist and book author focused on the environment, writer for The New York Times, the Mother Nature Network, The Daily Green, senior writer and past editor of E: the Environmental Magazine, member of the Society for Environmental Journalists (Jim, “Will Electric Cars Cause More Summer Power Outages?,” New York Times, July 8 2012, http://wheels.blogs.nytimes.com/2010/07/08/will-electric-cars-cause-more-summer-power-outages/) // AMG

A January 2010 report for Mayor Michael Bloomberg’s PlaNYC estimates that New York could have tens of thousands of electric vehicles (including plug-in hybrids) by 2015. These include the electric drive Smart and the Chevrolet Volt, both of which have recently announced that New York will be among their early markets. The PlaNYC report concludes that the expected adoption rate “should not threaten the stability of the electric grid as long as most chargers are ‘smart,” allowing charging to take place during off-peak hours.” That’s by no means assured, however, because high-tech smart grids are still embryonic in many areas. One solution, proposed by energy companies, such as DTE Energy in southeastern Michigan, is to encourage electric car owners to charge at night. Scott Simons, a spokesman for DTE Energy, said the utility was developing an incentive to offer one-third price reduction during off-peak hours. Branko Terzic, a former commissioner at the Federal Energy Regulatory Commission who is regulatory policy leader in energy and resources at Deloitte, said that such time-of-day rates can be put into effect even with “a dumb grid.” He said that some utilities had delayed making smart grid improvements because they were a capital cost with benefits in the future.

##  AT Oil

#### Even the most aggressive EV deployment scenarios will leave us dependent on oil for years to come – your 1AC author

**MIT Energy Initiative Symposium, ’10 (April 8, “Electrification of the Transportation System,”** <http://web.mit.edu/mitei/docs/reports/electrification-transportation-system.pdf>**, p. 15)**

Finding: EVs can help address security, climate, and economic issues associated with oil consumption, but even under the most aggressive EV deployment scenarios, the LDV fleet will continue to be dependent upon oil and the ICE for years to come. HEV sales account for 3% of total sales after 10 years on the market. Increasing the EV penetration rate substantially will require major battery cost reductions and significant build-out of vehicle charging infrastructures.

### Lithium Turn

#### EV batteries use lithium – a rare material that will make us dependent on dictatorships

Lindsay, 12 – Author of “Aerotropolis: The Way We’ll Live Next”, which examines how and where we choose to live in an interconnected world. He is a contributing writer for Fast Company, a visiting scholar at NYU, and a fellow of the Hybrid Reality Institute (Greg, “The Rush To Electric Cars Will Replace Oil Barons With Lithium Dictators”, Mansueto Ventures, LLc. 2012, http://www.fastcoexist.com/1678208/the-rush-to-electric-cars-will-replace-oil-barons-with-lithium-dictators)//AL

One day in late 2005, after losing yet another bruising political battle to the bean counters inside General Motors, then-vice chairman “Maximum” Bob Lutz heard of a startup called Tesla Motors intending to bring an all-electric sports car to market. Enraged that a bunch of Silicon Valley gearheads could do what he couldn’t, Lutz, in his own words, “just lost it.” He rallied his fellow car guys within GM to develop the prototype of what became the Chevrolet Volt--the “moon shot” justifying the company’s survival and the first in a new wave of electric vehicles just beginning to break on dealers’ showrooms. And while the Volt uses just a tiny bit of gas, it's still powered by a material that is in short supply and controlled by some of the most hard to deal with governments in the world. Its lithium battery might just create a new geopolitical calculus that is just as problematic as the gas-based one electric cars are supposed to extricate us from. In his new book, Car Guys vs. Bean Counters, a triumphant Lutz mockingly recalls Toyota’s reaction to the Volt’s unveiling in January 2007. “Toyota immediately labeled Volt a clever but meaningless PR exercise, using a battery chemistry, lithium-ion, which was dangerous, unreliable, and far from ready for automotive use. How much sounder, they trumpeted, was their own homely little Prius using (now eclipsed) nickel metal hydride batteries.” Toyota was wrong. The lithium at the heart of the Volt’s battery is now the gold standard for new electric cars everywhere. But is there enough of the silvery soft metal to eventually power a billion automobiles, and can we mine it fast enough? Or are we trading one finite resource for another? And in doing so, will we also trade our allegiance from OPEC to OLEC--the “Organization of Lithium Exporting Countries?”

#### Lithium is the tech of choice for EVs

Tahil, 06 - the founder of Meridian International Research, a technology consultancy in Martainville, France (William, ‘The Trouble with Lithium Implications of Future PHEV Production for Lithium Demand”, Meridian International Research, December 06, [http://tyler.blogware.com/lithium\_shortage.pdf)//AL](http://tyler.blogware.com/lithium_shortage.pdf%29//AL)

Lithium Ion batteries are rapidly becoming the technology of choice for the next generation of Electric Vehicles - Hybrid, Plug In Hybrid and Battery EVs. The automotive industry is committed increasingly to Electrified Vehicles to provide Sustainable Mobility in the next decade. LiIon is the preferred battery technology to power these vehicles.

#### EVs would make us dependent on autocratic countries – turns their oil advantage

Lindsay, 12 – Author of “Aerotropolis: The Way We’ll Live Next”, which examines how and where we choose to live in an interconnected world. He is a contributing writer for Fast Company, a visiting scholar at NYU, and a fellow of the Hybrid Reality Institute (Greg, “The Rush To Electric Cars Will Replace Oil Barons With Lithium Dictators”, Mansueto Ventures, LLc. 2012, http://www.fastcoexist.com/1678208/the-rush-to-electric-cars-will-replace-oil-barons-with-lithium-dictators)//AL

Fortunately for GM and Toyota, Chile’s and Argentina’s lithium deposits are open for business. But the largest lies across the border in Bolivia, containing anywhere from 9 million (the official U.S. estimate) to a credulity-straining 100 million tons of lithium. Bolivia’s president Evo Morales (left) is no friend of the U.S., however; he pals around with Venezuela’s Hugo Chavez and Iranian president Mahmoud Ahmadinejad. He once expelled the U.S. ambassador and likes to end speeches with the rallying cry, “Death to the Yankees!” But Bolivia has had no shortage of supplicants. Representatives from China, France, Sumitomo, Mitsubishi and LG Chem--which supplies the Volt’s battery--have all made entreaties. What would happen if Morales gave in and went with a Chinese consortium, or picked a fight with Chile? If the Carter Doctrine was necessary to secure Middle East oil, will there someday be an Obama Doctrine for South American lithium? “Chile is the one we can rely on," says Steve LeVine, a contributing editor to Foreign Policy and an energy security expert at Georgetown. "But I just got back from Kazakhstan, and they have a lot of lithium, and it’s cheap.” Then again, Kazakhstan is a virtual autocracy ruled for 20 years by the opposition-less President Nursultan Nazarbayev. Afghanistan may also be rich in lithium if reports of a trillion dollars in mineral wealth are accurate. But America’s relationship with president Hamid Karzai is complicated, to say the least. After Bolivia and Chile, the nation with the largest reserves is China, which knows how to play hard ball with minerals--witness the recent fights over rare earth metal prices when China restricted their exports. While there is no OLEC looming on the horizon, the U.S. once again finds itself staking its way of life on a substance with very complicated geo-politics.

## AT Warming

#### EVs are all hype and don’t solve warming—night-charging necessitates a high level of CO2 emissions

Petersen, 11 – Attorney at Law, principally in the energy and alternative energy sectors, frequent speaker at international industry and energy policy conferences (John, “Plug-in Vehicles and Their Dirty Little Secret”, RenewableEnergyWorld.com, 6 January 2011, <http://www.renewableenergyworld.com/rea/news/article/2011/01/plug-in-vehicles-and-their-dirty-little-secret?cmpid=rss>)

Over the last few months I've had a running debate with some die-hard EVangelicals who insist that plug-in cars will be cleaner than simple, reliable and relatively inexpensive Prius class HEVs. Since most of my readers have enough to do without slogging through the comments section, it's high time we lay the cards on the table and show why the myth of zero emissions vehicles is one of the most outrageous lies ever foisted on the American public. The following graph comparing the life-cycle CO2 emissions of conventional, hybrid and plug-in vehicles comes from a March 15, 2010 presentation by Dr. Constantine Samaras of Rand Corporation. It clearly shows that HEVs and PHEVs are equivalent emitters of CO2 if you take the analysis all the way back to the black earth and base the comparisons on national average CO2 emissions from electric power generation. While the graph suggests that there is no meaningful air quality advantage to plug-in vehicles, the reality is much worse because the specific power generation assets that will be used for night-time charging of plug-in vehicles are dirtier than the national average. The following table is based on data extracted from US Energy Information Administration'srecently released "Electric Power Industry 2009: Year in Review." It lists high emissions power from fossil fuels in the top section, zero emissions power from conventional sources in the middle section and "clean power" from renewable sources in the bottom section. Since the data was pulled from different parts of the report, estimates of total power generated from specific renewable sources can't be provided. Since renewables as a class are inconsequential to national power production, I don't think the missing data is relevant. The most intriguing facts in the table are the capacity utilization rates for both natural gas and hydro power facilities. Natural gas facilities operated at 25% of capacity in 2009, which works out to a national average of six hours per day. You see the same thing with hydro power facilities which operated at 40% of capacity in 2009, or about ten hours per day. While some natural gas and hydro power plants run 24/7, the nation tends to operate both types of facilities as peak power providers rather than baseload power providers. We turn off the clean hydro power and natural gas at night. The two baseload elements of US power production are nuclear, which usually runs at a steady state 24 hours a day, and coal, which can be ramped up and down within a limited range to help match supply and demand. During night-time hours, the prime time for electric vehicle recharging, the vast bulk of electric power nationwide comes from nuclear and coal because operators want to conserve their more flexible resources including natural gas and hydro power for high value peak demand periods. As a result, coal accounts for a higher percentage of night-time power than it does day-time power or 24 hour power. There's just no avoiding the reality that electricity produced at night is significantly dirtier than the national average while electricity produced during the day is cleaner than the national average. As you shift the US average emissions line in the Rand graph to the right to reflect the differences between day-time and night-time power, plug-ins become seriously sub-optimal. The conclusions are inescapable when you study the data. I have searched without luck for a scholarly technical analysis that quantifies the emissions differential between relatively clean day-time power, which has a high proportion of variable hydro power and natural gas, and dirtier night-time power, which has a much higher proportion of coal. If you know of a credible study, I'd love to have a reference. The dirty little secret of plug-in vehicles is that they'll all charge their batteries with inherently dirty night-time power and be responsible for more CO2 emissions than a fuel efficient Prius-class HEV that costs a third less and doesn't have any pesky issues with plugs, charging infrastructure or range limitations. News stories, speeches and press releases can only maintain the zero emissions mythology for so long. Sooner or later the public is going to realize that it's all hype, blue smoke and mirrors, and that plug-in vehicles have little of substance to offer consumers. When the public comes to the realization that plug-in vehicles: Won't save their owners significant amounts of money; Won't be as efficient as HEVs when utility fuel consumption is factored into the equation; Won't be as CO2 efficient as HEVs when utility emissions are factored into the equation; and Are little more than feel-good, taxpayer subsidized eco-bling for the politically powerful elite, the backlash against EV developers like Tesla Motors (TSLA), General Motors (GM) and Nissan (NSANY.PK), together with battery suppliers like Ener1 (HEV) and A123 Systems (AONE), could be unpleasant.

#### **EVs increases CO2 emissions – night-time charging relies on coal power**

**Peterson 11 –** Attorney in the energy and alternative energy sectors and contributor to Renewable Energy World (John, “Plug-in Vehicles and Their Dirty Little Secret” Renewable Energy World, January 6, 2011, http://www.renewableenergyworld.com/rea/news/article/2011/01/plug-in-vehicles-and-their-dirty-little-secret?cmpid=rss) //ctc

Over the last few months I've had a running debate with some die-hard EVangelicals who insist that plug-in cars will be cleaner than simple, reliable and relatively inexpensive Prius class HEVs. Since most of my readers have enough to do without slogging through the comments section, it's high time we lay the cards on the table and show why the myth of zero emissions vehicles is one of the most outrageous lies ever foisted on the American public. The following graph comparing the life-cycle CO2 emissions of conventional, hybrid and plug-in vehicles comes from a March 15, 2010 presentation by Dr. Constantine Samaras of Rand Corporation. It clearly shows that HEVs and PHEVs are equivalent emitters of CO2 if you take the analysis all the way back to the black earth and base the comparisons on national average CO2 emissions from electric power generation. While the graph suggests that there is no meaningful air quality advantage to plug-in vehicles, the reality is much worse because the specific power generation assets that will be used for night-time charging of plug-in vehicles are dirtier than the national average. The following table is based on data extracted from US Energy Information Administration'srecently released "Electric Power Industry 2009: Year in Review." It lists high emissions power from fossil fuels in the top section, zero emissions power from conventional sources in the middle section and "clean power" from renewable sources in the bottom section. Since the data was pulled from different parts of the report, estimates of total power generated from specific renewable sources can't be provided. Since renewables as a class are inconsequential to national power production, I don't think the missing data is relevant. The most intriguing facts in the table are the capacity utilization rates for both natural gas and hydro power facilities. Natural gas facilities operated at 25% of capacity in 2009, which works out to a national average of six hours per day. You see the same thing with hydro power facilities which operated at 40% of capacity in 2009, or about ten hours per day. While some natural gas and hydro power plants run 24/7, the nation tends to operate both types of facilities as peak power providers rather than baseload power providers. We turn off the clean hydro power and natural gas at night. The two baseload elements of US power production are nuclear, which usually runs at a steady state 24 hours a day, and coal, which can be ramped up and down within a limited range to help match supply and demand. During night-time hours, the prime time for electric vehicle recharging, the vast bulk of electric power nationwide comes from nuclear and coal because operators want to conserve their more flexible resources including natural gas and hydro power for high value peak demand periods. As a result, coal accounts for a higher percentage of night-time power than it does day-time power or 24 hour power. There's just no avoiding the reality that electricity produced at night is significantly dirtier than the national average while electricity produced during the day is cleaner than the national average. As you shift the US average emissions line in the Rand graph to the right to reflect the differences between day-time and night-time power, plug-ins become seriously sub-optimal. The conclusions are inescapable when you study the data. I have searched without luck for a scholarly technical analysis that quantifies the emissions differential between relatively clean day-time power, which has a high proportion of variable hydro power and natural gas, and dirtier night-time power, which has a much higher proportion of coal. If you know of a credible study, I'd love to have a reference. The dirty little secret of plug-in vehicles is that they'll all charge their batteries with inherently dirty night-time power and be responsible for more CO2 emissions than a fuel efficient Prius-class HEV that costs a third less and doesn't have any pesky issues with plugs, charging infrastructure or range limitations.

#### **EVs increase CO2 – coal reliance, battery manufacturing, and urban sprawl**

**Zehner 12 -** author of “Green Illusions: The Dirty Secrets of Clean Energy and the Future of Environmentalism” and a visiting scholar at the University of California – Berkeley (Ozzie, “Tesla SUV with wings or not, we should kill the electric car” Christian Science Monitor, February 13, 2012, <http://www.csmonitor.com/Commentary/Opinion/2012/0213/Tesla-SUV-with-wings-or-not-we-should-kill-the-electric-car>)//ctc

What counts as an alternative-energy vehicle and what doesn’t is hardly a straightforward reckoning. For instance, is an electric car a true alternative if its drivetrain is ultimately powered by coal, nuclear power, and lithium strip mines rather than petroleum? When the Royal Society of Chemistry ran the numbers, it found that fully adopting electric cars in Britain would only reduce the country’s CO2 emissions by about 2 percent. Electric vehicles don’t eliminate the negative side effects of vehicular travel. They simply move the problems elsewhere – often to contexts where they become more opaque and difficult to address. When we start to exchange one set of side effects for another, the exchange rates become confusing. This opens a space for PR firms, news pundits, environmentalists, and others to step in and define the terms of exchange to their liking. For instance, electric vehicle manufacturers claim that customers can fill up for ten cents per kilowatt-hour, which they say works out to pennies on the mile. But if buyers intend to drive their electric car beyond the length of the extension cord from their garage, they won’t be able to take advantage of that cheap electricity. They’ll have to rely on a battery – a battery they can only recharge a finite number of times before it must be replaced, at considerable expense. The battery-construction step, not the “fuel” step, is the expensive part of driving an electric vehicle. Advanced batteries cost so much to fabricate that the ten-cent-per-kilowatt-hour “fuel” cost to charge them becomes negligible. Even though electric vehicles are moving to cheaper batteries, the costs of exhuming their required minerals extends far beyond simple dollars and cents. It takes a lot of fossil fuel to craft a battery.

## AT Solvency

### Logistical Barriers

#### Multiple logistical barriers to charging stations – permit bureaucracy, burdensome regulatory compliance

Lowenthal, ’10 – CEO Coloumb Technologies, (Richard, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 33 )

####

So, I have some policy recommendations. Permitting electrical

work is a local issue, typically the responsibility of a city or a coun-

ty government, and rules vary widely between jurisdictions. The

process of requiring an electrician to obtain a permit and schedule

an inspection can stretch an otherwise short and simple electrical

upgrade into a burdensome, several-weeklong process, a concern

that was confirmed by several participants in the recent project

conducted by BMW in Los Angeles, New York, and New Jersey.

So, first, policy, we need streamlined permitting processes na-

tionwide for the installation of EVSE in order to get those times

to reasonable levels.

Second, today there are roughly 54 million private garages for

the 247 million light-duty vehicles that we have in the United

States. For consumers who park in parking lots or curbside at

night, overnight charging requires shared stations. By treating

electricity as a transportation fuel, regulators can foster competi-

tion in the nascent EV infrastructure marketplace and help to fa-

cilitate a rapid deployment of public charging infrastructure.

The California Public Utilities Commission recently indicated

that it is not inclined to regulate electricity for sale for EVs. None-

theless, the decision is not yet finalized and represents the opinion

of only a single PUC.

In many cases, current regulations require a seller of electricity

to be treated as a regulated utility. In other words, if an apartment

building, shopping center, or fast food restaurant has been—has

charging stations, it could be subject to the full range of regulatory

compliance mechanisms that affect utilities. This level of regulation

would likely present—prevent even minimal deployment of charg-

ing infrastructure in the public, in private garages, in condomin-

iums, apartments, and the workplace.

Rather than depending on the Nation’s public utilities commis-

sions to rule on this, we would ask that the Federal Energy Regu-

latory Commission ensure that electric vehicle charging is a com-

petitive marketplace with market-based pricing.

#### Multiple barriers to installing charging infrastructure - cost, time, access

Ralston and Nigro, 11 - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

One challenge PEV integration faces is charging infrastructure, which research suggests will be concentrated in residential areas at the outset (CAR 2011). Residential charging infrastructure offers several benefits, including convenience and access to off-peak charging. 9 Off-peak charging is less expensive and can help maintain the reliability of the grid. However, home charging stations also face challenges, including cost, time, and access. Consumers will want access to Level 2 charging stations for BEVs, which can be costly without incentives (see Public Policy and Enabling Business Innovation), and consumers may be unaware of relevant financial incentives. 10 The installation of Level 2 charging stations may also be very time consuming, as consumers will need to coordinate with multiple stakeholders including automakers, charging equipment providers, inspectors, electricians, and the local electric utility. The process could become more complicated for those living in multi-dwelling units, where consumers may not have reserved parking or the authority to install charging infrastructure (California P).

### Quick Charging Fails

**Quick charging fails – safety, battery degradation, and costs**

Lee and Lovellette ’11 - Jassim M. Jaidah Family Director of the Environment and Natural Resources Program within the Belfer Center for Science and International Affairs at Harvard's John F. Kennedy School of Government, Faculty Co-Chair of the Center's Energy Technology Innovation Policy project, and a Senior Lecturer in Public Policy, Belfer Center for Science and International Affairs, Harvard Kennedy School, Harvard University (Henry and Grant, “Will Electric Cars Transform the U.S. Vehicle Market”, July 2011. http://belfercenter.ksg.harvard.edu/files/Lee%20Lovellette%20Electric%20Vehicles%20DP%202011%20web.pdf)//DHirsch

A popular topic among EV enthusiasts is “quick charging,” which is charging an electric car in approximately the same time it takes to fill up a gasoline car at your local gasoline station. These Level III systems draw about 210 kilowatts for ten minutes, or about the same draw as 140 houses, if one assumes that each home draws about 1.5 kW of power. The current could be up to 500 volts at 200 amperes, which would require very expensive conductors and sophisticated safety systems. This system has been demonstrated and is technically feasible, but for safety reasons, would only be available at dedicated service stations. Finally, Level III charging would likely subject the battery pack to significantly greater wear and tear than Level II charging and may cause the EV battery to degrade more quickly.

Level III charging would also put an enormous strain on the existing electric distribution systems and would require an industrial-sized substation to handle the power surges at each individual location. The cost of this system would be substantial, though we were not able to identify estimates that we could confidently embrace.

### Consumers Won’t Use Chargers/Don’t Spur EV Sales

#### If you build it mentality empirically fails – UK has more charging ports than EVs

Chesser, ’12 – associate fellow for the National Legal and Policy Center (Paul, “Dismal Outlook for EVs on Both Sides of the Atlantic,” National Legal and Policy Center, January 19 2012, http://nlpc.org/stories/2012/01/19/dismal-outlook-evs-both-sides-atlantic) // AMG

For electric vehicle enthusiasts with the “if you build it, they will come” mentality, who endorse endless taxpayer subsidies for plug-in automobiles and infrastructure to charge them, there’s bad news this week. The Daily Mail reported that sales of electric cars in the United Kingdom have fallen so sharply that there are now more charging stations than there are vehicles. If you thought the flaccid U.S. sales of the Chevy Volt (7,671 units) and Nissan Leaf (9,674 units) were a letdown – despite significant government funding for research and development, batteries, charging systems, and a $7,500 tax credit for buyers – the signs from Europe won’t lift spirits.

#### **Consumers empirically won’t use chargers – takes too long**

**Chesser, ’12** – associate fellow for the National Legal and Policy Center (Paul, “Dismal Outlook for EVs on Both Sides of the Atlantic,” National Legal and Policy Center, January 19 2012, http://nlpc.org/stories/2012/01/19/dismal-outlook-evs-both-sides-atlantic) // AMG

As for the charging network, the stations planted anywhere other than EV owners’ homes appear to be getting little or no use. That’s because the minimum time it takes to fully recharge a Leaf battery – which might extend the range an additional 70 miles, under ideal climatic and topographic conditions – is 30 minutes, if you are using one of the fastest chargers in the network (440 volts). Most chargers are much slower, and require several hours for a full recharge, which is why owners are doing so at home and are using their EVs for trips of limited distance from their homes. “In Washington state, only one percent of the time were the vehicles connected to the public charging infrastructure,” said Jim Francfort, an investigator for the Idaho National Laboratory who is tracking use of the chargers. “While over in Oregon, they were connected about 7 percent of the time to the public infrastructure, although only one percent of that time were they actually charging.”

### Consumers Won’t Buy EVs/Subsidies Fail

#### **Multiple barriers to selling EVs – resale value, limited savings, grid problems**

**Adner, ’12** – Associate Professor of Business Administration at Tuck School of Business, Dartmouth College (Ron, “The Three Hidden Blind Spots that will Crash the Electric Car,” Business Insider, March 23 2012, http://articles.businessinsider.com/2012-03-23/news/31227987\_1\_electric-cars-blind-spot-nissan-leaf) // AMG

The bad news is that solving these problems won’t bring mass market success to the electric car. Three critical blind spots are being neglected: Blind spot 1: Used E-car buyers. The very improvements that will make future electric cars more attractive will make purchasing used e-cars less attractive, undermining their resale value. By 2016, a new model Leaf could have a battery that is 20% cheaper and drives 20% farther than a 2012 model. The seller of a used 2012 will see depreciation of a sort that the used car market hasn’t seen in generations (but one that is well known to the used computer market). Blind spot 2: Limited savings. The common rejoinder to the limited driving range critique is that most drives are short, and that the current generation of e-cars makes perfect sense for short urban commutes. But this contradicts the economic justification for the high purchase price of the e-car – that the savings come with every mile driven. You’ll need to drive a lot of miles to break even, and if the e-car is positioned as a short distance car, the economic argument, which is key to winning in the mass market, breaks down. Blind spot 3: Electricity grid capacity. The electric car faces a problem of scalability. As long as only a handful of drivers plug-in each morning, the current grid will hold. But if a significant number of drivers all plug-in on a hot summer’s day when capacity is already strained, expect major problems in both power generation and distribution. And expect them to last as long as the installation of charge spots remains decoupled from the deployment of smart grid solutions.

#### **Consumers won’t buy EVs – still far from meeting their expectations – survey proves**

**Deloitte Touche Tohmatsu Limited (DTTL) Global Manufacturing Industry group, ’11** – group of industry professionals on oil, gas, automobiles, and transportation (“Global Consumers Not Plugging Into Electric Vehicles: Deloitte Survey,” Energy Weekly News, October 21 2011, ProQuest) // AMG

Consumers worldwide expect electric vehicles to travel farther, require less charge time and retail for a lower price than automakers are offering, according to a new survey from Deloitte. In fact, consumers' expectations around performance and purchase price are so divergent from the actual offerings available today, that no more than 2 to 4 percent of consumers worldwide would have their expectations met, according to the survey. The survey, "Unplugged: Electric vehicle realities versus consumer expectations," canvassed more than 13,000 consumers in 17 countries across the Americas, Asia and Europe -- revealing a general desire among consumers to buy electric vehicles, but a strong unwillingness to compromise on key performance criteria and especially price.

 .

#### **Current battery range is unacceptable to consumers – want 300 miles between charges**

**Deloitte Touche Tohmatsu Limited (DTTL) Global Manufacturing Industry group, ’11** – group of industry professionals on oil, gas, automobiles, and transportation (“Global Consumers Not Plugging Into Electric Vehicles: Deloitte Survey,” Energy Weekly News, October 21 2011, ProQuest) // AMG

"Vehicle range is clearly an issue among consumers," says Craig Giffi, vice chairman and automotive practice leader, Deloitte LLP. "American consumers have the highest range expectations with only 63 percent satisfied with a range of 300 miles -- despite the fact that 77 percent of American respondents said they drive only 50 miles or less per weekday. "The paradox here," Giffi adds, "is that current technology targeted at the mass market can usually accomplish a range of 100 miles between charges, which is twice as far as the typical American drives each work day. Yet, for some reason, the 100-miles-a-day capability is still unacceptable to most consumers; they want at least 300 miles between charges."

#### **Even if range needs are met, vast majority of consumers still won’t pay any premium for EVs – study proves**

**Deloitte Touche Tohmatsu Limited (DTTL) Global Manufacturing Industry group, ’11 –** group of industry professionals on oil, gas, automobiles, and transportation (“Global Consumers Not Plugging Into Electric Vehicles: Deloitte Survey,” Energy Weekly News, October 21 2011, ProQuest) // AMG

More than 50 percent of all consumers globally indicate they are unwilling to pay any kind of a price premium for an electric vehicle, which includes 65 percent of American respondents. Interestingly, Chinese consumers are most willing to pay a price premium, but even still, 44 percent indicate they will not pay anything extra. Consumers in the United Kingdom and Belgium are the most sensitive to paying a price premium with 71 percent opposing. Complicating the price premium issue further is the low overall price expectations consumers have for an electric vehicle. In 11 of the 17 countries where the survey was conducted, 50 percent or more of consumers said they expect a price of $20,000 or less for an electric vehicle, far below actual costs. Consumers in the United States exhibit a good understanding of what electric vehicles will likely cost at the dealer with only 34 percent looking to purchase an electric vehicle for $20,000 or less. Nonetheless, 78 percent of American respondents expect to pay no more than $30,000 for an electric vehicle. "Automotive executives and policymakers trying to encourage the adoption of 'green' personal mobility solutions face a dilemma: While current electric vehicle technology can satisfy a meaningful niche of consumers when it comes to range and charge time expectations, these consumers are unwilling to pay a price premium for this new and expensive electric vehicle technology," says Giffi.

#### **U.S. is experiencing parallel indicators of disinterest to the UK – federal EV incentives are going unused**

**Chesser, ’12** – associate fellow for the National Legal and Policy Center (Paul, “Dismal Outlook for EVs on Both Sides of the Atlantic,” National Legal and Policy Center, January 19 2012, http://nlpc.org/stories/2012/01/19/dismal-outlook-evs-both-sides-atlantic) // AMG

But parallel indicators to the U.K. experience foretell potential disinterest. In Tennessee an aggressive test program for EVs is being rolled out with a $2,500 tax rebate from the state (in addition to the $7,500 federal tax credit); a $1.4 billion U.S. Department of Energy loan to Nissan to retrofit its Smyna plant to build Leafs; and part of a $115 million grant from DOE going to Ecotality to establish a network of charging stations, many at Cracker Barrel restaurants alongside Tennessee Interstates. But so far only 228 Leafs were sold in the Volunteer State, using up only 20 percent of the tax rebate fund that’s available. And on Monday AFP reported that ten years after the introduction of the hybrid Toyota Prius into the U.S. market, only three percent of all vehicles sold are electric or gas-electric hybrids.

#### Consumers won’t buy – concerned new batteries will wipe out their investment

Frost and Webb, ‘11 – Reporters for Bloomberg News, focusing on business and financial market news (Laurence and Alexander, “Electric Vehicles Fail to Connect With Consumers”, Bloomberg Businessweek, September 20 2011, http://www.businessweek.com/lifestyle/electric-vehicles-fail-to-connect-with-consumers-09202011.html#p1)// AMG

Following the introduction last year of the Leaf, Mitsubishi Motors Corp. (7211)‘s i MiEV, and General Motors Co. (GM)‘s Chevrolet Volt, the new models will test consumer appetite for electric vehicles, which cost more than double the price of conventional models. Consumers are balking at paying up, concerned that their own investment will be wiped out in a few years because the batteries may not last. “We’re about to find out what happens when several big manufacturers try to sell electric vehicles to real people,” said Ian Fletcher, a London-based analyst with IHS Automotive. “The signs aren’t all good.”

#### Batteries too risky for consumers- price, lifespan, depreciation

Frost and Webb, ‘11 – Reporters for Bloomberg News, focusing on business and financial market news (Laurence and Alexander, “Electric Vehicles Fail to Connect With Consumers”, Bloomberg Businessweek, September 20 2011, http://www.businessweek.com/lifestyle/electric-vehicles-fail-to-connect-with-consumers-09202011.html#p1)// AMG

The batteries’ price and limited lifespan will combine to make electric vehicles depreciate faster than combustion-engine models in the used-car market, according to research by the University of Greenwich in London. “Electric cars suffer from the certainty, not just risk, of a large fixed cost a few years down the line,” said Michael Wynn-Williams, a business professor and author of the study. “This is sudden death, the point where an otherwise attractive vehicle is worth nothing.”

#### Consumer demand for EVs is low at current gas prices

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

Consumer demand is highly sensitive to price, and consumers are often hesitant or unwilling to pay more for a good if they can get something similar for less. This unwillingness is coupled with an insensitivity to fuel savings, as consumers have a discount rate of around 20 percent for fuel savings while society’s discount rate would be closer to 4 percent (Greene and Plotkin 2011). 23 Even if fuel savings over the lifetime of a vehicle outweighs the difference in initial cost, it may not be enough to convince consumers to pay more upfront (Indiana University 2011). The Deloitte survey found that as gas prices rise, consumer interest in PEVs increases. With gas prices at $3.50 per gallon, around 30 percent of respondents would be more likely to purchase a PEV, while at $5 per gallon this statistic increases to 78 percent (Deloitte 2011). However, the impact of fuel prices on vehicle purchasing decisions is slow to affect change, modest in scale, and is often based more on the availability of gasoline and the rate of change in price than the absolute price (Tuttle and Baldick 2010).

#### Subsidizing EVs empirically fails – despite battery subsidies, sales are still sluggish

**IER, 6/5/12** not-for-profit organization that conducts intensive research and analysis on the functions, operations, and government regulation of global energy markets. (Institute for Energy Research, “Obama’s Goal: One Million Electric Vehicles By 2015—A Pipe Dream”, Canada Free **Press, 6/5/12,** [http://www.canadafreepress.com/index.php/article/47139)//EW](http://www.canadafreepress.com/index.php/article/47139%29//EW)

President Obama speculates a lot about his vision of energy and its operation in our economy, but his vision often ignores economics. His proposals would probably become much more practical if he studied the economics of how markets function. While governments can subsidize high cost technologies, it doesn’t mean they are affordable to the American public, particularly in these gloomy times with official unemployment at 8.2 percent[ia]. High-cost technologies are still affordable to a very small niche market with enormous government subsidies, but remain too expensive for average Americans. That explains why Obama’s goal of million electric car and plug-in hybrid vehicle goal by 2015 is lucky to be at 50,000 vehicles right now.[ii] Edmunds, an industry research firm, expects electric cars and plug-in hybrids to make up only 1.5 percent of the U.S. market in 2017, compared with 0.1 percent last year. Lux Research estimates that number will be fewer than 200,000. [iii] The Electric Vehicle Market Last year 17,300 plug-in hybrid and electric vehicles were sold in the United States out of 12.8 million new light-duty vehicles.[iv] And, electric car sales continue to be sluggish. Nissan sold about 2,610 Leaf electric cars through the first five months of this year[v], but expects to sell 20,000 by year-end. After 2013, Nissan plans to sell up to 150,000 Leafs a year. The company borrowed $1.3 billion from the Department of Energy to build a battery plant and manufacturing line in Smyrna, Tennessee, which will be finished in September, and will be capable of making 200,000 battery packs a year. GM had expected to sell 45,000 Chevrolet Volts this year, but only sold about 7,380 Volts in the first five months. Last May, the Volt got bad press when one caught fire three weeks after a lab-supervised crash test. The fire was due to leaking coolant that came in contact with the battery, causing a short. The Chevy Volt’s range is 40 miles on a battery charge and 300 to 350 miles on a tank of gas. In mid-March, GM suspended its Volt production for five weeks and temporarily laid off 1,500 workers to let production levels equal demand, having lagged well below expectations. However, because of soaring gasoline prices, a record number of Volts sold in March—2,289 vehicles—prompting GM to resume production a week earlier than originally announced. Ford is introducing plug-in electric models this year that are versions of gasoline-engine models. It delivered the first Focus Electric vehicles to retail customers in May. The company is down-playing sales expectations given the current market sales statistics. Toyota is expected to release three plug-in vehicles in the United States, but only expects to sell about 15,000 a year. It sold 1,700 plug-in vehicles in April. According to American Enterprise Institute scholar Kenneth Green, electric vehicles have been the next great technology promise for more than a century. In fact, Henry Ford bought his wife, Clara, at least two electric cars in the early 1900s with 50 miles driving range and speed of about 35 miles per hour.[vi] According to Green, subsidies come to about a quarter of the Volt’s $41,000 sticker price, starting with the $7,500 tax credit and adding in federal, state and local government support for charging stations, HOV lanes and research grants for new battery technologies.“They’re not saying, ‘Take away our subsidy,’” Green said of the automakers. “When they say that, I’ll be convinced the cost curves are declining.” According to the Lundberg Survey, based on the cost of gasoline versus electricity, fuel efficiency and depreciation, gasoline prices would have to rise to $8.53 a gallon to make the Leaf competitive and $12.50 for a Volt to be competitive. Obama’s dream includes a car battery that costs half the price of today’s batteries and can reach 300 miles on a single charge, which the industry is far from achieving.[vii]

### No Battery Improvement

#### Battery breakthrough won’t happen for another 15-20 years – DOE says

Kelly, ’10 - Assistant Secretary DOE/Ph.D in Physics Harvard University (Henry, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 73)

Question. How do you rate the potential for a ‘‘true breakthrough(s)’’ in battery

technology and any thoughts on when and where that might occur?

Answer. The Department of Energy (DOE) views the potential for a breakthrough

in battery technology for advanced electric drive vehicles as being high. Multiple

universities, national laboratories, and commercial companies are investigating and

developing breakthrough technologies. A small sample include advanced anodes (Sil-

icon and other alloys), cathodes (high voltage, high capacity cathodes a), and electro-

lytes (such as composite electrolytes for use with lithium metal anodes). It is be-

lieved timescale for some of these technologies is 3–5 years in PHEVs, and perhaps

10 years before commercial application in BEVs. In addition, the Advanced Research

Projects Agency—Energy’s (ARPA–E) work on transformational energy storage con-

cepts is accelerating the development of these and other technologies such as lith-

ium/sulfur and lithium/air which promise to triple or quadruple the energy density

of today’s lithium ion batteries. The timescale for these technologies is highly specu-

lative, although some have estimated an additional 15–20 years of development will

be needed.

#### Battery price is more likely to increase – even in best case scenario price drop won’t make EVs cost competitive

Leveen, ’10 – Chemical Engineer with specialty in Alternative Energy Sources, 35 years of experience (Lindsay, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 84-6)

My name is Lindsay Leveen. I am a chemical engineer and my interest is to apply

my scientific knowledge to alternate energy sources. My graduate work involved the

study of thermodynamics. Over the last 35 years my work has been in cryogenics,

microelectronic device fabrication, nanotechnology development, fuel cell fabrication,

and most recently biotechnology.

Purpose.—The purpose of this essay is to provide the subcommittee with rea-

soning based on thermodynamics why lithium batteries will likely not lower in cost

and therefore why plug in passenger vehicles (cars and trucks) will probably not

make any significant dent in the consumption of gasoline and diesel. I wish to pre-

vent the waste of precious resources on a technology that I believe is headed toward

a dead end.

I have no commercial interest in any energy or battery technology and am writing

this essay as a concerned citizen to inform the Senate Subcommittee on Energy and

Water Development of the severe thermodynamic limitations of Lithium Secondary

Batteries and of the probable long term unaffordable economics associated with

plug-in passenger vehicles that will rely on them. Much of this report is taken from

my presentations, reports, publications and blogs www.greenexplored.com I have

produced in recent years.

Thermodynamics—Definition.—The science concerned with the relations between

heat and mechanical energy or work, and the conversion of one into the other: mod-

ern thermodynamics deals with the properties of systems for the description of

which temperature is a necessary coordinate. (dictionary.com).

Moore’s Law and Learning Rates for Technologies.—Gordon Moore one of the

founders of Intel Corporation, postulated that semiconductor integrated circuits

would enjoy a doubling in performance in a period of every 18 months. This rate

of learning allows performance to be improved exponentially with time for the same

original cost.

Many technologies that engineers and scientists develop need a ‘‘Moore’s Law’’ in

order to improve their performance and correspondingly their economics to capture

vast markets. Most efforts around the improvement of alternate energy technologies

vis a vis competing with fossil fuels have not yielded these ‘‘Moore’s Law’’ rates of

learning. In particular for the past decade as much as $6 billion has been spent

without any real success toward the ‘‘learning curve’’ of PEM fuel cells. Much of

these $6 billion was appropriated by the Federal Government. The learning curve

for PEM fuel cells over the past decade yielded a yearly learning rate of less than

2 percent. By comparison the Moore’s Law yearly learning rate for integrated cir-

cuits has averaged over 40 percent for more than three decades.

My Experience With Moore’s Law.—For almost 20 years I directed teams of engi-

neers that designed state of the art Integrated Circuit (IC) fabrication facilities that

helped drive this rapid rate of learning and therefore cost improvement in com-

puters and other electronic devices. A simple explanation for the high learning rates

in IC fabrication is that the technology was neither constrained by thermodynamics

nor reaction kinetics but simply by the line width of the circuits within the ICs. To

drive Moore’s law in IC fabrication improvements in lithography, higher purity

gases for deposition, implantation, and etch, as well as the occasional increase in

the size of wafer being fabricated were needed.

Moore’s Law, Thermodynamics and Lithium Batteries.—To drive the learning rate

in PEM fuel cells and similarly lithium secondary batteries both thermodynamic

and reaction kinetic constraints have to be overcome. The reason why thermo-

dynamics places such constraints is that the functioning of these systems depends

on chemical reactions. Thermodynamics determines how much useful energy can be

derived from a chemical reaction. But we know that the thermodynamic constraints

cannot be overcome as the laws of thermodynamics are inviolable. ICs do not under-

go chemical reactions to function, but all batteries and fuel cells do involve chemical

reactions to deliver energy. It is these chemical reactions that are limiting the pos-

sible learning rate.

The Resulting Economic Problem.—Significant effort and much money is now

being spent on advanced batteries for plug-in full electric or plug-in hybrid vehicles.

Such vehicles will require between 10 kilowatt hours and 50 kilowatt hours of

stored electricity if the range of the vehicle purely propelled on stored electricity is

to be between 40 and 200 miles. Lithium chemistry based secondary (chargeable)

batteries presently offer the best performance on a weight and volume basis and

therefore represent the best ‘‘hope’’ for a ‘‘Moore’s law’’ to solve the world’s addiction

to fossil oil. Sadly ‘‘hope’’ is not a winning strategy. Present costs of such battery

packs at the retail level range from $800 per kilowatt hour of storage to over $2,000

per kilowatt hour of storage. One can purchase a 48 volt 20 amp hour Ping Battery

for an electric bicycle directly from this Chinese ‘‘manufacturer’’ for less than $800

delivered by UPS to any address in the USA. A123 offers a battery system that will

modify a standard Prius to a 5 kilowatt hour plug-in Prius for $11,000 or around

$2,200 per kilowatt hour fully installed by a service station in San Francisco. The

Ping battery delivers much less instantaneous power (watts) and that is the reason

their batteries are less expensive on a stored energy basis (watt hours) than are the

A123 batteries. Both the Ping and the A123 batteries claim safety and claim to be

manufactured with phosphate technology that will neither short circuit nor burn.

Economic Case Study the Example the Standard Prius vs Plug-in Prius.—The fol-

lowing is an economic analysis of a standard Prius versus a plug-in Prius using

A123’s lithium battery pack: The standard Prius will get 50 MPG and let’s assume

that the driver drives 12,000 miles a year. The standard Prius driver will need to

purchase 240 gallons a year of gasoline at an estimated cost of $720 per year with

gasoline at selling for $3 per gallon. If the driver purchased the A123 plug-in system

and can recharge the system at home and at work such that half the mileage driven

in a year is on batteries and half is on gasoline the driver will save $360 a year

on gasoline. The driver will need to buy some 2,000 kilowatt hours a year of elec-

tricity from the grid in order to save this gasoline. At 10 cents per kilowatt hour

the driver will spend $200 a year for electric power and will therefore only enjoy

$160 a year in net operating savings. The $11,000 set of batteries have a maximum

expected life of 8 years and the owner must set aside $1,375 a year for battery re-

placement without accounting for the time value of money. The battery replacement

cost is simply too expensive to justify the savings in gasoline. How high do gasoline

costs have to rise and how little do batteries have to cost to make the plug in viable?

Let’s assume gas prices reach $6 per gallon and electricity remains at 10 cents a

kilowatt hours we have a yearly operating savings of $520. These savings will still

be far short of the money needed for battery replacement.

The A123 batteries will need to drop to 15 percent of their present cost to make

the proposition of converting a Prius to a plug-n ‘‘worthwhile’’. To reach this cost

target in a decade one needs a yearly learning rate of approximately 26 percent.

With 35 years of work experience, I have concluded that in the best case of battery

costs (no inflation in raw materials) a 4 or 5 percent yearly learning rate could be

achieved over the next decade. But if we believe that gasoline will double then we

also have to assume that plastics, copper, cobalt, nickel, graphite, etc. will also dou-

ble in unit cost. As raw materials account for three-quarters of the manufacturing

cost of lithium batteries the inflation adjusted cost will increase at a higher yearly

rate than the learning rate will lower costs. My prediction is therefore that lithium

secondary batteries will likely cost more per unit of energy stored in 2020 than they

do today.

 .

#### Economies of scale cannot drive Moore’s Law rate of learning with batteries

Leveen, ’10 – Chemical Engineer with specialty in Alternative Energy Sources, 35 years of experience (Lindsay, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 86)

I simply believe we will not have ‘‘Mtional Moore’s Law that holds.

Argonne National Labs published an exhaustive review of the materials and asso-

ciated costs of lithium batteries back in May 2000, http://

www.transportation.anl.gov/pdfs/TA/149.pdf. The total material cost for the cell was

estimated at $1.28 and the total manufacturing cost of the cell including overhead

and labor was estimated at $1.70. This Argonne report is perhaps the best report

written on the economics associated with lithium battery fabrication. Actually had

folks read this report back in 2000 they would have realized that the learning curve

for lithium batteries would be painfully slow. Materials just make up far too much

of the battery cost and the quantity of materials is fixed by the chemistry. Therefore

economies of scale could not drive a Moore’s Law type rate of learning and a very

fractional Moore’s Law resulted. In the early years of lithium cell development from

approximately 1990 to 2000, the improvements in chemistry and in economies of

scale did allow the technology to enjoy a Moore’s Law type learning rate and it has

been reported that costs of an 18650 cell reduced from $18 to $2 per cell in that

decade. Unfortunately the technology has now hit an asymptote in their cost reduc-

tion curve.

#### Lithium battery price will rise significantly not fall by 2020 – empirically proven

Leveen, ’10 – Chemical Engineer with specialty in Alternative Energy Sources, 35 years of experience (Lindsay, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 86)

By doing a Google search on an 18650 lithium ion battery I came across this link

http://www.batteryjunction.com/li18322mahre.html. This site lists a selling price of

$5.29 each for 200 or more cells. The cells are 3.7 volts with 2.2 amp hours so they

are capable of holding 8.1 watt hours of energy from full charge to discharge. Ex-

pressed in cost per kilowatt hour of nominal capacity these loose cells cost around

$650. My guess is that if you applied today’s costs of cobalt, nickel, lithium, lithium

salts, plastics, copper, graphite, and other constituent materials that make up a cell,

the material cost in November 2009 compared with May 2000 have increased by

more than 150 percent and a current estimate of the materials used in the Argonne

labs report will show cost of about $3 per cell versus $1.28 back in May 2000. Hence

this company sells the cells for $5.29 each. From my previous analysis of the prob-

able learning rate I would not be surprised if in 2020 the selling price per 18650

lithium cell is as high as $6 rather than as low as $3.

Conclusion.—Lithium batteries are and will remain best suited for items as small

as a cell phone and as large as a bicycle. The cost relative to performance or these

batteries will likely not improve by much in the coming decade. Although some

standard hybrid vehicles may use lithium batteries with low capacity, their cost will

remain high. Also plug-in vehicles that have a range longer than 10 miles using bat-

tery power will likely not penetrate the market significantly. Given the likely sce-

nario that plug-in passenger cars and trucks based on lithium battery technology

will not reduce U.S. consumption of gasoline and diesel fuel in large measure, I am

#### Batteries won’t be cost competitive until 2020

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

The principal challenge PEVs face to becoming competitive with conventional vehicles is the high initial cost of purchasing the vehicle, which is in large part due to the high cost of the battery system. The cost to auto manufacturers of current PEV lithium-ion batteries is around $600 per kilowatt-hour (kWh) of total energy or nameplate capacity, while the cost of consumer home-use lithium-ion batteries has been reduced to $250 per kWh (Ener1 2010, BCG 2010). 1 Prices for large-format automotive-grade batteries 2 are expected to drop, with the potential to reach $500 per kWh by 2015 (BCG 2010). However, PEVs may not become cost-competitive with conventional vehicles until battery costs reach $300 per kWh 3 (MIT 2010). The United States Advanced Battery Consortium has set a cost target of $250 per kWh, but a Boston Consulting Group analysis of battery costs estimates the cost will remain above that target through 2020. The analysis concluded that between 2009 and 2020 the cost that original equipment manufacturers (OEMs) pay for batteries would decrease by 60 to 65 percent. And the price of 15 kWh battery that costs $990 to $1,220 per kWh in 2009 would drop to $360 to $440 per kWh in 2020, with a total cost of the battery at around $6,000 (BCG 2010).

#### EVs are a long ways from being cost competitive, even with federal support for batteries

Klayman ’12 – Bachelors Degree in English Literature from Washington University in St. Louis, Head writer of the automobile section of Reuters, (Ben, “Electric car revolution faces increasing headwinds”, 3/21/2012. http://www.reuters.com/article/2012/03/21/us-electriccars-idUSBRE82K06T20120321)//DHirsch

And even with rising gasoline prices -- topping $4 a gallon in parts of the country -- EVs are just not competitive, according to the Lundberg Survey. Gasoline prices would have to rise to $8.53 a gallon to make the Leaf competitive and hit $12.50 for a Volt to be worth it, based on the cost of gasoline versus electricity, fuel efficiency and depreciation, the survey said.

Obama's vision, which he laid out at a Daimler truck plant in North Carolina this month, includes a car battery that costs half the price of today's versions and can go up to 300 miles on a single charge. The industry is far from achieving that.

#### EVs aren’t cost competitive – battery prices must be a third lower or gas above $5

Doren ’11 – Senior Fellow at the CATO Institute, has taught at the Woodrow Wilson School of Public and International Affairs (Princeton University), the School of Organization and Management (Yale University), and the University of North Carolina at Chapel Hill, Bachelor's degree from M.I.T and Master's degree and doctorate from Yale University (Peter van, “Batteries Matter”, 4/16/2011. http://www.nytimes.com/roomfordebate/2010/10/07/will-electric-cars-finally-succeed/electric-cars-are-not-the-answer-to-our-problems)//DHirsch

But the lower marginal costs of electric car operation are offset by the much higher fixed costs of batteries relative to an internal combustion engine of equivalent output. So for electric cars to be cost competitive, battery costs would have to be much lower (probably about a third of their current costs) or gasoline prices would have to be much higher (**above $5 a gallon**).

#### Support for battery R&D has empirically failed to lead to major advances needed to make EVs cost competitive

**MIT Energy Initiative Symposium, ’10** (April 8, “Electrification of the Transportation System,”<http://web.mit.edu/mitei/docs/reports/electrification-transportation-system.pdf>**, p. 3)**

The wide spread of opinion

about the mid-term prospects

for improved technical perfor-

mance and cost of EV battery

systems based on advanced

lithium-ion (Li-ion) or other

battery concepts, as shown in

the chart from the Sloan

Automotive Lab2, underlines

the uncertainty in price/

performance of EV battery

systems. Some industry

participants stated that

battery costs are already

lower than the Natural

Resource Council (NRC)

projection for 2020, but this

depends on unstated

assumptions underlying the

different estimates in the

chart. A rough rule of thumb

is that battery costs must

reach about $300 per kWe-h

in order to compete with

spark ignition, ICE LDVs

fueled with $3.50 per gallon

gasoline. However, it is

important to bear in mind that

conventional ICE technology

is projected to improve over

time with regard to fuel

economy and cost. There are

also other important battery

metrics besides cost: safety,

reliability, high energy den-

sity, charging time, and buffer

levels. It is worth noting that

there has been considerable support for battery research and development (R&D) by industry and government both in the US and elsewhere for many years without the kind of major advance that would make EVs economically competitive.

#### **Further battery development is crucial to jumpstarting the EV industry**

Vlasic and Wald 6-12-12 – award-winning business reporter with more than fifteen years of experience specializing in the automotive industry, reporter at The New York Times, where he has been writing about energy topics for 30 years (Bill and Matthew L., “Shaky battery maker claims a breakthrough” The New York Times, June 12, 2012, http://www.msnbc.msn.com/id/47780668/ns/business-us\_business/#.T\_C6k7VfE3M)//ctc

The government may have financed the company because “these guys have some new chemistry, some new ideas,” rather than the ability to commercialize the product, said Professor Prashant N. Kumta, a materials science expert at the University of Pittsburgh, who began working on lithium-ion batteries in the 1990s. He said that A123 had been “a bit of a disappointment” because it had not put much product into the market. The Energy Department said it would not comment on the viability of individual companies. But a spokeswoman, Jen Stutsman, said, “The market for electrified vehicles is expected to triple by 2017 — which is why automakers in every part of the world are racing to introduce new models of hybrid and electric vehicles.” Alternative-fuel vehicles gaining favor with motorists “The investments being made today will help ensure that the jobs that support this rapidly growing industry are created here in the United States,” she said. Supporters of the energy programs say it is unrealistic to expect every government-backed company to thrive immediately. “We should be willing to take on some of the risks for the new energy economy, even if some of these start-ups fail,” said Representative Diana DeGette of Colorado, the ranking Democrat on the House Energy and Commerce subcommittee that investigated Solyndra. But Mitt Romney, the presumed Republican nominee for president and former governor of Massachusetts, has attacked subsidies to energy companies as a waste of taxpayer dollars. “When Mitt Romney is president, government will stop meddling in the marketplace,” a Romney spokeswoman, Andrea Saul, said on the campaign’s Web site. A123 Systems is a prime example of how a promising venture can bog down in the harsh realities of the automotive marketplace. Founded in 2001, the company has been primarily focused on making lithium-ion battery packs specifically for cars, like the Fisker Karma and a forthcoming all-electric version of the Chevrolet Spark, a minicar made by General Motors. But the company stumbled when it was forced to recall potentially defective batteries planned for use in the Fisker vehicle. And with the future market for electric cars in question, A123 might not survive solely on batteries for those models. Instead, A123 is now hoping that the new technology it is unveiling Tuesday, called Nanophosphate EXT, will help it enter new markets. The company says the new electrolyte chemistry eliminates the need for heating and cooling in extreme temperatures. That would avoid the addition of costly and heavy temperature-management equipment and prolong the life of the battery. The technology could be used to produce batteries for telecommunications equipment, military vehicles and hybrid gas-electric cars that employ start-and-stop engine systems. It also could yield batteries that could be used to replace the millions of ordinary lead-acid batteries in cars currently on the road. “It’s a hedge against the market for electric vehicles,” Mr. Vieau said. The company is hoping that the promise of the new technology will help persuade investors to back a $50 million convertible debt offering by the company. One battery expert said the new technology’s extended life span could have an immediate impact on the luxury-car market. “The car company can advertise that this lithium-ion battery is going to last the life of the vehicle, with no need for replacement,” said Ahmad A. Pesaran, an engineer at the government’s National Renewable Energy Laboratory in Golden, Colo. Potential automotive customers can test samples later this year, with production scheduled to begin in the first half of 2013.

#### **Reducing battery cost is key to future of EVs**

Fairley 11 – freelance science writer (Peter, “Will Electric Vehicles Finally Succeed?” Technology Review, January/February 2011, http://www.technologyreview.com/featured-story/422133/will-electric-vehicles-finally-succeed/)//ctc

At the end of 2010, GM and Nissan each began selling cars that run on electricity most or all the time. The Volt and the Leaf are only the first of dozens of new electric vehicles and plug-in hybrids to come: every major automaker has promised to start selling such cars over the next few years. Toyota, which has led the world in its development of gas-electric hybrid technology, plans next year to introduce a new version of its Prius that will be able to run on electricity alone for short distances. Meanwhile, startups such as Coda Automotive are trying to break into the auto industry with plug-in hybrids and all-electric cars—following the lead of Tesla Motors, whose electric sports car may have helped set the new wave in motion when it was introduced in 2006. If these cars become popular with buyers, it will mark the beginning of the biggest shift the auto industry has seen for decades: a shift away from an almost exclusive reliance on petroleum and the internal-combustion engine. GM, just emerging from bankruptcy, is counting on the Volt to change its image from purveyor of the Hummer and other large SUVs to leader in innovation and energy efficiency. For its part, Nissan is staking much of its future on electric vehicles; over the next few years it plans to ramp up production to sell hundreds of thousands of them annually, far more than any other automaker. The new cars are a departure from conventional hybrids, which use batteries mainly to supplement the gasoline engine and store energy recovered from braking. In those cars, the batteries are recharged by a generator that draws its energy not from a wall outlet but from either the gas engine or the regenerative brakes. Battery power alone can take them only short distances at low speeds. In contrast, the new generation of electric cars can run at least tens of miles without gas, and they can be recharged by plugging them in. Some, such as the Leaf, are totally dependent on the battery. Others, such as the Volt, use a combination of batteries and a gasoline engine. Each configuration has its own benefits and problems, but all are limited, ultimately, by one thing: despite many technological advances in recent years, the batteries remain expensive. The fate of the new electric cars will depend above all on automakers' ability to bring down battery cost, or find ways to engineer around it.

#### Massive increase in battery R&D is key to becoming a global leader in EV technology

**TEP 11 –** The Transport Electrification Panel consists of Gurminder Bedi (Ford Motor Company) Michael Brylawski (Bright Automotive) John German (International Council on Clean Transportation) Dr. Sara Hajiamiri (Pardee RAND Graduate School) Dr. Donald Hillebrand (Argonne National Laboratory) Dr. Kara Kockelman (University of Texas at Austin) Michael Ligett (North Carolina State University) Dr. Virginia Mcconnell (Resources for the Future) Paul Mitchell (Energy Systems Network) Nick Nigro (Pew Center on Global Climate Change) Brett Smith (Center for Automotive Research) Michael Tinskey (Ford Motor Company) Dr. Thomas Walton (Defour Group) Dr. John D. Graham (School of Public and Environmental Affairs at Indiana University) Dr. Wanya Carley (Assistant Professor, School of Public and Environmental Affairs, Indiana University) Chris Crookham (MPA Student, School of Public and Environmental Affairs, Indiana University) Devin Hartman (MPA and MS Student, School of Public and Environmental Affairs, Indiana University) Dr. Bradley Lane (Assistant Professor, Institute for Policy and Economic Development, University of Texas at El Paso) Natalie Messer (MPA Student, School of Public and Environmental Affairs, Indiana University) (Transportation Electrification Panel, “Plug-in Electric Vehicles:

A Practical Plan for Progress” School of Public and Environmental Affairs, Indiana University, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//ctc

Modernizing the Electric Power System. Even a partial shift from petroleum to electricity as a transportation fuel will have ramifications for the operation and growth of the electric power system. Detailed knowledge of the power grid is required to ensure that outages are avoided**.** To optimize the benefits of electrification, public policies should be adopted to: • accelerate “smart grid” research, standards, and implementation; • expand the availability of lower electricity prices during off-peak periods to enhance consumers’ willingness to charge their vehicles at night, and include continuous time-of-use pricing adjustments where acceptable; • increase the availability of metering, recharging, and vehicle technologies that will enable these time-of-use adjustments to electricity prices; and • encourage or require enhanced efficiency and the movement toward a cleaner power generation system in order to reduce upstream emissions associated with PEVs in the form of greenhouse gases and conventional pollutants. 8. Long-Term R&D Commitments. Lithium-ion batteries may never have adequate energy density to independently power a household’s primary multi-purpose vehicle**.** Although there have been significant improvements in battery technology since the 1990s,policymakers should consider a large increase in federal R&D investments into innovative battery chemistries, prototyping, and manufacturing processes**.** A broader selection of R&D grantees, with even more vigorous competition, is appropriate compared to past practices. Sustained investment in R&D, including both public and private funds, is crucial as the United States seeks to establish a leadership position in the growing global market for advanced battery technologiesand related components. Thepotential spillover benefits in the economy from R&D and manufacturing leadership deserve serious consideration by policymakers**,** even though public R&D decisions will be made in a troubled federal fiscal situation. In order to determine the appropriate scale of R&D expansion**,** the expected payoffs from long-term R&D investments in energy storage techniques should be compared to the anticipated payoffs from R&D investments in other advanced fuels and propulsion systems**.** Countries around the world are jockeying for position in the emerging PEV industry. The time for the United States to secure a leadership position in the global market for PEVs is now. **T**his report provides an expert panel’s view of how the United States can secure this role in a cost-effective manner.

###  Picking Winners Bad Turn

#### Clean energy tech is still too undeveloped to determine winners and losers – EVs are just the current niche market

Chandler, ’11 (David, January 24, “Electrifying Transportation: Devil is in the Details, ”http://web.mit.edu/mitei/news/spotlights/electrify-transport.html)

John Heywood, the Sun Jae Professor Emeritus of Mechanical Engineering and former director of the Sloan Automotive Laboratory, said the report does a good job of summing up the complexities of the decisions facing this country and the world. In terms of figuring out which technologies — plug-in hybrids, fuel cells, biofuels or something else — would make the biggest dent in petroleum use, “the technology hasn’t developed enough to have clear answers,” he said. “We don’t know yet where we’re going to end up.” All of the transportation technologies, both the conventional ones and the newer ones, are improving all the time, Heywood said, and the newer ones are getting better faster. But for now, those in the industry tend to see electrification — whether through plug-in hybrids or pure electric vehicles — as just a niche market, primarily because such vehicles are too expensive in their current form, and petroleum currently is not expensive enough.

#### Picking EVs as winners stunts potentially better alternatives like efficient engines or hybrids

The Economist ’12 (“Government and the electric car”, 4/20/2012. http://www.economist.com/blogs/freeexchange/2012/04/innovation)//DHirsch

One lesson is the tried and true aphorism that government isn't any good at picking winners. This isn't, by the way, a knock on government. No one is particularly good at picking winners. The problem for government is that while market-produced losers usually fail and go away, making room for winners, government-produced losers tend to stick around for a while, sucking resources away from potential winners. No one knows in advance whether something will work; government's failure is in its relative unwillingness to clear away the chaff.

That is the risk in something like a programme of generous tax credits for EVs. That sort of programme may develop a constituency which will rally to protect it, even after it seems clear that the credit isn't having the desired effect. And it is hard to see that it is. Some subset of consumers is clearly willing to pay a premium for EVs in order to make a statement; many of them would be willing to do so with or without a tax credit. Among marginal buyers, the most cost- and environmentally effective option might well be efficient conventional engines or hybrids—the growth of which options might be stunted by the tax advantages given to EV options. In the sort of common sense manner of thinking that we tend to see among sensible bureaucrats, **EVs seem like the logical next step in automotive technology. But the logical next step is quite often not the next step, and markets excel at finding unconventional ways to tackle problems.**

#### Government is bad at picking winners – wastes money and crowds out private investment – multiple studies prove

Kenneth ’12 – Resident Scholar at the American Enterprise Institute, M.S., San Diego State University and B.S., University of California, Los Angeles (Green, “Government Is a Lousy Venture Capitalist“, 2/24/2012. http://www.american.com/archive/2012/february/government-is-a-lousy-venture-capitalist)//DHirsch

As Obama’s own economic adviser Larry Summers [pointed out](http://www.nytimes.com/2011/10/04/us/politics/e-mails-reveal-white-house-concerns-over-solyndra.html?_r=2&pagewanted=all" \t "_blank), the government is a bad venture capitalist. It has no greater ability to pick winners than does any private individual, but it can be far more reckless in its “investments” because there is no penalty for wasting money, and because it can use state force to favor cronies and rig outcomes. Sure, the government invested in hydraulic fracturing, but were their investments key to its success, or are they simply claiming credit for an accidental situation where something went right? Based on the evidence, the latter is more likely than the former.

2) Displacement is not addition. Studies show that government “investment” in applied research and development does not add new money to the pot, it displaces private capital, and does so disproportionally. When government steps in, it displaces more money than it throws in the pot.

Again, Kealey [sums it up well](http://www.amazon.co.uk/Sex-Science-Profits-Terence-Kealey/dp/0434008249%22%20%5Ct%20%22_blank) using a study by the OECD:

Furthermore, regressions including separate variables for business-performed R&D and that performed by other institutions (mainly public research institutes) suggest that it is the former that drives the positive association between total R&D intensity and output growth... The negative results for public R&D are surprising and deserve some qualification. Taken at face value, they suggest publicly performed R&D crowds out resources that could be alternatively used by the private sector, including private R&D. There is some evidence of this effect in studies that have looked in detail at the role of different forms of R&D and the interaction between them. (p.19)

Kealey’s own research agrees:

Moreover, the OECD does not stand alone: at least two other researchers, Walter Park of the Department of Economics at the American University at Washington, D.C., and myself, have found—by similar surveys of OECD data—similarly damaging effects of the government funding of research and development.

Government, like a really bad surgeon, sings the praises of patients it heals and buries those it mangles, quietly when it can, and loudly blaming others when it can’t. As Frédéric Bastiat [explained](http://www.econlib.org/library/Bastiat/basEss1.html%22%20%5Ct%20%22_blank) some 150 years ago, economic actions have both seen and unseen consequences. Fans of industrial policy are keen to point out the seen, and never countenance the unseen waste and opportunity costs.

I gladly walk with Nordhaus and Schellenberger when they argue that supporting basic research in STEM fields is a valid, important, and often beneficial governmental activity. However, we fall out of step when they start **endorsing industrial policy and** having bureaucrats pick winners and losers in the market.

#### Picking EVs as a winner empirically leads to market gluts – Obama battery investment proves

Muller ’12 – Detroit bureau chief for Forbes (Joann, “Car Battery Shakeout Is Proof That Government Shouldn't Pick Winners And Losers”, 5/31/2012. http://www.forbes.com/sites/joannmuller/2012/05/31/car-battery-shakeout-is-proof-that-government-shouldnt-pick-winners-and-losers/)//DHirsch

Today’s excellent [Wall Street Journal](http://online.wsj.com/home-page) story about the [troubles facing advanced battery makers](http://online.wsj.com/article/SB10001424052702304791704577420350163856824.html?mod=WSJ_business_LeadStoryCollection) like A123 Systems should come as no surprise. Any time the government gets involved in trying to “help” industries, there are unintended consequences.

In this case, the Obama Administration tried to foster development of cleaner electric cars by handing out more than $1 billion to companies that make batteries for electric vehicles. But according to the Journal, the money came with aggressive requirements for production and staffing without any regard for what the actual demand for electric vehicles might be. Instead of being halfway to Obama’s goal of selling one million EVs by 2015, the industry has sold only about 50,000.  The result is there are now nine battery plants in the U.S., with very little work to do.

[Forbes predicted a battery glut](http://www.forbes.com/global/2010/0208/technology-electric-vehicle-batteries-overcapacity.html) back in February 2010 on the grounds that there wouldn’t be enough people interested in electric cars unless gas prices soared or battery prices plunged. So far, neither has happened.

#### Wireless infrastructure will emerge within the next decade and be fueled solely by solar power – plan discourages automakers from equipping vehicles with wireless

**Vagus, 4/9/**12 author for HydrogenFuelNews.com (Stephen, “Department of Energy funding developing of wireless charging system for electric vehicles”, Hydrogen Fuel News, 4/9/12,[http://www.hydrogenfuelnews.com/department-of-energy-funding-developing-of-wireless-charging-system-for-electric-vehicles/853007/)//EW](http://www.hydrogenfuelnews.com/department-of-energy-funding-developing-of-wireless-charging-system-for-electric-vehicles/853007/%29//EW)

**Electric vehicles are beginning to gain traction in the U.S. as more charging stations take root throughout the country and bolster the transportation infrastructure. These charging stations have been well received by drivers of electric vehicles**, but they do not appear to be good enough for the Department of Energy. The DOE is looking to further bolster the electric transportation infrastructure by funding the development of wireless charging stations. This funding is going through the agency’s Vehicle Technologies Program, which aims to promote advanced technologies that make vehicles safer and more efficient. Wireless charging is not something new. Such charging methods already exist for mobile devices, though such charging systems are in limited supply. The DOE is funneling $4 million to make wireless charging for vehicles a reality and believes such a system will be nationwide within the next 10 years. The agency has much loftier goals for wireless charging, however, and believes that drivers should never have to worry about whether their battery runs out of charge before reaching their destination. The ultimate goal of the Vehicle Technologies Program is to install wireless charging systems throughout the entirety of the country’s roads. This system would be powered by solar energy and would provide a constant charge for electric vehicles as they travel. The DOE believes such a system is feasible, but the agency’s efforts may be held back by the auto industry’s progress in charging technologies. Electric vehicles must be equipped with wireless charging technologies in order to use the DOE’s proposed system. General Motors is currently the only automaker that has such a vehicle, though Toyota is also working on developing such technologies. It will take more than two automakers to make the DOE’s plan a success. It may be difficult to encourage automakers to participate in a wireless charging initiative as most of the auto industry is currently focused on developing hydrogen fuel cells and establishing a hydrogen fuel infrastructure in the U.S. Nonetheless, the DOE believes that a wireless charging roadway will be a very important part of America’s transportation future.

### AT Clean Tech Shift

#### Plan doesn’t cause a clean tech shift – roadblocks and trade barriers

Lovins ’12 - American physicist, environmental scientist, writer, and Chairman/Chief Scientist of the [Rocky Mountain Institute](http://en.wikipedia.org/wiki/Rocky_Mountain_Institute). He has worked in the field of [energy policy](http://en.wikipedia.org/wiki/Energy_policy) and related areas for four decades, Harvard Educated,

(Amory, “Farewell to Fossil Fuels: Answering the Energy Challenge”, March/April 2012. <http://www.foreignaffairs.com/articles/137246/amory-b-lovins/a-farewell-to-fossil-fuels>)// DHirsch

The United States is a leader in developing renewable technology but lags in installing it. In June 2010 alone, Germany, with less sun than Seattle, added 142 percent more solar-cell capacity than the United States did in all of 2010. Stop-and-go congressional policies sank U.S. clean-energy investments from first place globally to third between 2008 and 2010. (Federal initiatives expiring in 2011–12 temporarily restored the U.S. lead in 2011.) From 2005 to 2010, while the renewable fraction of the United States’ electricity crawled from nine percent to ten percent, that of Portugal’s soared from 17 percent to 45 percent. In 2010, congressional wrangling over the wind-power tax credit halved wind-power additions, while China doubled its wind capacity for the fifth year running and beat its 2020 target. The same year, 38 percent of China’s net new capacity was renewable. China now leads the world in five renewable technologies and aims to in all.

Legacy industries erect many anticompetitive roadblocks to U.S. renewable energy, often denying renewable power fair access to the grid or rejecting cheaper wind power to shield old plants from competition. In 34 U.S. states, utilities earn more profit by selling more electricity and less if customers’ bills fall. In 37 states, companies that reduce electricity demand are not allowed to bid in auctions for proposed new power supplies. But wherever such impediments are removed, efficiency and renewables win. In 2009, developers offered 4.4 billion watts of solar power cheaper than electricity from an efficient new gas-fired plant, so California’s private utilities bought it -- and in 2011, they were offered another 50 billion watts.

### Clean Tech Leadership Bad Turn

#### Turn: Trying to win the clean tech race backfires – causes trade barriers, deters foreign participation, and kills innovation

Levi et al ’10 - David M. Rubenstein senior fellow for energy and environment at the Council on Foreign Relations, bachelor's degree in mathematical physics from [Queen's University](http://en.wikipedia.org/wiki/Queen%27s_University), an M.A. degree in physics from [Princeton University](http://en.wikipedia.org/wiki/Princeton_University), and a Ph.D. degree in war studies from King’s College (Michael, Elizabeth Economy, Senior Fellow for Asian Studies at CFR, Shannon O’Neil, Fellow for Latin American Studies at CFR, Adam Segal, Senior Fellow for Counterterrorism and National Security Studies at CFR, “Globalizing the Energy Revolution: How to Really Win the Clean-Energy Race”, Foreign Affairs, November/December 2010. http://www.foreignaffairs.com/articles/66864/michael-levi-elizabeth-c-economy-shannon-k-oneil-and-adam-segal/globalizing-the-energy-revolution)//DHirsch

They are right that the United States is dangerously neglecting clean-energy innovation. But an energy agenda built on fears of a clean-energy race could quickly backfire. **Technology advances most rapidly when researchers, firms, and governments build on one another's successes**. When clean-energy investment is seen as a zero-sum game aimed primarily at boosting national competitiveness, however, states often erect barriers. They pursue trade and industrial policies that deter foreigners from participating in the clean-energy sectors of their economies, rather than adopting approaches that accelerate cross-border cooperation. This slows down the very innovation that they are trying to promote at home and simultaneously stifles innovation abroad.

Turn: Trying to win the clean tech race fails and causes green protectionism – tech cooperation is key to solving

Levi et al ’10 - David M. Rubenstein senior fellow for energy and environment at the Council on Foreign Relations, bachelor's degree in mathematical physics from [Queen's University](http://en.wikipedia.org/wiki/Queen%27s_University), an M.A. degree in physics from [Princeton University](http://en.wikipedia.org/wiki/Princeton_University), and a Ph.D. degree in war studies from King’s College (Michael, Elizabeth Economy, Senior Fellow for Asian Studies at CFR, Shannon O’Neil, Fellow for Latin American Studies at CFR, Adam Segal, Senior Fellow for Counterterrorism and National Security Studies at CFR, “Globalizing the Energy Revolution: How to Really Win the Clean-Energy Race”, Foreign Affairs, November/December 2010. http://www.foreignaffairs.com/articles/66864/michael-levi-elizabeth-c-economy-shannon-k-oneil-and-adam-segal/globalizing-the-energy-revolution)//DHirsch

Even with extremely ambitious programs, no one country will produce the majority of the clean-energy innovation that the world needs. Different countries' efforts need to be tightly connected so that they can build on one another. U.S. utilities, for example, will need to utilize Chinese advances in clean-coal implementation; Indian solar manufacturers will need to benefit from basic research done in the United States in order to meet their government's targets; and Brazilian biofuel engineers will need to be able to tweak the inventions of Danish enzyme companies to make them work with local sugar cane.

This is already happening in certain places. California-based CODA Automotive, for example, was able to move ahead quickly with its plans to field an electric vehicle thanks to a partnership with the Chinese battery maker Lishen Power Battery, creating jobs in both the United States and China and improving the potential for more affordable electric cars. Amyris, another California start-up, is developing synthetic biofuels in Brazil through partnerships with local sugar-cane producers, allowing it to strengthen its technology before applying it to more difficult challenges in the United States. This sort of cross-border fertilization needs to happen faster and on a much larger scale.

Yet many governments may instinctively move in the opposite direction, particularly if they worry that they are engaged in a clean-energy race with other nations. Aggressive government support for innovation is typically sold as support for domestic workers and companies. That can quickly lead to "green protectionism," with politicians coming under pressure to wall off domestic markets or to discriminate against foreign firms. Governments also promote their own local technology standards in an effort to ensure that their domestic companies can control markets and collect royalties. This sort of Balkanization of clean-energy markets blocks the free flow of technology.

### **Lack Public Knowledge**

#### Alternate causality – public lack of knowledge about EVs

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

In addition to price issues, the average consumer’s interest may be limited by a lack of knowledge of or experience with PEVs, which can be overcome by increasing consumer awareness of and familiarity with PEVs. Only 36 percent of American consumers claim to know enough about PEVs to consider one for their next purchase, although even that low level of consumer awareness is second only to that of China (Accenture 2011). Increasing awareness could include education campaigns that clearly identify the benefits and convenience of using PEVs, as well as events or PEV fleets that enable consumers to have individual experiences with PEVs (California PEV Collaborative 2010).

### Lithium Safety Issues

#### Lithium-ion batteries have safety issues – results in negative impact on EV’s reputation

**SPEA 11** - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

Lithium-ion batteries are associated with potential safety risks: They can potentially dispense the energy they store too rapidly, which has resulted in a few incidents of consumer electronics spontaneously bursting into flames. 126 If real-world safety problems surface with the first generation of PEVs, the resulting negative impact on the technology’s reputation could be severe. One of the reasons that Toyota has delayed the company’s transition from nickel to lithium-ion batteries is a concern that lithium-ion batteries will have safety problems under unusual yet plausible conditions of use. 127 The damage that safety troubles inflict on an automaker’s (or supplier’s) reputation was demonstrated in early 2010 when Toyota issued a widespread recall due to (allegedly) faulty gas pedals. Toyota quickly lost its top rank for both consumer loyalty and perceived quality among survey respondents. 128 Sales declined 9% during the month of the recall, while competitors Ford and GM saw their sales jump 43% and 12%, respectively. 129 And Toyota has incurred some lasting reputational damage from the incident, even though the recent investigations by federal agencies found no design defect and instead suggested that the incidents were caused primarily by misuse of the pedal by drivers. 130

### Only Integrated Approach Solves

#### Integrated approach only way to solve – must target manufacturers, energy suppliers, and consumers

**Kendall 8** – current Deputy Director at the Cambridge Programme for Sustainability Leadership, formerly worked for Esso Petroleum and ExxonMobil before becoming a senior energy analyst at WWF, BSc in Chemistry and PhD in Surface Science from the University of Liverpool (Gary, “Plugged In: The End of the Oil Age”, WWF, 1 April 2008, http://electricdrive.org/index.php?ht=a/GetDocumentAction/id/27921)//BI

As a matter of principle, chosen policies must also attribute responsibilities appropriately across the various actors. Consider the example of energy-consuming domestic appliances, such as televisions, refrigerators, or light bulbs. The equipment manufacturers may reasonably be requested – or incentivised – to produce the most energy efficient appliances possible. How they choose to achieve that aim may be open to their own interpretation and skills of innovation. Light bulb manufacturers may discover new efficient lighting technologies which are presently unknown to policy makers and to their competitors. For their part, customers may be offered incentives to favour the purchase of more energy efficient appliances over inefficient alternatives, thereby creating a ‘market pull’ for superior products. Meanwhile, electrical utilities would be held responsible for reducing the CO2 intensity of the energy they supply, which ultimately powers the appliance. This may be achieved through supply side efficiency improvements, through increasing the proportion of renewable energy in their generating mix, or through end-of-pipe abatement solutions like CCS. Taken together, a suite of policies which are appropriately targeted at (i) suppliers of energy, (ii) manufacturers of energy-consuming appliances, and (iii) purchasers and operators of those appliances would come together to form an integrated approach to reducing CO2 emissions per unit of energy service consumed.\* Figure 24 shows how this principle applies to automotive transport policy.

### No Solvency Without Carbon Pricing

#### EV deployment cannot succeed without some type of carbon pricing – your 1AC author

**MIT Energy Initiative Symposium, ’10** (April 8, “Electrification of the Transportation System,” <http://web.mit.edu/mitei/docs/reports/electrification-transportation-system.pdf>, p. 18)

Finding: There is a lack of cohesion and clearly defined policy goals in the current assort- ment of subsidies that comprise US energy policy. A unified energy policy is needed that appropriately defines, analyzes, and sequences public investments and incentives. Electrification of the transportation system would benefit from a more thoughtful approach to what amounts to major nationwide changes.

Finding: Stimulus funding has created significant momentum for technological innovation. One challenge moving forward will be maintaining this momentum when the funding runs out. Finding: For EV technologies to more rapidly and efficiently scale, there must be a price on carbon in the form of a carbon tax, cap-and-trade system, or gas tax, though the relative effectiveness of these three options was contested. Finding: A unified policy must achieve three distinct goals: improve the fuel efficiency of new vehicles, reduce the carbon content of fuels, and drive consumer acceptance.

### EVS Get Stuck in Emergencies

#### EVs’ limited range causes people to be stuck in emergency areas

**Morrissey 7/2** – political columnist, contributor to the Heritage Foundation, New York Sun, and New York Post (Ed, “DC, Mid-Atlantic Region Could be Without Power Several More Days,” Hot Air, July 2 2012, http://hotair.com/archives/2012/07/02/dc-mid-atlantic-region-could-be-without-power-several-more-days/) // AMG

Thus we see the wisdom of energy diversity. Light rail and subways run on electricity, which is only stable and plentiful enough to supply that kind of power because of the use of coal and natural gas. Cars**,** on the other hand, generally run on gasoline in this country, and that gives them a value in emergency situations. They can run independently of a failure in the electric grid, and have the range necessary to go further out for refueling when running low; most internal-combustion vehicles can go 300 miles on a “full charge,” while their electric-only counterparts can only go one-tenth that distance.That’s usually enough of a range to get families to shelter where power exists to run air conditioning and provide food storage**.** Even hybrids can manage this muc**h**, and this same argument would be true of natural-gas-powered vehicles. On the other hand,those who have no other transportation options except electric are stuck inside the emergency area. Their vehicles don’t have the range to get them out of the disaster area, which means they have to be dependent on rationed supplies if their food supplies run low.They can’t easily get to distribution centers for that, either, at least not more than a couple of times, which means that emergency response teams eventually have to bring in gasoline-powered vehicles to reach them in a disaster**.** This kind of multiple-resource system has a lot of value, and we should consider that when arguing whether we need to spend massive amounts on subsidies to eliminate the diversity — especially when electricity production comes from less-efficient resources, and other parts of our energy policy will restrict the amount of electricity produced in this country.

## States CP

### States Solve

#### States are financing ports now – California is supporting a comprehensive network of 10,000 stations

Rubio ’12 – writer for Digital Journal (R. Francis, Digital Journal, “Charging stations increase in U.S. as electric car sales struggle”, 5/27/2012. http://digitaljournal.com/article/321927)//DHirsch

More companies are increasingly investing in charging stations for pure-electric and hybrid vehicles across the country getting in on the ground floor and scooping up the best sites.
With fewer than 15,000 pure-electric cars on U.S. roads today along with so far lackluster sales on hybrid vehicles, investors and business owner alike seem to be looking towards the future with optimism when it comes to an electric vehicle infrastructure.

In a [press release on Business Wire](http://finance.yahoo.com/news/nrg-energy-inc-build-unprecedented-182800086.html) Friday, NRG Energy announced a $100 million, four year agreement with California Public Utilities Commission to begin building a state-wide comprehensive network of electric vehicle charging stations.

The plan calls for a minimum of 10,000 individual charging stations **to be installed at individual homes, offices, multifamily communities, schools and hospitals,** along with approximately 200 public fast-charging stations **installed in San Diego county, San Francisco Bay area and the Los Angeles Basin, adding vehicles up to 50 miles of range in less than 15 minutes of charge.**

#### States currently offer financial incentives and grants for installing charging stations

Ralston and Nigro, 11 - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

Some states and cities also offer consumer incentives to promote the adoption of PEVs. Similar to action at the federal level, some states offer financial incentives to reduce the high up-front cost of purchasing a PEV or associated infrastructure, such as purchase incentives and infrastructure grants (Benecchi, et al. 2010). Several states offer tax incentives in addition to comparable federal incentives, including tax credits and sales tax exemptions for the purchase of a PEV or for the installation of charging infrastructure (Center for Climate and Energy Solutions 2011). Cities can contribute with lower-cost incentives such as special parking access, reduced toll fees, reduced vehicle registration fees, and small-scale infrastructure funding (California PEV Collaborative 2010, Benecchi, et al. 2010). When possible, incentives should be bundled so the process is easier to navigate, and rebates should be provided at the time of purchase or installation (California PEV Collaborative 2010).

#### States can facilitate deployment and integration of EVS with the electrical grid

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

State and local governments, as well as utilities, can also adopt policies that facilitate the deployment of PEVs and their integration with the electrical grid. While federal policy focuses on high-level policies that promote fuel-efficient vehicles in general and provides financial incentives to aid initial deployment, state and local governments can adopt policies that will help support PEVs in their region from manufacturing to point-of-sale to once they are on the road. This support may include financial incentives for manufacturers and consumers, as well as planning, coordination, and performance requirements (Benecchi, et al. 2010).

#### States empirically solve through their own PV incentive programs

SPEA 11 - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

Many states have introduced their own incentive programs to encourage the production, purchase, and use of electric vehicles. The most popular policy instrument used by states is a tax incentive aimed at reducing the incremental cost of purchasing an electric vehicle. These incentives can take the form of a rebate, an income tax credit, or a sales tax exemption. California, Colorado, Georgia, Illinois, Louisiana, Maryland, New Jersey, Oregon, Oklahoma, South Carolina, Utah, and Washington have incentives that range from a $750 income tax credit (Utah) to a rebate of up to $20,000 for commercial PEVs (California). Recently, Tennessee also announced a rebate of $2,500 on the first 1,000 PEVs sold in the state. 225 New Jersey and Washington offer state sales tax exemptions for BEVs, a policy that DOE models suggest is quite effective at stimulating sales of BEVs. 226 Washington offers PHEVs a more modest exemption from its 0.3% motor vehicle tax. Montana has chosen to offer a tax incentive of $500 for the conversion of a vehicle to run on electricity, but has not added any incentives for the purchase of a new electric vehicle. Similarly, Florida has used stimulus money to fund the conversion of 100 Priuses to run on electricity. Utah offers a larger tax credit for those who convert their existing vehicle than for those who buy a new electric vehicle ($2,500 compared to $750). Georgia, Illinois, Louisiana, and Oregon offer conversion tax credits of equal or lesser value compared to the tax credits they offer for vehicle purchase. Another popular option for states is policy that encourages manufacturing of PEVs or their batteries in the state. Implemented by Indiana, Michigan, Louisiana, New Mexico, Oklahoma, South Carolina, and Pennsylvania, these policies include property tax exemptions, tax credits for purchasing manufacturing equipment, and tax credits based on kilowatt hours of battery capacity produced. Several of these credits are not specifically targeted to promote PEVs, but apply to the manufacture of all alternative fuel vehicles. Other states, mainly in the Midwest and Plains states, have alternative fuel credits, but exclude electricity from their definition of “alternative fuels.”

#### **Several states already subsidize recharging infrastructure for PVs**

**SPEA 11** - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

 A related option is to provide incentives or grants for R&D to improve PEV technology, such as those now in place in Michigan, Vermont, California, and Wisconsin. Several states have chosen to subsidize recharging infrastructure for PEVs, both at home and on the go. **Arizona provides a $75 tax credit for the installation of home recharging outlets. Colorado provides recharging infrastructure grants to local governments based on the municipality’s energy efficiency record, and Virginia has a similar program. Louisiana offers a tax credit for 50% of the cost of constructing an alternative fueling station. Washington, in particular, has developed a suite of infrastructure policies that strongly encourage PEV use**. Washington sales and use taxes do not apply to labor and services for installing, repairing, altering, or improving PEV infrastructure (the same exemption applies to batteries) or to the sale of property to be used for PEV infrastructure. All regional transportation planning organizations that encompass a county with a population of 1 million or more must collaborate with state and local governments to invest in PEV infrastructure and promote PEV use generally. Additionally, the state must provide PEV recharging infrastructure at all state rest stops and fleet parking and maintenance facilities by 2015. Local governments are required to develop regulations that allow the installation of PEV infrastructure, contingent on federal funding. Washington allows leasing of state land for Better Place-style battery-switching stations for 50 years and exempts these stations from certain environmental regulations. States have also adopted policies to ease or reduce the auxiliary costs and inconveniences of driving a car powered by electricity. Arizona has reduced the license fee for BEVs and some PHEVs. Florida provides PEV owners with exemptions from most insurance surcharges. Washington exempts PEVs from emissions inspection requirements. An especially common practice is to allow single-rider PEVs to occupy HOV lanes—Virginia, Maryland, and California are among the states to adopt this policy. Delaware has a unique approach to offsetting costs of a PEV: it has passed a law requiring that PEV owners be credited for electricity provided to the grid by the car battery at the same rate that the owner is charged for electricity use.

#### States are providing loans for recharging infrastructure

**SPEA 11** - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

Finally, states have opted to provide grants and loans to local governments for various activities that will promote use of PEVs. These activities include electrifying school buses, purchasing PEVs for municipal fleets, and installing recharging infrastructure. Local governments are also working to encourage their residents to purchase PEVs. The City of Austin’s public utility provides a rebate of $150–$500 to customers who buy an electric car, scooter, bicycle, or motorcycle. 227 The City of Portland has adopted a strategic plan for PEVs, which includes streamlining electrical permitting, providing consistent signage for recharging points, making the municipal fleet more sustainable, and providing PEV recharging for homes without garages. 228 New York City provides grants to private firms and nonprofit groups for up to 50% of the incremental cost of purchasing a PEV. Houston has a similar program for governmental or private firms, and Dallas has a grant program for reducing taxi emissions. The City of New Haven, Conn. provides free parking on city streets to all alternative fuel vehicles. Washington, D.C. exempts all vehicles that achieve more than 40 miles per gallon from the excise tax imposed on an original certificate of title, while the town of Warren, R.I. allows excise tax exemptions of up to $100 for qualified alternative fuel vehicles registered in the town. This sampling of local initiatives reveals that PEV promotion policies can be found at all levels of government (see Figure 4).

### **States Not Perceived**

#### **State and local PV policies are not perceived – they receive less national attention than federal action**

**SPEA 11** - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

State and local policies receive less national attention than presidential executive orders or new legislation from Congress. Nevertheless, state and local actions can have significant impacts. Compliance with California’s ZEV mandate, all by itself, is projected to compel industry to produce at least 58,000 PEVs per year by 2016. 229 In addition, when state rebates are combined with the federal tax credit, the affordability of a PEV improves markedly.

##  Advantage CPs

### State/Local Demonstration Project

#### Electrification of state and local vehicle fleets rapidly achieves scale necessary for new manufacturing products

Wright, ’10 – VP Business Accelerator Technology, Leadin Supplier of Batteries for EVs and Hybrids (Mary Ann, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 63-4)

Early in the life cycle of any new product or technology, scale is one of the critical

factors enabling manufacturing success, as well as cost reductions. Electrification of

vehicle fleets, including government fleets, can be a major contributor toward rap-

idly achieving scale.

Combined, the U.S. General Services Administration, Postal Service, and Depart-

ment of Defense operate approximately 1 million non-tactical vehicles. Many of

these vehicles, particularly Postal Delivery LLV vans, are excellent candidates from

an economic standpoint for some level of power train electrification. The average

Postal Delivery vehicle travels 18 miles a day at very low speeds in stop-start mode

and averages only 10 mpg. The Postal Service’s Inspector General Office estimates

that a full electric version of a delivery vehicle will save $1,500 per year in fuel cost

if gasoline is priced between $3–$4 per gallon. Many other Federal fleet vehicles are

also good candidates for electrification and would help create demand.

Beyond the Federal Government, the 50 states collectively operate another 1 mil-

lion vehicles. Electrification of State and local government fleets would have a sig-

nificant impact on creating demand. Johnson Controls Building Efficiency business

operates a service vehicle fleet of 5,548 vehicles. Seventy-seven percent of these ve-

hicles travel less than 60 miles daily and 25 percent travel less than 40 miles per

day. This represents a tremendous opportunity for us to electrify our own vehicles

and gain invaluable field experience and help to build demand. We have imple-

mented a pilot program in Milwaukee and will be taking delivery of our first fully

electric service van within the next month.

#### A national demonstration project solves the informational barriers

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

A national demonstration project would address informational barriers that face PEV deployment by taking a “learning-by-doing” approach. This project would deploy vehicle and infrastructure in selected cities, from which data could be gathered from stakeholders such as consumers, utilities, city governments, and charge point owners and operators. The information would then be used to successfully deploy PEVs in other areas (Indiana University 2011). Similar projects are already underway in many cities as public-private partnerships, but to date, there is no nationally coordinated effort. 27

### Federal PEV Demonstration Project

#### **Federal PEV demonstration project solves - resolves uncertainties**

**Lane 11** (Bradley W., Assistant Professor, Institute for Policy and Economic Development, University of Texas at El Paso, “Plug-in Electric Vehicles: A Practical Plan for Progress”, SCHOOL OF PUBLIC AND

ENVIRONMENTAL AFFAIRS, February 2011, <http://works.bepress.com/cgi/viewcontent.cgi?article=1010&context=bradleywlane&sei-redir=1&referer=http%3A%2F%2Fscholar.google.com%2Fscholar%3Fas_ylo%3D2011%26q%3DElectric%2Bvehicles%2Bare%2Bkey%2Bto%2Benvironmental%2Bleadership%2B%26hl%3Den%26as_sdt%3D0%2C23#search=%22Electric%20vehicles%20key%20environmental%20leadership%22>, HLR)

A federally supported, national PEV demonstration program should be implemented

to help overcome the information barriers faced by the PEV industry today. A de facto demonstration is already underway as private and governmental efforts prepare target communities for PEVs. Yet these efforts have not been combined and coordinated in a focused national program aimed at “learning by doing.” In order to resolve uncertainties about PEVs, it is crucial that the demonstrations gather data from consumers, dealers, manufacturers, utilities, retailers, and municipalities. Without key data, the opportunity to learn about the real-world experience with PEVs—successes, burdens, and mistakes—will be foregone, and unnecessary public uncertainty, confusion, and debate will continue. In the design of a cost-effective national demonstration program, the following program characteristics should be considered.

#### A national demonstration project solves the informational barriers

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

A national demonstration project would address informational barriers that face PEV deployment by taking a “learning-by-doing” approach. This project would deploy vehicle and infrastructure in selected cities, from which data could be gathered from stakeholders such as consumers, utilities, city governments, and charge point owners and operators. The information would then be used to successfully deploy PEVs in other areas (Indiana University 2011). Similar projects are already underway in many cities as public-private partnerships, but to date, there is no nationally coordinated effort. 27

###  Clean Energy R&D CP

#### Clean-energy R&D funding is key to innovation that can compete with conventional energy sources

Victor ’11 - Ph.D., MIT, political science, and A.B., Harvard University, (history and science, cum laude), Professor at the School of International Relations and Pacific Studies, director of the Program on Energy and Sustainable Development at Stanford University where he was also a professor at Stanford Law School and Kassia Yanosek, holds a joint MBA/MPA from Stanford Business School and the Harvard Kennedy School, a joint degree program she pioneered between the two schools, and a BA with Distinction from the University of Virginia. She is a term member of the Council on Foreign Relations (David,“The Crisis in Clean Energy: Stark Realities of the Renewables Craze”, July/August 2011. <http://www.foreignaffairs.com/articles/67903/david-g-victor-and-kassia-yanosek/the-crisis-in-clean-energy>) //DHirsch

After years of staggering growth, the clean-energy industry is headed for a crisis. In most of the Western countries leading the industry, the public subsidies that have propelled it to 25 percent annual growth rates in recent years have now become politically unsustainable. Temporary government stimulus programs -- which in 2010 supplied one-fifth of the record investment in clean energy worldwide -- have merely delayed the bad news. Last year, after 20 years of growth, the number of new wind turbine installations dropped for the first time; in the United States, the figure fell by as much as half. The market value of leading clean-energy equipment manufacturing companies has plummeted and is poised to decline further as government support for the industry erodes.

The coming crisis could make some of the toughest foreign policy challenges facing the United States -- from energy insecurity to the trade deficit to global warming -- even more difficult to resolve. The revolution in clean energy was supposed to help fix these problems while also creating green jobs that would power the economic recovery. Some niches in clean energy will still be profitable, such as residential rooftop solar installations and biofuel made from Brazilian sugar cane, which is already competitive with oil. But overall, the picture is grim. This is true not only for the United States but also for the rest of the world, because the market for clean-energy technologies is global.

Whether this shakeout will strengthen or weaken the clean-energy industry will depend on how policymakers, notably in the United States, prepare for it. The root cause of today's troubles is a boom-and-bust cycle of policies that have encouraged investors to flock to clean-energy projects that are quick and easy to build rather than invest in more innovative technologies that could stand a better chance of competing with conventional energy sources over the long haul. Indeed, nearly seven-eighths of all clean-energy investment worldwide now goes to deploying existing technologies, most of which are not competitive without the help of government subsidies. Only a tiny share of the investment focuses on innovation.

Solutions must start with more consistent long-term policies that depend less on subsidies and thus are less vulnerable to cutbacks in these times of fiscal restraint. Rather than rely on such "push" incentives, a new strategy must favor policies that "pull" new clean-energy technologies into the market, such as rules requiring that more energy gradually be produced from clean sources. It should shift scarce public funds to the development and testing of more radical innovations in biofuels and electric power, including innovations in the energy storage that is essential to deal with the intermittence of solar and wind power. It should also do more to encourage innovation in and greater access to markets in emerging countries, such as China, where energy demand is growing. An open and competitive global clean-energy market, underpinned by an innovation-driven clean-energy strategy, could yield a true energy revolution.

### Battery R&D CP

#### Massive increase in battery R&D is key to becoming a global leader in EV technology

**TEP 11** – The Transport Electrification Panel consists of Gurminder Bedi (Ford Motor Company) Michael Brylawski (Bright Automotive) John German (International Council on Clean Transportation) Dr. Sara Hajiamiri (Pardee RAND Graduate School) Dr. Donald Hillebrand (Argonne National Laboratory) Dr. Kara Kockelman (University of Texas at Austin) Michael Ligett (North Carolina State University) Dr. Virginia Mcconnell (Resources for the Future) Paul Mitchell (Energy Systems Network) Nick Nigro (Pew Center on Global Climate Change) Brett Smith (Center for Automotive Research) Michael Tinskey (Ford Motor Company) Dr. Thomas Walton (Defour Group) Dr. John D. Graham (School of Public and Environmental Affairs at Indiana University) Dr. Wanya Carley (Assistant Professor, School of Public and Environmental Affairs, Indiana University) Chris Crookham (MPA Student, School of Public and Environmental Affairs, Indiana University) Devin Hartman (MPA and MS Student, School of Public and Environmental Affairs, Indiana University) Dr. Bradley Lane (Assistant Professor, Institute for Policy and Economic Development, University of Texas at El Paso) Natalie Messer (MPA Student, School of Public and Environmental Affairs, Indiana University) (Transportation Electrification Panel, “Plug-in Electric Vehicles:

A Practical Plan for Progress” School of Public and Environmental Affairs, Indiana University, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//ctc

Modernizing the Electric Power System. Even a partial shift from petroleum to electricity as a transportation fuel will have ramifications for the operation and growth of the electric power system. Detailed knowledge of the power grid is required to ensure that outages are avoided**.** To optimize the benefits of electrification, public policies should be adopted to: • accelerate “smart grid” research, standards, and implementation; • expand the availability of lower electricity prices during off-peak periods to enhance consumers’ willingness to charge their vehicles at night, and include continuous time-of-use pricing adjustments where acceptable; • increase the availability of metering, recharging, and vehicle technologies that will enable these time-of-use adjustments to electricity prices; and • encourage or require enhanced efficiency and the movement toward a cleaner power generation system in order to reduce upstream emissions associated with PEVs in the form of greenhouse gases and conventional pollutants. 8. Long-Term R&D Commitments. Lithium-ion batteries may never have adequate energy density to independently power a household’s primary multi-purpose vehicle**.** Although there have been significant improvements in battery technology since the 1990s,policymakers should consider a large increase in federal R&D investments into innovative battery chemistries, prototyping, and manufacturing processes**.** A broader selection of R&D grantees, with even more vigorous competition, is appropriate compared to past practices. Sustained investment in R&D, including both public and private funds, is crucial as the United States seeks to establish a leadership position in the growing global market for advanced battery technologiesand related components. Thepotential spillover benefits in the economy from R&D and manufacturing leadership deserve serious consideration by policymakers**,** even though public R&D decisions will be made in a troubled federal fiscal situation. In order to determine the appropriate scale of R&D expansion**,** the expected payoffs from long-term R&D investments in energy storage techniques should be compared to the anticipated payoffs from R&D investments in other advanced fuels and propulsion systems**.** Countries around the world are jockeying for position in the emerging PEV industry. The time for the United States to secure a leadership position in the global market for PEVs is now. **T**his report provides an expert panel’s view of how the United States can secure this role in a cost-effective manner.

#### **Federal government needs to substantially increase spending on advanced battery research**

Kendall 8 –deputy director at Cambridge Programme for Sustainability Leadership (Gary, “plugged In: The End of the Oil Age,” WWF, April 1, http://electricdrive.org/index/php?ht=a/GetDocumentACtion/id/27921)/BI

Compared to a conventional hybrid, the battery system of a PHEV currently adds around $8,000 - $12,000 (€5,700 - €8,500) to the vehicle cost.259 This premium will inevitably decline over time as manufacturers achieve economies of scale and targeted research programmes deliver future technology improvements. Given the urgency of the issue and the numerous benefits of grid‑connected vehicles, governments should significantly increase public spending on advanced battery research programmes focused on reducing the cost of performance and on demonstration programmes, third-party warranty and other initiatives that foster cost reductions.

Reducing battery costs is key to reducing the current 2-6 year payback period

**Priddle, 6/21** Detroit Free Press business writer (Alisa, “Chu: U.S. must become leader in low-cost electrical vehicles”, [http://www.freep.com/article/20120621/BUSINESS01/120621088/Stephen-Chu-U-S-must-produce-affordable-electric-cars)//EW](http://www.freep.com/article/20120621/BUSINESS01/120621088/Stephen-Chu-U-S-must-produce-affordable-electric-cars%29//EW)

Energy Secretary Steven Chu wants the U.S. to become a global leader of affordable electric vehicles, starting with a 5-passenger plug-in hybrid where the extra cost is paid back within five years. The goal is to produce and sell unsubsidized plug-in electric vehicles within 10 years that are comparable in cost with conventional vehicles. The “EV Everywhere Grand Challenge” was announced by President Barack Obama in March and the Department of Energy is holding a series of workshops across the country to brainstorm and inspire the dramatic advances needed in batteries, power electronics, motors, lightweight materials and fast-charging infrastructure technology to make it a reality. Chu was in Dearborn Thursday for one of the workshops designed to recruit scientists, engineers and businesses so U.S. companies become the first in the world to produce affordable and convenient plug-ins for the average American family. Today electric vehicles with a range of 200 miles like the Tesla Roadster are too expensive. Even the mass-market Nissan Leaf at $36,050 (not counting the $7,500 tax credit) has a payback period of seven years at $4 a gallon, according to Edmunds.com. The DOE estimates the extra cost of a Toyota Prius hybrid over a Camry is recouped in two years; a Ford Fusion hybrid needs 2.4 years to recoup, according to a draft of a DOE white paper.. Chu said the goal is to reduce cost so electric vehicles like the Leaf can come down about $10,000 in price and there is a choice of EVs with a 100-mile range in the $23,000 price range. He told reporters afterward there should be prototype batteries for testing by 2020. By 2015, there will be the capacity to build 500,000 batteries a year in the U.S. Reducing battery cost is key to shortening the 2-6-year payback period for more expensive hybrids and electric vehicles, according to the EV Everywhere white paper. Chu wants to see better lithium ion batteries in electric vehicles -- he thinks they can improve their efficiency as much as threefold -- and the ability to replace individual bad cells in a battery. But he also wants exploration of alternatives such as lithium sulfur batteries and the ability to recharge zinc-air batteries used in hearing aids. Non-invasive testing of batteries before they ship to customers would also reduce recalls and improve warranties which automakers would appreciate. “To find a problem that prevents failure in five years is huge,” he said. Research will also look at reducing the need for rare earths or get rid of them altogether. Chu wants to bring electro-chemists into automotive and encourage new sets of experts. Chu equates this challenge with putting a man on the moon before the Russians. It follows the DOE’s “Sun Shot” Grand Challenge two years ago to drive down the price of solar energy to be competitive with natural gas in the next couple decades.

#### Battery R&D is key to bringing down costs – increasing production volume won’t solve

Fairley, 11 – B.Sc. in molecular biology, M.A. in Science, Health and Environmental Reporting, Vice President for the Society of Environmental Journalism, contributing editor for Technology Review (Peter, “Will Electric Vehicles Finally Succeed?,” Technology Review Vol. 114, Iss. 1, Jan/Feb 2011, ProQuest) // AMG

Despite Ghosn's expectations**,** merely increasing the volume of battery production may not bring prices low enough. The new electric vehicles and plug-in hybrids use lithium-ion batteries, which are more compact and lightweight than the nickel-metal hydride batteries used in previous electric cars and in the conventional hybrid Prius. Many battery experts, including some at GM, argue that high -volume production of lithium-ion batteries for use in laptops and mobile phones has already squeezed out much of the excess cost. What's more, increasing production enough to meet the needs of the auto industry could drive up the cost of battery materials such as manganese, at least in the short term. If increasing production volume doesn't do the trick, the remaining hope is innovation. New kinds of batteries that use cheaper materials and store more energy could greatly reduce costs, mainly by decreasing the number of cells needed to power a car. Researchers are developing several battery technologies in laboratories around the world. Nanostructured silicon electrodes have been used to make prototype batteries that store twice as much energy as conventional lithium-ion batteries. Solid-state batteries replace liquid electrolytes with solid ones that are more compact and less flammable, reducing the need for bulky cooling systems. Another new type of battery, called metal-air, could in theory allow cars to travel 500 miles on a charge, according to the Department of Energy.

#### Expanding R&D battery grantees is key to vigorous competition and establishing EV leadership in the global market

####

**SPEA 11** - School of Public and Environmental Affairs at Indiana University (“Plug-in Electric Vehicles: A Practical Plan for Progress”, written by an expert panel, February 2011, http://www.indiana.edu/~spea/pubs/TEP\_combined.pdf)//AL

Lithium-ion batteries may never have adequate energy density to independently power a household’s primary multi-purpose vehicle. Although there have been significant improvements in battery technology since the 1990s, policymakers should consider a large increase in federal R&D investments into innovative battery chemistries, prototyping, and manufacturing processes. A broader selection of R&D grantees, with even more vigorous competition, is appropriate compared to past practices. Sustained investment in R&D, including both public and private funds, is crucial as the United States seeks to establish a leadership position in the growing global market for advanced battery technologies and related components. The potential spillover benefits in the economy from R&D and manufacturing leadership deserve serious consideration by policymakers, even though public R&D decisions will be made in a troubled federal fiscal situation. In order to determine the appropriate scale of R&D expansion, the expected payoffs from long-term R&D investments in energy storage techniques should be compared to the anticipated payoffs from R&D investments in other advanced fuels and propulsion systems. Countries around the world are jockeying for position in the emerging PEV industry. The time for the United States to secure a leadership position in the global market for PEVs is now. This report provides an expert panel’s view of how the United States can secure this role in a cost-effective manner.

### Battery-Switching CP

#### Battery-switching stations overcome charging time obstacles

Ralston and Nigro, 11 - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

For BEVs, charging can be done faster using a higher voltage charging station (e.g., 480-volt), where a 100-mile battery can be recharged to 80 percent of its capacity in 30 minutes. These units can be very expensive to install for households and will likely only be available in public spaces, such as parking lots, parking garages, and shopping centers. This technology is also more expensive than Level 1 or Level 2 charging stations, which may dissuade governments and businesses from installing it (NAS 2010). Also, PHEVs may not include the power electronics to support these high-power chargers. Furthermore, even with “quick chargers,” the recharging time is much longer than the time it takes to refuel a conventional vehicle, which can be inconvenient for vehicle owners (J.D. Power and Associates 2010). Battery switching stations, which swap batteries in the same amount of time it takes to refuel at a gas station, could ultimately overcome this problem (Becker, Sidhu and Tenderich 2009).

### Electrification Ecosystems CP

#### Electrification ecosystems solve by demonstrating EV effectiveness and enabling economies of scale

**Wright, ’10 - VP Business Accelerator Technologies, Leading Supplier of Batteries for EVs and Hybrids (**Mary Ann, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 64)

ELECTRIFICATIONCOALITIONECOSYSTEMCITIES

Another approach to stimulating market demand is advocated in the Electrifica-

tion Coalition’s Roadmap—the creation of Electrification Ecosystems. Investing in a

series of large-scale demonstration projects will encourage the adoption of electric

vehicles and prove their market readiness. The establishment of Electrification Eco-

systems has three important goals:

—Prove that wide scale deployment of grid-enabled vehicles is not only possible,

but desirable;

—Take advantage of economies of scale; and

—Support research to answer critical questions about usage and recycling pat-

terns.

By concentrating investments in a limited number of communities, we can maxi-

mize leverage from the opportunity to demonstrate that grid-enabled vehicles can

meet drivers’ needs. As the Roadmap stated:

‘‘Electrification ecosystems will demonstrate that a community is capable of put-

ting the infrastructure in place, operating the vehicles over their lifetimes, and dis-

posing of them after their useful life has ended, all in a manner that profits the

participants in the value chain. In short, electrification ecosystems provide the best

opportunity to give consumers confidence in the safety, performance, and benefits

of the vehicles themselves and the reliability of the surrounding infrastructure.’’

(Electrification Roadmap, November 2009, Electrification Coalition, page 141.)

#### A national demonstration project solves the informational barriers

**Ralston and Nigro, 11** - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

A national demonstration project would address informational barriers that face PEV deployment by taking a “learning-by-doing” approach. This project would deploy vehicle and infrastructure in selected cities, from which data could be gathered from stakeholders such as consumers, utilities, city governments, and charge point owners and operators. The information would then be used to successfully deploy PEVs in other areas (Indiana University 2011). Similar projects are already underway in many cities as public-private partnerships, but to date, there is no nationally coordinated effort. 27

### Extend EV Tax Rebate CP

#### Extending the EV tax rebate is key to sending the right market signal

**Wright, ’10 - VP Business Accelerator Technologies, Leading Supplier of Batteries for EVs and Hybrids (**Mary Ann, February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 64)

A third and critical element to help spur demand is the continuation of tax incen-

tives for the purchase of electrified vehicles. These incentives are proven demand

boosters that must be maintained. Failure to continue these important tax policies

at this time would send exactly the wrong signal to the marketplace and individual customers.

#### Tax credits currently fail because many fleets are county and city creations – payroll tax conversion solves

**Lowenthal, ’10 –** CEO Coloumb Technologies (Richard**,** February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 72)

Mr. LOWENTHAL. I wanted to weigh in a bit on tax credits. There

is a tax credit on infrastructure, as well. There’s a 50-percent tax

credit. It’s part of the energy bill. It expires at the end of this year,

which is not great timing, given that the vehicles just start coming

out then. So, we would like to see that extended.

It has a flaw in it, in that it’s an income tax credit, and many

of the fleets now are county fleets and city fleets, none of whom

pay any taxes. So, it actually isn’t working very well. Most cases

where we try to use that income tax credit, it isn’t working. It’s a

wonderful idea, and so there’s the idea. In fact, Senator Hatch has

an idea of converting that to a payroll tax, which will work a lot

better, as opposed to an income tax credit.

We do see, for example, sort of a mixture of these ideas. The

county of Sonoma, in California, wants to create one of these eco-

systems, where the county of Sonoma’s known for EVs and attract

EV players; they’ve attracted Nissan, they’re attracting others to

the county, as an EV Center of Excellence. In their case, they have

an innovative idea, which is that the city and county fleets have

charging stations and are being electrified, and then the—and they

use those at night; in the daytime, they open them up to the public.

So, they’ve—this is a way of getting two-for-one on this investment.

But, still, the tax credit doesn’t work, because it’s the county of Sonoma.

#### Tax credits will speed up conversion of government fleets - in turn spurring the public

**Smith, ’10 – CEO FedEx (**February 23, Hearing Before a Subcommittee on the Committee on Appropriations, United States Senate, “Opportunities and Challenges Presented in Increasing the Number of Electric Vehicles in the Light Duty Automotive Sector,”

<http://www.gpo.gov/fdsys/pkg/CHRG-111shrg56643/pdf/CHRG-111shrg56643.pdf>, p. 73)

If we can find a way to use tax credits that bring the cost down

for conversion, we will incentivize those that are hauling our gar-

bage, FedEx, and all of those kinds of trucks running around this

country, to convert very quickly. That mass moving, from the Fed-

eral Government to its fleet to the other truck fleets and so on,

would have a profound impact on moving this country in a com-

pletely different direction, toward an electric drive future.

I also think the consumers would very, very quickly follow, be-

cause all of the advances that will come from that—and there’ll be

a lot of advances in technology and capability—will, I think, show

up in the marketplace very quickly for the kinds of vehicles that

consumers want to drive.

#### Rebates, feebates and tax credits solve the affordability issue

Ralston and Nigro, 11 - Center for Climate and Energy Solutions (Monica and Nick, “PLUG-IN ELECTRIC VEHICLES: LITERATURE REVIEW”, Center for Climate and Energy Solutions, July 2011, <http://www.c2es.orgwww.c2es.org/docUploads/PEV-Literature-Review.pdf> | JJ)

Another approach is to offer financial incentives to consumers in order to make purchasing a PEV more affordable. Examples of incentives include rebates, feebates, and tax credits. With a rebate, consumers receive a discount for purchasing a high-mileage vehicle. With a “feebate,” consumers purchasing highmileage vehicles receive a rebate, while those purchasing low-mileage vehicles must pay a fee (Greene and Plotkin 2011). The federal government offers a similar program for PEVs, which is a tax credit of up to $7,500 for purchasing a PEV (DOE 2011b). The credit extends to the first 200,000 PEVs sold by any OEM in the United States, is phased out afterwards, and does not expire at a particular point in time. Since the credit applies to all OEMs and with current sales of PEVs in the low thousands, this credit will likely be available for quite some to come. When possible, rebates are preferable to tax credits because the consumer receives the discount at the point of purchase (Benecchi, et al. 2010). These types of financial incentives should also be limited in terms of time and/or production volumes, so they are reduced or eliminated as the market matures (Indiana University 2011).

## DA Links

### Political Capital

#### **Republicans hate EVs- ridiculed on the campaign trail**

Kiley 12 – Editor-in-Chief of AOL Autos, award winning journalist with more than 25 years of writing about the auto industry (David, “Why Gingrich And GOP Bash Electric Vehicles”, AOL Autos, 22 February 2012, [http://autos.aol.com/article/why-gingrich-and-gop-bash-electric-vehicles/)//BI](http://autos.aol.com/article/why-gingrich-and-gop-bash-electric-vehicles/%29//BI)

Republicans vying for the White House and members of Congress looking to appeal to part of their "base" constituents enjoy ridiculing the extended range electric Chevrolet Volt, as well as other electric vehicles they don't see as viable, attractive to drive or even manly. Former Speaker of the House Newt Gingrich, addressing Georgia and Oklahoma Republicans this week singled out the Volt, saying: "You can't put a gun rack in a Volt." The line drew cheers. "We believe in the right to bear arms and we like to bear the arms in our trucks." The full context of Gingrich's screed was a general opposition to the Obama White House's support of investments in alternative energy and what the presidential candidate sees as the President's inaction to stem rising gasoline prices. General Motors public relations chief Selim Bingol responded: "Newt Gingrich has taken up saying that 'You can't put a gun rack on a Volt.' That's like saying 'You can't put training wheels on a Harley.' Actually, you can. But the real question is 'Why would you?' In both examples: It looks weird. It doesn't work very well, and, there are better places for gun racks and training wheels - pickup trucks and little Schwinns, respectively." Bingol added: "Seriously, when is the last time you saw a gun rack in ANY sedan?" The Volt has been a favorite target of Republicans over the past several months. Republicans have opposed federal tax credits for electric vehicles. The Volt is eligible for a credit up to $7,500 and the White House is proposing raising it to $10,000 for all EVs. Republicans have also tied the Volt to the White House's decision to bail out GM with taxpayer funds in 2009 with a larger agenda of pushing electric vehicles. Radio-talk-show host Rush Limbaugh, who aligns himself with Republicans, has frequently ridiculed the government's efforts to promote the sale of electric and extended-range electric vehicles like the Volt and Nissan Leaf. Limbaugh also was among the throng charging that the National Highway Traffic Safety Administration mishandled an incident of a fire in a Volt after an accident as a way, alleging pressure from the White House, to shield the car from bad publicity. Bashing these cars has been an applause line on the Republican campaign trail. This is unfortunate. A shift toward diversifying the U.S. car fleet away from vehicles that rely on only gasoline to ones that draw on multiple sources of fuel, including natural gas and electricity, will decrease the country's reliance on foreign oil, as well as free consumers from the stranglehold oil companies have over the cost of driving. The best part of a growing electric fleet of cars for consumers is that utility companies will increasingly become a competitor to oil companies when it comes to pricing per-mile driven. As gas prices climb back toward $4 per gallon nationally, amid forecasts that $5 per gallon could be a reality in most parts of the country by late spring or early summer, a broader fleet of natural gas and electric vehicles in the U.S. would provide relief. Electric rates and natural gas prices are well below that of gasoline. Prices for electricity and natural gas, too, aren't affected by increased demand for oil in China and Europe, nor strife in the Middle East. They are affected by supply and demand. A Chevy Volt today costs in excess of $40,000, around $10,000 more than an Audi A3. Some compare the Volt to the Chevy Cruze, which would make the Volt around $20,000 more expensive. But I think the Volt is more aptly compared with the Audi and Volvo S40 sedan because of the premium features and technology found in the car. The federal tax credit brings the Volt's final price pretty close to those vehicles. The high cost of the Volt, as well as the fully electric Nissan Leaf, is due to the cost of the lithium-ion batteries in the vehicles' drive-train. The costs of the batteries alone is said to be around $10,000. Conservative writer George Will called the Volt a failure on arrival because the federal government had to "bribe" people to buy them. But it is not unusual for high tech to be expensive in the beginning of consumer sales. The Japanese government, for example, indirectly subsidized the Toyota Prius in the beginning. As more of the vehicles are sold, and manufacturing scale broadens, the price of new tech comes down. Governments all over the world routinely sponsor and support new transportation technology in cars, trains, buses to advance a change the government deems in the nation's and society's best interest. But there is no question that electric vehicles, even ones like the Volt that run on both gas and electric power and spare the driver from worry over running out of juice, will continue to face an uphill battle with U.S. consumers, who have historically exhibited a preference for big horsepower and large SUVs.

### Elections

#### EVs are still a partisan issue amongst the public—overall Republicans are not optimistic

ChargingStations.com 2/08(“Would a Republican President Be a Setback for Electric Vehicles?”, Ferbruary 8, 2012, <http://www.chargingstations.com/news/would-a-republican-president-be-a-setback-for-electric-vehicles/>)// LCS

However, not all Republicans are as friendly to the idea of EVs and their tax credits as the Tennessee Senators. Republican Mike Kelly of Pennsylvania argued recently that President Obama’s “Green Agenda” has failed and that the $7,500 tax credit for electric vehicles should be dropped. Even though the $7,500 tax credit was actually signed into law by President George Bush, Kelly takes exception to government subsidies for what he feels are vehicles currently affordable only by the elite. He cites poor consumer response and high prices for these cars as reasons to remove the tax credit, stating that those who cannot afford to buy these vehicles are subsidizing their purchases through tax dollars. Overall, Republicans tend to be less optimistic about the future of electric cars. In a recent poll, 71% of those who identified themselves as Republicans said there would never be more electric than gas-powered cars, while only 42% of those who identified themselves as Democrats agreed. Independents agreed at a rate of 60%.

#### DA turns the case - Republican win in 2012 means loss of EV tax breaks

**Klayman ’12** – Bachelors Degree in English Literature from Washington University in St. Louis, Head writer of the automobile section of Reuters, (Ben, “Electric car revolution faces increasing headwinds”, 3/21/2012. http://www.reuters.com/article/2012/03/21/us-electriccars-idUSBRE82K06T20120321)//DHirsch

Whether electric vehicles can find an audience beyond policymakers in Washington and Hollywood celebrities depends on lowering vehicle prices without selling cars at a loss, analysts and industry executives say, while extending driving range to make the cars competitive with their gasoline-powered peers.

"It's going to be a slow slog," said John O'Dell, senior green car editor at industry research firm Edmunds.com. "Maybe there's too much expectation of more and quicker success than might realistically be expected of a brand new technology."

He also questioned whether priorities will simply change for whomever is U.S. president after the November election. Electric vehicles could lose tax breaks -- currently worth $7,500 a vehicle for buyers -- particularly if a Republican ends up in the White House.

Edmunds expects pure electric cars and plug-in hybrids to make up only 1.5 percent of the U.S. market in 2017, compared with 0.1 percent last year, and O'Dell said that may be optimistic. Consumers charge all-electric cars by plugging into an outlet, while hybrid versions include a gasoline engine.