# Case Answers

## Inherency

### Inherency – Electric/Hybrids Solve

#### Electric cars and plug-in hybrids coming now – solves fossil fuels in cars better than hydrogen.

Romm 2008, Joseph Romm, Senior Fellow @ Center for American Progress Fellow @ American Association for the Advancement of Science, The Guardian “Hydrogen Cars and Hot Air,” Monday 23 June 2008, <http://www.guardian.co.uk/commentisfree/2008/jun/23/automotive.usa>

Most egregious: Where, exactly, does the Times think hydrogen comes from? Santa Claus? More than 95% of US hydrogen is made from natural gas, so running a car on hydrogen doesn't reduce net carbon dioxide emissions compared with a hybrid like the Prius running on gasoline. OK, you say, can't hydrogen be made from carbon-free sources of power, like wind energy or nuclear? Sure, but so can electricity for electric cars. And this gets to the heart of why hydrogen cars would be the last car you would ever want to buy: they are wildly inefficient compared with electric cars. Electric cars - and plug-in hybrid cars - have an enormous advantage over hydrogen fuel-cell vehicles in utilising low-carbon electricity. That is because of the inherent inefficiency of the entire hydrogen fuelling process, from generating the hydrogen with that electricity to transporting this diffuse gas long distances, getting the hydrogen in the car, and then running it through a fuel cell - all for the purpose of converting the hydrogen back into electricity to drive the same exact electric motor you'll find in an electric car. The total power-plant-to-wheels efficiency with which a hydrogen fuel-cell vehicle is likely to utilise low-carbon electricity is 20-25% - and the process requires purchasing several expensive pieces of hardware, including the electrolyser and delivery infrastructure. The total efficiency of simply charging an onboard battery with the original low-carbon electricity, and then discharging the battery to run the electric motor in an electric car or plug-in, however, is 75-80%. That is, an electric car will travel three to four times farther on a kilowatt-hour of renewable or nuclear power than a hydrogen fuel-cell vehicle will. No wonder the Wall Street Journal reported this in March: Top executives from General Motors Corp and Toyota Motor Corp Tuesday expressed doubts about the viability of hydrogen fuel cells for mass-market production in the near term and suggested their companies are now betting that electric cars will prove to be a better way to reduce fuel consumption and cut tailpipe emissions on a large scale. So why do a few car companies persist in rolling out generation after generation of overhyped Hindenburgs? Maybe it's because they keep getting so much free positive publicity. The Times story includes not a single critic of hydrogen cars and reads like a Honda press release. The Times opens the story by saying that the FCX "may have just moved the world one step closer to a future free of petroleum." Not quite. The story does end with some illumination: "For now, the first batch of customers seem drawn by the car's novelty as much as anything else." The same might be said of the media.If you build it, the media will come, but don't hold your breath waiting for mass-market hydrogen-car buyers. In two years, GM and Toyota have promised to deliver plug-in hybrids. That will be a real step closer to a future free of petroleum.

### Inherency – Home Fueling Stations

#### Home fueling stations are being implemented

Micker ‘11

(Tom Micker, 3/2/11, Hydrogen Fuel Cars now, “Home Hydrogen Fueling Stations”, <http://www.hydrogencarsnow.com/home-hydrogen-fueling-stations.htm>, AD)

Imagine in the future, driving your hydrogen car into your garage and gassing it up with your very own home hydrogen fueling station. Sounds pretty out there, doesn't it? But, as far off as it sounds, there are people right now working to make this concept a reality. Take for instance Honda Motor Company, which has developed the Home Energy Station III that not only refuels a hydrogen car such as the Honda FCX, but it can also power a home as well. The Home Energy Station III uses natural gas and an onboard reformer to separate out the hydrogen for refueling the car. In order to create energy, it runs the hydrogen through a fuel cell and can thus generate power for a home as well. In November 2007, Honda announced its new Home Energy Station IV that uses steam reforming of natural gas to derive hydrogen from both the steam and natural gas in equal parts. The Home Energy Station IV is 75-percent smaller than older units and provides hydrogen for a car as well as heat and electricity for the home. The home refueling station is being tested at the Honda R&D Americas facility in Torrance, California. Honda is stating that the Home Energy Station IV will reduce CO2 emissions by 30-percent and energy costs by 50-percent compared to an average home that is on the grid and uses a gasoline-powered car. General Motors has announced that they are developing a home hydrogen fueling station for use with their line of Equinox Fuel Cell vehicles that they will begin rolling out in limited numbers in 2007. The General Motors hydrogen generator will be able to run on either solar energy or electricity. In 2008, British firm ITM Power announced that they were building a home hydrogen fueling station that would be available by the end of the year. This H2 refueling station uses an inexpensive plastic membrane and electrolyzes water to produce the hydrogen. Through economies of scale the price of this unit could drop as low as $4,000. Hydrogenics HomeFueler Energy Station Hydrogenics (formerly Stuart Energy) also has developed a home hydrogen fueling station called the HomeFueler that is based upon the larger HyStat-A Energy Station. The HomeFueler uses electricity to electrolyze water, generating hydrogen for refueling cars. The HomeFueler may also be hooked into a wind energy or solar power for a home hydrogen fueling station based upon renewable energy resources. Then there's the Angel's Nest in Taos, New Mexico built by Robert Plarr, which uses solar and wind power to electrolyze water and create hydrogen that generates power for the vast home. Excess hydrogen is also used in an Air Products Series 100 fueling station to gas up any hydrogen vehicle that may have wandered off the main roadway. And then there's Michael Strizki's solar / hydrogen home in East Amwell, New Jersey that can use the excess hydrogen created by the solar panels and electrolysis to power all the hydrogen cars that may just happen to be in the neighborhood. In fact, Mr. Strizki has one such hydrogen car in his garage that he keeps for the New Jersey Department of Transportation. Both the Angel's Nest site and Strizki's home use Proton OnSite hydrogen generation units. Then there's someone who has a hydrogen home who could use a brand new hydrogen generator (and car) to go along with it. In 2005, Bryan Beaulieu, an engineer and inventor in Scottsdale, Arizona built a $2 million, 6,000 square foot, solar / hydrogen powered dream home. If Mr. Beaulieu were inclined to attain a hydrogen car, he would most likely need a hydrogen home fueling station since Arizona currently only has two hydrogen stations statewide. Three friends in Washington State have also built a solar-hydrogen house on their little weekend island getaway just off the coast. Stephen Friend, Jason Lerner and Charles Delahunt were tired of hauling batteries back and forth to the home so that put up solar panels, electrolyzer, PEM fuel cell and hydrogen storage tank to supply all their electrical needs. The Chewonki Renewable Hydrogen Project is a demonstration project in Maine. The Chewonki Project has a house that 60 participants have adapted to run on hydrogen using a Avalence Hydrofiller electrolyzer and ReliOn fuel cells. The hydrogen generators and home hydrogen fueling stations of the future will most likely come in three varieties including electrolysis units, reformers and chemical reaction units. The electrolysis units work by simply splitting water into hydrogen and oxygen, then compressing and storing the H2 for future use. The reformers use natural gas, methane or another hydrogen-rich gas and separate out the hydrogen for use as fuel. The chemical reaction units use boron, aluminum or other chemical substances and water to create a reaction generating hydrogen for use for fuel. There are many companies right now claiming to have commercial hydrogen generation units available for sale. Unfortunately, leading-edge technology tends to bring out the scam artists as well. So, a word of caution to the wise is before spending any money - ask the company for references from satisfied customers so that you know they are legitimate vendors. Check the company out with the Better Business Bureau and ask the company to see a working demo of their products. A little caution will go a long way in making sure you're on the leading edge of technology and not on the bleeding edge of technology. As an update, in January 2010, the Honda Solar Hydrogen Station went into operation at the company's headquarters in Torrance, California. The Honda Solar Hydrogen Station is an upgrade to the Home Energy Station IV eliminating the compressor altogether.

#### Home Fueling stations will be soon available to many consumers, and they are only thing needed to solve

Business Wire ‘10

(Business Wire, an organization that exhibits and reports on new green technology , 4/1/12, “Horizon to Unveil World’s First “Personal Hydrogen Station” at CES 2010”, AD)

“A hydrogen station in every home” is a futuristic vision that is about to become reality this week as Horizon Fuel Cell Technologies unveils what could be its biggest breakthrough to date: a small home hydrogen refueling and storage solution that could begin our transition to a hydrogen-based economy. In addition to making many new fuel cell products possible, the refueling device enables a lower cost, scalable, and consumer-centric hydrogen supply model which eliminates the dependence on large-scale fueling infrastructure investments. Horizon’s game-changer innovation can unlock the age-old dilemma over which comes first: clean cars, or clean fuels. “We no longer need to rely on nationwide networks of hydrogen fueling stations to enable large-scale fuel cell commercialization,” comments Taras Wankewycz, one of the company’s founders. “Horizon is initiating a transition that places consumers in the driving seat. Thanks to our innovation each household can gradually become a major part of tomorrow’s hydrogen fuel supply infrastructure.” Named HYDROFILLTM, the world’s first personal hydrogen station designed by Horizon will be unveiled at the upcoming Consumer Electronics Show in Las Vegas. The small desktop device simply plugs into the AC, a solar panel or a small wind turbine, automatically extracts hydrogen from its water tank and stores it in a solid form in small refillable cartridges. Horizon believes this new development is the first step towards private refueling of new generations of fuel cell electric vehicles. Fuel cell technology can greatly improve the features and usability of many battery or engine-powered devices, and create the possibility for lower cost electric cars that drive longer distances and recharge instantly.

### Inherency – Private Sector Solves

#### Private companies are building filling stations now

Liane Yvkoff, 3/14/12, Cnet, "hydrogen fueling stations - they're coming," <http://reviews.cnet.com/8301-13746_7-57398216-48/hydrogen-fueling-stations-theyre-coming/>,

Two key players in the hydrogen manufacturing arena will be working together to make hydrogen fueling stations a reality for the fuel cell vehicles that should be coming to market in the second half of this decade. Air Products and Fuel Cell Energy have signed a Memorandum of Understanding to market stationary Direct Fuel Cell (DFC) power plants. These systems, manufactured by Fuel Cell Energy, are designed to take natural gas or renewable biogas and produce hydrogen, electricity, and heat. The three energy byproducts can be used to power and heat the production facility or nearby homes or businesses while creating hydrogen fuel for industrial fleet or consumer vehicle use. The companies are already working together to operate a pilot facility near Los Angeles, Calif. Using captured methane generated by sewage waiting for processing at the an Orange County Sanitation District wastewater treatment facility, the DFC power plant produces hydrogen for a nearby fueling station operated by Air Products. The agreement formalizes their effort to develop a market for this clean energy solution with a low carbon footprint.

#### Lots of private companies are building stations across the country

Claire Martin, 3/19/12, Exhaust Notes, "hydrogen fueling stations get a boost," <http://editorial.autos.msn.com/blogs/autosblogpost.aspx?post=0cefab4a-f719-4277-94dd-1a4f26c92924>,

The hydrogen fuel-cell vehicle has remained more or less in concept mode ever since the first one was built in 1991. The reasons range from high production costs to safety issues to difficulties in building fueling stations. As automakers take on the former challenges, the fueling-station problem remains. So far, there are only 56 such stations in the U.S. -- a minuscule number compared even with biodiesel fueling stations (630 nationwide) and compressed natural-gas stations (988). But that's about to change. FuelCell Energy, a Connecticut-based manufacturer of fuel-cell energy plants, and Air Products, a natural-gases specialist in Pennsylvania, have announced plans to build a hydrogen-vehicle fueling infrastructure in the U.S. As the backbone, they will use FuelCell Energy’s fuel-cell power plants, which produce excess hydrogen while generating electricity.

#### California Fuel Cell Company already planning on building stations

CaFCP ‘09

(California Fuel Cell Partnership, Partnership between car manufacturers and fueling station manufacturers in California, “Hydrogen Fuel Cell Vehicle and Station Deployment Plan: A Strategy for Meeting the Challenge Ahead

Action Plan”, February 2009, p3, <http://www.cafcp.org/sites/files/Action%20Plan%20FINAL.pdf> , AD)

Fuel cell vehicles and hydrogen stations are at the cusp of transition into the early commercial market. In 2000, the automakers and energy companies began small demonstration programs in California, New York, Michigan, Germany, Japan and Korea to prove out the vehicle and station technology. The demonstration programs have also revealed the technical and regulatory advances that must take place to transition to early market customers. The automakers are confident that they can build FCVs that meet customer demands for driving range, performance, durability and comfort and meet the nation’s need for a domestic fuel that is better for the environment. They believe that California is the best place to begin the transition to a commercial market. California must support this transition to meet the state’s target of reducing greenhouse gas emissions by 80% below 1990 levels. Hydrogen fuel cell vehicles are electric drive vehicles that produce zero tailpipe emissions and greenhouse gases. From well to wheels, a fuel cell vehicle using hydrogen produced from natural gas reduces GHGs by about half compared to a conventional vehicle. When the hydrogen is produced from renewable sources, the well-to-wheel GHGs are virtually zero. Major automakers plan to place fuel cell vehicles in early market areas in Southern and Northern California beginning in 2009. By 2017, nearly 50,000 California customers could be driving fuel cell vehicles. In a recent survey, automakers reported plans to deploy FCVs as illustrated in Table A. TABLE A: Fuel Cell Vehicle Deployment in California To date, 250 demonstration vehicles—passenger and transit buses—have been placed on California’s roads. They fuel at 26 hydrogen stations in the state. Most of these are small stations built to fuel a specific fleet of cars for a limited period. Only six of California’s current stations are useable by all the automaker’s FCVs. California will need 50-100 hydrogen stations in just eight years. To meet that demand, we must start now. The early commercial fuel cell vehicles and hydrogen stations must be placed together in a manner that makes efficient use of limited government and industry resources to support a nascent industry, but also places stations slightly ahead of vehicle rollouts. Communities must be prepared so that permitting becomes routine, and fuel providers must see a path to a viable business plan for investing in infrastructure and realizing a profit from selling hydrogen as a retail fuel. The California Fuel Cell Partnership’s strategy for a coordinated deployment specifies: 1. Developing early “hydrogen communities” for passenger vehicles with clusters of retail hydrogen stations in four Southern California communities: Santa Monica, Irvine, Torrance and Newport Beach, with additional stations to support the next identified communities and a network of connector stations 2. Expanding the transit program in the San Francisco Bay Area with new mixed-use stations that provide fuel for passenger vehicles and transit buses, as well as dedicated retail hydrogen stations for passenger vehicles.

#### Linde is making stations Now

Hill ‘12

(Murray Hill, writer for Enhanced online news, 5/31/12, “Linde to Feature Hydrogen Fueling Technologies for Commercial Fuel Cell Vehicles at Hydrogen Energy Conference”, AD)

Linde North America is a member of The Linde Group, a world-leading gases and engineering company and one of the world’s largest hydrogen producers. Visitors to booth #308 can meet with Linde’s hydrogen fueling team to discuss the latest developments in hydrogen fueling technology for buses, forklift trucks and automobiles, along with other applications. Mike Beckman, vice president of hydrogen fueling and industrial applications for Linde North America, said, “Linde has been a vigorous supporter of alternate energy for decades and has been a pioneer in bringing hydrogen into use as a cost-effective everyday fuel. We’re showing that our technology can help improve sustainability, lower emissions and reduce our dependence on foreign fuel.” At its booth, Linde will feature several state-of-the-art systems, including: Linde is one of the earliest entrants into the hydrogen energy arena and is the world’s only company with the in-house technology to fuel gaseous or liquid hydrogen regardless of the mode of on-board storage. Linde has equipped over 80 hydrogen fueling stations in 15 countries, supplying hydrogen for projects large and small. Amounts supplied range from a few hundred cubic feet of compressed hydrogen in cylinders to thousands of tons of liquid and gaseous hydrogen delivered by tank truck or pipeline. Linde recently completed installation of a hydrogen production and dispensing station to fuel buses and automobiles for AC Transit at its terminal in Emeryville, California, and has received the Compressed Gas Association’s coveted Environmental Excellence Award for the AC Transit project. Linde also recently completed installation of forklift fueling stations for the BMW expansion at its Spartanburg, South Carolina, manufacturing plant, and just received an award of $3 million from the California Energy Commission to install two new hydrogen fueling stations in California. Beckman will also deliver a speech at the plenary session on Thursday, June 7, covering Linde’s global progress in hydrogen fueling. Five additional papers will be presented at technical sessions: Green Hydrogen by Pyroreforming of Glycerin, presented by Satish Tamhankar, Linde innovation management, biomass to energy manager, on development of innovative processes for sustainable production of hydrogen from biogenic raw material. Daimler’s and Linde’s 20 Hydrogen Fueling Station Project – Status Quo, by Benjamin Kaehler, of Daimler-Benz, and Dr Alexander Stubinitzky, Linde innovation manager, hydrogen solutions, CIMM –advanced customer application, providing details, along with perspective, on the hydrogen fueled 125-day Mercedes-Benz F-CELL World Drive. AC Transit / Linde Hydrogen Fueling Station for Buses and Cars, by Nitin Natesan, Linde hydrogen fueling engineer, detailing the hydrogen installation of a hydrogen production and dispensing station to fuel buses for AC Transit at its terminal in Emeryville, California. Hydrogen for grid-scale storage of renewable energy, Dr Alexander Stubinitzky, will discuss the potential of various hydrogen energy storage systems. Advanced hydrogen fueling & compression technologies - Experiences gained and technology developments by Dr Alexander Stubinitzky, will provide an understanding of the hydrogen fueling technology to be used in the Linde/Daimler joint project to install 20 hydrogen fueling stations in Germany. Linde North America is a member of The Linde Group, a world-leading gases and engineering company with around 50,500 employees in more than 100 countries worldwide. In the 2011 financial year, it achieved sales of EUR 13.787 bn (USD 18.1 billion). The strategy of The Linde Group is geared towards long-term profitable growth and focuses on the expansion of its international business with forward-looking products and services. Linde acts responsibly towards its shareholders, business partners, employees, society and the environment – in every one of its business areas, regions and locations across the globe. The Group is committed to technologies and products that unite the goals of customer value and sustainable development.

#### **22 Hydrogen stations were built in 2010 alone, and there are no signs of slowing**

Chatham 2011 United States, Chatham:,. “In 2010 Worldwide 22 New Hydrogen Refueling Stations Opened.”, ABI/INFORM Global; ProQuest Central; ProQuest Discovery. 28 June 2012 . LSV

Even during this worldwide wretched economic recession, nations all over the globe managed to open 22 new hydrogen fueling stations in 2010 for a total of 212. Hydrogen car critics will tell you that there must be some sort of mass delusion going on for so many people around the world to be putting up H2 fueling stations (and building hydrogen cars). According to TUV SUD, "27 hydrogen refueling stations were in operation in Germany in 2010 and definite plans have been made for a further 13. Throughout Europe including Germany, eleven new hydrogen refueling stations took up operations last year, while five new stations opened in the US and another nine will be completed shortly. However, some refueling stations also closed, so that LBST's records show the number of hydrogen refueling stations in operation as 80 each in Europe and the USA and 48 in Asia. The other four refueling stations are located in Latin America and Australia. "In addition to the announced extensions in Japan and Hawaii, definite plans for another 30 new hydrogen refueling stations across the world have been reported. In this context, the numbers of new hydrogen refueling stations in North America and Europe are equal, at 13 refueling stations in each region." Now, it's been a while since I had last perused over the worldwide map of hydrogen fueling stations so I thought I would take another gander. One of the first things that jumped out at me were not the fueling stations in the U. S. and Europe as those are a given. But, the ones that jumped up were the ones in areas of extreme unrest right now such as Egypt (out of operation) and Pakistan (planned). Also I hadn't realized that Brazil has two operational hydrogen fueling stations and Argentina has one as well. The H2 deniers want other people to think that hydrogen cars are a local phenomenon that is just one of those wacky "California things" (plus maybe a couple of other places). But, as anyone can see hydrogen cars and fueling stations are a worldwide phenomenon and force that will not be held back by a handful of skeptics and naysayers.

#### California alone plans to have 100 refueling stations by 2010

Gardner May 27 2005 Michael COPLEY, NEWS S. Daily Breeze "$53 Million Hydrogen Car Plan is Introduced.": A.1. ABI/INFORM Global; ProQuest Central. 28 June 2012 LSV

SACRAMENTO -- Hydrogen-powered cars are ready to leave the laboratory and hit the road in growing numbers. In a rare agreement on such a sweeping and costly initiative, automakers and clean-air advocates Thursday introduced an ambitious plan to add 2,000 experimental vehicles to the modest fleet and open dozens of refueling stations from Sacramento to San Diego by the end of the decade. Gov. Arnold Schwarzenegger has embraced the $53.5 million, five- year blueprint, although it is substantially more modest than his aggressive hydrogen highways initiative. "Our role is to provide the heavy foot on the hydrogen pedal," said an enthusiastic Terry Tamminen, a top environmental adviser who developed the governor's policy. Supporters see hydrogen-fueled cars as tomorrow's hybrids. Today's consumers, weary of wallet-draining gas prices, are flocking to hybrids that run on a combination of battery power and gasoline. "We see hybrids as the bridge to the hydrogen vehicle," said Dave Barthmuss of General Motors. But challenges lie ahead. Hydrogen cars cost $1 million each. Refueling stations are generally not accessible to the public. The range between fill-ups averages about 100 miles. And disputes persist over hydrogen sources. Nevertheless, 200 interests with a stake in the emerging technology are backing the California Hydrogen Blueprint Plan, which establishes a road map for the state to follow through the end of this decade and beyond. By 2010, automakers and others involved have promised to introduce 2,000 cars and 100 convenient fueling stations situated primarily in urban areas of Los Angeles, San Diego and San Francisco. Farther out, the policy calls for 20,000 hydrogen cars and 250 stations. Once accomplished, "any vehicle driven by any person could go into any fueling station at any time and pick up hydrogen fuel," said Catherine Dunwoody, executive director of a consortium of automakers and fuel-cell developers. Today, there are about 90 hydrogen vehicles -- used mostly by government agencies -- on California roads. There are 16 refueling sites. Honda expects to lease the first hydrogen vehicle to a member of the general public this year. But most automakers do not expect large numbers of the cars to arrive in showrooms for at least 10 more years. Under the latest plan, the state would spend slightly more than $10 million annually for the next five years to accelerate the introduction of vehicles and stations, including a $10,000 subsidy for buyers. Refueling stations alone can cost about $1 million, half of which would be paid by the state. "This would allow you with a hydrogen car to travel freely throughout California," said Ron Roberts, a member of the state's Air Resources Board. "This is a huge step toward the commercialization of hydrogen vehicles." Despite their enthusiasm, other air board members questioned whether the goals are too timid. "The current pattern will get us experiments. It doesn't get us to a paradigm shift," said Riverside Councilman Ron Loveridge, who also serves on the air board. Schwarzenegger initially wanted to be more aggressive. His original initiative called for a network of up to 200 stations and "tens of thousands" of cars. But the various interests involved in reviewing the governor's proposal concluded it went too far too fast. Schwarzenegger subsequently signed off on the more tempered schedule. "It's fair to say he was looking for greater results," Tamminen said. "But we want to get it right. We want to make sure it's realistic." Jason Mark, an environmentalist who helped create the compromise plan, supported the final version. "This is a modest down payment on a cleaner future," he said. "The technology is not there yet for the mass market." Mark said environmentalists are wary of where California goes to produce hydrogen. The choice could come down to clean, renewable fuels such as wind and biomass products, or coal. Vehicles powered by hydrogen fuel cells emit only drops of water from the tailpipe, a huge advantage in the battle against smog. Fuel cells draw on electricity generated through a chemical reaction between hydrogen and oxygen. Hydrogen cars average about twice the fuel mileage as conventional vehicles, but hydrogen fuel is about twice as expensive as gasoline. While the state's investment may seem like a lot of money, Mark said Californians collectively pay twice that much at the pump every day. Lawmakers must still approve the governor's budget for the program, but the industry-environmental alliance should overcome any misgivings.

## Solvency

### No Solvency – AT “Just Have to Build Stations”

#### Addressing refueling alone fails – offsets vehicle development.

Farrell et al 2003 Alexander E Farrell, Energy and Resources Group @ University of Cal Berkeley, David W Keith, Dept of Engineering and Public Policy @ Carnegie Mellon, James J Corbett, Marine Policy Program @ University of Delaware, A strategy for introducing hydrogen into transportation, Energy Policy 31:13, October 2003, pg 1357–1367

Network effects arise in markets for composite goods or services that can be obtained from alternative combinations of basic products, such as fuel/vehicle combinations (Roson and van den Bergh, 2000; Unruh, 2000). The extreme case is personal vehicles due to the reliance of consumers on a ubiquitous refueling infrastructure that allows them to travel and refuel at will. One of the main problems of such markets is that two different industries (fuel and vehicle) must coordinate on technologies and investment patterns in the face of different incentives (Winebrake and Farrell, 1997). Unfortunately, US research efforts do not address this problem, including the new FreedomCAR initiative (Sperling, 2002). In addition, network effects can hamper technological innovation, a condition called “excessive inertia” (DeBijl and Goyal, 1995). The presence of network effects implies that even if they were superior in cost and performance, new fuels would find it hard to compete against existing fuels. The timescales for the diffusion of new energy technologies is typically long due to this need for a coordinated evolution of infrastructure and end-use equipment (Grübler et al., 1999).

#### Fuel infrastructure is only one barrier – problems with conversion, storage, and fuel cells all prevent widespread hydrogen use.

Bullis and Chu, 2009 Kevin Bullis, senior editor, interview with Steven Chu, the U.S. Secretary of Energy, MIT Technology Review, “Q & A: Steven Chu,” 5/14/2009, http://www.technologyreview.com/news/413475/q-a-steven-chu/

TR: It used to be thought, five to eight years ago, that hydrogen was the great answer for the future of transportation. The mood has shifted. What have we learned from this? SC: I think, well, among some people it hasn't really shifted [laughs]. I think there was great enthusiasm in some quarters, but I always was somewhat skeptical of it because, right now, the way we get hydrogen primarily is from reforming [natural] gas. That's not an ideal source of hydrogen. You're giving away some of the energy content of natural gas, which is a very valuable fuel. So that's one problem. The other problem is, if it's for transportation, we don't have a good storage mechanism yet. Compressed hydrogen is the best mechanism [but it requires] a large volume. We haven't figured out how to store it with high density. What else? The fuel cells aren't there yet, and the distribution infrastructure isn't there yet. So you have four things that have to happen all at once. And so it always looked like it was going to be [a technology for] the distant future. In order to get significant deployment, you need four significant technological breakthroughs. That makes it unlikely.

### No Solvency – Can’t Compete w/Gas Cars

#### H-cars can’t compete with gas cars

Peter Valdes-Dapena, 3/19/12, CNN Money, "Hydrogen cars: a zero-emission longshot?," <http://money.cnn.com/2012/03/15/autos/hydrogen-fuel-cell-cars/index.htm>,

Still an expensive longshot. John DiCicco, an auto analyst with Environmental Defense Fund, remains unconvinced that hydrogen-powered cars will make it in the real-world anytime soon. Alternative-fuel advocates, he points out, tend to compare idealized future visions of their favorite technology -- scenarios in which all the challenges have been resolved -- to today's gasoline-powered cars. The trouble is that, while hydrogen cars and plug-in cars will improve, so will gasoline cars, DiCicco said. In the end, more fuel efficient, cleaner-burning gasoline vehicles could leave car buyers little reason to embrace more expensive exotic technologies.

### No Solvency – Transition

#### No chance the aff solves – requires a massive transition

Steve Hallett and John Wright, 2011, "Life without Oil," Google Books, <http://books.google.com/books?id=9XhGp1vJ2wkC&pg=PT108&lpg=PT108&dq=%22Let%E2%80%99s+put+part+of+the+hydrogen+fuel+myth+to+rest.+Hydrogen+is+not+a+source+of+energy;+it+is+a+carrier+of+energy.%22&source=bl&ots=Wv-G5AYqFB&sig=u2NevDQZpGLJUcXbZKlwGFlrF8A&hl=en&sa=X&ei=RgXpT_fBC8XY2QX7kaXQDQ&ved=0CCEQ6AEwAA#v=onepage&q&f=false>,

The biggest problem with hydrogen technology for transportation, however, might not be the scale of the remaining needs for technological innovation but the scale of the needed transition. Converting our transport systems to hydrogen will require changing vehicle designs, gas station designs, distribution systems, and power-generation systems; and the size of the required infrastructure makeover is huge. The entire transportation fleet and its supporting industries - trillion-dollar industries that support them – will need to be replaced. As the Jewish saying from the Great Depression has it: "If I had some ham, I'd have a ham sandwich, if I had some bread."

#### 50 or more years for U.S. to see oil impacts- too long

Chuck Squatriglia, 5/12/08, Wired.com, " Hydrogen Cars Won't Make a Difference for 40 Years”

<http://www.wired.com/cars/energy/news/2008/05/hydrogen?currentPage=all>

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Unfortunately, experts say it will be 40 years or more before hydrogen has any meaningful impact on gasoline consumption or global warming, and we can't afford to wait that long. In the meantime, fuel cells are diverting resources from more immediate solutions. "As a climate strategy, it's not very good," said Dr. Joseph Romm, executive director of the Center for Energy and Climate Solutions and author of The Hype About Hydrogen: Fact and Fiction in the Race to Save the Climate. "We don't have the time."

### No Solvency – Transition/Timeframe

#### Transition takes decades

Farrell et al 2003 Alexander E Farrell, Energy and Resources Group @ University of Cal Berkeley, David W Keith, Dept of Engineering and Public Policy @ Carnegie Mellon, James J Corbett, Marine Policy Program @ University of Delaware, A strategy for introducing hydrogen into transportation, Energy Policy 31:13, October 2003, pg 1357–1367

The introduction of new transportation fuels is an infrequent, uncertain, and slow (decadal) process, largely due to the difficulties associated with major changes in the social and economic systems in which new technologies are always embedded (Kemp, 1994). Throughout history, transportation fuels have included a succession of human and animal muscle, wind, wood, coal, petroleum, and electricity (Smil, 1991, pp. 128–136, 168–175). These changes have been driven by the fact that they provided private benefits—new fuels have historically provided greater mobility, so that investment in them proved worthwhile to private firms and individuals. Today, non-petroleum-derived energy accounts for less than 0.4% of all transportation energy in the US (ignoring pipelines), almost all of which is accounted for by electrified rail (Davis, 2001, Table 2.5). Although natural gas now powers over 6% of all transit buses and some municipal and state vehicles, this has come at a cost of over $2 billion and has failed to lead to the widespread development of natural gas refueling infrastructure (Kreith et al., 2002).

#### Long timeframe between policy action and technological change.

Farrell et al 2003 Alexander E Farrell, Energy and Resources Group @ University of Cal Berkeley, David W Keith, Dept of Engineering and Public Policy @ Carnegie Mellon, James J Corbett, Marine Policy Program @ University of Delaware, A strategy for introducing hydrogen into transportation, Energy Policy 31:13, October 2003, pg 1357–1367

The third dilemma is that significant mismatch exists between the processes of policy development and technological change. The latter can take considerably longer than the former, which tend to be driven by the daily news cycle and 2–4 year election cycles. Further, when legislators or regulators set standards they can only select from available technological solutions, which are much more limited than those that will be developed subsequently. This is particularly problematic if they attempt to balance costs and benefits, since prospective cost estimates will be highly uncertain and systematically biased upwards. Lengthy litigation and implementation processes tend to follow this rule making process, which extends the time before diffusion begins and serves as another economic barrier to technological change.

### No Solvency – Fuel Cells

#### Tech Fails: Large-Scale Production Impossible

Ogden and Ruben 09

http://www.rff.org/Publications/WPC/Pages/03\_09\_09\_Outlook\_for\_Hydrogen\_Cars.aspx

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Fuel cells are at the heart of the hydrogen strategy. They are electrochemical devices, akin to batteries, that combine hydrogen and oxygen (from air) to generate electricity to fully power a vehicle. The only tailpipe emission is water vapor from the reaction of hydrogen and oxygen. While fuel cell technology has improved substantially in recent years, current devices have not yet achieved the performance and cost goals required for large-scale commercial production. The chief technical challenges are to make fuel cells as durable and cost-effective as today’s internal combustion engine, to reduce the use of costly materials such as platinum-based catalysts, and to develop a compact, low-cost hydrogen storage system capable of providing a driving range of 300 miles or more, which is what most consumers demand.

#### Hydrogen fuel cells are bad

**Kanellos 11’** “Fuel Cells: The Future or a Flop?” <http://www.ecomagination.com/fuel-cells-the-future-or-a-flop> A.F

Fuel cells are in some ways the ultimate in energy technology. Liquids like methanol or gases such as methane or hydrogen are passed through a catalytic membrane to produce electricity and/or heat on the spot. With one of these, large amounts of electricity can be produced on demand, instead of at a centralized power station. In Japan, Osaka Gas installs fuel cells in homes that convert 80 percent of the energy injected into them into household power and heat. The grid generally is only around 30 to 35 percent efficient due to transmission and conversion losses. And unlike solar panels or wind turbines, fuel cells aren’t subject to the vagaries of nature. To top it off, fuels cells by their nature also store power and can circumvent the problems–long charge times, weight, high prices–associated with batteries. Oorja Protonics, a startup in Fremont, California, has created a fuel cell that provides all the energy a forklift will need for an eight hour shift. A fill up takes about five minutes. Traditional forklifts run on lead acid batteries, which take hours to charge and need to get swapped every four hours. Some car makers still continue to research the possibility of cars powered by hydrogen fuel cells. It’s too bad this dream technology is also one of the most finicky ideas ever devised. Catalytic membranes can require expensive materials such as platinum. Cracking and clogged membranes can also lead to high costs, unexpected maintenance and surly customers. Hydrogen? Yes, it can be harvested from water. But most industrial manufacturers get it by breaking apart methane molecules, which releases an inordinate amount of carbon dioxide. Remember portable fuel cells for cameras and phones? Consumers, it turned out, didn’t want to carry flammable liquids. It’s no wonder that fuel cells have been the Next Big Thing since William Grove demonstrated the concept in 1838. But will science and engineering come to the rescue? Companies like Bloom Energy and England’s Ceres Power say they have devised ways to boost reliability while dropping costs. Ceres in part relies on components from the diesel industry. Leasing and tax credits can lessen the sticker shock. New membranes concocted at MIT and other universities hope to reduce the amount of costly catalysts. Meanwhile, in Israel, Emefcy says it can help eliminate the need for expensive fuels. It has a microbial fuel cell that generates power from vegetable scraps. Hospitals and industrial sites have installed fuel cells in limited numbers as back-up generators. Then again, at least with solar panels you don’t have to worry about rising fuel costs. Or maintenance for the most part. With fuel cells, you’re stepping into uncharted waters. Is it a future whose time has come?

#### Fuel Cells bad and years away

Newman 08’ “Hydrogen/Fuel Cells”, <http://money.usnews.com/money/personal-finance/articles/2008/01/11/hydrogenfuel-cells>, A.F.

What is it? The concept is similar to hybrids: an electric motor would drive the car much of the time. In this case, the motor would be charged by something under the hood called a fuel-cell stack, which converts hydrogen and oxygen into electricity that flows to the battery. The on-board fuel would be hydrogen. What's good about it? Many things. Hydrogen is widely available, in natural gas and water, for instance. The only tailpipe emission is water. Pound for pound, hydrogen fuel has more inherent energy than gasoline, which could mean higher mileage: A prototype Honda fuel-cell vehicle gets the equivalent of nearly 70 miles per gallon. What's bad about it? While it can be extracted from water, the cheapest source of hydrogen is natural gas, an unrenewable hydrocarbon. There's no distribution system or standardized method of storage, which is crucial since hydrogen fuel is a gas that must be kept under high pressure. Where would it be most useful? Fuel cells make sense for most types of vehicles. One enduring challenge is "cold start"— the ability to power up at temps as low 30 below zero Fahrenheit—which means fuel cells are ill-suited for the coldest climates. That may be resolved by the time other technology matures. How much will it cost? If mass-produced and widely distributed like gasoline, the cost of hydrogen fuel could be equivalent to $2 per gallon or less. Plus, fuel cells are about three times as efficient as gas engines, which means better mileage. But building an infrastructure to deliver hydrogen would cost billions, which would certainly add to consumers' cost. When's it coming? Could still be 10 or 20 years away. There are major technical hurdles in terms of producing the fuel, distributing it widely, and storing it in cars. What's taking so long? Researchers are still searching for cost effective ways to produce the fuel, transport it, and store it in a car. An even bigger problem is building a hydrogen infrastructure comparable to a gas station on every corner, which would cost billions and require the unprecedented cooperation of automakers, energy companies, and the government. Who's doing it? Most of the big automakers have fuel-cell programs. GM has recruited ordinary consumers to test a fleet of 100 fuel cell vehicles on the east and west coasts. Honda plans to lease a fuel-cell car, for about $600 per month, to a few consumers in 2008. Others could announce similar programs. Could it be a silver bullet? Maybe. If the technology matures, costs fall, and hydrogen fuel becomes widely available, it would solve several problems: Hydrogen could come from renewable sources and generates no tailpipe emissions. And theoretically, it would be affordable—maybe even cheap

### No Solvency – Fuel Cells/Expensive

#### High costs prevents commercialization of H-cars

Ed Hiserodt, 2009, (aerospace engineer), Renewable Energy, "Hydrogen is not a practical fuel source," <http://ic.galegroup.com/ic/ovic/ViewpointsDetailsPage/ViewpointsDetailsWindow?displayGroupName=Viewpoints&prodId=OVIC&action=2&catId=&documentId=GALE|EJ3010573218&userGroupName=lom_inac&jsid=4413a206f83fb46bc9e440569afb9f1d>,

Then there are the other hydrogen engines, driven by fuel cells. In and of themselves, fuel cells are an almost ideal machine in that they have no major moving parts and are therefore incredibly reliable. When compressed hydrogen is used in them as a fuel, there are three outputs from the cell: electricity, heat, and water. With an efficiency of about 50 percent, half the energy from the hydrogen fuel is converted into electricity without the need for a generator. However, while there is great enthusiasm for the hydrogen fuel cell for use in automobiles, this technology has been rightly called "the miracle that is always 10 years over the horizon." There are numerous problems, with cost being among the most serious. GM Vice President Larry Burns opined that the cost of fuel-cell vehicles must be reduced 90 percent to compete with internal combustion engines. One of the major cost factors is the significant amounts of platinum required as a catalyst for fuel-cell operation.

### No Solvency - Storage/Delivery Fails

#### Difficulties of storage and delivery make hydrogen inefficient.

Farrell et al 2003 Alexander E Farrell, Energy and Resources Group @ University of Cal Berkeley, David W Keith, Dept of Engineering and Public Policy @ Carnegie Mellon, James J Corbett, Marine Policy Program @ University of Delaware, A strategy for introducing hydrogen into transportation, Energy Policy 31:13, October 2003, pg 1357–1367

It is in storage and delivery that hydrogen suffers. Hydrogen has low volumetric energy density, is difficult to compress, and requires extremely low temperatures for liquefaction. Hydrogen storage systems are typically larger but lighter than equivalent systems for petroleum-derived fuels, and more expensive. Liquefied hydrogen has higher energy densities than does compressed gas storage, but the energy required to liquefy hydrogen is equal to approximately one-third its energy content, while compression (to View the MathML source, or about View the MathML source takes only one-tenth. New, non-cryogenic storage technologies (e.g., carbon nanotubes) may dramatically improve the performance of storage systems, but progress has been slow despite decades of research (Dillon and Heben, 2001). Bulk shipment of hydrogen and local delivery will thus be more expensive and more complex than for liquid hydrocarbon fuels (Compressed Gas Association, 1990; Federal Transit Administration, 1998; Linden, 1999). And although hydrogen itself has very high energy per unit mass—perhaps its only private benefit in transportation applications—the extra weight of storage (relative to the simple steel or plastic tanks used for petroleum-based fuels) may largely negate this advantage.

### No Solvency – Cost/AT “Hydrogen is Plentiful”

#### Plentiful hydrogen doesn’t make it cheap – converting it to fuel is massively exspensive

Ed Hiserodt, 2009, (aerospace engineer), Renewable Energy, "Hydrogen is not a practical fuel source," <http://ic.galegroup.com/ic/ovic/ViewpointsDetailsPage/ViewpointsDetailsWindow?displayGroupName=Viewpoints&prodId=OVIC&action=2&catId=&documentId=GALE|EJ3010573218&userGroupName=lom_inac&jsid=4413a206f83fb46bc9e440569afb9f1d>,

The "hydrogen economy" is a Green dream. Environmentalists looking for a source of energy to replace fossil fuels and nuclear energy rightly note that over 99.9 percent of the visible matter in the universe is hydrogen and that our oceans have an inexhaustible supply of hydrogen atoms. Moreover, they point out, hydrogen burns, and when it is burned in internal combustion engines or combined with oxygen in fuel cells, the only byproduct is water. All that is true and wonderful and makes it seem as if hydrogen is the solution to the world's power needs. However, it ignores an important factor that diminishes the role hydrogen could otherwise play in solving our energy woes. Conveniently ignored in far too many cases is a problem similar to that besetting the ancient mariner in [Samuel Taylor] Coleridge's poem ["The Rime of the Ancient Mariner"]: there is indeed hydrogen everywhere, but not in a form that can be used as a fuel. Unlike petroleum, natural gas, and even helium, there are no hydrogen deposits that can be drilled and tapped for energy-production purposes. Because hydrogen readily combines with other molecules, to get usable hydrogen for energy-production purposes, we always have to separate it from its already chosen dance partner. A common process to commercially produce hydrogen is to use very high temperature steam to react with coke (almost pure carbon) to form hydrogen and carbon monoxide to produce what is known as "syngas." A second commercially viable method of hydrogen production begins with natural gas, which is usually about 75 percent methane—a molecule with one carbon and four hydrogen atoms. The process to release those hydrogen atoms is also completed with high-temperature steam, as in the case of coke conversion. Ironically, after using large amounts of energy to free the hydrogen, the resultant hydrogen has a much lower energy content than the natural gas it was freed from.... And there is another problem. Being the lightest substance in the universe, hydrogen must undergo compression or liquefaction before the product becomes useful as a fuel. Producing liquid hydrogen requires a further 25 percent energy input into the hydrogen-production process. For now let us estimate the energy cost of compressed hydrogen as requiring 60 kWh per kilogram. The equivalent of a gallon of gas (in terms of hydrogen) would require an energy cost of about 55 kWh of electrical power to produce. With the industrial cost of electricity in the range of six cents per kWh, then compressed hydrogen would cost in the neighborhood of $3.30 per gallon of gasoline. And this is the cost without any of the possible prodigious shipping and handling costs generated by transporting the hydrogen to a fuel station near you. The amount of energy needed to produce enough hydrogen fuel to sustain the economy would be immense. One normal-sized nuclear power plant, capable of producing 24,000 megawatt-hours of power per day, could produce about 450,000 gallon-equivalents of hydrogen per day. This would serve the automotive needs of a city of a million people.

### No Solvency – Cost (AT Cost Decreasing)

#### H-cars can’t reach commercialization – too expensive

Popular Science, January 2005, "Warning: the hydrogen economy may be more distant than it appears," <http://www.michaelbehar.com/popsci/warninghydrogen.html>,

Simply mass-producing fuel cell cars won’t necessarily slash costs. According to Patrick Davis, the former leader of the Department of Energy’s fuel cell research team, “If you project today’s fuel cell technologies into high-volume production—about 500,000 vehicles a year—the cost is still up to six times too high.” Raj Choudhury, operations manager for the General Motors fuel cell program, claims that GM will have a commercial fuel cell vehicle ready by 2010. Others are doubtful. Ballard says that first there needs to be a “fundamental engineering rethink” of the proton exchange membrane (PEM) fuel cell, the type being developed for automobiles, which still cannot compete with the industry standard for internal combustion engines—a life span of 15 years, or about 170,000 driving miles. Because of membrane deterioration, today’s PEM fuel cells typically fail during their first 2,000 hours of operation. Ballard insists that his original PEM design was merely a prototype. “Ten years ago I said it was the height of engineering arrogance to think that the architecture and geometry we chose to demonstrate the fuel cell in automobiles would be the best architecture and geometry for a commercial automobile,” he remarks. “Very few people paid attention to that statement. The truth is that the present geometry isn’t getting the price down to where it is commercial. It isn’t even entering into the envelope that will allow economies of scale to drive the price down.”

### No Solvency – All Hype

#### Hydrogen cars are hype – the aff can’t solve any of its impacts

**Sanders 03’** Robert Sanders, “Hydrogen-fueled cars not the best way to cut pollution, greenhouse gases and oil dependency, says expert”, <http://berkeley.edu/news/media/releases/2003/07/17_fuels.shtml>, A.F.

As politicians and the public leap aboard the hydrogen fuel bandwagon, a University of California, Berkeley, energy expert suggests we all step back and take a critical look at the technology and consider simpler, cheaper options. Alex Farrell In a paper appearing in the July 18 issue of Science magazine, Alex Farrell, assistant professor of energy and resources at UC Berkeley, and David Keith, associate professor of engineering and public policy at Carnegie Mellon University, present various short- and long-term strategies that they say would achieve the same results as switching from gasoline-powered vehicles to hydrogen cars. "Hydrogen cars are a poor short-term strategy, and it's not even clear that they are a good idea in the long term," said Farrell. "Because the prospects for hydrogen cars are so uncertain, we need to think carefully before we invest all this money and all this public effort in one area." Farrell and Keith compared the costs of developing fuel cell vehicles to the costs of other strategies for achieving the same environmental and economic goals. "There are three reasons you might think hydrogen would be a good thing to use as a transportation fuel - it can reduce air pollution, slow global climate change and reduce dependence on oil imports - but for each one there is something else you could do that would probably work better, work faster and be cheaper," Farrell said. President George W. Bush has proposed a federally funded, five-year, $1.7 billion FreedomCAR and Fuel Initiative to develop hydrogen-powered fuel cells, a hydrogen infrastructure and advanced automotive technologies. Several announced candidates for president have also proposed major research efforts to develop hydrogen-fueled vehicles and technologies to produce, transport and store the hydrogen, while many scientists have praised the initiative. For many people, the attraction of hydrogen is that it produces no pollution or greenhouse gases at the tailpipe. For others, the attraction is that hydrogen is a research program, not a regulation, and that some hydrogen-related research will also help develop better gasoline-powered cars. One problem, said Farrell, an expert on energy and environment issues, is that this glosses over the issue of where the hydrogen comes from. Current methods of producing hydrogen from oil and coal produce substantial carbon dioxide. Unless and until this carbon can be captured and stored, renewable (wind or solar) and nuclear power, with their attendant problems of supply and waste, are the only means of producing hydrogen without also producing greenhouse gases. In addition, Farrell points out that setting up a completely new infrastructure to distribute hydrogen would cost at least $5,000 per vehicle. Transporting, storing and distributing a gaseous fuel as opposed to a liquid raises many new problems. More billions of dollars will be needed to develop hydrogen fuel cells that can match the performance of today's gasoline engines, he said. The benefits might be worth the costs of fuel-cell development and creating a new infrastructure, however, if air pollution, greenhouse gases and imported petroleum could not be reduced in other ways. But they can, said Farrell. Improvements to current cars and current environmental rules are more than 100 times cheaper than hydrogen cars at reducing air pollution. And for several decades, the most cost-effective method to reduce oil imports and CO2 emissions from cars will be to increase fuel efficiency, the two scientists found. "You could get a significant reduction in petroleum consumption pretty inexpensively by raising the fuel economy standard or raising fuel prices, or both, which is probably the cheapest strategy," Farrell said. "This would actually have no net cost or possibly even a negative cost - buying less fuel would save more money than the price of the high-efficiency cars. The vehicles would still be large enough for Americans and they would still be safe." Technologies are now on the shelf to achieve better fuel efficiency, he said. All that's lacking are economic incentives to encourage auto makers to make and drivers to buy fuel-efficient cars. "Automobile manufacturers don't need to invest in anything fancy - a wide number of technologies are already on the shelf," he said, quoting, among other studies, a 2002 report by the National Academy of Sciences. "The cost would be trivial compared to the changes needed to go to a hydrogen car." Petroleum substitutes like ethanol that can be used in today's vehicles also are a possible way to reduce oil imports, the researchers say, but more research is needed to reduce the environmental impact and cost of these options. If one goal is to reduce greenhouse gases, it would be cheaper, Farrell and Keith argue, to focus on reducing carbon dioxide emissions from electric power plants than to focus solely on hydrogen-powered vehicles. But if passenger cars are targeted, fuel economy is still the key. If it becomes necessary to introduce hydrogen into the transportation sector, the scientists say, a better alternative is to develop hydrogen-powered fuel cells for vehicles such as ships, trains and large trucks instead of cars. Because these heavy freight vehicles have higher emissions, this strategy could provide greater air quality benefits. On-board hydrogen storage would be less of a problem also, and it would require a smaller fuel distribution network. Farrell and Keith provide figures that support their arguments and conclude that more research needs to be done before committing ourselves to a hydrogen economy, which might begin to make sense 25 years down the road. "Hydrogen cars are an attractive vision that demands serious investigation, but it's not a sure thing," they wrote. Farrell speculates that hydrogen has become attractive to people across the political spectrum in part because it doesn't challenge drivers to change their habits. It also doesn't challenge the auto industry to change its behavior, providing, instead, a subsidy for research that will lead to better cars whether they are hydrogen-powered or gasoline-powered.

## AT Global Warming Advantage

### SQ Solves – Electric Cars

#### Electric cars are already solving global warming in China and Italy in the status quo

Xinhua News Agency Mar 19 2012

." Xinhua News Agency - CEIS Mar 19 2012: "Emission Reduction in China Drives Green Economy: Italian Official n/a. ABI/INFORM Global; ProQuest Central. Emission reduction in China drives green economy: Italian official 28 June 2012 LSV

BEIJING, March 19 (Xinhua) -- Corrado Clini, Italy's minister of environment, said Monday that China's efforts to reduce CO2 emissions will drive clean energy innovation and introduce new technology to the field. In an exclusive interview with Xinhua, Clini said China has led the world in terms of investing in innovative technology for the generation and efficient use of energy. "If you look at data from 2006 to 2010, China is by far the largest single country worldwide in terms of total investment in clean energy. Greenhouse gas emissions were reduced by 1.5 billion tonnes during the period," Clini said. China's CO2 emissions from fossil fuel burning reached over 1,800 million tonnes in 2010, although the emissions were reduced by 1.5 billion tonnes between 2006 and 2010, according to a report on China's low-carbon development published by the Social Sciences Academy Press at the end of November. "China has achieved great innovation in solar and wind energy, but it is far from enough," Clini said. Clini has been working with China for the past decade on several environmental projects, including the Sino-Italian Collaboration Program for Environmental Protection. Italy has contributed 220 million U.S. dollars toward the project thus far, which has been used to develop sustainable buildings and electric cars and train environmental officials. Cooperation between Italy and China will likely provide a "post-Durban road map" for other countries to follow, Clini said. "We are standing on a common platform in addressing climate change and we are working together to create a better mechanism for global cooperation," Clini said.

#### Electric cars are reducing co2 emissions now

Derry Journal May 17 2012 "Derrys Mayor on e-Car Environmental Drive.": n/a. ABI/INFORM Global; ProQuest Central. 28 June 2012 . LSV

Derry's Mayor is on an environmental drive - attending this week's engagements in one of the city's first electric cars. An e-car pilot scheme is currently running in Derry with charging points installed at points across the city. Mayor Maurice Devenney says the e-car has many benefits. Speaking this morning as he set off for his daily engagements, he continued: "The city should be proud of the investment this scheme has so far brought to the city, not least the long term benefits to the environment in reducing CO2 emissions. "These vehicles which ideally are powered by electricity from renewable sources, are, once the initial investment is made with the purchase of the vehicle, much less expensive to maintain and run and reduce our dependency on the volatile oil industry. Recharging at the charging posts took a bit of getting used to at the start of the week but once we figured out how to use it once, we soon got the hang of it." "With the new generation of electric vehicles utilising an electric motor rather than a petrol engine, now more than ever with the focus is on the detrimental health risks attributed to road traffic emissions, the 'ecar' system offers an alternative which decarbonises emissions. "Derry City Council is proud to be working towards the Northern Ireland objectives to reduce CO2 emissions, improve air quality and reduce noise pollution by offering this renewable form of transport and the city is doing its e bit for climate change."

### Electric Cars UQ – Increasing Now

#### Electric Charging stations on the rise

Guy 11’

Sandra Guy, Sun Times, “Electric Car Use Becoming More Mainstream”, Feb 12, 2011, <http://www.suntimes.com/technology/innovation/3998194-613/electric-car-use-becoming-more-mainstream.html> KSM

Carbon Day, which kicked off Chicago’s electric-car charging installations two years ago, has set up 100 charging stations at private and public sites throughout the Chicago area, including 22 stations at 11 Interpark garages downtown, two at the 900 N. Michigan Ave. building and four in the garage of the Parc Huron apartment building known for its environmentally friendly construction certification. “The owners of the charging stations determine the pricing and set it in real time, with the majority of our customers offering electricity for free until more vehicles hit the road,” said Brian Levin, Carbon Day Automotive’s vice president. Carbon Day is looking to install another 150 to 200 electric charging stations locally this year, and touts the fact that its stations are part of the nation’s largest network of charging stations. Carbon Day and other early players are seeing rivals quickly emerge as auto companies roll out hybrid and electric versions of their mainstream models. Chicago officials announced last week a $1.9 million contract with California-based 350Green to install 280 electric vehicle charging stations throughout the region, and long-standing companies such as Siemens AG, General Electric Co., Eaton Corp. and Leviton Manufacturing Co. have announced plans to introduce their own electric charging stations later this year. The Chicago area could be home to as many as 950 electric charging stations this year, and, as more electric and hybrid cars hit the road, play host to 2,600 charging stations in 2012, according to a forecast by Pike Research, a Boulder, Colo.-based clean technology consulting and analyst firm. Said John Gartner, a senior analyst at Pike Research, “The charging-station market will become a commodity market relatively quickly and [ownership] prices will come down.” Mariana Gerzanych, CEO of 350Green, foresees increased interoperability, too, as electric cars roll out with GPS systems that will show every charging station within driving range, regardless of the manufacturer. “For electric vehicles to catch on, drivers need to feel that the use of any charger is easy, convenient and affordable,” she said. The companies manufacturing, selling and distributing the charging stations are offering a variety of revenue plans. Chicago and 350Green have agreed to a ceiling on the charging prices, and drivers can pay on a per-use basis or through a monthly subscription rate. Prices have not yet been set, but a monthly subscription is estimated to cost $50 to $60 and include unlimited use during off-peak electricity timeframes.

#### Increasing use of electric car charging stations in Florida show popularity

George 11

Justin George, Times Staff Writer, “There's growing usage of electric car charging stations in Tampa”, Dec 9, 2011, <http://www.tampabay.com/news/environment/airquality/theres-growing-usage-of-electric-car-charging-stations-in-tampa/1205221> KSM

Then evidence rolled in. The day after installing an electric station in a city garage, a city worker spotted a user and hurriedly snapped a photo — as if it were a sighting of the Loch Ness Monster. "We were pleasantly surprised that it happened almost immediately," Lee said. "Once the things went live people were using them." City usage numbers requested by the St. Petersburg Times showed how many visits the stations were getting. As of Dec. 1, 19 customers had plugged their cars into charging stations at an average of nearly three hours per use. "It does appear there are some vehicles out there in the Tampa Bay area that are using our garages and lots," Lee said. "It'll be interesting to see how it continues to grow. I'm anticipating that it will." From October until November, Florida saw a threefold increase in the use of electric charging stations run by Coulomb Technologies as part of the ChargePoint America program, which includes Tampa's charging stations. Tampa applied for and received its 10 charging stations at no cost from the $37 million ChargePoint America program — which includes $15 million in federal stimulus funding. Tampa's stations are spread across the city in parking lots and spaces, restaurants and shopping areas. The stations receiving the most usage were inside the William F. Poe parking garage, visited seven times, and the Tampa Convention Center garage, with six charges. Drivers can access the charging stations using a ChargePoint card, through a special "RFID-enabled" credit card, or by calling the toll-free number on the charging station, said Scott Miller, eastern regional director for Coulomb Technologies. The city is not charging users a fee at this time but several stations are located in city parking spaces or garages, which require parking fees. Demand will decide whether Tampa will acquire more stations, but Lee said the city has no plans to add any at this time. Across the bay, St. Petersburg is installing 10 charging stations; Dunedin was considering acquiring as many as three late last month. Clearwater opened its first station in November with two more expected to be installed soon.

#### Popularity of Electric Cars and Charging Stations Going Up

Kent 11

Dawn Kent, Birmingham News, “Alabama Power to Study Use of Electric Cars”, March 6, 2011, <http://blog.al.com/businessnews/2011/03/alabama_power_to_study_use_of.html> KSM

Studies show this state has a long way to go before such vehicles even approach mainstream, but Alabama Power is researching their impact on the power grid, as well as future infrastructure needs, such as charging stations. "Our position is to educate the public," said Robin White, product manager in retail sales and development at Alabama Power. For now, the utility advocates at-home charging for owners of electric vehicles, and eventually, employers could offer charging stations at the workplace. Public infrastructure is being studied as part of short, medium and long-range plans that will vary by market. "There has to be enough vehicles for that infrastructure to make sense," White said. The utility also is looking at ways to make life easier for electric car owners. Areas of study include building code requirements, because some at-home charging methods may require a permit for installation. The Volt, for example, offers an optional 240-volt home charging station that will charge the battery in four hours, or less than half the time required by the 120-volt standard line. "Nothing could be worse than buying a car, and then it's just a headache to get that plug ready," White said. Alabama Power also plans to buy five Chevrolet Volts and use them for research. The vehicle, which is now available in seven markets nationwide, is expected to be in all 50 states by year's end. It is expected to arrive at Birmingham-area dealers as early as the third quarter, said Araba Dowell, a spokeswoman for GM. That's after the automaker boosted its delivery schedule following higher-than-expected demand. The Volt has won numerous awards and is seen in many automotive circles as a symbol of the resurgence of Detroit automakers. The Volt has a total driving range of 379 miles and can run on full electric power for 35 miles before its gas-powered engine kicks in for the next 344 miles, on a full tank. In Alabama, electric vehicles such as the Volt could go a long way toward improving the state's economic development prospects, by helping clean up non-attainment areas. Such regions are limited in the types of new business that can locate there because of poor air quality. "Electric vehicles will help solve that problem," White said. Jefferson County is one of those non-attainment areas, and the average commute is 25 miles. According to a new study by the Center for Automotive Research, sales of electric vehicles in Alabama should be just under 1,000 by 2015. That's compared to the leading state of California, where electric vehicle sales are expected to top 33,500 the same year. Jesse Toprak, vice president of industry trends and insights for TrueCar.com, said electric vehicles are at least five years away from reaching the same market share that hybrids have now, which is about 3 percent. Besides the Volt, the only other mass-produced electric vehicle at the moment is the Nissan Leaf, which is a pure electric vehicle with no backup gas engine. On the horizon later this year is an electric version of the Ford Focus, as well as a electric car offered by Mini. Next year, TrueCar has confirmed electric vehicle introductions planned by Audi, Cadillac, Mitsubishi and Tesla, along with a new variation of the Volt.

### Can’t Solve – Fuel Production Causes Warming

#### The production of Hydrogen fuel offsets any reduction in emissions

Popular Science, January 2005, "Warning: the hydrogen economy may be more distant than it appears," <http://www.michaelbehar.com/popsci/warninghydrogen.html>,

Unlike internal combustion engines, hydrogen fuel cells do not emit carbon dioxide. But extracting hydrogen from natural gas, today’s primary source, does. And wresting hydrogen from water through electrolysis takes tremendous amounts of energy. If that energy comes from power plants burning fossil fuels, the end product may be clean hydrogen, but the process used to obtain it is still dirty. Once hydrogen is extracted, it must be compressed and transported, presumably by machinery and vehicles that in the early stages of a hydrogen economy will be running on fossil fuels. The result: even more C02. In fact, driving a fuel cell car with hydrogen extracted from natural gas or water could produce a net increase of CO2 in the atmosphere. “People say that hydrogen cars would be pollution- free,” observes University of Calgary engineering professor David Keith. “Lightbulbs are pollution-free, but power plants are not.”

### Can’t Solve – Long Timeframe

#### Must cut emissions by 80% by 2050 – the transition to H-cars would overshoot that

Chuck Squatriglia, 5/12/08, Wired, "hydrogen cars won't make a difference for 40 years," <http://www.wired.com/cars/energy/news/2008/05/hydrogen?currentPage=all>,

Many hurdles remain to be cleared before hydrogen is a viable source of energy -- not the least of which are making, storing and distributing it on a large scale. Meeting these challenges will require, in the words of several hydrogen proponents, a "Manhattan Project"-level of research and funding. And we're a long way from the hydrogen economy President Bush envisioned in his 2003 State of the Union. The transition has begun though, and California is leading the way even as it keeps relaxing the rule dictating how many electric and hydrogen vehicles automakers must build. There are 175 fuel cell vehicles in California and more coming. Honda will begin leasing its hydrogen-powered Clarity FCX this summer and General Motors will put its Equinox fuel cell vehicles in 100 driveways this year. Hyundai plans to begin mass-producing fuel cells cars in 2012, and GM -- which has invested more than $1 billion in hydrogen -- says it will have 1,000 vehicles on the road in California by 2014. But few people expect to see fuel cell vehicles in showrooms before 2020, and we won't see any large-scale benefit from them until 30 years after that. "2050 is when hydrogen might -- might -- have a significant impact," said John Heywood, director of the Sloan Automotive Laboratory at the Massachusetts Institute of Technology. The timeline has more to do with economics than science. There are roughly 240 million vehicles in America and about 16 million new vehicles sold each year. That means it takes about 15 years to turn over the fleet. But it takes even longer for new technologies to penetrate the market. Heywood cites hybrids as an example. They may seem ubiquitous, but after 10 years, hybrids accounted for just 2.2 percent of domestic auto sales last year. Run the numbers and Heywood estimates fuel cell vehicles will need 25 years to make up 35 percent of new vehicle sales and 20 years beyond that to get to 35 percent of the U.S. fleet. We can't wait that long. Scientists increasingly agree that industrialized nations must cut greenhouse gas emissions as much as 80 percent by 2050 if we are to curb global warming. The Environmental Protection Agency says fuel economy may have to rise to 75 mpg within 30 years to hit that target. California law requires easing emissions even further than that by 2050. Hitting these targets will require putting 379,000 zero-emission vehicles on the road by 2020 and 7.6 million by 2050, according to the Union of Concerned Scientists.

### Long Timeframe/Tradeoff Turn

#### It will take 40 years for H-cars to come online, plus that trades off with better short term solutions

Chuck Squatriglia, 5/12/08, Wired, "hydrogen cars won't make a difference for 40 years," <http://www.wired.com/cars/energy/news/2008/05/hydrogen?currentPage=all>,

President Bush, Gov. Arnold Schwarzenegger and the big automakers agree on this much: They love hydrogen-powered fuel cell technology and its promise of a zero-emission, petroleum-free future. Unfortunately, experts say it will be 40 years or more before hydrogen has any meaningful impact on gasoline consumption or global warming, and we can't afford to wait that long. In the meantime, fuel cells are diverting resources from more immediate solutions. "As a climate strategy, it's not very good," said Dr. Joseph Romm, executive director of the Center for Energy and Climate Solutions and author of The Hype About Hydrogen: Fact and Fiction in the Race to Save the Climate. "We don't have the time." Climate experts and alternative-fuel researchers, including some hydrogen proponents, agree that hydrogen is at best a long-term solution. In the short and medium term, however, other technologies offer far greater benefit at far less cost: Cleaner internal combustion engines, hybrids and plug-in hybrids. Some worry that these near-term solutions are being short-changed. But hydrogen advocates counter that the answer isn't cutting hydrogen funding, but increasing funding for research into a wide variety of alternatives to oil.

### AT “Cars are the leading cause of warming”

#### Cars aren’t the leading cause of warming – power plants are

Popular Science, January 2005, "Warning: the hydrogen economy may be more distant than it appears," <http://www.michaelbehar.com/popsci/warninghydrogen.html>,

“An economically sane, cost-effective attack on the climate problem wouldn’t start with cars,” David Keith says. Cars and light trucks contribute roughly 20 percent of the carbon dioxide emitted in the U.S., while power plants burning fossil fuels are responsible for more than 40 percent of C02 emissions. Fuel cells designed for vehicles must cope with harsh conditions and severe limitations on size and weight.

### Turn – Makes it worse

#### Hydrogen fuels actually increase GW

BBC News 6/16/08 [“Honda makes first hydrogen cars” <http://news.bbc.co.uk/2/hi/business/7456141.stm>]

Critics also point out that hydrogen is costly to produce and the most common way to produce hydrogen is still from fossil fuels. Analysis of the environmental impact of different fuel technologies has shown that the overall carbon dioxide emissions from hydrogen powered cars can be higher than that from petrol or diesel-powered vehicles.

#### Hydrogen cars produce 4 times as much CO2 as gas cars

David Talbot March 2007 [“Hell and Hydrogen” Talbot is the Senior Editor for the Technology Review <http://www.technologyreview.com/read_article.aspx?ch=specialsections&sc=transportation&id=18301&a>=]

According to Romm's analysis, the math for hydrogen cars simply doesn't work out. Burning coal to generate one megawatt-hour of electricity produces about 2,100 pounds of carbon dioxide. It follows that one megawatt-hour of renewable power can avert those emissions. Using that electricity to make hydrogen would yield enough fuel for a fuel-cell car to travel about 1,000 miles, Romm says. But driving those 1,000 miles in a gasoline- powered car that gets 40 miles per gallon would produce just 485 pounds of carbon dioxide. In this sense, Romm says, a vehicle powered by hydrogen fuel cells would indirectly create four times the carbon dioxide emissions of today's most efficient gasoline cars. And the numbers for the Hydrogen 7 are worse, because it burns hydrogen. Combustion produces thrilling torque, but it's far less efficient than fuel-cell technology. Also counting against the Hydrogen 7 is the fact that it stores hydrogen as a liquid; chilling hydrogen and compressing it into liquid form consumes more energy than storing it as a compressed gas. "It's safe to say this is a pointless activity," Romm says. "BMW has managed to develop the least efficient conceivable vehicle that you could invent."

#### Fuel cell technology creates co2- infrastructure dubbed as extremely expensive

NSDL (National Science Digital Library), Global Warming: The Hydrogen Car, adapted from “What’s Up with the Weather?” (PBS), Feb. 04, http://nsdl.org/resource/2200/20061002133409419T?verb=Search&hdl=2200/20061002133409419T&type%5B%5D=Audio/Visual (Under “Background Essay”), SJ

Fuel cell technology is proven but nevertheless problematic. Like batteries, fuel cells turn chemical energy into electricity. A fuel cell, using a platinum catalyst, combines hydrogen and oxygen into water in a way that produces an electric potential, like that of a battery. In vehicles, the electric current is routed to small motors in the wheels, and the by-products -- heat and water -- are released into the air through a tailpipe. Unlike fossil fuel resources, which are extracted from the ground, hydrogen must be made. Hydrogen can be removed from water using another fuel, such as natural gas or coal, to power the extraction process, but this creates CO2. Thus, the challenge is to find a way to extract hydrogen using a carbon-free energy source. Non-polluting, renewable sources of energy, like solar cells, wind turbines, or hydroelectric dams, might one day fuel the extraction process, but at present such a solution would not be efficient. The other problem with hydrogen as a fuel is that a distribution and refueling infrastructure to serve drivers of hydrogen-powered cars would be extremely expensive.

### GW Defense: Alt Causes

#### China makes warming inevitable

Keith Bradsher, 7/4/10, New York Times, "China Fears Consumer Impact on Global Warming ," <http://www.nytimes.com/2010/07/05/business/global/05warm.html>

Already, in the last three years, China has shut down more than a thousand older coal-fired power plants that used technology of the sort still common in the United States. China has also surpassed the rest of the world as the biggest investor in wind turbines and other clean energy technology. And it has dictated tough new energy standards for lighting and gas mileage for cars. But even as Beijing imposes the world’s most rigorous national energy campaign, the effort is being overwhelmed by the billionfold demands of Chinese consumers. Chinese and Western energy experts worry that China’s energy challenge could become the world’s problem — possibly dooming any international efforts to place meaningful limits on global warming. If China cannot meet its own energy-efficiency targets, the chances of avoiding widespread environmental damage from rising temperatures “are very close to zero,” said Fatih Birol, the chief economist of the International Energy Agency in Paris. Aspiring to a more Western standard of living, in many cases with the government’s encouragement, China’s population, 1.3 billion strong, is clamoring for more and bigger cars, for electricity-dependent home appliances and for more creature comforts like air-conditioned shopping malls. As a result, China is actually becoming even less energy efficient. And because most of its energy is still produced by burning fossil fuels, China’s emission of carbon dioxide — a so-called greenhouse gas — is growing worse. This past winter and spring showed the largest six-month increase in tonnage ever by a single country.

### GW Defense: Irreversible

#### Warming is irreversible

Richard Harris, 1/26/09, NPR, "global warming is irreversible, study says," <http://www.npr.org/templates/story/story.php?storyId=99888903>

Climate change is essentially irreversible, according to a sobering new scientific study. As carbon dioxide emissions continue to rise, the world will experience more and more long-term environmental disruption. The damage will persist even when, and if, emissions are brought under control, says study author Susan Solomon, who is among the world's top climate scientists. "We're used to thinking about pollution problems as things that we can fix," Solomon says. "Smog, we just cut back and everything will be better later. Or haze, you know, it'll go away pretty quickly." That's the case for some of the gases that contribute to climate change, such as methane and nitrous oxide. But as Solomon and colleagues suggest in a new study published in the Proceedings of the National Academy of Sciences, it is not true for the most abundant greenhouse gas: carbon dioxide. Turning off the carbon dioxide emissions won't stop global warming. "People have imagined that if we stopped emitting carbon dioxide that the climate would go back to normal in 100 years or 200 years. What we're showing here is that's not right. It's essentially an irreversible change that will last for more than a thousand years," Solomon says. This is because the oceans are currently soaking up a lot of the planet's excess heat — and a lot of the carbon dioxide put into the air. The carbon dioxide and heat will eventually start coming out of the ocean. And that will take place for many hundreds of years.

### GW Defense: Not Human Caused

#### Warming isn’t human caused

Singer - an atmospheric physicist, is Research Fellow at the Independent Institute, Professor Emeritus of Environmental Sciences at the University of Virginia, and former founding Director of the U.S. Weather Satellite Service. – in 2007(Fred, “The Great Global Warming Swindle”, The Independent Institute, May 22nd, http://www.independent.org/newsroom/article.asp?id=1945)//CNDI

1. There is no proof that the current warming is caused by the rise of greenhouse gases from human activity. Ice core records from the past 650,000 years show that temperature increases have preceded—not resulted from—increases in CO2 by hundreds of years, suggesting that the warming of the oceans is an important source of the rise in atmospheric CO2. As the dominant greenhouse gas, water vapor is far, far more important than CO2. Dire predictions of future warming are based almost entirely on computer climate models, yet these models do not accurately understand the role or water vapor—and, in any case, water vapor is not within our control. Plus, computer models cannot account for the observed cooling of much of the past century (1940–75), nor for the observed patterns of warming—what we call the “fingerprints.” For example, the Antarctic is cooling while models predict warming. And where the models call for the middle atmosphere to warm faster than the surface, the observations show the exact opposite. The best evidence supporting natural causes of temperature fluctuations are the changes in cloudiness, which correspond strongly with regular variations in solar activity. The current warming is likely part of a natural cycle of climate warming and cooling that’s been traced back almost a million years. It accounts for the Medieval Warm Period around 1100 A.D., when the Vikings settled Greenland and grew crops, and the Little Ice Age, from about 1400 to 1850 A.D., which brought severe winters and cold summers to Europe, with failed harvests, starvation, disease, and general misery. Attempts have been made to claim that the current warming is “unusual” using spurious analysis of tree rings and other proxy data. Advocates have tried to deny the existence of these historic climate swings and claim that the current warming is "unusual" by using spurious analysis of tree rings and other proxy data, resulting in the famous “hockey–stick” temperature graph. The hockey-stick graph has now been thoroughly discredited.

### GW Defense: Earth is Cooling

#### The earth is cooling, not warming

Peter Ferrara 5/31/2012 Peter Ferrara graduate of Harvard College and Harvard Law School, and the author most recently of America's Ticking Bankruptcy Bomb. “Sorry Global Warming Alarmists, The Earth Is Cooling” http://www.forbes.com/sites/peterferrara/2012/05/31/sorry-global-warming-alarmists-the-earth-is-cooling/

**Climate change itself is already in the process of definitively rebutting climate alarmists who think human use of fossil fuels is causing ultimately catastrophic global warming. That is because natural climate cycles have already turned from warming to cooling, global temperatures have already been declining for more than 10 years, and global temperatures will continue to decline for another two decades or more. That** is one of the most interesting **conclusion**s to **come out of the seventh International Climate Change Conference sponsored by the Heartland Institute**, held last week in Chicago. I attended, and served as one of the speakers, talking about The Economic Implications of High Cost Energy. The conference featured serious natural science, contrary to the self-interested political science you hear from government financed global warming alarmists seeking to justify widely expanded regulatory and taxation powers for government bodies, or government body wannabees, such as the United Nations**. See for yourself, as the conference speeches are online. What you will see are** calm, dispassionate presentations by **serious, pedigreed scientists discussing and explaining reams of data**. In sharp contrast to these climate realists, the climate alarmists have long admitted that they cannot defend their theory that humans are causing catastrophic global warming in public debate. With the conference presentations online, let’s see if the alarmists really do have any response. The Heartland Institute has effectively become the international headquarters of the climate realists, an analog to the UN’s Intergovernmental Panel on Climate Change (IPCC). It has achieved that status through these international climate conferences, and the publication of its Climate Change Reconsidered volumes, produced in conjunction with the Nongovernmental International Panel on Climate Change (NIPCC). Those Climate Change Reconsidered volumes are an equivalently thorough scientific rebuttal to the irregular Assessment Reports of the UN’s IPCC. You can ask any advocate of human caused catastrophic global warming what their response is to Climate Change Reconsidered. If they have none, they are not qualified to discuss the issue intelligently**. Check out the 20th century temperature record, and you will find that its up and down pattern does not follow the industrial revolution’s upward march of atmospheric carbon dioxide (CO2), which is the supposed central culprit for man caused global warming (and has been much, much higher in the past). It follows instead the up and down pattern of naturally caused climate cycles. For example, temperatures dropped steadily from the late 1940s to the late 1970s. The popular press was even talking about a coming ice age.** Ice ages have cyclically occurred roughly every 10,000 years, with a new one actually due around now**. In the late 1970s, the natural cycles turned warm and temperatures rose until the late 1990s, a trend that political and economic interests have tried to milk mercilessly to their advantage.** The incorruptible satellite measured global atmospheric temperatures show less warming during this period than the heavily manipulated land surface temperatures. Central to these natural cycles is the Pacific Decadal Oscillation (PDO). **Every 25 to 30 years the oceans undergo a natural cycle where the colder water below churns to replace the warmer water at the surface, and that affects global temperatures by the fractions of a degree we have seen**.

### GW Defense: Won’t Cause Extinction

#### MSU satellite data is best and proves no catastrophic warming

Thomas **Pearson**, research analyst at CEI, **2002**, in *Global Warming and Other Eco-myths* edited by Ronald Bailey, pg. 322

Highly accurate temperature measurements, however, have been taken from space using microwave sounding units (MSUs) aboard satel­lites since 1979. The data series graphed on the opposite page shows the difference between recorded temperature and the 1979 mean values. In October 2001, the average global temperature departure was 0. 1450C, with a Northern Hemisphere temperature departure of 0. 1460C and a Southern Hemisphere departure of 0. 1430C, yielding an average in­crease of only 0.060C per decade.. The satellite data are highly corre­lated with balloon temperature data taken from radiosonde instruments, strengthening the confidence in the accuracy of the satellite data. MSUs measure the temperature of the lower troposphere, the at­mospheric layer from the surface to 20,000 feet. This layer of the at­mosphere is important for climatic research because, according to global circulation models, global warming would be much more pro­nounced in the lower troposphere than on the surface. The failure of the satellite data to verify rapid global warming predictions provides a strong argument against fears that man-made global warming will result in a climate catastrophe.

#### A NASA administrator has even admitted global warming is not an issue to worry about

Amanda Terkel on May 31, 2007 Amanda Terkel is currently a senior politics reporter and manager. She graduated from Colgate University “NASA Administrator: Global Warming Is Not A ‘Problem’” http://thinkprogress.org/politics/2007/05/31/13432/griffin-nasa-global-warming/

This morning on NPR, **NASA administrator Michael Griffin was asked, “Are you concerned about global warming?” His answer: “I’m aware that global warming exists” but “[w]hether that is a longterm concern or not, I can’t say.” Griffin said he is “not sure that it is fair to say that it is a problem we must wrestle with.” Griffin** also **charged that people are “arrogant” for assuming that “this particular climate that we have right here today, right now is the best climate for all other human beings,” hinting that global warming may actually be good for the earth**. This myth is a popular right-wing talking point.

## AT Hydrogen Economy Advantage

### No Solvency – Laws of Physics

#### The laws of physics prove hydrogen could never replace fossil fuels – trying to do so only depletes oil faster

Alice Friedemann, 3/1/2005, Energy Bulletin, "hydrogen economy: energy and economic black hole," <http://www.energybulletin.net/node/4541>

At some point along the chain of making, putting energy in, storing, and delivering the hydrogen, you’ve used more energy than you get back, and this doesn’t count the energy used to make fuel cells, storage tanks, delivery systems, and vehicles (17). The laws of physics mean the hydrogen economy will always be an energy sink. Hydrogen’s properties require you to spend more energy to do the following than you get out of it later: overcome waters’ hydrogen-oxygen bond, to move heavy cars, to prevent leaks and brittle metals, to transport hydrogen to the destination. It doesn’t matter if all of the problems are solved, or how much money is spent. You will use more energy to create, store, and transport hydrogen than you will ever get out of it. The price of oil and natural gas will go up relentlessly due to geological depletion and political crises in extracting countries. Since the hydrogen infrastructure will be built using the existing oil-based infrastructure (i.e. internal combustion engine vehicles, power plants and factories, plastics, etc), the price of hydrogen will go up as well -- it will never be cheaper than fossil fuels. As depletion continues, factories will be driven out of business by high fuel costs (20, 21, 22) and the parts necessary to build the extremely complex storage tanks and fuel cells might become unavailable. In a society that’s looking more and more like Terry Gilliam’s “Brazil”, hydrogen will be too leaky and explosive to handle. Any diversion of declining fossil fuels to a hydrogen economy subtracts that energy from other possible uses, such as planting, harvesting, delivering, and cooking food, heating homes, and other essential activities. According to Joseph Romm “The energy and environmental problems facing the nation and the world, especially global warming, are far too serious to risk making major policy mistakes that misallocate scarce resources (3).

### No Solvency – Not Energy Efficients

#### The process of creating hydrogen fuel uses more energy than it will save.

Reuel Shinnar, technology in Society, Department of Chemical Engineering, The hydrogen economy, fuel cells, and electric cars, page 458, 2003, <http://csauth.ccny.cuny.edu/ci/cleanfuels/upload/Hydrogen-Paper.pdf>, SJ

Hydrogen atoms are widely available in nature, but only bound to other atoms, mainly oxygen (water) or carbon (hydrocarbons). It requires huge energy to separate it; in practice much more than the energy obtained from using it. This energy can be supplied wither by fossil fuels or by solar or nuclear generated electricity. Simple thermodynamics and experience show that processes which involve such a large increase in the free energy are with present technology inherently thermally very inefficient, relative to the increase in free energy. The most efficient way for generating hydrogen from water is electrolysis with an efficiency of 70%.

#### Triple the hydrogen fuel is needed due to energy loss during transportation

Reuel Shinnar, technology in Society, Department of Chemical Engineering, The hydrogen economy, fuel cells, and electric cars, page 459, 2003, <http://csauth.ccny.cuny.edu/ci/cleanfuels/upload/Hydrogen-Paper.pdf>, SJ

For H2 we need to triple the volume to supply the same energy as natural gas. Therefore, if we were to use existing pipelines, the velocity in the pipe would have to be tripled, which makes H2 transport much less efficient than either electricity or natural gas in the national distribution system. The transport losses of methane and electricity over large distances are fairly equal at 5-7% (with energy having a slight advantage over long distances). With hydrogen, using the same pipelines for hydrogen could increase losses to 20% (see Table3). In reality, it is very doubtful that we would use natural gas pipelines of local distribution systems for H2. Hydrogen requires various different fitting and pipe specifications. It would also require installation of much more powerful compressors. We would probably need a totally new distribution system both nationally and into the houses, a very high cost. Additional electricity can be gradually introduced and the grid can be expanded as needed. While it is true that H2 could be shipped in liquid form, this is prohibitively expensive and energy intensive (based on available cost of shipping methane) as H2 is more expensive to liquefy and much more expensive to ship.

### AT Solves the Environment

#### Hydrogen must be produced and doing so worsens Co2 emissions more than Hydrogen Cars can make up for

Reuel Shinnar, technology in Society, Department of Chemical Engineering, The hydrogen economy, fuel cells, and electric cars, page 462, 2003, <http://csauth.ccny.cuny.edu/ci/cleanfuels/upload/Hydrogen-Paper.pdf>, SJ

As said before, hydrogen is not an energy resource, but an energy delivery system. Therefore, while hydrogen just like electricity is clean, the impact on the environment in both cases depends on the primary energy source used. If H2 were made from a fossil fuel such as natural gas, the inherent loss of efficiency would cause a large increase in greenhouse gases compared to direct use of the fossil fuel (double or higher). Furthermore, if the hydrogen is generated in small- distributed generators, instead of a large central plant, the increase in greenhouse emissions could be much larger. Small units are hard to tightly supervise, and as the catalyst ages the unit could have significant emissions of methane, which has 20 times larger global warming effect than carbon dioxide. Therefore, the hydrogen economy could have a string negative impact on the environment especially if distributed energy is used.

### AT H-Economy is Sustainable

#### A hydrogen economy is not sustainable – can’t eliminate fossil fuels

Popular Science, January 2005, "Warning: the hydrogen economy may be more distant than it appears," <http://www.michaelbehar.com/popsci/warninghydrogen.html>,

Perform electrolysis with renewable energy, such as solar or wind power, and you eliminate the pollution issues associated with fossil fuels and nuclear power. Trouble is, renewable sources can provide only a small fraction of the energy that will be required for a full-fledged hydrogen economy. From 1998 to 2003, the generating capacity of wind power increased 28 percent in the U.S. to 6,374 megawatts, enough for roughly 1.6 million homes. The wind industry expects to meet 6 percent of the country’s electricity needs by 2020. But economist Andrew Oswald of the University of Warwick in England calculates that converting every vehicle in the U.S. to hydrogen power would require the electricity output of a million wind turbines—enough to cover half of California. Solar panels would likewise require huge swaths of land. Water is another limiting factor for hydrogen production, especially in the sunny regions most suitable for solar power. According to a study done by the World Resources Institute, a Washington, D.C.–based nonprofit organization, fueling a hydrogen economy with electrolysis would require 4.2 trillion gallons of water annually—roughly the amount that flows over Niagara Falls every three months. Overall, U.S. water consumption would increase by about 10 percent.

#### Hydrogen is bad in economic, environmental, and safety respects, and other tech solves more effectively

**Shinnary 2003**

Reuel Shinnar, Department of chemical engineering, The City College of New York, “The Hydrogen Economy, Fuel Cells, and Electric Cars,” Technology in Science, 23 October 2003, Volume 25, Issue 4, Pages 455-476, <http://www.sciencedirect.com/science/article/pii/S0160791X03000836>, E.L.

There is a considerable research effort in the United States, Europe, and Japan directed towards developing a “hydrogen economy”, in which hydrogen would be expected to replace oil and natural gas for most uses, including transportation fuel. Initially hydrogen would be made from fossil fuels, and later from alternative sources, such as solar, nuclear, and biomass. The US Department of Energy (DOE) has developed a project on how to achieve this goal, and the president included it in the state of the union address, presenting it as a way to energy independence. Claims about the advantages of the H2 economy have been published which argue or assume that hydrogen will be a widely available, clean, safe fuel. The concept has received strong support from environmentalists. This article argues that such expectations are almost certainly illusory. Hydrogen, like electricity, is not an energy resource, but an energy carrier. Almost no hydrogen in a combustible form is available in nature. There is a vast amount of hydrogen in water, of course, but it takes more energy to extract it from the H2O molecules than the hydrogen can provide. This is a fundamental law of thermodynamics that no research can change. There are also inevitable losses in storage, transmission, and final mechanical or heating applications. The question then turns on the efficiency of the entire chain of conversion, from the energy source (fossil, solar, or other) to the final use. Hydrogen can be made from fossil fuels or by electrolysis of water. If other elements in the chain remain constant, hydrogen from fossil fuels would require more fossil fuel than currently used for the same purpose and would significantly increase our energy imports and globalwarming. If the hydrogen were to be released by electrolysis using solar- or nuclear-derived electricity, the cost would be higher. The direct use of the electricity would cost half as much as via the hydrogen route. Also, additional electricity could be slowly introduced into the existing grid, whereas it is physically and economically almost infeasible to switch to a radically new source like hydrogen that requires a new distribution system. In addition, hydrogen is the most dangerous of all known fuels and while it can, under certain conditions, burn invisibly and radiate little heat except upwards, mixed with air in a confined space it is a powerful explosive. Hydrogencars would be a boon to terrorists. If the US really wants to reduce imports and reduce greenhouse emissions, there are many currently feasible ways to do so gradually and at lower cost. Raising corporate average fuel economy standards (CAFE), use of hybrid cars, thermal solar energy, electric cars, and several other partial solutions are cheaper and better. Another immediately available solution discussed in this paper is to utilize large amounts of hydrogen in the oil refinery processes to improve the environmental quality of transportation fuels. Either hydrocracking or hydrotreating all residual fractions increases the yield by 20%. This alone would reduce oil imports with available technology by 3 million barrels a day. These measures will cost more and sometimes are less convenient than current practices, but they are all currently feasible and are more cost-effective than direct use of hydrogen. A hydrogen economy is, for the foreseeable future, at least twice as expensive as any other solution.

### AT Peak Oil

#### Geological claims of oil scarcity have been disproven for 40 years

Leonardo Maugeri, ENI SPA's senior vice-president of corporate strategies and international relations, senior fellow at the World Economic Laboratory at MIT, a senior fellow at the Foreign Policy Association, and a member of the executive council of the Center for Social Investment Studies, degree in petroleum economics and a PhD in international political economy,, 12/15/2003, Oil & Gas Journal

The prophets of "oil exhaustion," however, don't want to deal with these realities, which are basically moved by economics and technology, not by geology. Thus it is comprehensible why a school of geological thought -- drawing on the observations made by geologist M. King Hubbert in the 1950s -- periodically "cries wolf." The problem with this school is that for 40 years it's been predicting that oil reserves will be exhausted within a few years and then has to stay the final curtain once its predictions appear to be wrong. But no one remembers past mistakes, so its credibility has not been tarnished.

#### Unconventional hydrocarbons offer a secure, long-term supply

Bunger, Crawford, and Johnson, 8/9/2004, James Bunger, BS in chemistry, a PhD in fuels engineering, and has authored 40 technical papers and 11 patents., principal investigator for value-enhancement processing of US and Estonian kerogen oils, Peter Crawford, consults in energy technology, policy, and strategic communications, senior manager for Intek Inc., and Harry Johnson, former director of the US Department of Energy's Bartlesville Energy Technology Center, member of the Society of Petroleum Engineers, and has authored over 40 technical papers., Oil & Gas Journal

Recent discussions regarding the advent of a peak in global crude oil production generally fail to address the potential of America's rich, massive oil shale resources to augment petroleum supplies. While hope is often expressed for continued reserves growth and a smooth transition to future sources of energy, a realistic assessment of the full range of alternatives will reveal that only unconventional hydrocarbon resources, i.e., oil shale, tar sand, extra-heavy oil, and possibly coal liquids, are large enough to supplement petroleum supply with meaningful quantities of liquid fuels in the long term. Interestingly, most of the world's known unconventional hydrocarbon resources are found in the Western Hemisphere -- in the US, Canada, and Latin America -- which geopolitically is relatively secure. Increased production from unconventional Western Hemisphere hydrocarbon resources could substantially shift the center of gravity of America's petroleum supply. Canada and Latin America already supply at least half of current US oil imports. About one quarter, or 2.5 million b/d, is imported from Persian Gulf countries, with the remainder from numerous other sources.

### Warming Turn

#### A “hydrogen economy” would worsen warming – leaks would increase hydrogen in the atmosphere by 800%

Popular Science, January 2005, "Warning: the hydrogen economy may be more distant than it appears," <http://www.michaelbehar.com/popsci/warninghydrogen.html>,

Hydrogen gas is odorless and colorless, and it burns almost invisibly. A tiny fire may go undetected at a leaky fuel pump until your pant leg goes up in flames. And it doesn’t take much to set compressed hydrogen gas alight. “A cellphone or a lightning storm puts out enough static discharge to ignite hydrogen,” claims Joseph Romm, author of The Hype about Hydrogen: Fact and Fiction in the Race to Save the Climate and founder of the Center for Energy and Climate Solutions in Arlington, Virginia. A fender bender is unlikely to spark an explosion, because carbon-fiber-reinforced hydrogen tanks are virtually indestructible. But that doesn’t eliminate the danger of leaks elsewhere in what will eventually be a huge network of refineries, pipelines and fueling stations. “The obvious pitfall is that hydrogen is a gas, and most of our existing petrochemical sources are liquids,” says Robert Uhrig, professor emeritus of nuclear engineering at the University of Tennessee and former vice president of Florida Power & Light. “The infrastructure required to support high-pressure gas or cryogenic liquid hydrogen is much more complicated. Hydrogen is one of those things that people have great difficulty confining. It tends to go through the finest of holes.” To calculate the effects a leaky infrastructure might have on our atmosphere, a team of researchers from the California Institute of Technology and the Jet Propulsion Laboratory in Pasadena, California, looked at statistics for accidental industrial hydrogen and natural gas leakage—estimated at 10 to 20 percent of total volume—and then predicted how much leakage might occur in an economy in which everything runs on hydrogen. Result: The amount of hydrogen in the atmosphere would be four to eight times as high as it is today. The Caltech study “grossly overstated” hydrogen leakage, says Assistant Secretary David Garman of the Department of Energy’s Office of Energy Efficiency and Renewable Energy. But whatever its volume, hydrogen added to the atmosphere will combine with oxygen to form water vapor, creating noctilucent clouds—those high, wispy tendrils you see at dawn and dusk. The increased cloud cover could accelerate global warming.

## AT Oil Dependence Advantage

### No Solvency – Can’t Eliminate Dependence

#### The refining of hydrogen fuel will perpetuate oil dependence

Barry Lynn, May/June 2003, Mother Jones, "hydrogen's dirty secret," <http://www.motherjones.com/environment/2003/05/hydrogens-dirty-secret>

When President Bush unveiled his plans for a hydrogen-powered car in his State of the Union address in January, he proposed $1.2 billion in spending to develop a revolutionary automobile that will be "pollution-free." The new vehicle, he declared, will rely on "a simple chemical reaction between hydrogen and oxygen" to power a car "producing only water, not exhaust fumes." Within 20 years, the president vowed, fuel-cell cars will "make our air significantly cleaner, and our country much less dependent on foreign sources of oil." By launching an ambitious program to develop what he calls the "Freedom Car," Bush seemed determined to realize the kind of future that hydrogen-car supporters have envisioned for years. Using existing technology, hydrogen can be easily and cleanly extracted from water. Electricity generated by solar panels and wind turbines is used to split the water's hydrogen atoms from its oxygen atoms. The hydrogen is then recombined with oxygen in fuel cells, where it releases electrons that drive an electric motor in a car. What Bush didn't reveal in his nationwide address, however, is that his administration has been working quietly to ensure that the system used to produce hydrogen will be as fossil fuel-dependent -- and potentially as dirty -- as the one that fuels today's SUVs. According to the administration's National Hydrogen Energy Roadmap, drafted last year in concert with the energy industry, up to 90 percent of all hydrogen will be refined from oil, natural gas, and other fossil fuels -- in a process using energy generated by burning oil, coal, and natural gas. The remaining 10 percent will be cracked from water using nuclear energy. Such a system, experts say, would effectively eliminate most of the benefits offered by hydrogen. Although the fuel-cell cars themselves may emit nothing but water vapor, the process of producing the fuel cells from hydrocarbons will continue America's dependence on fossil fuels and leave behind carbon dioxide, the primary cause of global warming.

#### Hydrogen cars will increase reliance on imported oil

Joseph J. Romm March 17, 2004 [“Hype about Hydrogen” Technology Review Romm is the former Assistant Secretary of Energy and Executive Director of the Center for Energy and Climate Solutions <http://www.technologyreview.com/Energy/13518/>]

It is a popular misconception that hydrogen is inherently good for the environment. But in fact, hydrogen is no greener than the energy sources used to produce it. As the National Academy panel noted, "It is highly likely that fossil fuels will be the principal sources of hydrogen for several decades." Any premature push toward hydrogen cars would inevitably mean the hydrogen would come from the cheapest source today, natural gas. Yet, given the constraints on the North American gas supply, we would just be trading imported gas for imported oil.

#### Hydrogen wont reduce our dependence on foreign oil. – solving the oil advantage is still at least 30 years away

Whitten 05, Daniel Whitten, Inside Energy with Federal Lands March 28, 2005 <http://www.lexisnexis.com/hottopics/lnacademic/> zp

A child born today will be among a small minority if he or she is driving a hydrogen-powered car, even in 2050, according to Bush administration projections. In FY-06 budget documents sent to Congress, the administration estimates that hydrogen technologies would displace only 200,000 barrels per day of oil in 2025 and 2.7 million b/d in 2050. This despite the fact that President Bush talks about hydrogen as a potential solution to U.S. dependence on Middle East oil. The Energy Information Administration estimates that U.S. oil demand will be 27.9 million b/d in 2025. EIA does not have a figure for U.S. consumption in 2050, though the Energy Department estimates North American demand will be close to 40 million b/d then. "I don't see hydrogen emerging as a major replacement for oil in the next decade or two, and I think DOE's numbers bare that out," said Dan Reicher, an assistant secretary for energy efficiency and renewable energy during the Clinton administration. In budget justifications for DOE's $257-million FY-06 budget request for hydrogen, the administration said hydrogen technologies will boost clean energy supplies, "dramatically reducing, or even ending dependence on foreign oil." But the same document also estimates that hydrogen will displace less than 1% of the oil the country is projected to use in 2025. The data indicate that the United States will need to come up with an alternative to hydrogen if the country wants to quench its growing thirst for foreign oil in the first half of this century. According to EIA data, the U.S. will import 68% of its crude oil in 2025, up from 56% in 2003. While there appears to be a general consensus among policy-makers that hydrogen offers great promise, uncertainty over its potential role also raises questions about the extent to which the United States should rely on it, and when. The president has been actively touting hydrogen since his January 2003 State of the Union address. "Our scientists and engineers will overcome obstacles to taking these cars from laboratory to showroom, so that the first car driven by a child born today could be powered by hydrogen, and pollution-free," he said in the speech. The following month, Bush said, "If we develop hydrogen power to its full potential, we can reduce our demand for oil by over 11 million barrels per day by the year 2040." To achieve his aims for hydrogen, the president has pledged to spend $1.2 billion over five years though 2008. David Garman, DOE's assistant secretary for EERE, said the administration was not sacrificing research into other technologies in its quest to usher in a hydrogen economy. "We're not putting all our eggs in one basket," he said. "We are still working on hybrids, advanced internal combustion engines and biofuels. But no single technology gets you as far as hydrogen" toward reducing reliance on foreign oil imports, he said. His assertions are largely supported by the president's FY-06 budget request, which provides an 8% boost to hybrid funding and a 7% jump to fuels technology funding over levels appropriated for FY-05. The department has pledged to slash 17% from the budget for advanced combustion engine r&d. Reicher argued that the administration will not meet its goals, though he added that its long-term research plans could lead to a fleet of automobiles that run on hydrogen in the next five or six decades. He said the private sector's interest has been tepid, which hurts the administration's already overly hopeful goals. "Setting aside what government is doing, I don't see the success in the private sector that we were envisioning even a few years ago," he said. Garman said hydrogen could dramatically cut reduce gasoline use in light-duty vehicles in 35 years. "Some of our models suggest that most, if not all, of the light-duty fleet could be fueled by hydrogen by 2040 if we are fully successful and the business case for hydrogen can be made," he said. The $257 million the department has requested in FY-06 for hydrogen is roughly a 13% jump over the $225 million Congress appropriated for FY-05. Critical to the future of hydrogen cars is a scheduled 2015 commercialization decision, Garman said. DOE expects the auto industry and others will decide then whether development of hydrogen technology has gone far enough to justify rolling out hydrogen cars on a commercial schedule. Nobody, including Garman, believes that getting to a hydrogen economy will be without hurdles. Critics of the administration's hydrogen plan ? ranging from the conservative think tank Cato Institute, to the Public Interest Research Group, to the National Academy of Sciences ? complain in one form or another that hydrogen is not the best way to reduce oil use over the next 50 years. In debates on the issue, three pervasive criticisms of hydrogen come up: There is no infrastructure in place to fuel hydrogen cars; producing hydrogen is inefficient and may require use of expensive sources like natural gas; and hybrid cars and renewable fuels could provide substantially more fuel economy than today's cars using existing infrastructure. Donald Anthrop, a former San Jose State University professor who conducted a study for Cato, said 74% of the energy content of gas is lost in producing hydrogen and running it through fuel cells. "If you poured enough money into it, you could probably improve the efficiency of the fuel cell," Anthrop said. "But I'm not at all persuaded that hydrogen is going to be any part of a solution to anything." He added, "As the price of energy goes up, throwing energy away making hydrogen becomes less attractive. Hydrogen is certainly not energy efficient, and if it's not energy-efficient, it's not cost-effective." Reicher said competing automobile technologies are going to push back the timetable for hydrogen cars. "As hybrids take hold in the market and as the use of renewable fuels becomes more real, I think that represents a major challenge to build an entirely new hydrogen production and distribution infrastructure," he said. Reicher was involved in the Clinton administration's Partnership for a New Generation of Vehicles, a government-industry collaboration promoting development of fuel-efficient hybrid cars. The Bush administration killed the initiative soon after it took office. DOE is not the only hydrogen advocate. Sens. Byron Dorgan, D-N.D., and Lindsey Graham, R-S.C., are sponsoring legislation that would devote $7.9 billion over 10 years to r&d that Dorgan says would transform the transportation sector with hydrogen and fuel cells. "We have only just begun to explore the potential of hydrogen fuel cell technology," Dorgan said recently. "This bill will create the 'Apollo Project' our nation needs to make hydrogen technology a real part of our energy picture for future generations and realize true energy independence." The bill (S. 665) is about as expensive as the Bush administration's proposed expenditures under comprehensive energy legislation, which policy-makers hope will solve all manner of energy problems facing the country. Brian Wynn, president of the Electric Drive Transportation Association, said the Dorgan-Graham bill is "an understanding that we need concrete steps in order to get to the targets, and that is not necessarily going to come without additional public investment." Wynn's group is promoting various new vehicle technologies. He said the country is well on the way to developing cars that will ease U.S. dependence on foreign energy sources while also helping the environment. When asked, he could not say when that day will come. Garman said that even if industry decides to move ahead and build hydrogen cars on a commercial scale, "there are not that many [hydrogen] cars on the road in 2020. ? We have always consistently said that."

#### Multiple barriers prevent the implementation of large enough hydrogen fuel infrastructure to solve the harms of the 1ac.

Ken Silverstein, Editor, Energy Central. “Hydrogen-Powered Vehicles Could Emerge From Traffic”, Forbes. 06/06/2012. <http://www.forbes.com/sites/kensilverstein/2012/06/06/hydrogen-powered-vehicles-could-emerge-from-traffic/>

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The “hydrogen economy” is taking a back seat to the “green economy,” which essentially means that today’s prevailing automotive technologies are pushing the purest energy forms further down the road. In other words, the latest hybrid vehicles and all-electric cars are already here. So the use of [hydrogen in fuel cells](http://www.energybiz.com/article/11/05/hydrogens-hope) to run cars, buses and trucks are still stuck in traffic. But maybe not for too much longer. A lot of smart people are working to commercialize the effort and to produce ultra-clean vehicles that could run 300 miles before they would need to re-juice. In fact, both the national energy labs as well as the auto companies are laboring, with Toyota saying it wants to have a hydrogen-powered sedan ready next decade. “The hydrogen economy has a high degree of environmental friendliness,” says Bryan Pivovar, acting director for hydrogen projects at the [National](http://www.nrel.gov/hydrogen/proj_tech_validation.html)[Energy](http://www.forbes.com/energy/) Renewable Laboratory, in a phone conversation with this reporter. “But it comes down to questions of economics: Hybrids are here now while fuel cell-powered vehicles will initially emerge in small numbers and then gradually expand.” The paradox is, however, that no one wants to construct hydrogen fueling stations if hydrogen vehicles are not mass produced, he adds. But they won’t be built until the infrastructure exists. That dilemma is being addressed. Notably, Toyota, [Daimler](http://www.forbes.com/companies/daimler/) and Hyundai all have projects in the mix. The vehicles will trickle out at first but may eventually start to flow. “We are preparing to be able to produce tens of thousands per year in the 2020s,” says Didier Leroy, head of Toyota’s European operations, in a formal statement at a car show. Obstacles, though, are standing in the way. Hydrogen does not sit alone in nature and must therefore be separated from oxygen. To break it out, however, requires energy produced by other fuels. If fossil fuels are used, the process then consumes more energy than is produced, and the result is likely more pollution. If renewable or nuclear sources are used, the procedure is more benign. But questions arise as to whether it is more efficient to make hydrogen or just directly burn the associated fuels. Abundant shale gas resources could be used. Such unconventional natural gas releases about half the emissions as coal. But the problem is that it takes a lot of natural gas to isolate the hydrogen, leaving many to say that it would be more productive to just combust the natural gas in a conventional engine. “Initially, hydrogen will likely come from the steam reforming of natural gas, as this is the most economic route,” says the renewable lab’s Pivovar. It is also difficult to store hydrogen — something the [U.S. Department of Energy](http://www.fueleconomy.gov/feg/fuelcell.shtml) has said is the top priority when it comes to commercializing fuel cell vehicles. There is a further need to develop a pipeline infrastructure that can deliver the product. Pipelines that move hydrogen are said to be 30 percent more expensive than those that carry natural gas. While the production of hydrogen results in lost energy, Pivovar says that the use of hydrogen in a fuel cell vehicle provides much more oomph than gasoline. That would help compensate for those efficiency losses during the generation process. [Fuel](http://blogs.forbes.com/christopherhelman/) cells are now being adopted in the area of materials handling equipment that includes fork lifts as well as in the [field of telecommunications](http://www.energybiz.com/article/12/05/fuel-cells-arent-spewing-hot-air), says Pivovar. As for the automotive sector, he says that the first fuel cells will also include a battery. With that, he goes on to say that today’s hybrid vehicles will evolve and serve as a bridge to the ultimate hydrogen economy. The know-how exists but the cost of creating a new hydrogen-powered auto sector is now prohibitive. That’s why the immediate focus will remain on improving those hybrid technologies that are firmly planted. All-electrics are next in line while hydrogen-fueled vehicles are a few car lengths behind.

### Dependence Decreasing Now

#### The US is already decreasing oil dependence without the use of hydrogen

Angel Gonzalez, Wall Street Journal. “Expanded Oil Drilling Helps U.S.Wean Itself From Mideast”

The Wall Street Journal. 06/27/2012. http://online.wsj.com/article/SB10001424052702304441404577480952719124264.html

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America will halve its reliance on Middle East oil by the end of this decade and could end it completely by 2035 due to declining demand and the rapid growth of new petroleum sources in the Western Hemisphere, energy analysts now anticipate. The shift, a result of technological advances that are unlocking new sources of oil in shale-rock formations, oil sands and deep beneath the ocean floor, carries profound consequences for the U.S. economy and energy security. A good portion of this surprising bounty comes from the widespread use of hydraulic fracturing, or fracking, a technique perfected during the last decade in U.S. fields previously deemed not worth tampering with. By 2020, nearly half of the crude oil America consumes will be produced at home, while 82% will come from this side of the Atlantic, according to the U.S. Energy Information Administration. By 2035, oil shipments from the Middle East to North America "could almost be nonexistent," the Organization of Petroleum Exporting Countries recently predicted, partly because more efficient car engines and a growing supply of renewable fuel will help curb demand. The change achieves a long-sought goal of U.S. policy-making: to draw more oil from nearby, stable sources and less from a volatile region half a world away. "Whereas at one point there were real and serious concerns about the ability to maintain sustainable access of supplies to the United States if there were disruptions in the Middle East, that has changed," Carlos Pascual, the top energy official at the State Department, said in an interview.

#### Oil Dependence Dropping in the Status Quo—Oil imports from the Middle east could be nonexistent by 2035`

International Business Times,June 27**,** 2012. Phil Flynn, “Energy Report—In Good Company” International Business Times June 27, 2012, http://www.ibtimes.com/articles/356937/20120627/en ergy-report-good-company.htm, KB

As reported by Bloomberg News a Harvard University Researcher is predicting a big rise in global oil production and a major drop in price. See I told you it wouldn't be long before the bears were jumping on the bandwagon. Just Kidding Harvard! Leonardo Maugeri, a fellow at Harvard's Belfer Center for Science and International Affairs in Cambridge, Massachusetts, said in a report that global oil output capacity could climb by 20 percent by the year 2020 in what would be the "most significant" gain in a decade since the 1980s. Global oil output capacity may climb almost 20 percent by 2020, led by gains in Iraq, the U.S., Canada and Brazil, raising production capacity to 110.6 by 2020 from 93 million barrels a day in 2011 which he predicts may prompt a plunge in oil prices. Mr. Maugeri says that three of the four biggest capacity gains will occur in the Western Hemisphere countries that are boosting output of so- called unconventional oils, the report showed. Iraq will be the only one of the four in the Persian Gulf region, pumping mostly conventional crude oil, according to Maugeri, who was director of strategy and development at Eni Spa, Europe's fourth-largest energy company, from 2000 until 2010. "Thanks to the technological revolution brought about by the combined use of horizontal drilling and hydraulic fracturing, the U.S. is now exploiting its huge and virtually untouched shale and tight oil fields," Maugeri said in the report. "U.S. shale-tight oil could be a paradigm shifter." The other paradigm shifter has been changing us demand patterns. In fact you only have to go as far as the weekly MasterCard Spending Pulse report to see the evidence of demand destruction. According to MasterCard US Fuel Consumption came in 3.5 percent below the year-earlier level, the 43rd straight drop in that measure. Year-to-date gasoline demand is 4.7 percent below 2011. Fuel use over the previous four weeks fell 3.2 percent below the same period in 2011, a record 66th consecutive drop in that measure. Now I guess we can blame the economy for the demand drop but the question you then have to ask is whether things are really that much worse that they were a year ago. If the answer is no then you really have to start thinking about what is permanent demand destruction. You see the combination of long term demand destruction as well as the emergence of new technologies is changing the face of demand. We are producing more oil and we are being more fuel efficient and that is the recipe for lower prices. Even the Wall street Journal today is bringing up something we have talked about many times before and that is that our dependence on Middle Eastern Oil is becoming a thing of the past. In today's Journal it says that ' America will halve its reliance on Middle East oil by the end of this decade and could end it completely by 2035 due to declining demand and the rapid growth of new petroleum sources in the Western Hemisphere, energy analysts now anticipate.

### Dependence Inevitable

#### Energy Independence is impossible – can’t produce enough alternatives

Hadar 2008 (Leon –3-28, Washington correspondent, Business Times Singapore, “Facts don’t back notion of US energy independence,” Lexis-Nexis, EA)

Mr Bryce demolishes the many 'false promises' that are promoted by those calling for energy independence. For example: That energy independence will reduce or eliminate terrorism. (Terrorism is not dependent on oil: terrorist groups have operated for years without petrodollars.) That big push for renewable and alternative fuel will mean energy independence. (In 2006, the US produced about five billion gallons of corn ethanol, and 250 million gallons of bio-diesel. But that was only 90 per cent of the energy demands of a single airline - American Airlines. And using the entire existing crops of soybeans and corn to make ethanol and bio-diesel would still only displace about 7.5 per cent of America's oil imports.) Or that energy independence will cause a collapse of global oil prices that will benefit the US. (The collapse of oil prices could result in the collapse of America's domestic oil production and increase its reliance on foreign oil.) The reality is that the world, and the energy business in particular, is becoming more interdependent, and that interdependence is likely to only accelerate as new supplies of fossil fuel become more difficult to find and more expensive to produce. Notwithstanding all the concerns about oil shortages, global warming, wars in the Persian Gulf, and terrorism, 'the plain and unavoidable truth is that US, along with nearly every other country on the planet, is married to fossil fuel', a reality that is not going to change in the next 30 to 50 years, Mr Bryce says. That means that American politicians and business executives will need to be actively engaged with the energy-producing economies of the world, especially in the Middle East. They will need to embrace the global market for energy while acknowledging the limits on the ability to develop new sources of energy that could displace fossil fuels and nuclear reactors.

#### Solving dependence takes decades

Klare 06 (Michael T., 6-10, Professor of Peace and World Security Studies at Hampshire College, “The Permanent Energy Crisis,” CommonDreams, <http://www.commondreams.org/views06/0210-20.htm>, EA)

"Up to this point," Senator Richard G. Lugar told the Senate Foreign Relations Committee on November 16, "the main issues surrounding oil have been how much we have to pay for it and whether we will experience supply disruptions. But in the decades to come, the issue may be whether the world's supply of oil is abundant and accessible enough to support continued economic growth…. When we reach the point where the world's oil-hungry economies are competing for insufficient supplies of energy, oil will become an even stronger magnet for conflict than it already is." Averting Environmental Catastrophe In addition to this danger, we face the entire range of environmental perils associated with our continuing reliance on fossil fuels. Consider this: The DoE predicted in July 2005 that worldwide emissions of carbon dioxide (the principal source of the "greenhouse gases" responsible for global warming) will rise by nearly 60% between 2002 and 2025 -- with virtually all of this increase, about 15 billion metric tons of CO2, coming from the consumption of oil, gas, and coal. If this projection proves accurate, the world will probably pass the threshold at which it will be possible to avert significant global heating, a substantial rise in sea-levels, and all the resulting environmental damage. The surest way to slow the increase in global carbon emissions is to reduce our consumption of fossil fuels and accelerate the transition to alternative forms of energy. But because such alternatives are not currently capable of replacing oil, gas, and coal on a significant scale (and won't be, at present rates of investment, for another few decades), the temptation to increase reliance on fossil fuels is likely to remain strong. We are, in fact, caught in a conundrum: the world needs more energy to satisfy rising global demand, and the only way to accomplish this at present is to squeeze out more oil, gas, and coal from the Earth, thereby hastening the onset of catastrophic climate change. In turn, the only way to avert such change is to consume less oil, gas, and coal, which would involve severe economic costs of a sort that most national leaders would be reluctant to consider. Hence, we will be trapped in a permanent crisis brought on by our collective addiction to cheap energy.

### Dependence Defense - General

#### U.S. Oil dependence not bad

Ivan Eland, 7/12/08, , Independent.org “U.S. Dependence on Foreign Oil: Why We Shouldn’t Be Alarmed " http://independent.org/newsroom/article.asp?id=2306

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But one thing is sure: it’s a myth that being dependent on imported oil is bad. As a way to stump politicians who perpetuate this nonsense, perhaps we should ask them this question: If oil is so critical and will become even more valuable when world supplies allegedly dwindle in the future, shouldn’t we use other countries’ oil now and have the U.S. government require that our limited production be saved to use or sell as the shortages worsen and future prices go even higher? Diametrically opposed to the present time, with the prevalent fears of dependency on foreign oil, this “conservation theory” was all the rage in the late 1930s and 1940s when a slowdown in finding new oil deposits seemed to threaten chronic future shortages (similar to the dire predictions after World War I and in the early 1920s before big oil discoveries were made late in the 1920s).

### Independence Doesn’t Solve

#### Fear of energy dependence is overblown – and independence wouldn’t solve oil shocks anyway

Wall Street Journal**,** June 27**,** 2012**.** SethBorenstein and Dina Cappiello, “Exxon’s CEO: Climate, Energy Fears Overblown” Wall Street Journal June 27, 2012, http://online.wsj.com/article/AP7d046 778cdba4ee5959394a30b7c2cfa.html, KB

NEW YORK — ExxonMobil CEO Rex Tillerson says fears about climate change, drilling, and energy dependence are overblown. In a speech Wednesday, Tillerson acknowledged that burning of fossil fuels is warming the planet, but said society will be able to adapt. The risks of oil and gas drilling are well understood and can be mitigated, he said. And dependence on other nations for oil is not a concern as long as access to supply is certain, he said. Tillerson blamed a public that is "illiterate" in science and math, a "lazy" press, and advocacy groups that "manufacture fear" for energy misconceptions in a speech at the Council on Foreign Relations. He highlighted that huge discoveries of oil and gas in North America have reversed a 20-year decline in U.S. oil production in recent years. He also trumpeted the global oil industry's ability to deliver fuels during a two-year period of dramatic uncertainty in the Middle East, the world's most important oil and gas-producing region. "No one, anywhere, any place in the world has not been able to get crude oil to fuel their economies," he said. In his speech and during a question-and-answer session after, he addressed three major energy issues: Climate change, oil and gas drilling pollution, and energy dependence. CLIMATE CHANGE Tillerson, in a break with predecessor Lee Raymond, has acknowledged that global temperatures are rising. "Clearly there is going to be an impact," he said Wednesday. But he questioned the ability of climate models to predict the magnitude of the impact. He said that people would be able to adapt to rising sea levels and changing climates that may force agricultural production to shift. "We have spent our entire existence adapting. We'll adapt," he said. "It's an engineering problem and there will be an engineering solution." Andrew Weaver, chairman of climate modeling and analysis at the University of Victoria in Canada, disagreed with Tillerson's characterization of climate modeling. He said modeling can give a very good sense of the type of climate changes that are likely. And he said adapting to those changes will be much more difficult and disruptive than Tillerson seems to be acknowledging. Steve Coll, author of the recent book "Private Empire: ExxonMobil and American Power," said he was surprised Exxon would already be talking about ways society could adapt to climate change when there is still time to try to avoid its worst effects. Also, he said, research suggests that adapting to climate change could be far more expensive than reducing emissions now. "Moving entire cities would be very expensive," he said. Legislation or regulation that would help slow the emissions of global warming gases would likely lead to lower demand for oil and gasoline, and could reduce Exxon's profit. DRILLING Tillerson expressed frustration at the level of public concern over new drilling techniques that tap natural gas and oil in shale formations under several states. He said environmental advocacy groups that "manufacture fear" have alarmed a public that doesn't understand drilling practices — or math, science or engineering in general. He blamed "lazy" journalists for producing stories that scare the public but don't investigate the claims of advocacy groups. Drilling for oil and gas will always involve risks of spills and accidents, he said. But those risks are manageable and worth taking because they are small given the amount of energy they produce. Drilling in shale formations, he said, only poses a small risk to those living nearby. It is neither life threatening nor long lasting and can be controlled in the event of an accident. Drillers force millions of gallons of water mixed with sand and some hazardous chemicals into shale formations. The technique breaks up rock and creates escape routes for oil and gas. If the drilling wastewater is not treated properly or if it seeps through cracked drilling pipes, it could contaminate drinking water. The industry's biggest challenge, he said, is "taking an illiterate public and try to help them understand why we can manage these risks." ENERGY SECURITY Tillerson made a distinction between energy security and energy dependence. He said that energy security — making sure that the economy has access to energy — is crucial. But he said access to energy is not in peril. "Some of the fears around energy security are not well founded," he said. The quest for energy independence, though, is misguided, he said. It doesn't matter where the U.S. gets oil because crude is priced globally. Even if the U.S. used only oil from North America, a disruption in the Middle East would increase global prices, hurt the U.S. and global economies, and force Americans to pay more at the pump. Even if the U.S. no longer needed Middle Eastern oil, it would likely want to play a major role in helping maintain the region's security, Tillerson said.

### AT Resource Wars

#### Scarcity of resources doesn’t cause conflict – no evidence otherwise

Salehyan 07 [Idean Salehyan, assistant professor of political science at the University of North Texas, “The New Myth About Climate Change”, Foreign Policy, August 2007, <http://www.foreignpolicy.com/story/cms.php?story_id=3922>]

First, aside from a few anecdotes, there is little systematic empirical evidence that resource scarcity and changing environmental conditions lead to conflict. In fact, several studies have shown that an abundance of natural resources is more likely to contribute to conflict. Moreover, even as the planet has warmed, the number of civil wars and insurgencies has decreased dramatically. Data collected by researchers at Uppsala University and the International Peace Research Institute, Oslo shows a steep decline in the number of armed conflicts around the world. Between 1989 and 2002, some 100 armed conflicts came to an end, including the wars in Mozambique, Nicaragua, and Cambodia. If global warming causes conflict, we should not be witnessing this downward trend. Furthermore, if famine and drought led to the crisis in Darfur, why have scores of environmental catastrophes failed to set off armed conflict elsewhere? For instance, the U.N. World Food Programme warns that 5 million people in Malawi have been experiencing chronic food shortages for several years. But famine-wracked Malawi has yet to experience a major civil war. Similarly, the Asian tsunami in 2004 killed hundreds of thousands of people, generated millions of environmental refugees, and led to severe shortages of shelter, food, clean water, and electricity. Yet the tsunami, one of the most extreme catastrophes in recent history, did not lead to an outbreak of resource wars. Clearly then, there is much more to armed conflict than resource scarcity and natural disasters.

### AT US-China War

#### Military primacy and economic interdependence will prevent a war with China. Even China admits that it will be at least 20 years before it can challenge the U.S.

Phil Stewart, 2/1/11, Reuters, "Analysis: U.S. military says keeps up with china; is it enough?" <http://www.reuters.com/assets/print?aid=UKTRE7101AG20110201>

The core U.S. defense budget -- not including war funding -- was $530 billion in 2010. That's well beyond China's 532.1 billion yuan (about $80 billion) in official defense spending. Analysts believe that China's military spending is much higher than it publicly admits. "The Chinese are not 10 feet tall," said Admiral Mike Mullen, who as chairman of the U.S. military's Joint Chiefs of Staff is the top U.S. military officer. A top Chinese official acknowledged recently the United States will retain unchallengeable global dominance for at least two decades. Still, analysts point out that Chinese advances in areas like cyber warfare could more quickly level the playing field. The U.S. military can invest heavily in new capabilities, but it will always have weaknesses that can be exploited. A U.S. military official, speaking on condition of anonymity, said exercises and simulations conducted by the U.S. military have taken into account new technologies and capabilities in the region that could alter the status quo. The official declined to cite China specifically. Pentagon officials, when asked about China, have pointed to a five-year budget plan that -- while lower than initially projected -- still invests heavily in new technologies like a new generation of long-range nuclear bombers, jammers and radar. The U.S. military does not expect to build new bases in Asia in the near future but aims to "enhance" its presence in Southeast Asia while maintaining it in Northeast Asia, Gates said recently. There are nearly 80,000 U.S. military personnel stationed in Japan and South Korea alone. Gates recently warned an audience in Tokyo that China "might behave more assertively toward its neighbors" without the U.S. presence in Japan. INEVITABLE ADVERSARIES? Gates, for one, has said he did not believe the United States and China are "inevitable strategic adversaries." The United States and China are the world's two largest economies, and some analysts say their economic dependency and shared interest in global stability will over time smooth tensions -- and lower the risk of conflict. "The Chinese do not want to go to war with us. They own too much of our debt, and rely too much on us for trade," said Chris Hellman of the nonprofit National Priorities Project.

### AT Terrorism – Low Risk

#### Their terrorism scenario is hype – all facets of Al-Qaeda are on the decline

Michael Cohen and Micah Zenko, March/April 2012, Foreign Affairs, "Clear and Present Safety: The United States is more secure than Washington Thinks," <http://search.proquest.com.proxy.wichita.edu/docview/923214213/135A8598FDC5D1705EB/9?accountid=15042>

Take terrorism. Since 9/11, no security threat has been hyped more. Considering the horrors of that day, that is not surprising. But the result has been a level of fear that is completely out of proportion to both the capabilities of terrorist organizations and the United States' vulnerability. On 9/11, al Qaeda got tragically lucky. Since then, the United States has been preparing for the one percent chance (and likely even less) that it might get lucky again. But al Qaeda lost its safe haven after the U.S.-led invasion of Afghanistan in 2001, and further military, diplomatic, intelligence, and law enforcement efforts have decimated the organization, which has essentially lost whatever ability it once had to seriously threaten the United States. According to U.S. officials, al Qaeda's leadership has been reduced to two top lieutenants: Ayman al-Zawahiri and his second-in-command, Abu Yahya al-Libi. Panetta has even said that the defeat of al Qaeda is "within reach." The near collapse of the original al Qaeda organization is one reason why, in the decade since 9/11, the U.S. homeland has not suffered any large-scale terrorist assaults. All subsequent attempts have failed or been thwarted, owing in part to the incompetence of their perpetrators. Although there are undoubtedly still some terrorists who wish to kill Americans, their dreams will likely continue to be frustrated by their own limitations and by the intelligence and law enforcement agencies of the United States and its allies.

### AT Terrorism – Nuclear Terrorism Defense

#### Terrorism won’t go nuclear and they won’t be able to attack the US - several warrants

Mearsheimer11**,**January, John J., Wendell Harrison Distinguished Service Professor of Political Science at the University of Chicago. He is on the Advisory Council of The National Interest, “Imperial by Design,”<http://nationalinterest.org/article/imperial-by-design-4576?page=3>,

The fact is that states have strong incentives to distrust terrorist groups, in part because they might turn on them someday, but also because countries cannot control what terrorist organizations do, and they may do something that gets their patrons into serious trouble. This is why there is hardly any chance that a rogue state will give a nuclear weapon to terrorists. That regime’s leaders could never be sure that they would not be blamed and punished for a terrorist group’s actions. Nor could they be certain that the United States or Israel would not incinerate them if either country merely suspected that they had provided terrorists with the ability to carry out a WMD attack. A nuclear handoff, therefore, is not a serious threat. When you get down to it, there is only a remote possibility that terrorists will get hold of an atomic bomb. The most likely way it would happen is if there were political chaos in a nuclear-armed state, and terrorists or their friends were able to take advantage of the ensuing confusion to snatch a loose nuclear weapon. But even then, there are additional obstacles to overcome: some countries keep their weapons disassembled, detonating one is not easy and it would be difficult to transport the device without being detected. Moreover, other countries would have powerful incentives to work with Washington to find the weapon before it could be used. The obvious implication is that we should work with other states to improve nuclear security, so as to make this slim possibility even more unlikely. Finally, the ability of terrorists to strike the American homeland has been blown out of all proportion. In the nine years since 9/11, government officials and terrorist experts have issued countless warnings that another major attack on American soil is probable—even imminent. But this is simply not the case.3 The only attempts we have seen are a few failed solo attacks by individuals with links to al-Qaeda like the “shoe bomber,” who attempted to blow up an American Airlines flight from Paris to Miami in December 2001, and the “underwear bomber,” who tried to blow up a Northwest Airlines flight from Amsterdam to Detroit in December 2009. So, we do have a terrorism problem, but it is hardly an existential threat. In fact, it is a minor threat. Perhaps the scope of the challenge is best captured by Ohio State political scientist John Mueller’s telling comment that “the number of Americans killed by international terrorism since the late 1960s . . . is about the same as the number killed over the same period by lightning, or by accident-causing deer, or by severe allergic reactions to peanuts.”

#### No retaliation

J.R. Nyquist, 10/19/07, "The Logic of Nuclear Proliferation," <http://www.financialsense.com/stormwatch/geo/pastanalysis/2007/1019.html>

A few days ago President Bush made a chilling statement. He said that if we wanted to avoid World War III we must not allow the current Iranian government to acquire nuclear weapons. He spoke from the conviction that Islamic fundamentalists with nuclear weapons cannot be checked by the threat of retaliation. A faith that sanctifies suicide bombers might be expected to sanctify a suicidal nuclear exchange. What nobody wants to hear, and nobody will say, is that the situation is much worse than President Bush imagines. More than half a century ago the Russians acquired nuclear weapons. In 1964 China became a nuclear power. While the nuclear martyrdom of an Islamic nation is to be feared, the rational use of nuclear weapons by Russia and China is even more likely. If a nuclear bomb were detonated in New York we would not be able to prove that Moscow or Beijing conspired in the attack; especially if Iran and North Korea possess nuclear weapons. America can be attacked anonymously. The enemies of America know this to be true; therefore they want nuclear weapons technology to spread throughout the world. When New York and Washington are destroyed, nobody will know who ordered the attack. In that event retaliation will be impossible. Mutual Assured Destruction (MAD) will be a thing of the past. The generals in Moscow and Beijing are working out a strategy based on the knowledge that America is defenseless; for America’s strategy has been based on a doctrine of massive retaliation.

## AT Pollution Advantage

### Alt Cause – India/Brazil

#### ALT CAUSE – INDIA & BRAZIL

ROY 2012 Nabanita Roy, RushLane, Daily Auto News, “Vehicle pollution and fumes in India leading to chronic diseases”, 6/25/2012, <http://www.rushlane.com/vehicle-pollution-and-fumes-in-india-leading-to-chronic-diseases-1237493.html>

The environmental problems in India are growing rapidly. As the country grows economically, there is rapid deterioration of quality of air that we breathe. Growing population is one of the primary reasons for this chronic problem that we are facing. India is a country that has grown from 300 million people in 1947 to over 1 billion strong today. India ranks seventh in the most environmentally hazardous country in the world. Brazil is the worst on environmental indicators while Singapore is the best followed by the US and China. India needs to take up air pollution on a war footing. Rising incidents of chronic diseases is a major concern. Rising vehicular population and rising industrialization are the two major factors contributing to this pathetic air quality situation in the country.

### Alt Cause – Water Pollution

#### Multiple alternate causes to water pollution

Rubin 2009 Dr. Ken Rubin, Assistant Professor Department of Geology and Geophysics, University of Hawaii, Reply to ASK-AN-EARTH-SCIENTIST, Subject: Sources of Water Pollution, <http://www.soest.hawaii.edu/GG/ASK/waterpol3.html>, 2009

There are many causes for water pollution but two general categories exist: direct and indirect contaminant sources. Direct sources include effluent outfalls from factories, refineries, waste treatment plants etc.. that emit fluids of varying quality directly into urban water supplies. In the United States and other countries, these practices are regulated, although this doesn't mean that pollutants can't be found in these waters. Indirect sources include contaminants that enter the water supply from soils/groundwater systems and from the atmosphere via rain water. Soils and groundwaters contain the residue of human agricultural practices (fertilizers, pesticides, etc..) and improperly disposed of industrial wastes. Atmospheric contaminants are also derived from human practices (such as gaseous emissions from automobiles, factories and even bakeries).

### Alt Cause – Air Pollution

#### Stationary sources are a bigger alt cause of air pollution

NPS 2012, National Park Service, 2012, Air Pollution - Its Nature, Sources, and Effects, <http://www.nps.gov/shen/naturescience/airpollution.htm>

Air pollution occurs in many forms but can generally be thought of as gaseous and particulate contaminants that are present in the earth's atmosphere. Gaseous pollutants include sulfur dioxide (SO2), nitrogen oxides (NOx), ozone (O3), carbon monoxide (CO), volatile organic compounds (VOC), hydrogen sulfide (H2S), hydrogen fluoride (HF), and various gaseous forms of metals. These pollutants are emitted from large stationary sources such as fossil fuel fired power plants, smelters, industrial boilers, petroleum refineries, and manufacturing facilities as well as from area and mobile sources. They are corrosive to various materials which causes damage to cultural resources, can cause injury to plants and animals, aggravate respiratory diseases, and reduce visibility.

### Hydrogen Can’t Solve Pollution

#### H2 creates more pollution than it solves

Sanders 2003 Robert Sanders, Media Relations, UC Berkeley News, Hydrogen-fueled cars not the best way to cut pollution, greenhouse gases and oil dependency, says expert | 17 July 2003, http://berkeley.edu/news/media/releases/2003/07/17\_fuels.shtml

For many people, the attraction of hydrogen is that it produces no pollution or greenhouse gases at the tailpipe. For others, the attraction is that hydrogen is a research program, not a regulation, and that some hydrogen-related research will also help develop better gasoline-powered cars. One problem, said Farrell, an expert on energy and environment issues, is that this glosses over the issue of where the hydrogen comes from. Current methods of producing hydrogen from oil and coal produce substantial carbon dioxide. Unless and until this carbon can be captured and stored, renewable (wind or solar) and nuclear power, with their attendant problems of supply and waste, are the only means of producing hydrogen without also producing greenhouse gases.

#### Production process cancels all environmental benefits of hydrogen

Lynn 2003 Barry C. Lynn, “Hydrogen's Dirty Secret”, May/June 2003 Issue, http://www.motherjones.com/environment/2003/05/hydrogens-dirty-secret

By launching an ambitious program to develop what he calls the "Freedom Car," Bush seemed determined to realize the kind of future that hydrogen-car supporters have envisioned for years. Using existing technology, hydrogen can be easily and cleanly extracted from water. Electricity generated by solar panels and wind turbines is used to split the water's hydrogen atoms from its oxygen atoms. The hydrogen is then recombined with oxygen in fuel cells, where it releases electrons that drive an electric motor in a car. What Bush didn't reveal in his nationwide address, however, is that his administration has been working quietly to ensure that the system used to produce hydrogen will be as fossil fuel-dependent -- and potentially as dirty -- as the one that fuels today's SUVs. According to the administration's National Hydrogen Energy Roadmap, drafted last year in concert with the energy industry, up to 90 percent of all hydrogen will be refined from oil, natural gas, and other fossil fuels -- in a process using energy generated by burning oil, coal, and natural gas. The remaining 10 percent will be cracked from water using nuclear energy. Such a system, experts say, would effectively eliminate most of the benefits offered by hydrogen. Although the fuel-cell cars themselves may emit nothing but water vapor, the process of producing the fuel cells from hydrocarbons will continue America's dependence on fossil fuels and leave behind carbon dioxide, the primary cause of global warming.

### H-Cars can’t reduce pollution

#### **H-2 cars not the best way to cut pollution, greenhouse gases and oil dependency**

Sanders 03, By Robert Sanders, | 17 July 2003 Hydrogen-fueled cars not the best way to cut pollution, greenhouse gases and oil dependency, says expert <http://berkeley.edu/news/media/releases/2003/07/17_fuels.shtml>> zp

As politicians and the public leap aboard the hydrogen fuel bandwagon, a University of California, Berkeley, energy experts suggests we all step back and take a critical look at the technology and consider simpler, cheaper options. In a paper appearing in the July 18 issue of Science magazine, Alex Farrell, assistant professor of energy and resources at UC Berkeley, and David Keith, associate professor of engineering and public policy at Carnegie Mellon University, present various short- and long-term strategies that they say would achieve the same results as switching from gasoline-powered vehicles to hydrogen cars. "Hydrogen cars are a poor short-term strategy, and it's not even clear that they are a good idea in the long term," said Farrell. "Because the prospects for hydrogen cars are so uncertain, we need to think carefully before we invest all this money and all this public effort in one area." Farrell and Keith compared the costs of developing fuel cell vehicles to the costs of other strategies for achieving the same environmental and economic goals. "There are three reasons you might think hydrogen would be a good thing to use as a transportation fuel - it can reduce air pollution, slow global climate change and reduce dependence on oil imports - but for each one there is something else you could do that would probably work better, work faster and be cheaper," Farrell said. President George W. Bush has proposed a federally funded, five-year, $1.7 billion FreedomCAR and Fuel Initiative to develop hydrogen-powered fuel cells, a hydrogen infrastructure and advanced automotive technologies. Several announced candidates for president have also proposed major research efforts to develop hydrogen-fueled vehicles and technologies to produce, transport and store the hydrogen, while many scientists have praised the initiative. For many people, the attraction of hydrogen is that it produces no pollution or greenhouse gases at the tailpipe. For others, the attraction is that hydrogen is a research program, not a regulation, and that some hydrogen-related research will also help develop better gasoline-powered cars. One problem, said Farrell, an expert on energy and environment issues, is that this glosses over the issue of where the hydrogen comes from. Current methods of producing hydrogen from oil and coal produce substantial carbon dioxide. Unless and until this carbon can be captured and stored, renewable (wind or solar) and nuclear power, with their attendant problems of supply and waste, are the only means of producing hydrogen without also producing greenhouse gases. In addition, Farrell points out that setting up a completely new infrastructure to distribute hydrogen would cost at least $5,000 per vehicle. Transporting, storing and distributing a gaseous fuel as opposed to a liquid raises many new problems. More billions of dollars will be needed to develop hydrogen fuel cells that can match the performance of today's gasoline engines, he said. The benefits might be worth the costs of fuel-cell development and creating a new infrastructure, however, if air pollution, greenhouse gases and imported petroleum could not be reduced in other ways. But they can, said Farrell. Improvements to current cars and current environmental rules are more than 100 times cheaper than hydrogen cars at reducing air pollution. And for several decades, the most cost-effective method to reduce oil imports and CO2 emissions from cars will be to increase fuel efficiency, the two scientists found. "You could get a significant reduction in petroleum consumption pretty inexpensively by raising the fuel economy standard or raising fuel prices, or both, which is probably the cheapest strategy," Farrell said. "This would actually have no net cost or possibly even a negative cost - buying less fuel would save more money than the price of the high-efficiency cars. The vehicles would still be large enough for Americans and they would still be safe." Technologies are now on the shelf to achieve better fuel efficiency, he said. All that's lacking are economic incentives to encourage auto makers to make and drivers to buy fuel-efficient cars. "Automobile manufacturers don't need to invest in anything fancy - a wide number of technologies are already on the shelf," he said, quoting, among other studies, a 2002 report by the National Academy of Sciences. "The cost would be trivial compared to the changes needed to go to a hydrogen car." Petroleum substitutes like ethanol that can be used in today's vehicles also are a possible way to reduce oil imports, the researchers say, but more research is needed to reduce the environmental impact and cost of these options. If one goal is to reduce greenhouse gases, it would be cheaper, Farrell and Keith argue, to focus on reducing carbon dioxide emissions from electric power plants than to focus solely on hydrogen-powered vehicles. But if passenger cars are targeted, fuel economy is still the key. If it becomes necessary to introduce hydrogen into the transportation sector, the scientists say, a better alternative is to develop hydrogen-powered fuel cells for vehicles such as ships, trains and large trucks instead of cars. Because these heavy freight vehicles have higher emissions, this strategy could provide greater air quality benefits. On-board hydrogen storage would be less of a problem also, and it would require a smaller fuel distribution network. Farrell and Keith provide figures that support their arguments and conclude that more research needs to be done before committing ourselves to a hydrogen economy, which might begin to make sense 25 years down the road. "Hydrogen cars are an attractive vision that demands serious investigation, but it's not a sure thing," they wrote. Farrell speculates that hydrogen has become attractive to people across the political spectrum in part because it doesn't challenge drivers to change their habits. It also doesn't challenge the auto industry to change its behavior, providing, instead, a subsidy for research that will lead to better cars whether they are hydrogen-powered or gasoline-powered.

#### Hydrogen cars not the most cost effective way to reduce emission

Keith and Farrell 2003 [David W. Keith (Department of Engineering and Public Policy, Carnegie Mellon University, Pittsburgh PA) and Alexander E. Farrell (former. Asst. professor of energy and resources at University of California at Berkeley) (Science 18 July 2003: Vol. 301 no. 5631 pp. 315-316 ENVIRONMENTAL SCIENCE Rethinking Hydrogen Cars] <http://www.sciencemag.org/content/301/5631/315.full#p-64> zp

Hydrogen could essentially eliminate vehicular emissions, but the cost of reducing NOx emissions [HN5] (for example) with hydrogen will be on the order of $1 million per tonne NO2 (5). In contrast, meeting the EPA's new Tier 2 standards [HN6] will reduce emissions for about $2000 per tonne, and inspection and maintenance programs will cost about $4000 per tonne and scrappage programs (voluntary programs offering bounties for old vehicles), less than $10,000 per tonne (6–8). The cost of reducing NOx emissions from electricity production is in the same range. Similar comparisons can be made for other important air pollutants. It is comparatively expensive to reduce pollutant emissions by using hydrogen because regulation-driven technological innovation has reduced emissions from gasoline-powered cars to the point where they have very low emissions per-unit-energy compared with other sectors and other transportation modes (see table, below). This trend will continue, reducing the benefit of zero-emission hydrogen vehicles, particularly because many technologies (e.g., electric drive) can be used on both platforms. Hydrogen could largely eliminate the problem of “high emitters”—the few poorly designed or maintained cars that account for most automobile emission—because hydrogen cars do not have high-emission failure modes. Nevertheless, the approaches listed above, possibly in conjunction with roadside emission monitoring and other advanced techniques, provide far more cost-effective solutions

#### **Hydrogen cars produce 4.3 times as much C02 as gas powered cars because they burn coal and other fossil fuels**

Kanellos 07, Michael Kanellos April 3, 2007 12:42 PM Hydrogen: More polluting than petroleum? <http://news.cnet.com/8301-10784_3-6172950-7.html> zp

Hydrogen just can't get a break. Once touted as the clean wonder fuel of the future, hydrogen fuel cells for cars or homes are now routinely panned as inefficient and impractical, particularly when compared to technologies like electric cars or solar thermal water heaters. Joseph Romm, a physicist, author of, among other books, Hell and High Water: Global Warming--the Solution and the Politics--or Hydrogen and editor of the respected ClimateProgress, also points out that the gas can be worse for the atmosphere than regular gas, depending on the circumstances. Hydrogen burns clean out of the car's tailpipe, but producing hydrogen at a factory generates significant amount of CO2. The standard hydrogen process involves mixing methane with water at 815 degrees Celsius. It takes about a megawatt-hour worth of electricity to produce enough hydrogen to drive a fuel cell car 1,000 miles. If the electricity came from a coal-burning power plant, it would generate about 2,100 pounds of carbon dioxide, according to Romm's calculations. By contrast, a gas-powered car that gets about 40 miles per gallon would produce 485 pounds of CO2, or less than a quarter. (The MIT Technology Review does an extended analysis of the book..) Of course, different variable will impact the results, but none really upend his argument. Here are some hypothetical options. You could get electric power from a plant running on hydroelectric or solar power. Coal fired plants, however, produce a substantial amount of the electricity in the U.S. ( Coal produces 23 percent of the total energy consumed in the U.S.--it's bested only by oil at 40 percent, according to stats from the National Renewable Energy Lab.). Therefore, on average, a hydrogen car would likely result in more CO2 than a standard car. Hydrogen can also be produced at nuclear power plants or through biological or chemical reactions. These methods would short-circuit coal, but neither are considered practical or economical alternatives for mass production at the moment. Similarly, solar-powered stations for splitting water into hydrogen and water via electroalysis wouldn't pollute, but they also don't exist. To top it off, the conventional hydrogen generating techniques produce lots of CO2 independent of the CO2 produced by the coal: for every kilogram of hydrogen, 9.3 kilograms of CO2 are produced. Hydrogen backers, though, assert that many of these problems can be ameliorated through better, non-coal-burning electrical plants. Unlike gas cars, hydrogen cars belch out their CO2 at the factory, so the gas could be stored underground someday. Sequestration experiments are just getting underway. So it's not completely dead, but the arguments against it are getting stronger. Municipalities are tinkering with the idea of deploying hydrogen cars as fleet cars, which never have to travel too far from a central filling station. These trials could become a big indicator if hydrogen has much of a chance in the coming decades. Of course, this doesn't mean other alt fuel vehicles won't make it. There's a lot of work going on in biofuels and batteries and even hydrogen hybrids.

### Other Tech Solves

#### Other technological fixes solve pollution cheaper and more efficiently than H2

Sanders 2003 Robert Sanders, Media Relations, UC Berkeley News, Hydrogen-fueled cars not the best way to cut pollution, greenhouse gases and oil dependency, says expert | 17 July 2003, http://berkeley.edu/news/media/releases/2003/07/17\_fuels.shtml

Improvements to current cars and current environmental rules are more than 100 times cheaper than hydrogen cars at reducing air pollution. And for several decades, the most cost-effective method to reduce oil imports and CO2 emissions from cars will be to increase fuel efficiency, the two scientists found.

### Nitrogen Turn

#### Hydrogen cars create nitrogen overload, creating acid rain and threatening lakes and forests.

Stager 2011 Curt Stager, ecologist, paleoclimatologist, and science journalist with a Ph.D. in biology and geology from Duke University, The Hydrogen Economy’s Dirty Secret, Co.Exist, 6/29/2011 http://www.fastcoexist.com/1678206/the-hydrogen-economys-dirty-secret

The problem isn't exactly with hydrogen itself, but with the machines we might burn it in. In order to ignite the hydrogen in a typical eco-vehicle's internal combustion engine, you need a spark--as in spark plugs. Such sparks provide the energy needed to oxidize the H2 into H2O, but there's a lot more than hydrogen and oxygen in the atmosphere. We normally think "oxygen" when we draw a breath of air, but nitrogen makes up 78% of it. We don't use N2 gas for anything directly; it simply visits and exits our lungs as inert filler. But combine it with oxygen in the fiery cylinder of an internal combustion engine and you get "NOx" compounds such as nitrate, which forms nitric acid in raindrops. Such nitrogen fixation happens naturally, whenever lightning sizzles a strip of air. But we're doing it on a huge scale now, in vehicles whose spark-plug explosions amount to miniature lightning strikes. This isn't all bad. Nitrogen fixation is how nitrogen gas becomes biologically useful, and at least a third of the protein in our bodies is built around artificially fixed nitrogen atoms. To make fertilizer, for example, factories blast hydrogen and nitrogen with electricity to form ammonia, an important plant food that eventually enters our own bodies through the global food web. Without this human-driven fixation, there simply wouldn't be enough active nitrogen available to keep so many billions of people alive. But you can also have too much of a good thing. Here in the Adirondack Mountains of upstate New York, many of our 3,000 lakes and ponds are still chronically acidified by nitrogen-rich emissions from coal-fired power plants and from the millions of cars and trucks upwind of us in the mid-continent. Ecologists also worry that our forests and lakes face nutritional imbalances from airborne nitrogen overloads.

#### Forests are key to biodiversity, and they’re on the brink of collapse.

Shah 2011 Anup Shah, Loss of Biodiversity and Extinctions, April 6, 2011, <http://www.globalissues.org/article/171/loss-of-biodiversity-and-extinctions#Lossofforestsequatestoalossofmanyspecies>

A report from the World Commission on Forests and Sustainable Development suggests that the forests of the world have been exploited to the point of crisis and that major changes in global forest management strategies would be needed to avoid the devastation. What also makes this a problem is that many of the endangered species are only found in small areas of land, often within the borders of a single country. New species of animals and plants are still being discovered. In Papua New Guinea, 44 new species of animals were discovered recently in the forests. Logging may affect these animals’ habitats, though. The loss of rainforests around the world, where many species of life are found will mean that potential knowledge, whether medicinal, sustenance sources, or evolutionary and scientific information etc. could be lost. Brazil, which is estimated to have around 55,000 species of flora, amounting to some 22% of the world’s total and India for example, which has about 46,000 and some 81,000 animal species (amounting to some 8% of the world’s biodiversity), are also under various pressures, from corporate globalization, deforrestation, etc. So too are many other biodiverse regions, such as Indonesia, parts of Africa, and other tropical regions. The UN’s 3rd Global Biodiversity Outlook report, mentioned earlier, also notes the extent to which deforestation is occurring as well as measures to address associated concerns. The report notes (p.32) that forests Are approximately 31% of the Earth’s land surface, Contain more than half of all terrestrial animal and plant species (mostly in the tropics), and Account for more than two-thirds of net primary production on land – the conversion of solar energy into plant matter.

#### Lakes are key to biodiversity and human life – they’re on the brink.

WorldLakes 2002, WorldLakes website, “Biodiversity” http://www.worldlakes.org/Biodiversity.htm

Most human communities that surround lakes depend heavily on lake biodiversity and natural lake processes for their water, food and way of life. Many of the world's poorest people depend on freshwater biodiversity for their protein needs. In Malawi, Lake Malawi provides 70% to 75% of the animal protein consumed by both urban and rural communities. Lakes provide critical habitat for an amazing array of plants and animals including bacteria, fungi, algae, plankton, mussels, snails, crustaceans, insects, fish, amphibians, reptiles, birds and mammals. Lake biodiversity globally is severely threatened. Currently 30% of freshwater fish and over 800 other freshwater species are on the brink of extinction (IUCN, 2002).

### Water Turn

#### Switch to H2 causes massive water use, puts strain on water resources

Zyga 2007 Lisa Zyga, “First Analysis of the Water Requirements of a Hydrogen Economy” 10/18/2007, <http://phys.org/news111926048.html>

At that time, the NRC predicts an annual production of 60 billion kg of hydrogen. Webber’s analysis estimates that this amount of hydrogen would use about 19-69 trillion gallons of water annually as a feedstock for electrolytic production and as a coolant for thermoelectric power. That’s 52-189 billion gallons per day, a 27-97% increase from the 195 billion gallons per day (72 trillion gallons annually) used today by the thermoelectric power sector to generate about 90% of the electricity in the US. During the past several decades, water withdrawal has remained stable, suggesting that this increase in water intensity could have unprecedented consequences on the natural resource and public policy.

### Pollution Defense – Doomsayers are wrong

#### Claims of Environmental doomsday are drastically overblown

Dutton, 2001, Dennis October 21, , [professor of philosophy at the University of Canterbury in New Zealand, Greener than you think, The Washington Post, http://www.washingtonpost.com/ac2/wp-dyn?pagename=article&node=&contentId=A12789-2001Oct18]

That the human race faces environmental problems is unquestionable. That environmental experts have regularly tried to scare us out of our wits with doomsday chants is also beyond dispute. In the 1960s overpopulation was going to cause massive worldwide famine around 1980. A decade later we were being told the world would be out of oil by the 1990s. This was an especially chilly prospect, since, as Newsweek reported in 1975, we were in a climatic cooling trend that was going to reduce agricultural outputs for the rest of the century, leading possibly to a new Ice Age. Bjorn Lomborg, a young statistics professor and political scientist at the University of Aarhus in Denmark, knows all about the enduring appeal -- for journalists, politicians and the public -- of environmental doomsday tales, having swallowed more than a few himself. In 1997, Lomborg -- a self-described left-winger and former Greenpeace member -- came across an article in Wired magazine about Julian Simon, a University of Maryland economist. Simon claimed that the "litany" of the Green movement -- its fears about overpopulation, animal species dying by the hour, deforestation -- was hysterical nonsense, and that the quality of life on the planet was radically improving. Lomborg was shocked by this, and he returned to Denmark to set about doing the research that would refute Simon. He and his team of academicians discovered something sobering and cheering: In every one of his claims, Simon was correct. Moreover, Lomborg found on close analysis that the factual foundation on which the environmental doomsayers stood was deeply flawed: exaggeration, prevarications, white lies and even convenient typographical errors had been absorbed unchallenged into the folklore of environmental disaster scenarios.

### Pollution Defense – Environment is Reslient

#### The environment is indestructible and resilient

Gregg Easterbrook, Brookings Economic and Governance Studies Fellow, ‘95

[*A Moment on the Earth*, 25-26]

In the aftermath of events such as Love Canal or the *Exxon Valdez* oil spill, every reference to the environment is prefaced with the adjective "fragile." "Fragile environment" has become a weld­ed phrase of the modern lexicon, like "aging hippie" or "fugitive financier." But **the notion of a fragile environment is profoundly wrong**. Individual animals, plants, and people are distressingly fragile. **The envi­ronment** that contains them is close to indestructible. **The** living **environment** of Earth has **survived ice ages; bombard­ments of cosmic radiation** more deadly than atomic fallout; solar radia­tion more powerful than the worst-case projection for ozone depletion; thousand-year periods of intense volcanism releasing global air pollu­tion far worse than that made by any factory; reversals of the planet's magnetic poles; the rearrangement of continents; transformation of plains into mountain ranges and of seas into plains; fluctuations of ocean currents and the jet stream; **300-foot vacillations in sea levels**; shortening and lengthening of the seasons caused by shifts in the plane­tary axis; **collisions of asteroids** and comets **bearing far more force than** man's **nuclear arsenals**; and the years without summer that followed these impacts. Yet hearts beat on, and petals unfold still. **Were the environment fragile it would have expired many eons before** the advent of the **industrial affronts** of the dreaming ape. **Human assaults on the environment**, though mischievous, **are pinprinks compared to forces of the magnitude nature is accustomed to resisting.** The environmental torments cataloged above were not confined to the primordial eons. All are “recent” in geologic terms; most were endured by the primate ancestors of genus *Homo*. The bountiful natural world encountered by our forebears as they acquired self-awareness sprang not from gentle prelapsarian caresses but ceaseless defiance of calamitous duress. Two more words conjoined n contemporary thought are “environmental abuse” Unlike the fragile environment, abuse of the environment is a genuine concept. But the scale by which humankinds has abused the natural world is poorly understood, again handicapping society’s ability to determine the truth of falsity of ecological alarms. All impertinent actions by genus *Homo* combined have yet to produce anything approaching the environmental damage nature inflicts on itself on a recurrent basis.

### Pollution Defense – AT Water Pollution

#### Water pesticide levels are too high to clean up the water, impacts inevitable

Utility Week 6/27/08 - "WATERPesticide and nitrate levels too high.(Features)." Utility Week 121 (June 27, 2008): NA. General OneFile. Gale. University of Michigan – Ann Arbor <http://find.galegroup.com.proxy.lib.umich.edu/itx/start.do?prodId=ITOF>

Almost half of OECD member countries, including many in Europe, have potentially dangerous nutrient and pesticide concentrations in drinking water sources, a report from the Organisation for Economic Co-operation & Development (OECD) has claimed. Tests carried out on surface water and groundwater monitoring sites in agricultural areas showed these pollutants often "exceed national drinking water recommended limits", said the OECD in its report on the environmental impact of farming. It said: "Of concern is agricultural pollution of groundwater drawn from shallow wells and deep aquifers, especially as natural recovery rates from pollution can take many decades." In the UK, 30 per cent of monitored sites in agricultural areas had nitrates in surface water and groundwater above national drinking water threshold values. The OECD said the annual clean-up bill could be as high as [euro]345 million. Some other countries fared worse: Portugal (37 per cent), Belgium (41 per cent) and the Netherlands (71 per cent). Agriculture was held responsible for more than half the nitrates in surface fresh water in nine European OECD countries: Ireland, Denmark, France, Italy, Poland, the UK, Germany, Belgium and the Netherlands.

#### Alt cause; Sewage dumping causes water pollution

Grinning Planet 05, <http://www.grinningplanet.com/2005/09-06/water-pollution-causes-article.htm>

In developing countries, an estimated 90% of wastewater is discharged directly into rivers and streams without treatment. Even in modern countries, untreated sewage, poorly treated sewage, or overflow from under-capacity sewage treatment facilities can send disease-bearing water into rivers and oceans. In the US, 850 billion gallons of raw sewage are sent into US rivers, lakes, and bays every year by leaking sewer systems and inadequate combined sewer/storm systems that overflow during heavy rains. Leaking septic tanks and other sources of sewage can cause groundwater and stream contamination. Beaches also suffer the effects of water pollution from sewage. The chart below shows the typical reasons that about 25% of the beaches in the US are put under water pollution advisories or are closed each year. It's clear that sewage is part of the problem, even in what is supposedly the most advanced country in the world.

### Pollution Defense – AT Bees – Alt Causes

#### Mites are an alt cause for bee decline worldwide

The Age, 6/26/12, "this mite be the bee's worst enemy," <http://www.theage.com.au/technology/sci-tech/this-mite-be-the-bees-worst-enemy-20120626-20z6u.html>

Although bees have not disappeared yet, the insects that collect nectar and pollen and make honey and wax are in precipitous decline: populations in the US and Britain, for example, have halved over the past 25 years. Reasons for the decline range from the prevalence of chemicals, particularly common crop pesticides, to the destruction of flower-rich habitats and the rise in electromagnetic radiation from mobile telephone towers and transmission lines. The biggest pest threat is from the evil-sounding Varroa destructor, an oval-shaped, reddish-brown mite that sucks the blood from bees and transmits virulent diseases, such as deformed-wing virus. The pinhead-sized bloodsuckers have decimated bee populations worldwide, including in neighbouring New Zealand and Papua New Guinea, but have not arrived yet in Australia.

### Pollution Defense – AT Honeybees Impact

#### Honeybees are replaceable

Christopher Mims, 7/14/09, Scientific American, "replacing the honeybee," <http://www.scientificamerican.com/article.cfm?id=replacing-the-honeybee>

Honeybees have been dying in record numbers, yet many commercial crops depend on them for pollination. Entomologists who have been struggling to find an alternative now report that another bee might fill the void. The blue orchard bee, also known as the orchard mason bee, is undergoing intensive study by the U.S. Department of Agriculture pollinating insect research unit at Utah State University at Logan. James Cane, an entomologist there, says a million blue orchards are now pollinating crops in California. Like honeybees, the species can pollinate a variety of flora, including almond, peach, plum, cherry and apple trees. Unlike honeybees, however, they tend to live alone, typically in boreholes made by beetles in dead trees. In cultivation, the bees will happily occupy holes drilled into lumber or even Styrofoam blocks. The blue orchards rarely sting and, because of their solitary nature, do not swarm. They are incredibly efficient pollinators: for fruit trees, 2,000 blue orchards can do the work of 100,000 honeybees. Their biggest drawback is that beekeepers can increase their population only by a factor of three to eight a year; a honeybee colony can expand from several dozen individuals to 20,000 in a few months. “We’re still in the development stage” of applying the USDA’s research, says David Moreland, CEO of AgPollen, which is supplying blue orchard bees to the California almond industry. Last season local almond growers were paying up to $300 for enough honeybees to work an acre, 10 times what they paid a decade ago, making the blue orchard bees cost-competitive, albeit only barely.

# Offcase Arguments

## Disads

### Spending Link

#### Each station costs $2.2 million

Liane Yvkoff, 2/3/12, Cnet, "a hydrogen fueling station powered by the wind," <http://reviews.cnet.com/8301-13746_7-57371352-48/a-hydrogen-fueling-station-powered-by-the-wind/>,

Figuring out an inexpensive and carbon-neutral way to produce an abundant amount of hydrogen will be key to the success of fuel cell vehicles. Solar hydrogen fueling stations have been introduced on both U.S. coasts over the past couple years, but haven't gained traction due to the high costs of production and low demand. Not that wind-powered hydrogen filling stations are cheap. The turbine cost $615,000, paid from a $4.6 million United States Department of Energy grant that provides funding for a range of clean-energy projects. The hydrogen and natural gas fueling station cost $2.2 million to construct.

#### Infrastructure for hydrogen refueling costs $500 billion.

Mintz et al 2002 Marianne Mintz, Stephen Folga, John Molburg, Jerry Gillette,

Argonne National Laboratory, Transportation Technology R&D Center, Transportation Research Board, January 16, 2002, <http://www.solarelectrode.com/gov224.pdf>, jam

With current technologies, on a well-to-tank basis, hydrogen is likely to be at least twice as costly as gasoline. • With current technologies, the hydrogen delivery infrastructure to serve 40% of the light duty fleet is likely to cost over $500 billion.

#### Hydrogen refueling stations cost over 2 million a piece and businesses can’t recoup losses because hydrogen isn’t profitable.

Romm 2008, Joseph Romm, Senior Fellow @ Center for American Progress Fellow @ American Association for the Advancement of Science, The Guardian “Hydrogen Cars and Hot Air,” Monday 23 June 2008, <http://www.guardian.co.uk/commentisfree/2008/jun/23/automotive.usa>

And who, exactly, is going to buy a car that can't easily find fuel? On the other hand, who is going to build tens of thousands of fuelling stations - price tag $2m apiece or more - until the cars are wildly successful? That is the so-called chicken-and-egg problem, which is especially acute for hydrogen. After all, why should oil companies spend tens of billions of dollars building a hydrogen fuelling infrastructure, which at best will take away business from their tremendously profitable gasoline sales, and at worst will be a complete business loss, assuming, as now seems likely, that hydrogen cars never catch on?

### Politics Link – Unpopular

#### No support for Hydrogen funding now

The Futurist and Jim Motavalli, 2012, (interview), "the futurist interviews Jim Motavalli, author of high voltage: te fast track to plug in the auto industry," <http://www.wfs.org/content/futurist-interviews/futurist-interviews-jim-motavalli-author-high-voltage-fast-track-plug-au>,

Motavalli: Under Steven Chu, the Department of Energy has been very negative about hydrogen and has defunded it. Chu is seen as the enemy of hydrogen. Hydrogen advocates can’t say enough bad things about him. In addition, four car companies—Daimler, Toyota, Honda, and Hyundai—plan to roll out tens of thousands each of new hydrogen-powered cars by 2015. The question remains, however, of will there be an infrastructure for them. They may end up being sold in Europe or Japan because we don’t have the hydrogen stations. THE FUTURIST: To what extent are Europe and Japan ahead of the United States on hydrogen infrastructure? Motavalli: Their public commitments are much stronger. The U.S. government has had an on-again, off-again relationship with hydrogen-powered cars. The Bush administration was actually very much into them. The Obama administration is not. Right now, it's not looking great for hydrogen funding in the United States.

#### Congress opposes the plan – cost

Angela Keane and Alan Ohnsman, 6/20/12, Bloomberg, "fuel-cell frenzy looks to convert obama favoring plug-ins," <http://www.bloomberg.com/news/2012-06-20/fuel-cell-frenzy-looks-to-convert-obama-favoring-plug-ins.html>

Remarks by two aides to President Barack Obama yesterday calling fuel cells part of the solution for improving automobile efficiency gave boosters some optimism the U.S. will help create a market for the technology. Hydrogen fuel cells, encouraged by President George W. Bush, lost favor to plug-in electric vehicles after Obama took office in 2009. Energy Secretary Steven Chu questioned the merits of hydrogen-powered cars and cut funding for fuel-cell research, as Obama set a goal of having 1 million electric vehicles on the road by 2015. “There’s been a dramatic turnaround in the past six to nine months of the need for this in the future” by the Energy Department, Scott Samuelsen, National Fuel Cell Research Center director, said in an interview at a conference in Washington sponsored by the Hydrogen Education Foundation. “What has not yet occurred is the action that will be needed to meet the needs by 2015.” That’s the year by which automakers including Toyota Motor Co. (7203) are aiming to introduce their first fuel-cell vehicles in the U.S. Honda Motor Co.’s FCX Clarity and Daimler AG (DAI)’s Mercedes Benz B-Class are available now in parts of California, where environmental rules encourage zero-emission vehicles. Revived interest in fuel cells coincides with congressional scrutiny of U.S. financial assistance to plug-in vehicle and battery makers including A123 Systems Inc. (AONE) and Fisker Automotive Inc. Last year, Congress held hearings into a fire in a General Motors Co. (GM) Chevrolet Volt after crash testing.

## Counterplans

### States CP Solvency

#### States should do the plan since H-cars will be used equally across the US

Steve LeVine, 5/17/12, Slate, "giving hydrogen fuel-cell cars another chance," <http://www.slate.com/articles/technology/future_tense/2012/05/hydrogen_fuel_cell_vehicles_and_the_obama_administration_.single.html>,

Fuel-cell vehicles will start out not with mass deployment, but in targeted regions—especially islands. The first places in the United States will be Los Angeles and Hawaii, Freese thinks—Los Angeles because there are high population concentrations that can be served by just 50 or 55 refueling stations; Hawaii because driving patterns are predictable: along set coastal routes and around self-contained islands, so drivers can’t go too far afield and find themselves stranded without fuel. GM and the U.S. Army launched a test fleet of 16 hydrogen fuel-cell cars in Hawaii earlier this year. In California, the state government is already behind the allocation of funds for building hydrogen fueling stations. Twenty-six are either in place or funded. An industry-government collaboration called the California Fuel Cell Partnership has established equipment standards and permitting processes, and organized the training of emergency personnel in the case of an accident. In Hawaii, GM is teamed up with 13 companies, government agencies and university bodies in order to organize the rollout of infrastructure there.

## Kritiks

### Cap K – Alt Solves the Aff

#### K solves the case – Only a transition away from capitalism creates lasting economic and political conditions for hydrogen transportation to occur.

Nance 2009 Kevin Nance, “Capitalism, Socialism and the Environment,” In Defence of Marxism, Thursday, 03 September 2009, http://www.marxist.com/capitalism-socialism-environment.htm

Recently, there has been much talk of electric cars and hydrogen powered cars. These cars could be amazing technologies that could lessen our dependence on fossil fuels, but sadly, under capitalism, we will not be off of fossil fuels until there are no more fossil fuels left. However, even these solutions fall short. Electric cars cannot be a long-term solution in and of themselves. When you plug an electric car in, the energy must come from somewhere. At present, that would mean that it will likely be fueled by fossil fuels burned at a power plant. Even though your car is not pumping carbon into the air directly, the power plant that powers your car will be. Also, the prospects for hydrogen cars under capitalism are bleak. In order for hydrogen cars to become widespread, it is necessary to institute a massive plan for retooling auto plants for green production, combined with a plan for retooling refueling stations across the country to accommodate these new vehicles. We also need to dramatically increase access to safe, efficient and cheap public transportation. Such a massive program can only be accomplished painlessly through a harmonious plan of production encompassing all major sectors of the economy.

#### Transition to socialism is a pre-requisite to the plan.

Nance 2009 Kevin Nance, “Capitalism, Socialism and the Environment,” In Defence of Marxism, Thursday, 03 September 2009, http://www.marxist.com/capitalism-socialism-environment.htm

We could put our best and brightest minds to use, not in developing earth-destroying technologies for the benefit of the minority, but in the exploration of technologies such as nuclear fusion, which unlike current nuclear fission, could potentially provide a limitless, safe source of cheap power for generations to come. Or we could look at the failing auto industries and easily, through a universal plan of production, retool them for the production of hydrogen cars and vastly expand public transportation. We could also organize the construction industry to make homes that are better insulated so that we could use less fuel to heat our them. But under capitalism, this will never happen. For the future of humanity and for the earth, we need socialism. It’s as simple as that.

### Consumption K – Link

#### H2 Is only politically viable because it fails to challenge consumption or the energy industry.

Sanders 2003 Robert Sanders, Media Relations, UC Berkeley News, Hydrogen-fueled cars not the best way to cut pollution, greenhouse gases and oil dependency, says expert | 17 July 2003, http://berkeley.edu/news/media/releases/2003/07/17\_fuels.shtml

Farrell speculates that hydrogen has become attractive to people across the political spectrum in part because it doesn't challenge drivers to change their habits. It also doesn't challenge the auto industry to change its behavior, providing, instead, a subsidy for research that will lead to better cars whether they are hydrogen-powered or gasoline-powered.

## Topicality

### Plan = Energy Infrastructure

#### The DOE defines hydrogen refueling stations as energy infrastructure

U.S. DOE, 2012, “DOE H2A Delivery Analysis,” Hydrogen and Fuel Cells Program, <http://www.hydrogen.energy.gov/h2a_delivery.html>, DY

Hydrogen delivery is an essential component of any future hydrogen energy infrastructure. Hydrogen must be transported from the point of production to the point of use and handled within refueling stations or stationary power facilities. The scope of hydrogen delivery includes everything between the production unit (central or distributed) and the dispenser at a fueling station or stationary power facility.

#### Hydrogen energy infrastructure defined

Joan M. Ogden, 1999, Co-director, Sustainable Transportation Energy Pathways (STEPS) Program, Institute of Transportation Studies Professor, Environmental Science and Policy Department, “Prospects for Building a Hydrogen Energy Infrastructure,” Center for Energy and Environmental Studies, Princeton University, pg 229, <http://web.mit.edu/smaurer/Public/joeenergy/1ogden.pdf>

A hydrogen energy infrastructure is deﬁned as the system needed to produce hydrogen, store it, and deliver it to users. This includes hydrogen production systems (for converting primary-energy sources or other energy carriers to hydrogen), hydrogen storage capacity (needed to match time-varying fuel demandsto production output), long-distance transmission systems (if hydrogen is to be transported long distances from the production site to users), local pipeline distribution systems (analogous to a system of natural gas utility pipes), and equipment for dispensing hydrogen to users (for example, hydrogen compressors and dispensers at vehicle refueling stations).