SYNERGY CONSULTING GROUP, LLC
Helping business out-perform itself

The High Price of Gasoline

And what to do about it

Based on original research:

"Impediments to moving towards a Hydrogen Economy"

June 18, 2005

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Contact:
Contact: Mark Paul, Managing Partner
SYNERGY CONSULTING GROUP, LLC
P. O. Box 91507 ● Portland, OR 97291
503-690-8720 ● mpaul@energy2025.com

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The high price of gasoline: and what to do about it

Based on primary research: Impediments to moving towards a Hydrogen Economy

Performed by Mark Paul, Managing Partner - Synergy Consulting Group, LLC

June 18, 2005

Executive Summary

Originally, "pricing research' was performed to obtain the perception of consumers on what price they would be willing to pay for an "equivalent gallon" of hydrogen. What resulted was surprising, and caused an entirely different approach to be taken. The results indicate that Americans are dependent on (addicted to?) cheap gasoline. And (as human nature dictates) they don't really want to change! With supply and demand at work, there are really only two choices in front of us: [1] *To remain addicted* to and at the mercy of foreign oil producers or [2] *To take bold action* to become a net-exporter of clean, renewable energy.

This report presents bold recommendations - on a national level - to help re-establish the United States as the world leader in energy production and energy technology.

In order to accomplish this, we must:

[1] Recognize there *is* a (growing) problem.
[2] Make a decision to make a significant change.
[3] Take responsibility.
[4] Through leadership, create and fund national policy that will enable our energy self-sufficiency.
[5] Tackle the "25% issues" of energy efficiency, energy storage, and distributed energy solutions.
[6] Build awareness: Help Americans better understand the grave issues facing our country, so they can make better-informed decisions.
[7] Develop an "H-Prize:" To encourage innovators to create the energy technologies of tomorrow.
[8] Support non-partisan solutions: To avoid polarized "solutions" which continue to fail all Americans.

A high-level proposal has been created in this document (recommendation # 3, and Appendix #1), and in an accompanying article that will (hopefully) be published in major newspapers across the country - with the goal that political leaders will embrace the concepts and rally behind the basic ideas… so that progress in this area can be made.

The following (next) steps need to be taken: [1] Review of this document (which is why you are receiving it), and [2] submit to Oregon's congressional leaders and national newspapers.

Original Purpose

During significant research in renewable energy two years ago, I discovered that nowhere is there published research that clarifies what people are willing to pay for hydrogen as a fuel. Nor what their perspectives are on the risks associated with and benefits of a "hydrogen economy." Therefore, primary research was performed to determine consumers' current expectations: what they would pay for an "equivalent gallon of hydrogen" in order to fuel their vehicles.

Provided in this report is a discussion of what was researched, the results and analysis on the research, and high-level conclusions. Additionally, the closed-ended pricing data, and answers to an open-ended question on their general thoughts are presented in graphical form to help the reader gain insights into respondents' perceptions.

The results of this research have provided an eye-opening awareness: something quite a bit more than was expected.

Original Summary

Initially intended to determine what people will pay for an “equivalent gallon of Hydrogen” - instead of gasoline - this report actually answers the question: “Why are gas prices so high?”

This report does *not* address the global supply & demand issues associated with gas prices (including China’s economic growth, OPEC’s market manipulation, etc.). It simply asks consumers what they think the benefits of a Hydrogen-based economy might be, along with their concerns / issues associated with moving to this type of economy. And then develops proposed actions to help solve America’s long-term energy problems.

However, it is clear that the huge United States consumer market has more than a little bit to do with pricing. Along with US Government inaction for the past 30 years, global growth over this period, shrinking supplies, and volatile geopolitical situations - prices have risen, and Americans are wondering why this is happening and why “something” isn’t being done. It appears slow increases are not as troubling as volatile price swings!

The research in this paper shows that consumers expect, almost feel they deserve low gasoline prices, and that through this market mechanism (having relatively low energy prices, since the first oil shock) - have actually *crippled* innovation in renewable / alternative energy.

In fact, it will not be until gas prices hit over $3 to $4 a gallon that American’s core belief that they are entitled to cheap gas will be shaken enough to DO something about it. It will clearly be “too late” to maintain cheap fuel… the time it takes to develop cost-effective alternative energy is measured in decades, not years.

Discussion

The survey asked - if hydrogen were to be sold in “equivalent gallons*,” what they would consider: [1] expensive, [2] too expensive such that they would not purchase it, [3] inexpensive and [4] too cheap, such that they would question its quality. These data were then plotted in such a way as to provide insight into what percentage of people who would expect to spend certain “per equivalent gallon” prices. Additionally, they were asked questions about their concerns and benefits, domicile, along with their age, to see if there was any correlation with price expectations. They were also asked an open-ended question as to their thoughts about this topic.

* Equal to the amount it would take to fill their vehicle to go the same distance as gasoline

The questions were positioned relative to the hidden costs associated with the effects of “cheap oil” such as increasing health care costs (due to pollution), and increased defense spending (due to dealing with middle east conflicts).

The following questions were asked:

- How interested would you be to buy hydrogen instead of gasoline if priced within your budget.
- What concerns would you have about hydrogen fuel?
- What benefits would you see, w/ a "hydrogen economy?"
- Price per gallon - for hydrogen as an alternative fuel.
- What else would you "want to exist" to increase the value of hydrogen for use in your vehicle?
- What other comments and/or ideas do you have?
- What is your age?
- In which state & country do you live?

Conclusions

Several conclusions can be drawn from the research and analysis of the results. These have been prioritized - relative to the value of the conclusions - to help the United States move towards becoming a "net-exporter" of clean, renewable energy:

[1] People *will* buy Hydrogen: If alternative, renewable and clean energy were made available at lower-than-gasoline prices, up to 90% of people would make the switch. However, only if other (significant) issues of safety and "transition issues" were addressed.

[2] This is a societal problem, not a political problem: We are quick to "take sides." If someone says "sustainable," they are branded a liberal tree-hugger (read Democrat). If someone says "profit," they are branded as a greedy businessman (read Republican).

[3] "Cheap oil" is expected: Americans feel they are entitled to cheap gasoline. There is a general expectation that "the system" ought to produce and deliver cheap gas. There is a serious unwillingness to pay any more for renewable energy than what people are currently paying for fossil fuel. This cycle of wanting the cheapest fuel has actually caused our own problem: cheap fuel reduces the pressure for competition to be created. One could conclude (though not statistically) from responses that the need for cheap energy (32 responses) actually outweighs the need to avoid war (17 responses).

[4] Leadership is needed: It has been 32 years since the first oil shock. In that time, only one prospective world leader had the nerve to propose a solution that could have solved our current problem: John Anderson advocated for a 50-cent a gallon tax on gasoline to fund research and development of clean, renewable, alternative energy. Had we followed that path, we may have solved several energy-related problems by now. Currently, liberals like to blame the Republicans for their "greedy" position. Conservatives avoid Government funding of renewables ("Government is not the solution), yet offer *billions* in tax incentives to oil companies. The cost of the (current Iraqi) war has ballooned to over $100 billion, pollution-caused health care cost increases are affecting all of us, and both costs could be dramatically reduced - if we could solve this problem. In 2004, President Bush authorized $1.2 billion for Hydrogen research… a fraction of what the Government spends annually on oil (tax incentives) and what is needed in order to solve the energy problem. Previous administrations have done even less!

For over 30 years, president after president has had neither the foresight nor "gumption" to address this looming and ever-increasing problem. Why? It appears to be political suicide to solve it.

The problem is neither a Republican problem, nor a Democrat problem. It is the lack of vision, and strength to tackle this large and long-term challenge *head-on.*

Drilling in the Arctic National Wildlife Refuge is palpable IF there is a concerted, future-focused, long term, holistic plan to enable the United States to become a net-exporter of clean energy.

Imagine a situation where our trade deficits were turned into trade surpluses, and other countries bought their energy from the US, instead of OPEC. If nothing else, this should appeal to the capitalist notion of "find a need and fill it - profitably" as well as solve other issues of national security, the environment, health, safety, welfare, etc. This list of benefits is long, and the value to society is large.

[5a] The country is polarized: The public has elected officials that represent their views… which are polarized. With our current two-party system, an "us and them" mentality has developed… to the detriment of moving forward on the very important, and increasingly urgent energy issue. As long as both sides blame the other, nothing will move forward. Therefore…

[5b] Joint solutions are essential: Solving our energy problems will only occur when the Democrats and Republicans stop blaming each other (for political advantage) and work together to create (and fund) policy that will enable and encourage our great nation of innovators and entrepreneurs to build, replicate, deliver and profit from clean, renewable energy - that benefits society, be they liberals or conservatives. The last time energy prices climbed rapidly, the US implemented an excess-profits tax… thereby discouraging additional exploration and innovation. The exact opposite result occurred: by demanding cheaper gas, the motivation for alternative sources dried up.

[6] Americans are complacent / do not want to change: We want cheap oil, but do not recognize that market forces drive competition. That is, expensive oil will have the effect of encouraging serious innovation… with cheap oil, innovation (on a grand scale) is not being encouraged, and will not lead to renewable, clean, alternative energy sources. *The price of gasoline will have to dramatically increase before Americans come together to take concrete action to develop alternate fuel.* There exists a very real concern that shifting to a Hydrogen economy will (adversely) impact our daily lives. We are more concerned with this problem than some of the benefits.

[7] Change will not happen, without a crisis / We do not have a 20-year vision: People do not like to change. However, we are resilient in the face of disaster, and can, have and will rise to any challenge, large or small. Unfortunately, it will take a significant "impact" for us to wake up and figure out that our oil is, in fact, running out (especially relative to our consumption). (The United States consumes 25% of the world's total oil production but has just 3% of the world's known oil reserves.) Apparently, what occurred on September 11th wasn't a large enough impact! We still do not have a "free from foreign oil / net exporter of energy" mentality, let alone a game plan!

[8] We lack a fundamental understanding of supply and demand: Americans tend to think that Big Oil and the Government (currently - Republicans) are in cahoots to keep oil prices high - even when demand is increasing, supplies are decreasing, and no serious competition is being offered! This is not the Republicans' fault! Our growing economy, and that of China is outstripping supply.

[9] "Someone else needs to solve this problem:" The conspiracy-theorists among us are saying what others are afraid to say… that "they" are causing this problem, and "they" need to fix it. For example: I had a recent discussion with a college student, where he wondered why people don't buy wind-generated energy. I asked if he does. He doesn't, because "it costs too much." He then recognized that he *is* "they!" This seems to be human nature.

[9] "Others need to live how I think they should live:" A vocal minority seem to think that other people are causing this gas-price problem. They are quick to judge those who purchase SUVs… making huge assumptions that "SUV owners use more gas than I do." Without taking into account that, perhaps many SUV owners may not drive nearly as many miles as fuel-efficient car owners do, and might actually use LESS gasoline. That would shatter their preconceived notions and the very human desire to blame others. To someone who walks everywhere, ANYone who drives a car is the culprit! It is so much easier to blame others, than to take responsibility ourselves. Which leads to…

[10] Adoption time: It may be a ten to twenty years or more before the vast majority of people will pay significantly more for hydrogen fuel. Shorter, should disruptions occur in the delivery (and therefore pricing) of oil.

[11] Early adopters will lead the market: Some people will pay more for hydrogen for vehicular fuel. (Twenty to forty percent of consumers, depending on the delivered price.)

[13] Disruptions not taken into account: It has been over thirty years since the last major "oil shock." There is a strong tie between the current price of gasoline and expected pricing of hydrogen. Therefore, should gas climb substantially, price expectations for hydrogen should also increase. More research is needed: if the relationship is linear, or if people would be willing to pay significantly more than $4 per gallon for hydrogen if - gas were to reach $4 per gallon (for example). A major war in the Middle East, beyond what is currently happening could dramatically shape people's expectations.

[13] Major shifts not accounted for: A few open-ended responses insinuated that there should be government intervention (tax breaks, price supports, some form of involvement) to bring the price of hydrogen to *less* than gasoline. This would be a way to turbo-charge the shift to a hydrogen economy… and thereby decreasing prices while developing new vehicles, distribution systems, etc. (Opinion: This is problematic, at best.)

[14a] Extrapolation to electricity pricing: Although no questions were asked regarding the price of electricity, it would be fair to assume that similar responses, on a percentage basis, could be applied to whatever people are paying now per kW-hour, for "grid energy."

[14b] Extrapolation to bio-diesel: Additionally, and in fact more appropriately, this analysis can be loosely applied to bio-diesel as a diesel alternative.

[15] Early adopters: There is some willingness (by some of the respondents) to pay a price premium to reduce our dependence on foreign oil.

[16] Majority of market: Contrarily, the overwhelming majority (defined by the price-research curve) would prefer the cost of Hydrogen be *less* than the current cost of gasoline - between $1 to $2 per gallon.

[17] Generational issue (opinion): The author has long concluded that significant changes can be defined in generational terms. Examples include the telephone, television, the microwave, the computer, the internet, etc. It takes about thirty years or more to fully adopt a new technology. However, this is a fundamental issue, in that "infrastructural" issues need to be dealt with: The solution to this problem is non-trivial.

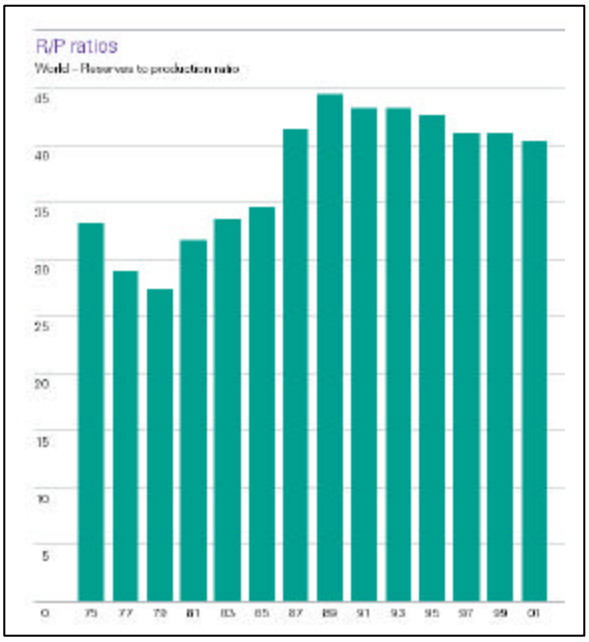
Recommendations

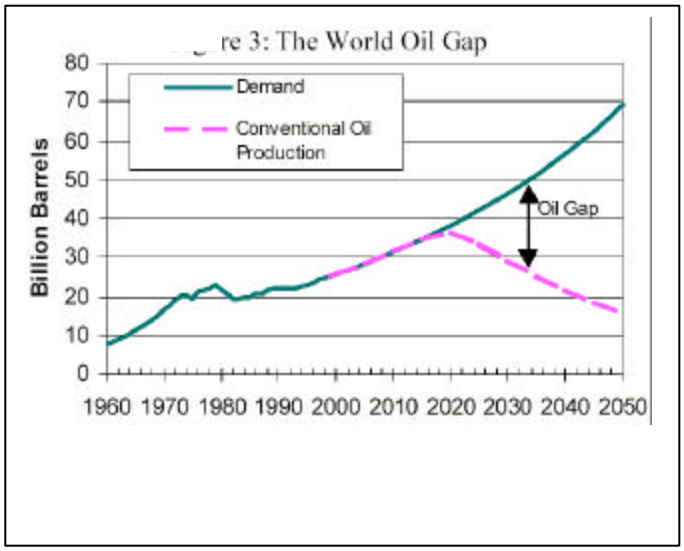
Provided below are potential solutions to the United States' energy situation. These recommendations are not intended to be an affront to anyone, nor any political party. The sole purpose is to ignite passion in those who can make a difference: to solve our energy problem for our children, and future generations.

[1] Recognize there *is* a problem: *Or no progress will be made.*

Rationale: Until we recognize there is a growing problem between supply and demand, Americans will continue to be polarized into two camps, and therefore be paralyzed - in finding solutions. The fundamental law of supply and demand is what is driving - and will continue to drive - increasing oil prices. China's growth is clear. As other third world and developing nations continue their growth, the problem will be greatly exacerbated!

The figure on the left represents the "World oil reserves to production:" (from British Petroleum's "Statistical Review 2002") - which indicates that reserves started declining in 1991. The figure on the right indicates the gap that will be created due to reduction in production - while demand continues to increase:





Discussion: Left-of-center administrations (and liberals) feel that this problem has everything to do with corporations trying to gouge consumers. They feel “windfall profit” taxes can solve the problem. Right-of-center administrations (and conservatives) feel there really isn’t a problem, other than - one of finding more oil / being even more efficient in extraction, refinement, production and transportation methods. Both are right, but only partially. It is this dual-mode partiality that is hiding the real problem - caused by the most-fundamental economic supply / demand law. Therefore, neither single approach can solve this very complex problem. Until we recognize the problem is not a political-party issue, polarized politics will not solve it.

Until the problem is accepted and embraced by both parties - and that bipartisan solutions are required, no solutions will be developed.

[2] Make a decision*: Is the status quo acceptable?*

Rationale: If we as a nation do not see that dependence on foreign oil is a problem, and are not willing to do what is needed to solve this problem, then we must make a decision to accept the status quo. And all of the ramifications that go along with this decision.

If no decision is made to solve our energy problems, we are destined for an even worse situation of rising oil prices, international terrorism, anti-Americanism, inflation (and worse: stagflation), negative environmental impacts, and business decline (due to increasing costs).

Discussion: Without [1] admitting we have a serious problem, nor [2] recognizing we - as a nation - must make a decision to solve it, no progress can be made.

Several groups must make this decision. In order to do something it, the Federal Government must develop a goal of (renewable) energy independence. The general population must understand that in order to avoid paying over $10 a gallon anytime soon, we must invest in our own future. Large energy companies need to become the innovators of tomorrow’s clean and renewable energy. State Government must support businesses, consumers and government agencies (example: The Energy Trust of Oregon) in developing and/or using energy efficient, renewable energy.

The following three recommendations must be implemented in tandem, if any one is to succeed:

[3] Take personal responsibility: In order to get ourselves out of this mess, we need to do the hard work: we need to understand that innovation in alternative fuel is sorely needed, and be able to pay the price now - for cleaner and even more cost-effective fuel, later. The word “conservation” was barely mentioned in the responses - with respect to an alternative to spiraling gas prices.

[4a] Become energy-independent*: Become a “net-exporter” of clean, renewable energy.*

Rationale: Great fortunes are being and will continue to be exchanged between countries. Currently, the United States is maintaining its lifestyle by being a net-importer of most commodities, finished products, and mostly - energy (oil). Our nation will continue to decline until and unless we can put our country back on the path to becoming a *net-exporter.*

Because energy costs permeate throughout our entire economy, *energy for transportation should be addressed first and foremost.*

[4b] Administration Leadership: *The administration* must *lead our nation to energy independence.*

Rationale: Since the first oil shock of 1973, neither party - Democrats or Republicans - have taken a true leadership role to move the U.S. to a net-energy-exporter status. In fact, energy policy after energy policy, administration after administration - has failed in this regard, as witnessed by terrorist attacks, our military response in oil-rich countries (why not North Korea? No oil), and the continuing rise in oil prices (due to simple supply / demand laws).

For the sake of future generations, now is the time for our administration to take bold, non-partisan action!

[4c] Policy change: *Develop and fund an energy-independence policy.*

Rationale: Whenever renewable-energy tax incentives are authorized (example: wind energy), hundreds of millions in investment dollars are funneled into (wind) projects. When incentives go away, projects go away. In the full scheme of eventual and total U.S. energy-independence, incentives create small progress. Significant policy development is needed. One which encourages research and technology development - towards the goal of energy self-sufficiency.

Discussion: *Energy-independence / Leadership / Policy*
On May 25, 1961, President Kennedy gave the now-famous speech to put a man on the moon:

> "I believe we possess all the resources and talents necessary. But the facts of the matter are that we have never made the national decisions or marshaled the national resources required for such leadership. We have never specified long-range goals on an urgent time schedule, or managed our resources and our time so as to insure their fulfillment.
>
> For while we cannot guarantee that we shall one day be first, we can guarantee that any failure to make this effort will make us last. We take an additional risk by making it in full view of the world … this very risk enhances our stature when we are successful. But this is not merely a race. I therefore ask the Congress, above and beyond the increases I have earlier requested… to provide the funds which are needed to meet the following national goals:
>
> *I believe that this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth.* No single… project in this period will be more impressive to mankind, or more important for the long-range… and none will be so difficult or expensive to accomplish."

The mission to the moon is not a single example. Facing another formidable challenge, the United States mustered the resources to overcome an immense obstacle: The Manhattan Project - to develop the first atomic bomb. Although questionable in it ethics, one of the world's most difficult research & technology challenge was overcome. Surprisingly quickly! Harnessing the power of Hydrogen is no less a challenge - and requires no less of a commitment!

The United States must have as a goal, by 2025, to become a net-exporter of clean, renewable energy. Significant investments must be made: in hydrogen-solution development, solar energy, fuel cell technology, energy storage, distributed energy, wave energy, and hyper energy-efficient solutions. Fundamentally new technologies must be created, infrastructure / transportation systems, as well as "grid" energy must be addressed. Energy technology should not be exported, but the systems / products that the United States develops: Profit is the motive, an extremely strong economy is the goal, and complete energy independence is the vision. We must control our own destiny, and we must do so with leadership, through funded policy changes and policy development.

The U.S. is most dependent of foreign sources in the transportation sector - which should be the focus of near-term energy policy. Solving this (oil dependency) problem will undoubtedly generate new ideas / solutions for on-grid energy, as well.

Appendix 1 describes how the United State can fund the development of new technologies to end our dependence on foreign oil.

[5] Tackle "25% issues: *Energy efficiency, energy storage and distributed energy solutions need to be addressed.*

Rationale: Should we, as a nation, decide to become a net-exporter of clean, renewable energy, there will undoubtedly be 15 to 25 years of "transition turmoil." (There will be even more national and international turmoil should we decide *not* to solve this problem!) During this transition, we must do more to reduce our reliance on energy, as well as become more resilient to terrorists' attacks. These two areas have the added benefits of [1] reducing costs (through efficiency / storage for level-loading), as well as [2] developing an impervious energy "channel" (through distributed generation solutions).

Description: The Energy Trust of Oregon (www.energytrust.org) provides an excellent example of how to incentivize reducing our dependence on "grid energy." By becoming more energy efficient, industry, businesses and consumer can save energy, money, and help the environment. That is "do good" while "doing well." Energy storage solutions are needed due to the cost impacts that hour to hour supply / demand changes have on current renewable energy solutions. For instance, the major cost driver for wind energy is that when energy is needed may not be when it is windy. When the wind is optimal for energy production, energy demand may not be enough to use all of it. Energy storage solutions can solve this problem - and can reduce costs in the long run. Incentivizing fuel-efficient behavior will encourage saving energy.

Saving energy, where practical, is needed to help us through the transition period.

[6] Develop an "H-Prize:" *Much like the "X-Prize," where the first non-government human space flight, under specific guidelines was awarded $10 million. The stakes are much higher, as should amount of the prize.*

Rationale: The mission of the X PRIZE Foundation was to create radical breakthroughs in space and other technologies for the benefit of humanity*. A similar "H-Prize" could be developed for independent development of a Hydrogen-based solution to transportation fuel. This would incentivize creativity and innovation in the private sector.

* On October 4th, 2004, the X PRIZE Foundation captured the world's attention when the Mojave Aerospace team led by Burt Rutan and Paul Allen flew SpaceShipOne to 100KM to win the $10 million ANSARI X PRIZE. Because of the dramatic nature of this achievement, the X PRIZE Foundation is now widely recognized as the leading model for capturing public support and fostering innovation through the use of competitions.

Discussion: The amount would need to be much large ($100 million?) and the requirements (selection criteria / specifications / licensing, etc.) would need serious development. (Jonathan Logan recently shared this idea with me: He is due full credit.)

The following two recommendations are "systemic" in nature. They are provided more as an "awareness of the problem" than they are any possible solution. That is - the process (and cost) to education Americans on the true costs of "cheap oil" is an expensive proposition at least. The shift to a multi-party system has an intrinsic fallacy: we are currently being led by a(n arguably) two party system: Change might never occur!

[7] Build awareness: *The American people need to be educated about the true costs of our addiction to cheap oil.*

Rationale: Fear *of* change is the biggest issue *to* changing our ways. We misunderstand fundamental supply and demand relationship. Depending on whether we are left, or right-leaning, we like to blame someone else for our problems. (For instance, there have been several email hoaxes that spread quickly - as if they will make a difference: "Don't buy gas next Thursday." "Don't buy from Shell." *The only way to bring down the price of oil is to user less!* Our misunderstandings cause us to behave in ways that actually reinforce the problem!

Description: The more educated we are on a problem, the more we can accept a solution. A more in-depth description for this recommendation can be found in Appendix 1.

[8] Support a multi-party system: *The two party system, developed and supported by Americans, is crippling our ability to solve ever-increasingly complex problems.*

Rationale: Currently, both parties are too busy blaming the others' approach (for short-term re-election purposes) to see that the long-term solution lies outside either a "left" or "right" solution. As long as we are too busy arguing about the wrong things, we will ignore the right things to argue about. For instance: "How can we become an energy-independent net-exporter of clean, renewable energy in the next 20 years?" would be a great national debate to have. We are too busy blaming Democrats or (currently) Republicans for our own troubles. Answering this question would be of tremendous value to all Americans, and to the rest of the world!

Discussion: Several states are considering abolishing "party politics" at the state level. The value in doing this is that we can (tend to) avoid labels like "tree huggers" and "religious zealots" as we try to solve pressing economic problems (like job creation, reducing our need to go to war, improving our environment (while building wealth), thereby reducing health-care costs, etc.)

Perhaps more important than these positive outcomes, is the fact that we can embrace "doing good while doing well." Left-of-center politicians think "profit" is a bad word. Human nature is to acquire and build wealth. Why not support it? Right-of-center politicians think "sustainability" is a bad word. Turning down a thermostat saves money! Why not support it?

Profit-motivated incentives should be supported… to help the United States re-establish itself as the economic world leader in clean, renewable energy. A multi-party system would air more differences, discuss more options, generate more ideas, and help us solve our problems sooner.

General Conclusions

- We are own worst enemy!
- Most surprisingly, respondents blame *others* for our current situation, yet want cheap energy. We do not see that our own desire for cheap fuel is actually the cause of our current situation! (Instant, rather than deferred gratification appears to be the norm.)
- The price of gasoline will have to dramatically increase before Americans take concrete action to develop alternate fuel.
- People do not want to change.
- It appears that the need for cheap energy outweighs the need to reduce wars.
- If alternative, renewable and clean energy were made available at *lower-than-gasoline prices*, up to 90% of people would make the switch (if other issues of safety and "transition issues" were addressed).

Specific Conclusions

The following conclusions - on a per-question basis - can be drawn:

Question 1: How interested would you be to buy hydrogen instead of gasoline if priced within your budget.

Conclusion:
- If priced within their budget, nearly 90% of respondents would be positive towards buying Hydrogen as an alternative fuel for transportation.

Rationale:
1) If priced within their budget, 60% would "definitely buy" hydrogen as an alternate fuel source, while 80% gave a positive response ("Definitely' and "probably.").
2) The average response was "Probably buy" - and is generally age-independent.
3) Only six percent would definitely not buy Hydrogen as an alternative fuel.
4) Fourteen percent indicated they may or may not buy. Assuming ½ of this total is positive, and ½ is negative, 87% are positive towards Hydrogen as an alternative fuel, while 13% are negative.

Question 2: What concerns would you have about hydrogen fuel?

Conclusions:
- The uphill battle to shift to a "Hydrogen economy" - in the minds of consumers - would need to address safety concerns, the true costs of fossil fuel, and the value of a Hydrogen economy.
- Additionally, "spot solutions," where some ("fringe" elements?) people would have intermittent access to it - will not work. Not only will marketing need to address these concerns, actual implementation will nee to address them! Cost and availability are real / valid issues which can not be marketed away.
- Safety is not as large a real issue as it is a perceived issue. Due to the deep-rooted nature of this concern, safety will need to be proven.

Rationale:

1) The top three issues people are concerned about are [1] safety of this fuel, [2] costs to use it, and [3] ensuring there is easy access to it, for every day use. This accounts for over 50% of their concerns. The next two issues are [4] Vehicular performance / maintenance costs and [5] General risks - bringing the top 5 concerns to account for nearly 75% of the concerns. Interestingly, a roughly equal (yet small) number of responses indicated they had "no concerns"… as admitted they "did not know enough" about the situation to comment intelligently.
2) There were 13 major concerns about hydrogen fuel.
3) "Safety / explosion" rated #1, and accounted for nearly a quarter of the responses. This included statements like "Didn't the Hindenberg explode, due to Hydrogen?" "I don't want to explode!" Worried about "blowing up." Even misconceptions about the different reactions involved was evident: "They made a very big bomb with this stuff once."
4) Costs (of Hydrogen and vehicles to operate with it) were identified as the #2 issue. An "embedded" concern is the cost to change from fossil fuel to Hydrogen (or any alternative, for that matter.)
5) Availability of Hydrogen was stated many times: people want the infrastructure to ensure their every day lives aren't affected. They want it just as accessible as gasoline is now. They are concerned with change.
6) There is a general uneasiness about Hydrogen as a fuel and the "change" it would require.
7) One astute individual understands that current methods of Hydrogen extraction (ex: methane reformation) may cause more environmental harm than good.

Question 3: What benefits would you see, w/ a "hydrogen economy?"

Conclusions:

- There is a strong belief that a hydrogen economy would have significant positive environmental effects. (35%)
- Adding "reduce dependence on foreign oil" and "reduce need for war," yields a "energy independence" (or even isolationist) aspect that accounts for over 38% of responses - the largest benefit seen.
- Interestingly, even with the Afghanistan and Iraqi wars, "reduce the need for war" accounted for less than 10% of the stated benefit.

Rationale:

1) The top three benefits respondents identified are [1] cleaner environment (35%), [2] energy independence (29%), and [3] reducing the need for war (9%). These three account for nearly 75% of the identified benefits.
2) The next two issues are [4] improved US financial strength and [5] Reducing costs / prices - bringing the top 5 benefits to account for nearly 90% of the identified benefits. Again, a roughly equal (yet small) number of responses indicated they saw "no benefits"… as admitted they "did not know enough" about the situation to comment intelligently.

Questions 4-7: Price: What value do you place on Hydrogen as an alternative fuel?

Conclusions:

- Americans are more interested in cheap fuel than they are the benefits that clean / renewable fuel would provide.
- People feel that Hydrogen is much lower in cost than gasoline, and feel that "big oil" (and President Bush) is manipulating the fuel supply, such that Hydrogen is not being developed. Some people feel there is a hidden agenda.

Rationale:

1) Most people feel anything over $3.00 per "gallon" of Hydrogen is too much.
2) Preferred pricing (~ $1.75) of nearly 90% of respondents is actually *less* than current gasoline prices (~ $2.40)!
3) There are some serious misunderstandings of the cost to produce hydrogen.
4) There are a few people who would pay $3 to $5 a gallon (or more), if the stated benefits were received.
5) The average of the top 50% of respondents would pay is $2.66/gal (about today's premium gasoline prices), while the bottom 50% of respondents would pay about half that ($1.42/gal).
6) Contrary to prior Hydrogen pricing research, the higher the average age, the more they are willing to spend.
7) There is nearly a 10x disparity between what people are willing to pay - between the top 1% price and bottom 1% price.
8) Non- U.S residents would pay $3.30/gal vs. US residents $1.90/gal. (Comparing "super-averages.")

Question 8: What else would you "want to exist" to increase the value of hydrogen for use in your vehicle?

Conclusions:

- Respondents want their cars to "work" with Hydrogen fuel, and are concerned about it's use in their cars & trucks. They also want to be assured it will be available wherever they go - and cheap.
- Respondents have advice as to how *others* should behave.
- Respondents like to blame others for this situation.

Rationale:

1) "Availability / ease of access to Hydrogen fuel" equaled "Vehicle performance," which both rated nearly 20% (40% total). "Vehicle adaptability" also rated high, and when coupled with "vehicle performance," and "Specific vehicle aspects," account for over 35% of all responses.
2) Initial and operational costs accounted for nearly 10% of this open-ended question.
3) Someone said it best: "It will take a complete catastrophe for our politicians to make it happen."
4) It's those damned SUV's.

Question 9: What other comments and/or ideas do you have?

Conclusions:

- There is serious suspicion that "they" are doing it to "us." (re: high gas prices.)
- There is a view that *someone else* needs to get us out of this problem.
- It appears that personal responsibility is lacking and there is a lack of understanding that those who want cheap fuel are actually encouraging others to maintain (relatively) lower prices… at the expense of funding innovation that could produce alternative fuels. Competing energy sources will ultimately drive down prices, but there is no motivation to spend money if prices are kept artificially low. It's fundamental supply and demand.

Rationale:

1) Costs rated highest (22%), when respondents were asked this very innocuous question.
2) Some people are supportive of this idea and offered other ideas.
3) People want others to live a certain way / feel there is a conspiracy (even with this questionnaire!), and that companies and big government are to blame.
5) Respondents think oil companies are gouging them with “high” prices; when other countries are paying significantly more.
6) There is a sense of entitlement.
7) There are some serious misunderstandings as to how a free market system works. Example: “Hydrogen is not expensive.” (Currently it costs about 5 times as much as it costs to produce as much energy as fossil fuel.)
8) Out of all the responses, *only one* had a focus on the future: “ “We need a comprehensive energy policy. One that provides a "bridge" from current infrastructure, to one of the future. This means that we need to FUND innovation, not just oil extraction!”

Question 10: What is your age?

Conclusions:

- Respondents were balanced between the ages of 20 to 50. No teenagers responded, and only a few over their 60s responded.

Question 11: In which state & country do you live?

Conclusions:

- US respondent made up 95% of responses, while non-U.S. accounted for 5%. Although 5% is not sufficient to be statistically significant, there was a clear trend that non-U.S. respondents appear much more used to higher gasoline prices, and therefore more willing to pay more for Hydrogen as a fuel.

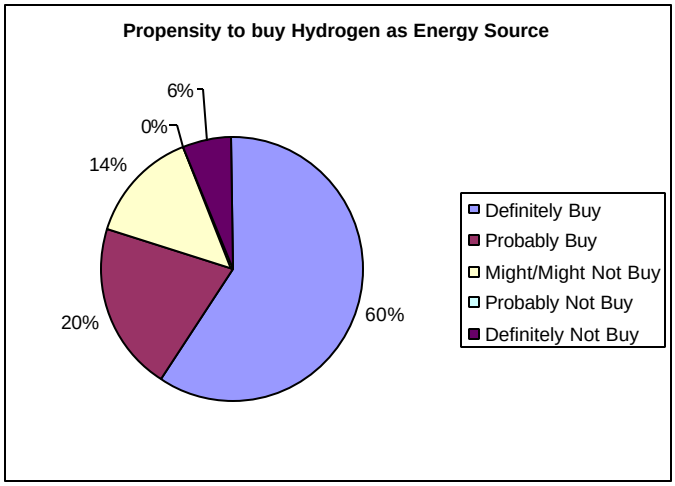
Detailed Results

Provided in this section are the raw results, as well as an assessment for the responses.

Question 1: How interested would you be to buy hydrogen instead of gasoline if priced within your budget.

Average: 4.27
Standard deviation: 1.11
Where: Definitely Not Buy =1
Probably Not Buy = 2
Might or Might Not Buy = 3
Probably Buy = 4
Definitely Buy = 5

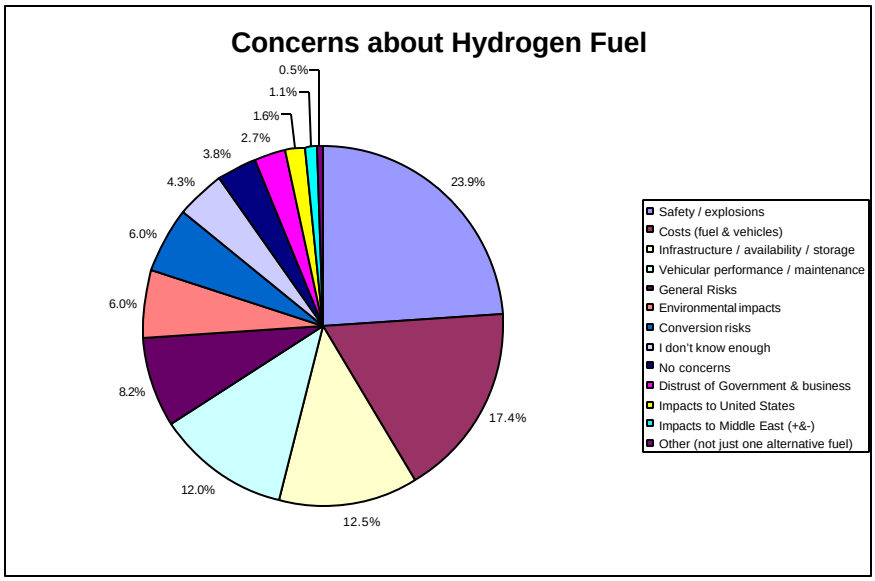
Age range	Average	Standard Deviation
Twenties	4.48	1.04
Thirties	4.00	1.00
Forties	4.36	0.99
Fifties	4.00	1.17
Sixties	4.08	1.56
Seventies	4.67	0.58



Question 2: What concerns would you have about hydrogen fuel?

Concern	# of mentions	Percent of Total	Cumulative
Safety / explosions	44	23.9%	23.9%
Costs (fuel & vehicles)	32	17.4%	41.3%
Infrastructure / availability / storage	23	12.5%	53.8%
Vehicular performance / maintenance	22	12.0%	65.8%
General Risks	15	8.2%	73.9%
Environmental impacts	11	6.0%	79.9%
Conversion risks	11	6.0%	85.9%
I don't know enough	8	4.3%	90.2%
No concerns	7	3.8%	94.0%
Distrust of Government & business	5	2.7%	96.7%
Impacts to United States	3	1.6%	98.4%
Impacts to Middle East (+&-)	2	1.1%	99.5%
Other (not just one alternative fuel)	1	0.5%	100.0%

Question 2: What concerns would you have about hydrogen fuel?



Safety / explosions **44**

All information and/or dangers must be disclosed about hydrogen; Also the safety of the fuel; Any safety issues? Base upon the instability of hydrogen, I question the safety of this product in the context of highway use. Blowing up; Explosion; Explosions; Explosive nature of gas; Fire safety concerns; Gasoline must have a specific amount of oxygen to explode otherwise, it just burns. Hidden problems like danger in crashes; How explosive is going to be? Hydrogen is more explosive than gasoline. Hydrogen will explode with almost any mixture of oxygen. I understand that it is safer to have the hydrogen in a solid form---my only concern would be the liquid form. I would also be interested to see the safety of this gas being that it is not just flammable like gas, but explosive. I don't want to explode!! I would be concerned about the safety due to explosiveness. I'd want to know what kind of combustion dangers there are? Initial cost of a hydrogen operated vehicle. Is hydrogen volatile? Is it safe to use and be around; None, besides safety; Potential explosion; Problem with safety - could it blow up? Safe and reliable; Safety; Safety; Safety; Safety; Safety; Safety; Safety; Safety; Safety - explosions as per the Hindenburg etc; Safety - H gas is volatile, won't it explode if it contacts air? Safety issues - in storage and delivery plus travel-explosions? Safety issues, explosions; Safety risks (ie: explosions while fueling, during a collision with another vehicle, etc); Storage of the Hydrogen at the fueling stations; The dangers to the area from Explosion. The Hindenburg! They made a very big bomb with this stuff once. Very concerned the hydrogen tank might explode, especially in a collision. What happens if I'm in an accident?

Costs (fuel & vehicles) **32**

How much would it cost per vehicle to switch to hydrogen? Price increasing after we are dependent on it; Cost of conversion on my vehicle; Cost; Price; Cost near and long term; Conversion costs; Cost; Will the cost be prohibitive? Price; Could the price of hydrogen fluctuate like gasoline? Consistency of price; Is its transport cost-effective; High costs to store & generate; Would hydrogen cars be more expensive than gasoline cars (as gas/electric hybrids are now); Cost; Price of car using it; Price; Cost; The cost; The cost first; Cost of the fuel...it needs to be cheap!; Cost; Cost; Price; Competitive pricing; I would of course be concerned it would be more expensive to replace parts considering your average mechanic wouldn't have the skills necessary to fix this vehicle, so even though you may say it would be comparable pricing you would end up paying dealer price especially in the lag phase where only dealers would be equipped to repair these vehicles. I don't get my vehicles fixed at dealers because they generally charge double or more than a privately owned garage; Competitive equates to economical and gas today does not meet that standard; Would big business drive prices up in the future; This could be another big expense; Quality; Value

Infrastructure / availability / storage **23**

Availability; Availability; Availability; Availability; Availability; Availability; Availability; Availability anywhere in US; availability of hydrogen fuel; Availability, ie "gas" stations; General available given that everyone is geared to petrol; How would the hydrogen be stored? Hydrogen is difficult to store, and leaks through extremely small holes so it tends to be "lost" more easily; I would like to be able to have access to it just as I have with gasoline. I would like to be able to fill up at local stations wherever I travel; Less accessible; No Current Infrastructure to support vehicles; Readily available; Refueling station availability; Storage, distribution; That enough outlets would offer it; That there was hydrogen fuel stations all over the country; The availability; Years ago I looked into replacing my car with a diesel fueled car. There was the pollution issue which does not apply here but also diesel fuel was just not readily available everywhere.

Vehicular performance / maintenance **22**

How long the car and fuel would last; Is it reliable? I wonder how a switch to hydrogen would affect a car's performance; Would my car still drive at a high rate of speed (75+ mph)? Would we still be able to achieve the same horsepower and acceleration for example? Driving range; Efficiency; Long range travel; .Engine maintenance; Performance; Maintenance; Performance; Loss of power; Loss of MPG; Fuel efficiency. That it would offer the same Power and performance as gasoline. Will mechanics need to be re-trained to service hydrogen fuel cars? Also they haven't fixed the power capability problems associated with these vehicles. I would of course be concerned it would be more expensive to replace parts considering your average mechanic wouldn't have the skills necessary to fix this vehicle, so even though you may say it would be comparable pricing you would end up paying dealer price especially in the lag phase where only dealers would be equipped to repair these vehicles. I don't get my vehicles fixed at dealers because they generally charge double or more than a privately owned garage. Performance concerns. The type and looks of a vehicle.

Risks: General Fear/uncertainty/doubt (& questions) **15**

That we aren't hearing the whole story, it seems too good to be true. If it's this new and advanced there's really no way to tell the effect if any long term use will have. Like a prescription drug that just came on the market. If there are as many people driving these cars rather than combustion engines will the water that is left as exhaust cause any problems for other drivers (ie causing fog, ice, slick spots)? The car itself would be a problem for a couple of years. Every car, regardless of fuel, has kinks to be worked out for the first few years. After the kinks were worked out, however, I would be interested in cleaner air, etc. Hydrogen fuel is a byproduct of water, will it contribute to water pollution or will it force a more comprehensive clean water act. How will hydrogen be produced without increasing more pollution & reliance on fossil fuels? How is it acquired? Does it take away from something/someone else in order to make it? What is the thermal value (BTU) comparison between diesel fuel and hydrogen? Hidden problems; How it will be processed and how it will be regulated; Time to market currently predicted at 10-20 years. Has the by-product of burning it been thoroughly tested? How is it helping the economy (i.e., is it creating more jobs); Where is it coming from? Would the program be feasible to enact.

Environmental impacts **11**

I've read some research articles that say hydrogen is not as beneficial as everyone says. It also pollutes the environment in the process of making it/extracting it; How it effects the environment, how it can be utilized.. processes; Would its manufacture cause significant pollution? How much better for the environment? How much coal and oil are used to produce the hydrogen? How will hydrogen be produced without increasing more pollution & reliance on fossil fuels? Also do not know what emissions you would get from burning hydrogen - would this be just swapping the current problem for something else? Pollution; Cleanliness; Based upon currently technology, your "Description" is flawed. Hydrogen production technologies need to be improved otherwise total pollution would increase. Hidden problems like something negative to environment.

Conversion risks **11**

I would need to replace my car, if regular gas was not available. It would take a long time to replace all gas fueled cars. Would oil still be available to heat our homes? If not, the same issues in 1 and 2 apply to home heating. What about buses and trucks, etc.? Will they also use hydrogen fuel? How complex would it be to convert a diesel vehicle engine to operate on hydrogen? Can gas cars be converted to hydrogen fueled cars? This could be another big

expense. Would there be a way to convert motorcycles as well? Would a hydrogen power engine be 2 stroke or 4 stroke? How will cars and home heating units be converted? Would this just be passenger cars, or would there be a focus on getting other vehicles changed (ie trains, large trucks, etc)?

I don't know enough **8**
I'm not educated enough on the subject to have concerns. Not understanding it. Don't know enough about it. I don't know enough about it. I don't know enough about hydrogen to ask specific questions. Not sure how it works. More information on hydrogen. I know too little about it, and have to depend upon the knowledge and opinions of those who do - who are "in the business"!

No concerns **7**
None - I am convinced that this is the best source for energy; None; None; Really none if it reduces the reliance on foreign oil and the environmental problems associated with its production; None, I know it is safe; None; None, so far.

Distrust of Government & business **5**
That our government and the oil companies will forever stand in the way of making this happen...as they have for years, already. Would then big companies have a monopoly? Would consumers actually end up benefiting or would companies. How do you get the oil companies who spend millions on lobbying to give it all up; Would big business drive prices up in the future.

Impacts to United States **3**
Only that those Americans who make a living in the fuel refining industry could shift to the new method and sustain their incomes and local economies. How will the production of fuel cells affect our reliance on strategic metals & other critical materials? How is it helping the economy (i.e., is it creating more jobs);

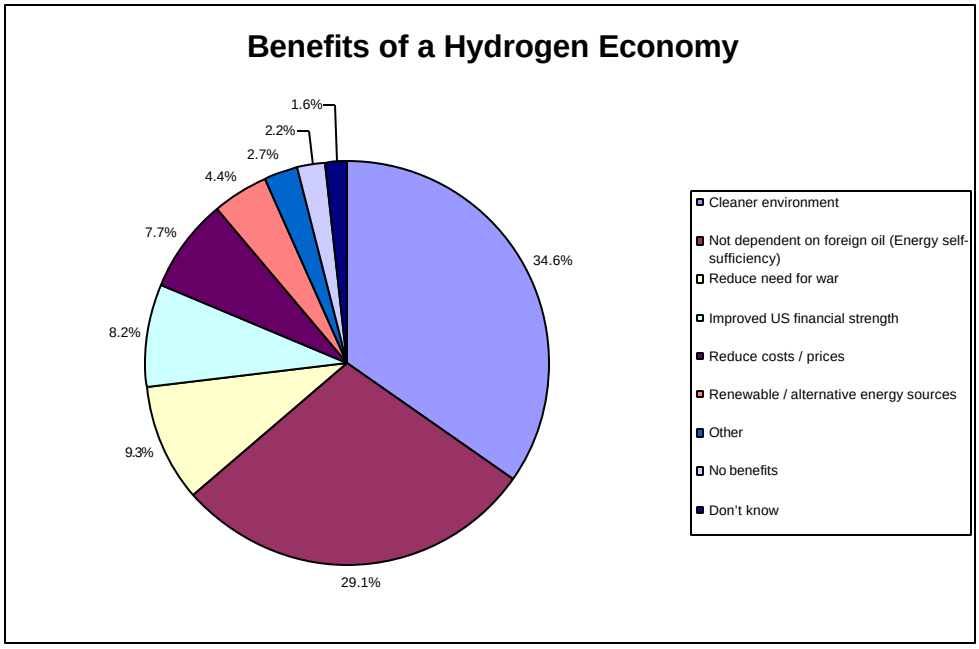
Impacts to Middle East (+&-) **2**
I don't care how many Saudis lose their jobs here in the states or overseas. The poor Middle Eastern countries would recess into even more severe poverty without the money we give them for oil.

Other (not just one alternative fuel) **1**
What is wrong with ethanol from corn? This would save the farmlands. How about Greaseoline from fries? How about diesel from the coal piles in Pa? I want more than one alternative competition works. Hydrogen is fine if all the other mediums are pushed. No single fuel for USA

Question 3: What benefits would you see, w/ a "hydrogen economy?"

Benefits	# of mentions	Percent of Total	Cumulative
Cleaner environment	63	34.6%	34.6%
Not dependent on foreign oil (Energy self-sufficiency)	53	29.1%	63.7%
Reduce need for war	17	9.3%	73.1%
Improved US financial strength	15	8.2%	81.3%
Reduce costs / prices	14	7.7%	89.0%
Renewable / alternative energy sources	8	4.4%	93.4%
Other	5	2.7%	96.2%
No benefits	4	2.2%	98.4%
Don't know	3	1.6%	100.0%

Question 3: What benefits would you see, w/ a "hydrogen economy?"



Cleaner environment **63**

A dramatic decrease of water contamination from fossil fuel products; A healthier environment would also benefit all; An earth that doesn't suck! ; Be better for the environment; Better environment; Better for environment; Better for the environment; Better protection of the pristine environments, less likelihood of oil spills; Clean air All over environmental benefits; Clean air, lower prices, less wear and tear on engines; Clean air, resource conservation; Clean air; Clean burning; Clean environment; Cleaner; Cleaner air; Cleaner air; Cleaner air; Cleaner air; Cleaner air; Cleaner air; Cleaner air; Cleaner burning fuel, better for the environment; Cleaner environment; Cleaner environment (offshore drilling); Cleaner environment, less "greenhouse effect."; Cleaner environment; Environmental benefits; Good for the environment; H+o2=H2O; Hopefully less pollution; I assume environmental benefits; It is environmentally friendly; Less pollutants / no devastation to the environment; Less pollution; Less pollution; Less pollution; Less pollution; Less pollution; Less pollution; Less pollution; Less pollution as long as the hydrogen can be produced in a environmentally friendly way; Less pollution is the obvious benefit; Less pollution; Lower pollution; Lower pollution; Minimize pollution; Most important...a cleaner environment and all the benefits that would bring; No fossil fuel by-product; No nasty smoke fumes behind semi trucks, L.A. wouldn't look so gross when flying in overhead; No need to go into Alaska to drill for oil; No pollution; Obviously the cleaner environment stuff, Yay; Obviously the HUGE environmental impact; Pollution free; Possibly less pollution; Potentially lower pollution depending on how the hydrogen is separated from water (or other hydrogen-rich substances); Quieter cars; Reduction in pollution x3; The vehicles would be cleaner; The vehicles would be cleaner and more quiet, not that noise was much of a problem.

Not dependent on foreign oil (Energy self-sufficiency) **53**

End dependence on foreign oil; End of foreign fuel dependency; Ending our reliance on foreign oil x3; Energy independence; Free up some of the need for importing oil; Freedom; Freedom from foreign fuel blackmail; Less able to be "black mailed" by OPEC; Less dependence on foreign energy; Less dependence on foreign oil sources hopefully; Less dependence on oil; Less dependence on oil; Less dependence on other countries; Less dependence on other countries; Less dependence on the Middle East; Less dependency on foreign oil; Less foreign oil dependent; Less power for OPEC; Less reliance of imports; Less reliance on foreign fuel sources; Less reliance on foreign oil; Less reliance on foreign oil; Less reliance on foreign oil is the biggest benefit by far; Less reliance on foreign oil with the economic and political benefits that follow;

Less reliance on other countries for fuel; Minimize reliance on outside influences that are not friendly to the USA; No dependence on Middle East oils; No dependence on oil countries; No dependence on oil sources; No foreign dependency; No foreign reliance; No oil dependency; No reliance on countries we are at war with; No reliance on foreign commodities; No reliance on foreign oil; No reliance on foreign oil; No reliance on other countries for the majority of our need; Not dependent on oil; Not depending on other countries for oil; Not having to rely on foreign oil; Not relying on foreign oil; Not relying on other countries to supply our oil; Not to be dependent on foreign oil would be a wonderful thing and I believe it would have positive effects on our world; Particularly, not having to be dependent upon "foreign" providers; Reduced dependency on foreign products; Reduced reliance on foreign countries, as previously stated; Reduction in consumption rate of limited resource; Reduction of reliance on oil with the consequent reduction in geo-political power of the Mid East; Saving money and more production; Severance of funds to Middle East; US independence; We could depend on our own oil rather then Middle East oil; Would make us far less dependent on other countries for a fuel source.

Reduce need for war **17**

As a military member, the threat of deployment to oil based companies would decrease; End of US war mongering (short term) forestall the end of the world (longer term); Less excuses for war; Less war; Less wars over oil; Lots, including stopping the need to be the "worlds police" in order to control oil rich nations; Might stop having stupid wars over oil; National security improved; No excuse for war with countries that we "need" oil from; No reliance on countries we are at war with; Reduce defense budget; Removal of fuel from the power struggle; Since fear over the availability of resources is a big factor in war and conflict in general, perhaps this will aid in greater relations with other countries; Strengthens our national defense - reducing the need to enter into "energy-need" conflicts. X3; No more power politics.

Improved US financial strength **15**

$ stay in USA; A stronger DOW; Additional business opportunities; Americans would support America - The Middle East can sit on it's oil and learn to grow it's own food and educate it's own children. Energy independence; Gets rid of the "hidden costs" associated with using fossil fuels for our power needs. X3; Improve health; Lower health costs; Lower insurance costs; Lower the federal budget deficit. X3; Net exporter of energy; Severance of funds to Middle East; Stronger economy.

Reduce costs / prices **14**

As a poor college student, right now cheaper is always better, and I would think that taking the importation of oil from foreign markets could achieve this. Equitable cost and efficiency. Hopefully it would cost less that gasoline; If hydrogen replaced gasoline at a price lower than today's for example it would be worth while otherwise not; Less expensive; Lighter, should be cheaper, change in gas tank location, no more dependence on middle east oil. Lower costs based on the information presented here. Lower fuel costs; Lower prices; Lowering health care costs x3; Much lower prices; Not relying on foreign oil; Price hikes

Renewable / alternative energy sources **8**

A different fuel source; more options; A more stable source of energy; Close to infinite power; Less dependence on fossil fuel. Less reliance on non-renewable energy sources; No more fuel shortage. Renewable! Unlimited fuel

No benefits **4**

I see none yet. The overall benefit of a "hydrogen economy" cannot be assessed until a comprehensive life-cycle cost/benefit study is completed. None; None. We have sufficient fossil fuels in this country for our energy needs. We just need to ignore the "tree huggers".

Don't know **3**

?; Do not know sufficient to be able to fully answer this question. Very unfamiliar with the topic

Stated in the survey **N/A**

All of the above; All of those you mentioned in the foregoing; If all of the above is true, then all the benefits are already stated. (Each of the following items were repeated three times, to account for the "all of the above" type of answers.): Ending our reliance on foreign oil; Lowering health care costs; Reduction in pollution; Strengthens our national defense - reducing the need to enter into "energy-need" conflicts; Gets rid of the "hidden costs" associated with using fossil fuels for our power needs; Lower the federal budget deficit.

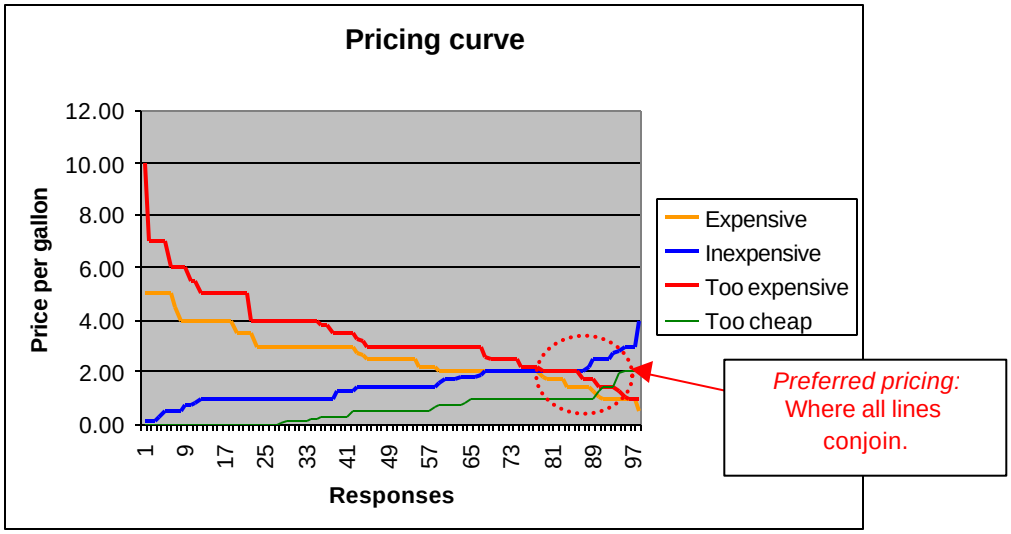
Other

Better health for all; Endless resource of nuclear weapons; Get on with other important things in life; If larger consumers such as trains, trucks, etc made user of hydrogen as a primary energy provider I would see it as very beneficial. No more Bush!

Questions 4-7: Price: What value do you place on Hydrogen as an alternative fuel?

Preferred price points

Correlating the pricing data as suggested in The Entrepreneur's Survival Guide[1], the expectation of respondents is that the "preferred price point" is between $1.25 to $2.00 ($1.63) per "equivalent gallon of hydrogen."



Comparison to gasoline

Currently, gasoline is selling for $2.20 to $2.60 per gallon in Oregon, with a nationwide (US) range of $1.85 to $2.85 per gallon[2]:

Range of responses

The top 1%, 10%, etc., results show that although the preferred pricing is approximately $1.63, the top 50% of respondents indicated they would pay more than $2.50 a gallon… currently where supreme is priced, while the bottom 50% of respondents indicated they would prefer to pay under $1.50 a gallon. The gaps between what age ranges would pay for an equivalent gallon of hydrogen indicates disparities as follows:

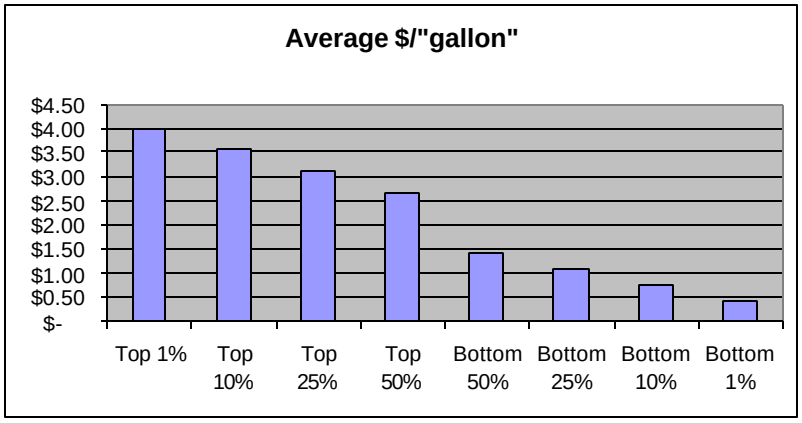
	Ave $	Age
Top 1%	$ 4.00	58.0
Top 10%	$ 3.57	54.0
Top 25%	$ 3.12	46.4
Top 50%	$ 2.66	45.7
Bottom 50%	$ 1.42	43.1
Bottom 25%	$ 1.10	41.9
Bottom 10%	$ 0.76	42.1
Bottom 1%	$ 0.40	44.0

(1) The Entrepreneur's Survival Guide, "How to Value Price Your Products & Services," starting on page 91; ISBN 0-9708665-2-6.

(2) www.gaspricewatch.com: May 3, 2005

Disparity within responses

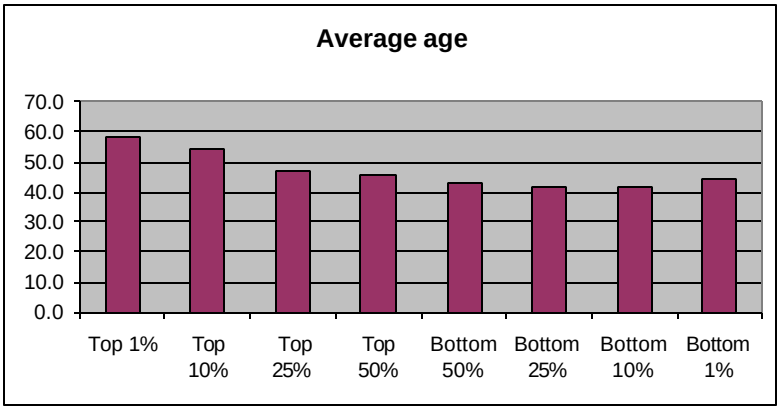
Further analysis, and graphical representation of these data shows a serious rift among respondents' perspective of what clean-fuel should sell for:



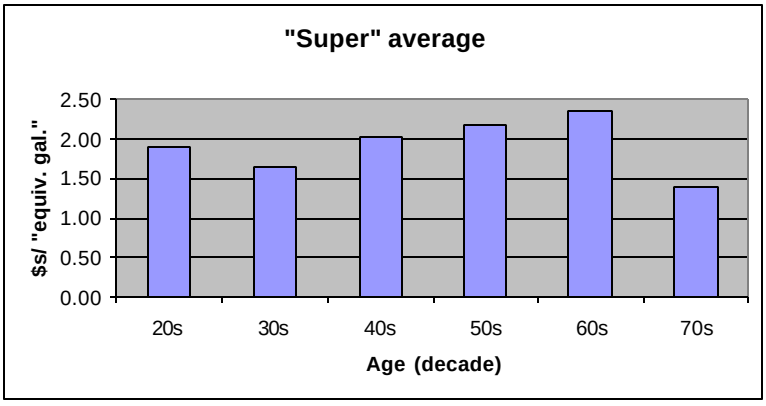
Top vs. bottom	Disparity
1%	9.9x
10%	4.7x
25%	2.8x
50%	1.9x

Age-dependence

Age-dependent aspects of preferred pricing shows that more mature individuals will tend to pay more:



Additionally, the "super average" [(3)] shows how price expectations change with age:



(3) "Super average:" An average of all values for pricing. This is for comparison sake only, and is not to be interpreted as "what the market will bear." It is only to be able to correlate two sets of high-level responses.

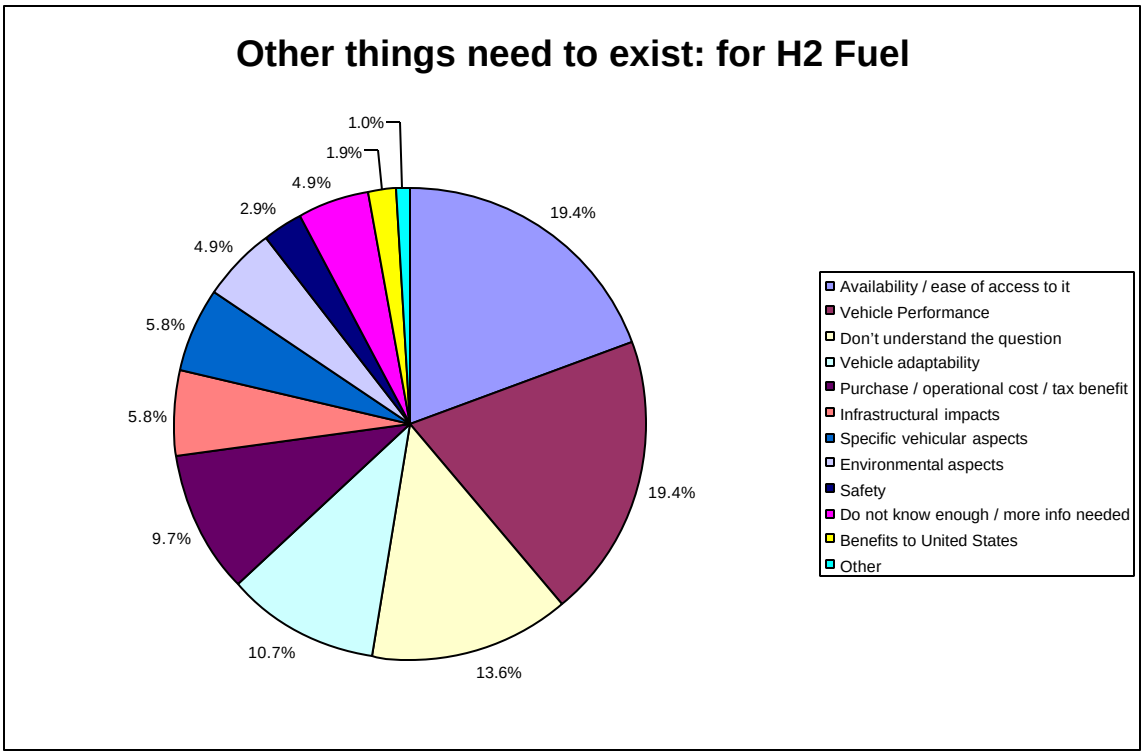
United States vs. non-U.S

The “super-average” comparison of the United States ($1.90) with non-US respondents ($3.30) shows that US respondents expect to pay significantly less than what non-US respondents expect to pay. (Even though insufficient relative responses have been received to draw this conclusion, it correlates well with the pricing structure outside the US. That is, contrary to what Americans feel, the United States enjoys relatively “cheap” oil.

(4) Four percent of respondents included those from Thailand, United Kingdom, and Costa Rica.

Question 8: What else would you "want to exist" to increase the value of hydrogen for use in your vehicle?

Things that need to exist	# of mentions	Percent of Total	Cumulative
Availability / ease of access to it	20	19.4%	19.4%
Vehicle Performance	20	19.4%	38.8%
Don't understand the question	14	13.6%	52.4%
Vehicle adaptability	11	10.7%	63.1%
Purchase / operational cost / tax benefit	10	9.7%	72.8%
Infrastructural impacts	6	5.8%	78.6%
Specific vehicular aspects	6	5.8%	84.5%
Environmental aspects	5	4.9%	89.3%
Safety	3	2.9%	92.2%
Do not know enough / more info needed	5	4.9%	97.1%
Benefits to United States	2	1.9%	99.0%
Other	1	1.0%	100.0%



Availability / ease of access to it **20**

Unlimited supply and availability; Easy access to it; Hydrogen distribution system; Easy access to hydrogen; Easily available; Ease of finding it; Availability; Availability at every gas station; Supply of hydrogen widely available; Many outlets; As much availability and ease of use as gasoline. An infrastructure so it was not too hard to get fuel and to have my vehicle serviced; Necessary fueling infrastructure and ease of use; Higher availability of outlets for refueling; Assured access to refueling stations, though not necessarily the same frequency as gas stations. A network of hydrogen service stations; Excellent engineering to assure good mileage; Just to be able to operate it in a similar fashion to my gasoline vehicle, i.e. available everywhere, maintenance availability; Same amount of hydrogen chargers; Assurance that there is a large population of people that will take this step toward hydrogen fuel with me.

Vehicle Performance **20**

Different models available with different "fuel" economy and mileage with hydrogen; More mile per gallon; Mileage; Booster systems for speed; Tax break for people who convert to alternative fuel; More data on

the performance of engines that run on hydrogen fuel; Good performance; Performance - mileage; No loss of engine horsepower; Same performance from engine; I would like the car to go further than the typical 200-300 miles on a tankful of fuel; Longer distances between fill ups; If the car runs well, I would use it; Miles per gallon; More miles per gallon; Easy to fuel and good mileage; Just to be able to operate it in a similar fashion to my gasoline vehicle; I think this question is a little unclear, but I would be ALL FOR not having to get DEQ approval anymore!; Prolonged vehicle life; Hydrogen Cars to be same quality as current oil consuming cars.

Don't understand the question **14**
?I'm confused?; ?; Don't understand the Q; unsure; don't know; I don't know what this question is asking; ?; I'm not quite sure what you are asking.; Unknown.; ?; Don't know; I don't understand the question. Sorry I must be stupid. I wish santa clause existed though. But I don't think that would help your situation; Don't understand the question. I don't really get the question, but I would stop using gasoline like that if something better came along. Not even that much better.

Vehicle adaptability **11**
Conversion kits; Performance after market products. Performance engines; Good vehicle performance; Hmmm, the only thing I can think of is that I hope environment friendly cars start to look like normal cars, not futuristic like some of the existing models; A mechanism to clean and lubricate the engine parts as fuel is used to keep the machine running cooler and longer - so we're not building machines which break down and need to be replaced so often; The ability to provide the kind of power we are used to with current vehicles using combustion; Easy change over at the gas pump; A network of hydrogen pumps everywhere there is a gasoline pump; A network of hydrogen "filling stations"; A gasoline switch over button; Conversion kits for cars.

Purchase / operational cost / tax benefit **10**
Tax benefit; Affordable vehicles that run on hydrogen; If you doubled or tripled the mpg, use of cars on hydrogen, i'd pay equivalently more relative to $3; Lower insurance costs with hydrogen powered vehicles; Miles per gallon; More miles per gallon; I would not want to have to pay a fortune to buy a hydro car; It too would have to be cheap as well as the fuel; It needs to be cheap!; Just to be able to operate it in a similar fashion to my gasoline vehicle, i.e. relatively inexpensive

Infrastructural impacts **6**
Competition between dealers; More automotive-maker buy-in; The backing of the automobile industry; Equitable access to jobs in the new industry; Equitable pay for all employees; A full evaluation of the impact on the environment of converting to this fuel source.

Specific vehicular aspects **6**
The ability to generate it on board the vehicle for immediate use from water!; To have a car that can produce hydrogen by itself; A system for recovering & re-using waste heat; A hydrogen powered motorcycle; "Duel fuel" engines. Diesel/Hydrogen; Fuel cells

Environmental aspects **5**
No pollution; Safe for environment; Green methods of producing it. Green methods of manufacturing new vehicles; The elimination of oil companies and traditional vehicle manufacturers. Elimination of oversized; SUV's and other resource hogging vehicles used for carpooling and grocery shopping.

Safety **3**
Just to know that it will not blow up in an accident; Safety; Size/crash resistance.

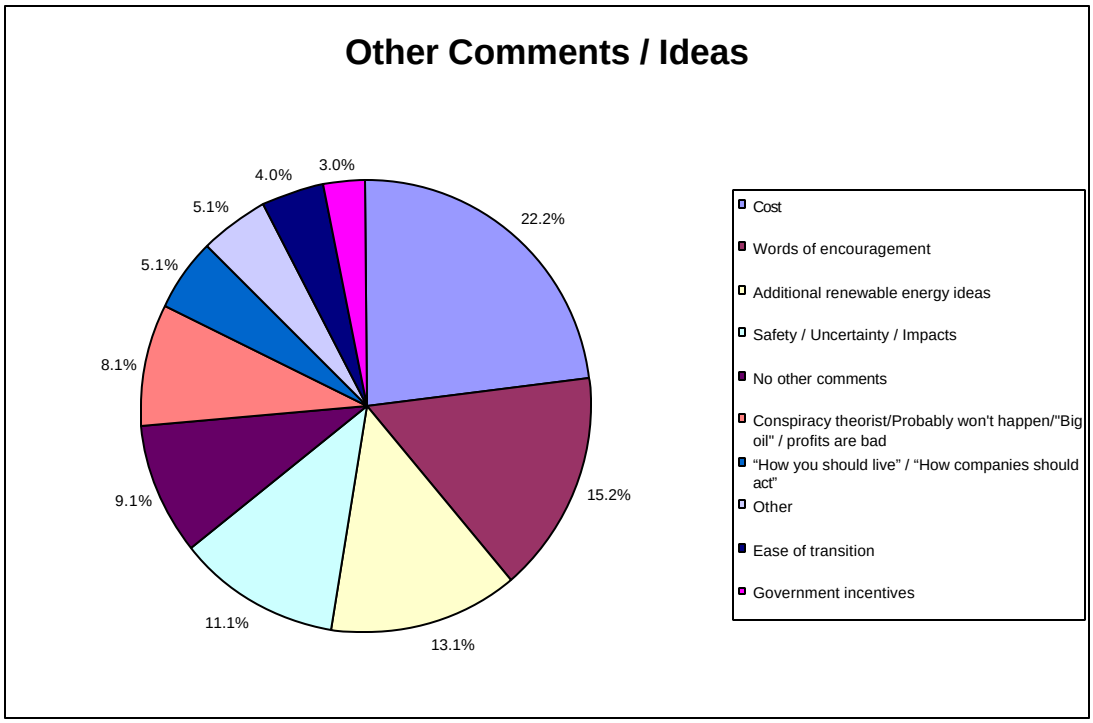
Do not know enough / more info needed **5**
Don't know at this point, due to my lack of information on it. More information to general public. Good understanding of all aspects. More testing; More information

Benefits to United States **2**
Direct reduction of defense budget, insurance rates; The US should be self-sufficient for its manufacturing and distribution.

Other **1**(x5)
Other things that might use hydrogen fuel. Maybe heating/cooling systems. Common Sense; Hybrid for hydrogen would give a back up. Intelligent use of the residue from the nuclear plants that would produce it. Keep California from f_____ it up.

Question 9: What other comments and/or ideas do you have?

Things that need to exist	# of mentions	Percent of Total	Cumulative
Cost	22	22.2%	22.2%
Words of encouragement	15	15.2%	37.4%
Additional renewable energy ideas	13	13.1%	50.5%
Safety / Uncertainty / Impacts	11	11.1%	61.6%
No other comments	9	9.1%	70.7%
Conspiracy theorist/Probably won't happen/"Big oil" / profits are bad	8	8.1%	78.8%
"How you should live" / "How companies should act"	5	5.1%	83.8%
Other	5	5.1%	88.9%
Ease of transition	4	4.0%	92.9%
Government incentives	3	3.0%	96.0%
Fiction stated as "fact" / misunderstandings	3	3.0%	99.0%
Focus on the future, not just present	1	1.0%	100.0%



Cost **22**

Build a VW type hydo vehicle that is cheap for good basic transportation that looks good. And you will have a winner. The fuel is going to have to be cheap. The public wants just cheap basic fuel to get around. There may be a market of the affluent public, however just create a basic cheap fuel that everyone can afford and we will buy it. Example - Toyota Prius or what ever it is called is too expensive for what it is. No power, looks funky, looks like something a mooch person would drive. I would never buy one. The car will have to look fine and the fuel would have to very cheap for me to get interested. I like the VW concept, but not for $25,000 to 30,000.
One way to keep the initial cost of hydrogen vehicles down may be to introduce hydrogen \ electric vehicles early on. This way if the cost per gallon were high initially because of availability, some of that cost could be offset by cheaper total cost of ownership. Another concern would be the cost to adapt existing vehicles for use. No matter what you think of oil shortages they are contrived and unless hydrogen is so cheap that it takes the current oil suppliers out you are

spinning your wheels. Hydrogen at 1.50 will give us gasoline at a 1.50 MARK MY WORD on that! I would pay more for our economy to convert to hydrogen if I was assured of a plan that would eventually make it cheaper or the same as oil today. I would prefer manufacturers mass produce a small, cheap "new energy" car first, to get a huge number on the market, like the VW beetle of the 60's, where even the moderately well off had one as a 2nd car, and the young, just starting out, could get one right away. (my income is relatively low and the current hybrids are out of my range, but I am willing to stretch for fuel economy or less dependence on oil); The prices I put down is based on gas prices now, in LA. I think the price of hydrogen should be based on gas prices...slightly cheaper or more expensive, but not too much difference. No one in college will be willing to buy fuel that is significantly more expensive than gasoline. I buy the cheapest gas I can find, even if I know it is low quality and not as clean burning. I am greatly concerned about the environment, but I also have to be able to afford food at the end of the month. Students, for the most part, will do anything they can to cut corners. It would be fiscally retarded to pay start these vehicles out costing more /gallon. I think it would be ridiculous to try to sell it at a higher price. People want to save money. I know that adding the dispensing service is going to be a huge cost, I would have no problem converting to Hydrogen if it were cost effective for me to switch my current vehicles over, and if the new fuel were easily available; But good marketing would implore you to not ask them to change AND pay more for it. Only the highest fiber-eating hippies would be passionate enough to go for it.

Words of encouragement **15**

What are we waiting for? Good Luck. Do it up. The sooner it happens the better. Good luck. Let's go for it. The concept is long overdue. Lets getting moving on this. Its a great idea, plus a good thing for the mother nature. Why have we waited this long? I love the idea of freedom from oil. Great idea to solve oil battles and the environment. Environmental benefits as well as fuel economy would make it more likely to purchase this product. From the little I've heard this is an untapped and virtually endless supply. There is no reason why auto manufacturers should be hurt by the transition. I would like to see hydrogen emerge as the new fuel that our cars and machines use, but I think it will be a very long time before we see it as the primary source.

Additional renewable energy ideas **13**

How about high RPM airless tires? Every roof top should have solar too. Eliminate restrictions (by code or CC&R's) against home owners using wind, solar, or other alternate energy sources. Use hemp seed oil instead. Read "the emperor wears no clothes" by jack herer. Hydrogen fueled home heating. Maybe some sort of fuel cell that would provide multiple functions, such as generating electricity and providing heat and sir conditioning all from one "in house" source. Smaller converters for motorcycles. We absolutely must consider all sources of energy. Coal in Pa alone will last us 400 years, farming corn in the heartland will help the farmer make ends meet while fueling our vehicles the above two are win win. How about hydroelectric? How about energy from the tides? How about energy from the wind? Combine affordable solar power for back up power and wind turbines for household use that would feed power back to the energy grid and reduce the dependence on power companies, and empower people to put effort into the energy supply problems. H fuel could be used for more than just motorized vehicles. It could be used in conjunction with solar energy to heat and air condition homes and office buildings as well.

Safety / Uncertainty / Impacts **11**

Would I have to buy a hydrogen powered lawn mower, chipper-shredder and power washer? Or would all of those things become useless? What does it require to produce the quantity of hydrogen needed. How would this affect jobs in the USA? What would be the price of converting existing autos? How easy would it be to have hydrogen stations accessible? How long would it take to have them as prevalent as gas stations? The general public is already afraid of change. Introducing a revolutionary fuel is wonderful, but its success or failure rests on how it can be adopted easily by the public. Questions about safety, storage and dispensing. As an educated consumer I would like to know all of the details concerning the safety of hydrogen fuel versus gasoline.

No other comments **9**

None; None; None; None; That's it; None; n/a; None; None at this point, as explained above.

Conspiracy theorist / Probably will not happen / "Big oil" / profit focus is bad **8**

If someone is looking to become a billionaire on this deal....to hell with it. Don't let big oil companies corner the market with Hydrogen. Bush and his buddies would never allow this to happen...they would lose control. It will take a complete catastrophe for our politicians to make it happen; All (wind, tides, hydro) must be pushed and promoted. I do not want to be locked in on a single source of energy. The hydrogen proponents have been promising a more efficient and less expensive car for years. Is this a sign that this was just a lie? Is this a survey just to jip us out of our money? Or are you really thinking of the environment; The oil companies will buy off our politicians as usual. When hydrogen is sold for vehicle fuel, the oil firms will continue to gouge consumers and manipulate high prices.

"How *you* should live" / "How companies should act" **5**

We need to realize that bigger just for the sake of bigger...is NOT better. We need to learn that just because we can, doesn't mean we should. Just because one can afford a huge SUV or diesel truck, unless you are hauling lumber or something equivalent...you don't need to but it. Stop rampant consumerism and buy used or recycled or barter with others for what you need. Solar panels and greenhouses should be a feature of all new homes, rainwater should be collected and stored for filtering and reuse. Companies using and manufacturing in recyclable plastics should be taxed for landfill space and pollution. All items which are not easily recycled should be taxed and coded with return labels for the manufacturer to recycle. Companies who use plastics to wrap and package items should find other paper/vegetable based materials which are recyclable and break down in the environment.

Other **5**

Difficult to answer these questions so theoretically so apologies if I have not been much use This is a new idea for me. I need more information; I have no way of judging cost of hydrogen because there is no way to judge the cost of the vehicle or the miles per gallon. Therefore I believe your cost questions are invalid because there is no overall cost per day, mile, year compared to our use of fossil fuels and existing vehicles. Have a hydrogen powered race car or dragster to show it is not a performance cost fuel option. Need to see more advertising on the benefits of hydrogen--not enough info out to the general public as yet

Ease of transition **4**

I think in order for hydrogen vehicles to succeed they will need to operate in much the same way vehicles operate today. For example gasoline \ electric hybrids are successful because they operate very much like a normal gasoline vehicle. However, pure electric vehicles have not had the same success because they required charging and the infrastructure was not in place to support such issues. One way to keep the initial cost of hydrogen vehicles down may be to introduce hydrogen \ electric vehicles early on. This way if the cost per gallon were high initially because of availability, some of that cost could be offset by cheaper total cost of ownership. Another concern would be the cost to adapt existing vehicles for use. I would have no problem converting to Hydrogen if it were cost effective for me to switch my current vehicles over, and if the new fuel were easily available

Government incentives **3**

Legislate tax credits for current usage. Incentives for use. Tax incentives are important.

Fiction stated as "fact" / misunderstandings **1**(x3)

Since hydrogen is only a carrier, similar to electricity, we have to be aware of the primary energy sources - e.g. fossil fuel, renewable, bio-diesel, etc. - and their potential to pollute; …but hydrogen is not expensive. Unless hydrogen is produced with alternative energies, such as wind & solar, I see no overall benefit.

Focus on the future, not just present **1**

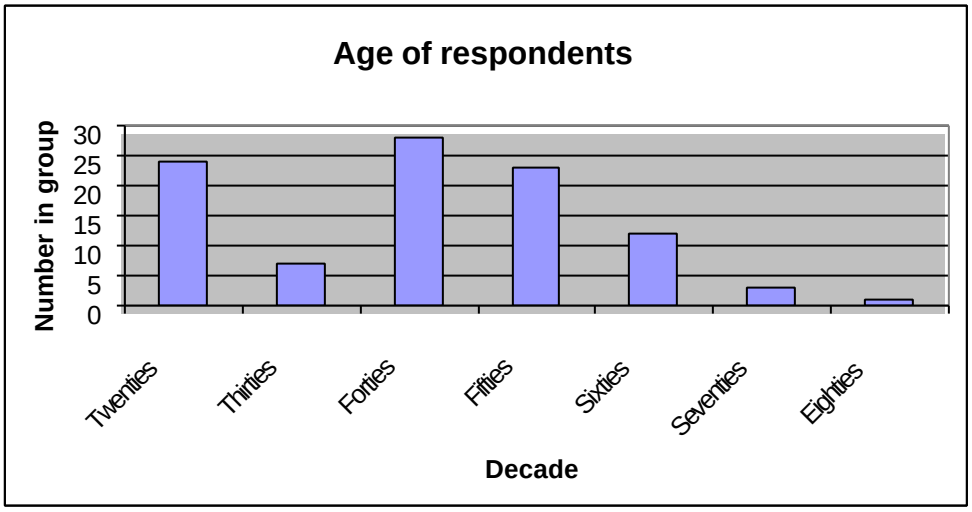
We need a comprehensive energy policy. One that provides a "bridge" from current infrastructure, to one of the future. This means that we need to FUND innovation, not just oil extraction!

Question 10: What is your age?

Ninety eight of 100 people answered this question.

The average age:	44.6
The median age:	46.0

Forties	28.6%
Twenties	24.5%
Fifties	23.5%
Sixties	12.2%
Thirties	7.1%
Seventies	3.1%
Eighties	1.0%



Question 11: In which state & country do you live?

United States	**95%**
Oregon	33%
California	24%
Pennsylvania	18%
Missouri	4%
Texas	2%
Idaho	2%
Nevada	3%
Florida	2%
Arizona	1%
Colorado	1%
Connecticut	1%
Maryland	1%
Massachusetts	1%
Michigan	1%
Washington	1%
Non-US	**5%**
United Kingdom	3%
Costa Rica	1%
Thailand	1%

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Appendix 1: How to fund Energy Independence for the United States of America

Executive Summary:

With gasoline prices fluctuating 10 to 15 cents at the pump almost daily, the notion is to spend 10 cents now to save $10 a gallon, later - while leveraging the United States' tremendous technology development and commercialization capabilities to enable us to become a net-exporter of energy. An "Energy Independence Fund" is envisioned, whereby 10 cents of every gallon of gasoline and diesel fuel is placed in a public/private trust.

Description:

Why: *If* we, as a country, make the bold decision to become an energy-independent, net-exporter of clean, renewable energy - then, and only then will we have the stamina, fortitude and will power to turn around our diminishing role as a national economic leader. This will enable us to become the world leader for centuries to come. If we fail to make this bold decision, we will continue be in a reactive, defensive mode on all international issues.

What: There is really only one course of action - at a strategic level: We must create an **Energy Independence Fund** (EIF). This EIF must have one goal only: to fund the development, deployment and success of clean, renewable energy that enables the United States to achieve energy independence by the year 2025. The (initial) focus must be transportation fuel, in that the increasing energy gap is oil.

Specifics of the fund need to be developed: A core team and seed money is needed in order to develop these specifics. Tenets of the fund include:

- *By America, for America*: The only objective is ensure America re-establishes itself as an energy exporter, focusing solely on clean, renewable energy.
- *Oversight of operations*: This public/private organization needs complete autonomy from political persuasion. However, due to the economic, national security, and environmental aspects of this organization, the EIF manager would need to have a seat on Executive Office of the President. It should *not* be managed by any government agency (like the Department of Energy), but it should be in close contact with DoE leadership. This is a business-oriented organization, with commercialization of clean, renewable energy solutions as its prime directive.
- *Oversight of funds / funding*: The EIF leadership should "fund the funders," and have high-level management responsibilities. Delegation to the lowest level of existing organizations should be maximized (vs. creating new entities). (More, below.) *Sarbanes-Oxley*: The EIF would follow the same financial reporting requirements as a public company.
- *Reviews*: Quarterly reviews to the President and annual progress reviews to Congress.
- *Large investments required*: The fund is too large for NGO investors. However, existing VC funds must be leveraged (see below).
- *Address many technologies*: Not sure which ones will "win:" need to fund multiple technologies, in various labs
- *Filter out poor engineering*: Need to ensure that poor technologies are not funded.
- *Filter out poor management*: Need to ensure that poor management teams are not funded.
- *Focus on "free" sources of energy*: The fossil fuel industry is based on readily available raw material: oil. Alternative fuels (like bio-fuels) that require growing something should not be pursued: the costs (and therefore price) to "create" the fuel could prove exorbitant. The cost for alternative fuel should be similar to fossil fuel: exploration, extraction, refinement and transportation. Solar ("free sun") and hydrogen (from nearly limitless water) are two examples. (For grid-level energy, wind and wave energy could be researched, but not initially).

- *Leverage universities*: Rely on best-of-breed universities, already performing transportation energy technology research. Enable others to participate, through a proposal process. (technical talent)
- *Leverage existing venture / capital management funds*: Rely on best-of-breed VC funds, with a very positive track record - already funding transportation energy technology research. (funding / management talent -Examples include: Nth Power / ÆQUITAS Capital Management / Cascadia Pacific Management).
- *Leverage existing organizations / companies*: Ensure those organizations who are performing research in this field have access to, and encourage partnership with the EIF (Examples: PNNL / DoE / Battelle / SBIR / ETO / GM / GE, etc.
- *Operational guidelines*: It is anticipated that 85% to 90% of the funds will use existing mechanisms (indirect channel: universities, VC funds, etc.) and that 10% to 15% will be direct through the EIF. Additionally, the organization of the EIF will need to have leaders with technology business backgrounds to help assess potential projects, through a proposal process.
- *Security / Repository*: Information obtained through research needs to be safe-guarded as well as searchable by need-to-know participants, (with specific limits for certain IP). This dual-role IT requirement is essential, and will be difficult to maintain, at best. Processes and IT systems will be implemented, appropriately.
- *Equity*: A public/private equity venture should be developed. The public should benefit from profits, along with companies that are formed, through technology implementation.
- *Licensing*: Developers of new technologies should be supported through existing technology transfer organizations
- *Export innovation*: When developed, the intention of the EIF is to help for-profit companies export clean, alternative fuels.

<u>How to fund:</u>

There are at least two options to fund the EIF:

[1] Diversion of $15 billion a year in federal money.

[2] Use existing gasoline taxes: Direct 10 cents of current taxes. Generates $14 billion*/year.

[3[New gasoline taxes. Maintain about a 5% rate.

[4] Combination: Use 5 cents of existing taxes and an additional 5 cents (<2% per gallon).

Note: Options 2 - 4 can be summed up: Ten cents now to avoid $10 later - for 10 years: We must address the cause of increasing oil prices, not the effect. Contrary to logic, the root cause of our energy problem is our reliance on “cheap oil:” We have been complacent in developing new technologies to harness alternative energy (example: energy stored in Hydrogen and other forms of matter). The essence of long term energy independence is *innovation* in energy, not further exploration, extraction, refinement and exploitation of fossil fuel. Just as there should be a time limit for investing in new technologies, the current fossil fuel-based energy industry should be self-supporting. New forms of energy need investment - at the levels few venture capital firms could deal with.

Contrary to John Anderson’s failed bid to add a 50-cent per gallon tax on gasoline in the late 1970s (which represented more than a 30% premium), 10 cents represents 4%, with gas at $2.50. Gas fluctuates this much in a day! It is a small price to pay to provide long term competition to imported fossil fuel. Investing in our future will actually support cheaper fuel later, *due* to this competition!

* In 2003, the United Sates used 9,273,000 barrels of oil, or 142,155,090,000 gallons of gasoline. Ten cents per gallon will generate just over $14 billion / year. A limit of $20 billion / year should be placed, as well as a 10 year limit.