What's Stopping Us?

Recognizing and Removing Obstacles to the Launch of Ammonia Fuel

9th Annual NH3 Fuel Association Conference

San Antonio, October 2012

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Part 1: NH3 Fuel Strawpoll

- I first heard of NH3 / Ammonia as a fuel in December 2011
- Over Summer 2012, I interviewed lots of NH3 fuel community members to:
  - Get to Know You, the NH3 Fuel Community
  - Identify the challenges you face, and priorities for action
- The "NH3 Fuel Strawpoll" is my way of presenting what I learned from you.
  - View the Strawpoll as a separate PDF here: http://nh3fuel.files.wordpress.com/2013/01/nh3fa-strawpoll-tb-sep2012.pdf
- There are no simple conclusions to draw because the "NH3 fuel community" represents:
  - Diverse Industries
  - Diverse Goals
  - Diverse Visions
- Note that the "Strawpoll" is limited by its small sample size:
  - the charts are not statistically useful
  - comments may not apply to individuals
  - but taken as a whole, it illustrates Consensus / Division of opinion
- It definitely helps us to understand:
  - **how to build a movement**
  - **what we need to do now**

NH3 Fuel Strawpoll

Visions, Roadblocks, and Government Engagement

Conversations with the NH3 Fuel community: Trevor Brown, Summer 2012

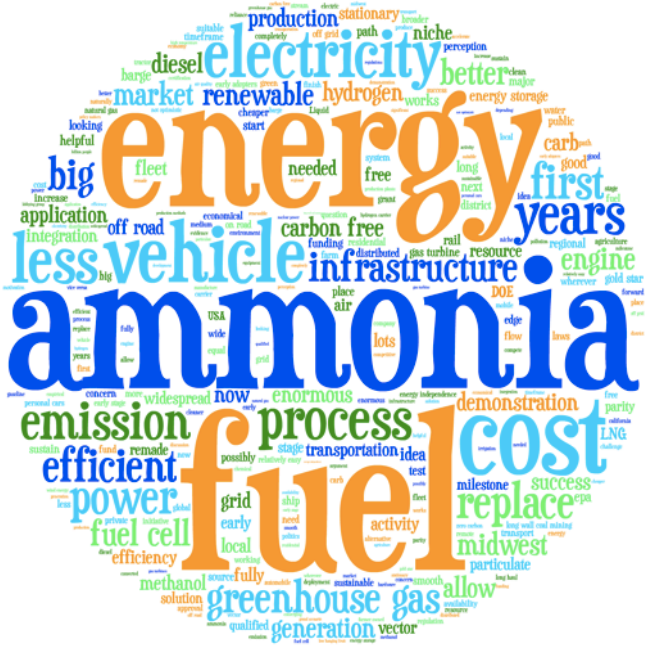


Illustration contains all relevant words recorded in answers to the question
"What's your vision for NH3 fuel?" Font size is proportional to frequency of use.
"NH3," the single most frequently used word, is omitted because the algorithm won't crunch numbers.

NH3 Fuel Strawpoll

Summary

This is an informal "straw poll."
I interviewed 26 individuals involved with the NH3 Fuel Association, to discover what opinions exist.
I interviewed them by phone or e-mail during the Summer of 2012. I transcribed phone conversations.

26 is a small sample size and this is a diverse group so, although I categorize opinions and present them as pie charts, this is to illustrate the diversity of opinions (or unanimity), not because these statistics might accurately represent the opinions of anybody else, or of any organization. Interviewing a different group would certainly yield different results.

Participants represent the following industries:
Academia
Advocacy
Alternative Fuel Production
Ammonia Production
Energy Production
Engineering – Consumer
Engineering – Industrial
Engineering – Research and Development
Public Policy Development / Think Tanks

All participants work in the US.
All participants but one are male.

Percentages

May not add up due to rounding.

Calculated by dividing responses within each category by total responses to each question.

Not all responders answered all questions. Where no direct answer was given but it was possible to accurately infer an answer from other comments, the inferred answer is included.

Sample size for each question is not represented.

Each responder's views receive equal weight. Where responder gave multiple answers, each of those answers receive proportionally less weight.

Quotations

Comments are included to illustrate the diversity of opinion and insight. Their presentation shouldn't be interpreted as reflecting weight of opinion: where many comments are similar, only one is included.

Comments do not necessarily represent the opinions of the author or NH3 Fuel Association. Some comments may be edited for brevity but their meaning is not misrepresented.

Abbreviations

NH3 = Ammonia
CO2 = Carbon Dioxide
H2 = Hydrogen
MeOH = Methanol
Ag = Agriculture / Agricultural Industry
EV = electric vehicle
KBR = KBR Inc (formerly Kellogg Brown & Root)
RFP = request for proposals
SOFC = Solid Oxide Fuel Cell
TOC = total cost of ownership
VC = venture capital
ARPA-E = Advanced Research Projects Agency – Energy (DOE)
CARB = California Air Resources Board
CEC = California Energy Commission
DOA = U.S. Department of Agriculture
DOD = U.S. Department of Defense
DOE = U.S. Department of Energy
DOI = U.S. Department of the Interior
DOT = U.S. Department of Transportation
EPA = U.S. Environmental Protection Agency
FEMA = Federal Emergency Management Agency
IMO = International Maritime Organization
NSF = U.S. National Science Foundation
OSHA = U.S. Occupational Safety and Health Administration
POTUS = President of the United States of America
TSA = U.S. National Highway Transportation Safety Administration

What's your vision for NH3 fuel?

"**20-30%** profile for **transport energy** in USA"

"Significant integration on **fleet vehicles** and **stationary applications**"

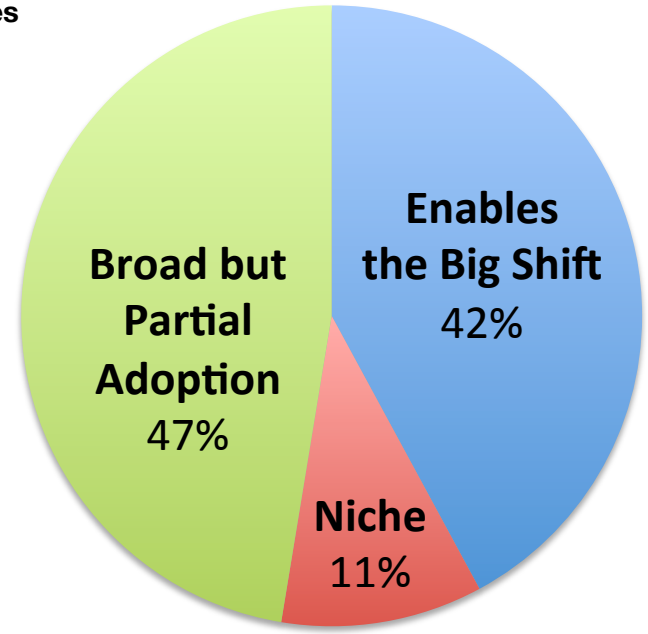
"Farm first, then **off-grid generation**"

"Replace **gas turbines**"

"**Storage** for remote power, also **off-road applications**"

"**Off-road diesel** equipment first, including **rail**. Then possibly **ships** and **barges**. Automobile fuel will come later, depending …"

"**Ag market**: tractors, irrigation, etc"



"A **zero-carbon** global energy system"

"**Local** energy covering 80% of what is needed to sustain 7 Billion people"

"Ammonia as a hydrogen carrier in a **Hydrogen Economy**"

"**Liquid**, carbon-free **mobile** and **stationary** power"

"**Energy independence** and **less air pollution**"

"A **completely remade** and **sustainable** energy economy"

"**Cleaner** environment, **cheaper** fuel"

"**Farmer-owned** ammonia **production**"

"Replace **10-20% of diesel/gasoline**"

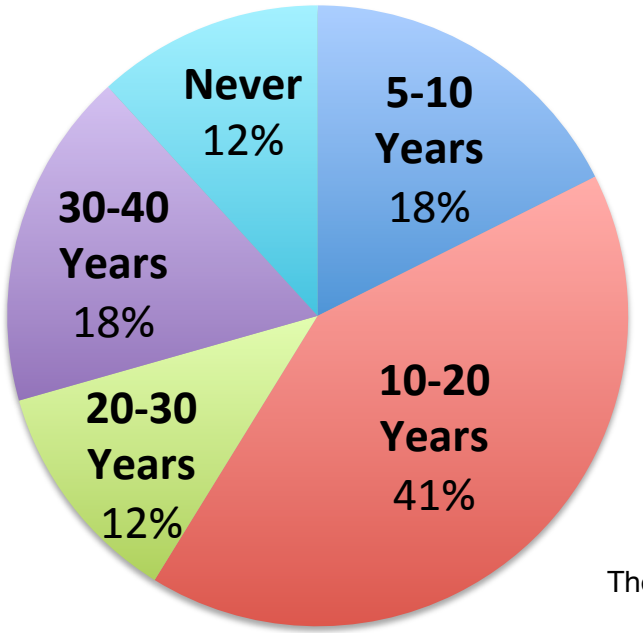
When will it happen?

"I don't know of any plans that will make this happen"

"Not in my lifetime"

"Zero carbon: 2050"

"Qualification in 5 years.
5 years after, significant momentum.
20-50 years later, alternative fuels and energy technologies become dominant"



"Within five years of approval of ammonia for an alternative vehicle fuel"

"Major auto companies indicated that oil companies said they need to be ready for big alternative switches in 2022-2025. That's when the real transition will start. There's cooperation in long-term planning. Big Oil has a clear map, and they don't want to see real change until then"

"A successful demonstration …
so they can allow ammonia as an alternative fuel …
followed by a looooong certification process (5 to 7 years) for on-road vehicles"

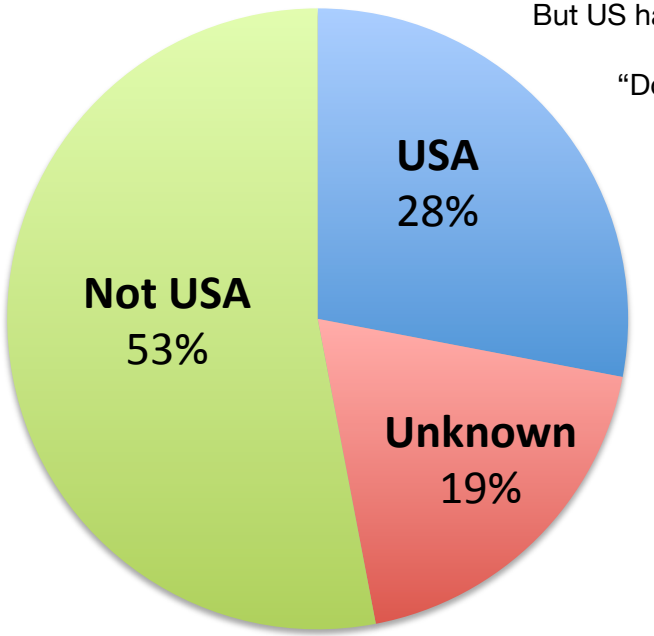
Where will it happen? (1)

"Other countries appear to have a **head start"**

"Possibly starts in California,
but they're **too averse to risk** –
they won't be tenable to it.
Can't take a quick idea and react"

"Hard to start here …
but we have to start
in a country or region
where the US is looking"

"Definitely international,
better chance for demonstration"



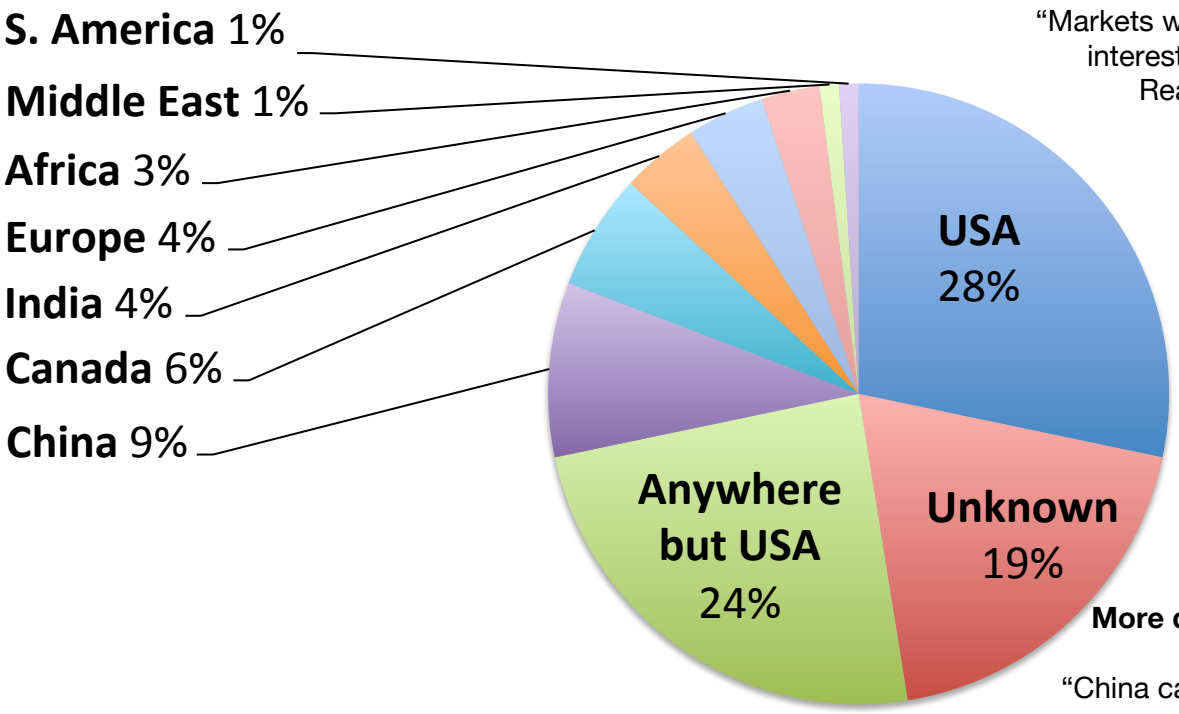
"Our world is highly connected – it's a question of where the advancement happens, and it will spread. But US has the **venture capital** that it will need"

"Doesn't need to happen here, but seems like the **critical mass of NH3 people** are here in North America"

"Starts with **off-road certification from EPA / CARB**. Much simpler than on-road"

*Note: "Unknown" category represents responses where, **considering all alternatives, it was impossible to determine any answer**. It does not represent "no answer given" (these responses not included in charts) or "multiple answers given" (included in other categories).*

Where will it happen? (2)



"Markets will develop outside US first – entrenched interests against you here, also **market forces**. Real interest is in India, Africa, Middle East. Where there isn't entrenched system, and **gov't can dictate what to do**"

"Canada – **fuel comparison** better (similar to Europe), **no retrofit rules** (but big safety compliance)"

"Lower **safety threshold** countries, with **pollution issues** in large cities: China, India. They'll **hedge diesel**"

"**Progressive** European cities"

"It will probably start in China. **More discipline, focus, and energy demand**"

"China can simply say 'This is what we're doing'"

"There's a product that works, fuel cell and reformer, with no demand in USA (market died due to MeOH competition), that has entered commercial service in Africa. Note the geographic location and that they **partnered locally** with an industrial fuel provider. The business model displaces diesels and delivers power to off-grid cell tower sites. For the cellular company **TCO is lower** than diesel, which was their only other option. The service is 'power' and **the customer doesn't touch anything**. They **don't care if it is NH3 or hamsters in an exercise wheel** delivering power"

What will stop it from happening?

3% SAFETY REGULATIONS
"Very complex, expensive. Safety standards are written for big industry (pipelines), not for small, local usage. Either beef up components (safer) or rewrite standards (takes ages)"

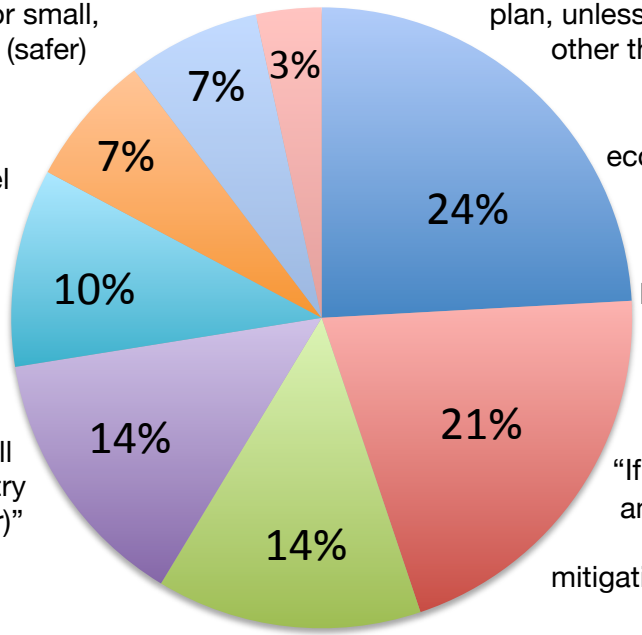
7% EMISSIONS
"Considerable testing required, both fuel and how the fuel works in the engine"

7% LACK OF PERSISTANCE
"Need to be much more aggressive"

"This is within our power. Need money and cooperation of public agencies, but there's no conspiracy against us. We will find organized resistance from oil industry (though we can avoid this if we're clever)"

10% OPPOSITION
"Big oil, irresponsible financial markets"

"Ag industry has cushy job, huge margins. If NH3 was a fuel, it would be much more competitive and regulated. Grow by factor of 100, but lose margin. Why wreck existing easy life?"



24% AMMONIA STATUS QUO
"It is unlikely that any entity can formulate a viable business plan, unless ammonia can be made from something other than, and more cheaply than, fossil fuels"

"It's not emissions, it's not safety. It's economics and manufacturing techniques"

"Where farmers get fertilizer is where fuel cell vehicles will get hydrogen. Our local ag industry prefers other fertilizers"

21% NO GOVERNMENT SUPPORT
"Inertia, risk-avoidance, no investment"

"If government doesn't get over the fear of ammonia then resistance to implementing new policy will be filled with very costly mitigations and regulatory compliance hurdles"

14% SAFETY PERCEPTION
"Safety perceptions (not actual safety). Our achilles heel is hyperbole, coming from existing fuel producers"

"You only hear about NH3 when there is a huge disaster. There is no positive message to industry or public"

14% COMPETITIVENESS
"Natural Gas … too cheap"

How vital is government action?

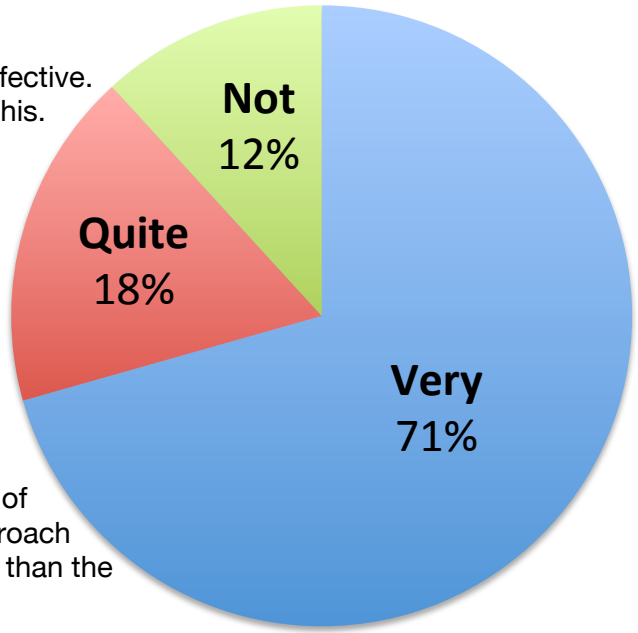
"Has to come from **philanthropic** world, an 'X Prize for' … and **VC funding**, maybe $100m"

"Government action hasn't been very effective. I'm **not sure what can be done** about this. Maybe governments can never be very good at picking winners and losers"

"Major, but **not likely to happen**"

"Let us hope that we can devise a plan that relies primarily on **market forces**. We are in a period of government impasse and incompetence from which we may not emerge for some decades. I recommend that we create an alliance of commercial organizations and then approach government entities to support it, rather than the other way around"

"We should be focused on **customer solutions**, and any governmental change should be focused on helping the customer **defray the capital cost** barrier to new technology"



"Critical. You can't deploy ammonia as a fuel because it is **not recognized as a fuel**"

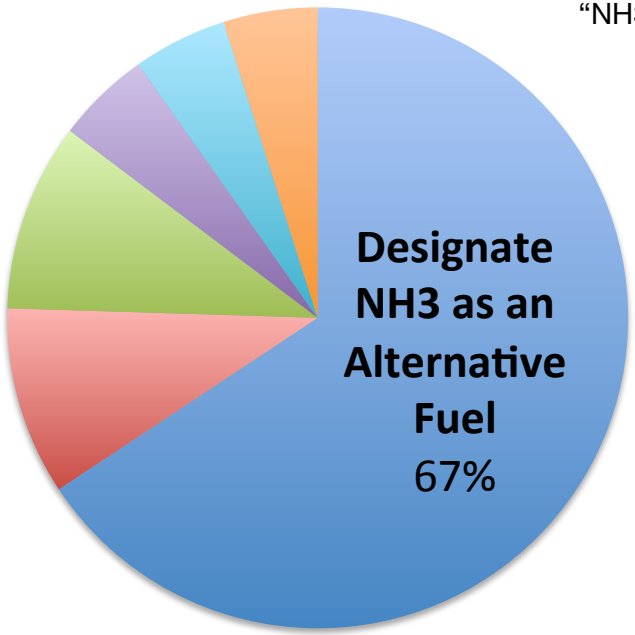
"Government is **a necessary disruptor** to private industry which is inherently limited in interest and imagination"

"NH3 will have to **compete with other alternatives** that are already heavily **subsidized** by the government"

"**Funding**"

"Utmost importance. Government **influences public attitudes and beliefs**"

What one thing should government do? (1)



"Make NH3 an accepted fuel **so that fleets can consider**"

"NH3 not accepted as alternate fuel by DOE, so **no impetus toward grants**"

"WA has accepted this – no use. **Must be DOE and EPA**"

"**Legitimacy**"

"This needs to be done in **every state** and at **federal level**"

"One group that could prove efficiency / emissions performance won't release the data ... but says if DOE makes it a legitimate fuel, they would make official announcements"

What one thing should government do? (2)

5% CARBON POLICY
"Strong **CO2 reduction regulations** may also drive interest"

5% FOLD NH3 INTO HYDROGEN
"They've made commitment to a **Hydrogen Infrastructure** – but you still can't fill your tank. Ammonia can help"

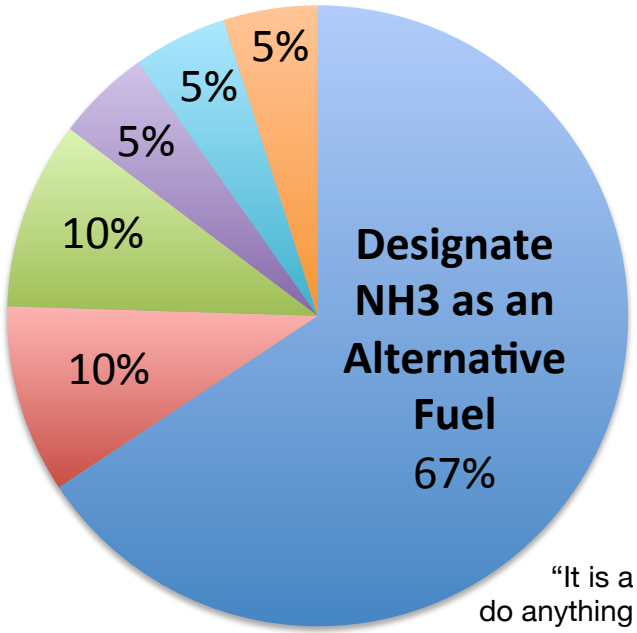
10% SAFETY
"Find an ammonia tank filling process to **make my wife feel comfortable** filling the tank"

"Change the **permitting** structure"

10% FUND R&D
"Chicken / Egg:
need **proof of concept** to get funding, need **funding** to get proof of concept"

"Get the **1603 Treasury Grant** program reinstated"

5% INFRASTRUCTURE



"It is a waste of time and money to get them to do anything relating to NH3. The problem is twofold:
1. **Affordable devices** to turn the liquid into electricity. Combustion engines or fuel cells. **There has to be demand** for the product. In this economy TCO or lifecycle cost benefits are not even worth bringing up.
2. Commercial and **industrial acceptance** of the fuel itself and distribution / handling. There is no demand due to a **basic fear of the chemical**, and not having a **second tier distribution / delivery network**, so the customer doesn't have to handle it"

What would gov't action achieve?

3% FUND REGULATORY TESTING
"Funding for emissions tests and field tests, to allow regulatory approval"

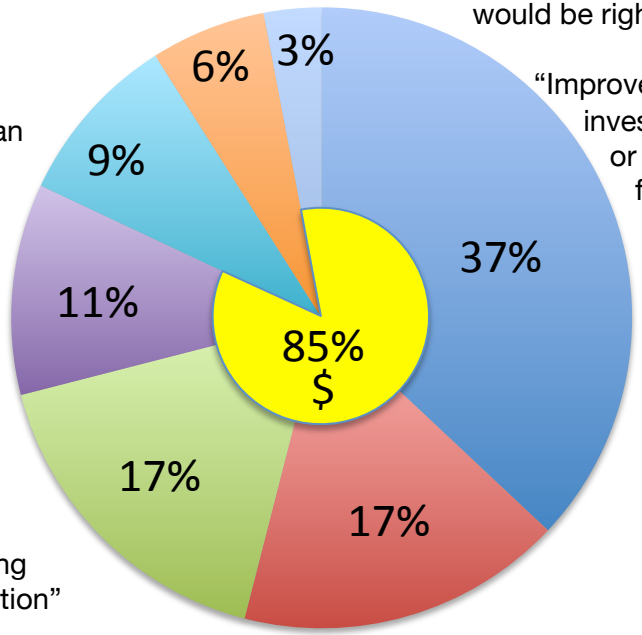
6% LEND CREDIBILITY
"Viability, infrastructure, safety issues can be overcome if government legitimates things. Doesn't take billions, but does need time and a lack of interference"

9% SPUR CORPORATE ACTION
"Both suppliers and car companies are too exhausted to want to pursue NH3. Too many alternatives. Just too tired. No room in the portfolio"

"Auto manufacturers don't want to create 'regional' fuels, so they're unwilling to be lead runners on creating a new option"

11% UNLOCK PRIVATE FUNDING
"We can't expect private investors to do much in advance of actual markets"

"Producers and distributors, including those who build the plants (like KBR), can start funding research"



37% UNLOCK GOVERNMENT FUNDING
"Some of the $$ now directed to the hydrogen economy would be rightly invested in NH3. Fuel cells included"

"Improved policy for renewable NH3 production: investment tax credits, low/no interest loans, or require a small percentage be produced from renewable sources. Take risk out of constructing renewable ammonia plants … jump-start regional production"

17% ALLOW US TO MAKE SALES
"Right now our potential clients do not accept NH3 as a legitimate fuel"

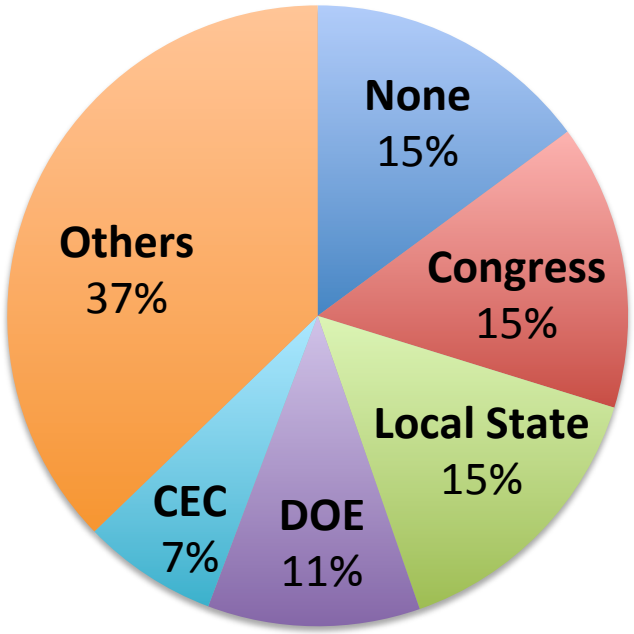
"If CARB would offer an RFP for a high efficiency / low emissions truck fleet … they would get proposals"

17% CREATE A LEVEL PLAYING FIELD
"As with other alternative fuels (and batteries) government subsidies may be required. Fossil fuels are still too cheap"

"Tax incentives (like $7,500 EV credit). Get us back to a level playing field"

What agencies do we already reach?

OTHERS:
CARB
DOA
DOD
EPA
FEMA
NSF
OSHA
TSA



"There's serious consideration at the federal level for ammonia SOFC research"

"We're lobbying for other tech, not NH3"

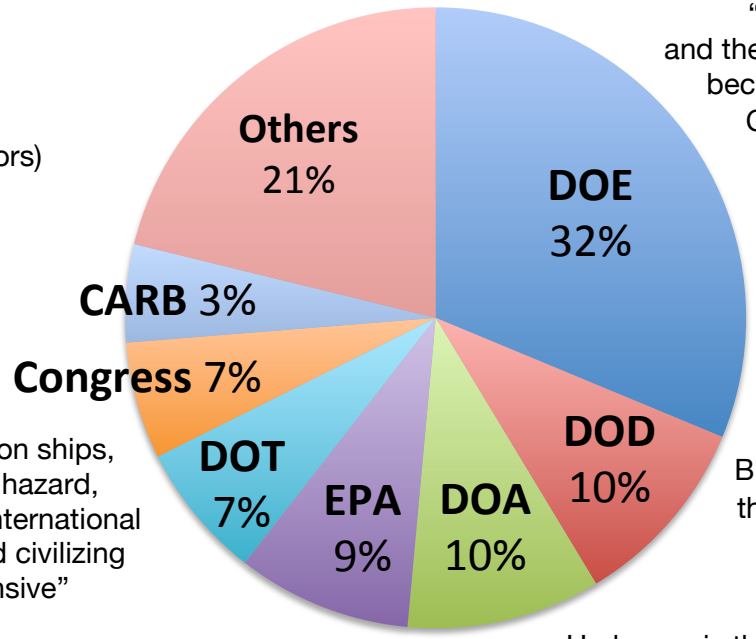
"As a public entity we are limited in our ability to advocate at the state and federal levels"

IS IT WORKING?
"Pretty useless – bureaucrats finding ways to say no to things"

"Achieved by logic: countering arguments (how safe, how expensive) standard objections, torn down with help of some representatives"

What agencies do we need to reach?

OTHERS:
ARPA-E
DOI
IMO (Int'l Maritime Org)
POTUS
OSHA
State / Local (Governors / Mayors)
TSA



"DOE, because cracking DOE is just as hard as cracking CEC"

"Probably easier to nail CARB than DOE, and they may move it forward further than DOE because auto manufacturers take their lead. CARB – they're considered the standard. EPA would follow"

"CARB — first instinct as they've made most progress, but EPA too. But they're not funding groups, so DOE important. How to get all three agencies together? We should have a consistent message"

"DOE is most focused on funding BIG corps to do incremental development that doesn't solve energy issues, and that corps would fund themselves anyway"

"CEC is unduly influenced by CARB. Hydrogen is the only zero-carbon fuel CARB will bless. We are advised not to make a case AGAINST hydrogen but rather FOR liquid renewable fuels, as there is an 'all of the above' philosophy that gives an opening"

"IMO doesn't permit ammonia on ships, treats it as a fire and explosion hazard, which it isn't … the national / international regulatory jungle. Exploring and civilizing this terrain is going to be expensive"

"High-level commitment to hydrogen forces all lower-level activity into supporting that path. Difficult to identify the source of that commitment …"

"Military: they're the right people to be involved. Unique requirements, efficiency matters, long history of R&D. Will try projects that aren't ready for commercial markets"

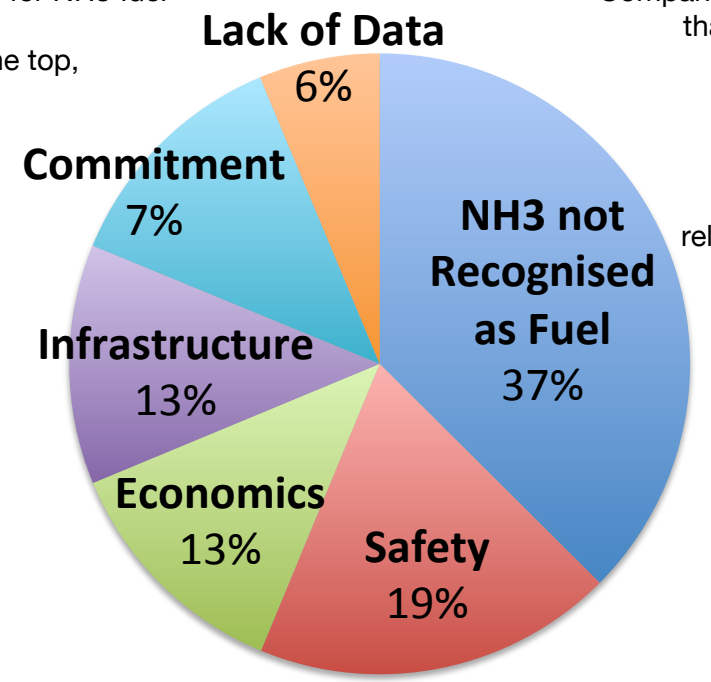
What are our gov't roadblocks?

"Lack of **hard data** to support case for NH3 fuel"

"No **directive** coming down from the top, or **pressure** from lobbyists"

"Lack of **interest** and **funding** in leapfrog solutions. Lack of **belief** in how practical it can be"

"Need some **high-level visionary** to take over, **create directives** for bureaucrats to enact. Elected people, not employees"



"Company has good relationship with DOE, such that they wouldn't want to **risk** it for NH3. Government wants us to work on coal gas – some synergy with CO2 sequestration / natural gas"

"Don't want to **risk** our government relationships by advocating NH3 because the existing relationships are good"

"NSF, USDA, and DOT should **stop sending** all energy-related **proposals to DOE** for review"

"**Acceptance** of ammonia as a safe alternative"

"**Fear** of **toxicity**, perceived **cost** of new infrastructure"

So what can we do to get gov't action?

3% BRING IN THE NH3 INDUSTRY
"Businesses act if there's revenue; we haven't created a convincing picture for the NH3 industry. We need a more powerful voice in Washington. Politics only responds to big voices with big money"

7% DEVELOP POLICY
"Give seminars at National Labs (and expect opposition). Submit papers to DOE conferences. Publish in the peer-reviewed journals that DOE reads"

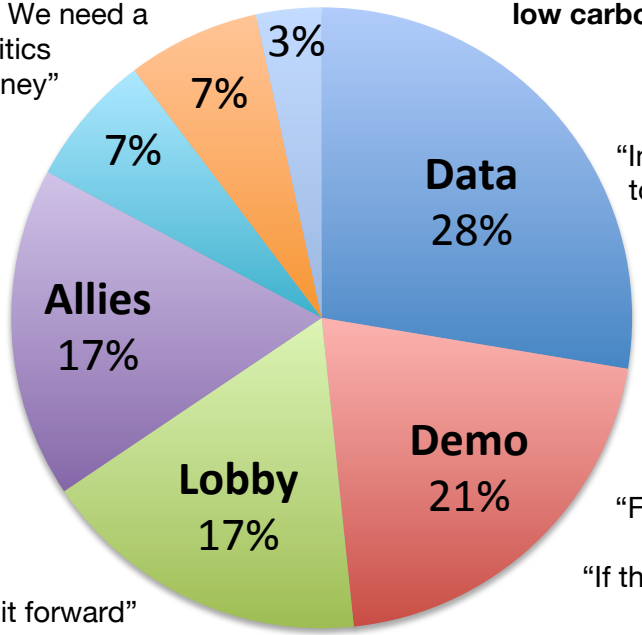
7% BUILD CONSUMER DEMAND
"Market pull affects DOE thinking – all the government can do is help"

17% FORM ALLIANCES
"With the Methanol Institute"

"Auto manufacturers: ask them to push it forward"

"Private sector. Big corporations and start-ups, for credibility to enable flexible thinking in government"

"Recruit major companies into a technology development alliance ... unseat hydrogen"



28% PROVIDE DATA
"Provide **emissions** testing data. Answer threshold questions: **low carbon** footprint, **economically competitive**, and prove it's **not so dangerous** that it's irresponsible to think about it"

"Internally, DOE thinks about other issues: toxic and expensive. We have to become technically very strong and argue that **these problems are solvable**. DOE will need to independently verify this"

21% DEMONSTRATION
"Get fuel running – engines in the field. Demonstrate more actual systems"

"Fleet or stationary, and DOE will perk up"

"If they can't kick the tyres, it's pure fantasy"

17% LOBBY
"Get legislators votes and campaign contributions: create pressure"

"Get more of a PR thing together: inform and engage. Let them know we exist, seed the ground. They're so busy, it's a rare soul who can see the what-ifs. Just let them know we're out there. What we're talking about is sensible"

Part 2: What's Stopping Us?

The NH3 Fuel Strawpoll showed me that …
http://nh3fuel.files.wordpress.com/2013/01/nh3fa-strawpoll-tb-sep2012.pdf

We face one significant obstacle with many aspects:

"Which comes first, the Chicken or the Egg?"

- Need Funding for Demonstration … Need Demonstration for Funding
- Need Demand for Product … Need Product for Demand
- Need Gov't Support to be Commercially Viable
  … Need to be Commercially Viable for Gov't Support (esp. in this economy)

- In this situation, we need to do both: Chicken AND Egg.

- Nothing is Stopping Us
- We know what we need to do
- We need to do it
- (Sorry if that's frustrating. I know it hasn't been and won't be easy.)

Recognizing Obstacles

- Practical Reality:
  - **Make a plan**: identify the gaps in our present capabilities
    - we're strong on the technical front (physics, chemistry, engineering)
    - we're weak in many other areas (products, funding, communications, data)
  - **Hire specialists**: fill the gaps in the movement's knowledge & talent base
    - Strategists / Managers: in areas of Innovation, Sustainability, Marketing
    - Communications / Social Media / Community Engagement
    - Designers / Computer Programmers (data: education and interaction)
    - Lawyers / Advocates / Lobbyists

- Can't afford to Hire?
    - Use Students (film? economics? journalism? political science?)
    - Hire Fundraisers
    - Make Friends (form coalitions, forge partnerships, strategic alliances)
    - Just start somewhere, somehow, and build

Removing Obstacles

Summary of Part 2 of this presentation:

1. **Responding to a few specific Strawpoll Comments: Lobbying, Industry Opposition, Political Gridlock**
   - What is **Lobbying**? Some people are confused.
   - **Advocacy**: let's walk before we run.
   - **Industry Opposition** is a known quantity: let's prepare to address it.
   - Two Strategies for **Creating Change** within **Political Gridlock**.
2. **Chicken v Egg: Trends to Harness to overcome inertia**
   - **Sustainable Industry**
   - **Carbon Pricing**
   - **Distributed … Capital and Production** (not just ammonia production, but also ammonia fuel products).
3. **How we can Change this Debate**
   - Today, during Romney-Obama election, it feels like action is impossible. Ideas to change the debate:
   - **What's our story?** (unfocused) **How are we using data?** (we're not) **Who is our storyteller?** (absent)
   - How to **inform** and **engage**: two cheat sheets (beginner's guides).
   - Conclusion: good communication and good data, to harness these trends, will lead to change.

Lobbying

Issues

Legislation

- **Campaign Contributions**
  Seriously? That's medieval.

Inside Lobbying
Talking to politicians and legislators about specific legislation

Outside Lobbying
Encouraging others to talk to politicians and legislators about specific legislation

We Are Here
Barely begun talking

Advocacy
Talking to people about issues
Getting people educated and excited
Giving people something to do about it

This is **NOT** helpful:

"Access is vital in lobbying. If you can't get in your door, you can't make your case. Here we had a hostile senator, whose staff was hostile, and we had to get in. **So that's the lobbyist safe-cracker method: throw fundraisers, raise money, and become a big donor**."
Jack Abramoff
NPR, December 20, 2011
"The Tuesday Podcast: Jack Abramoff On Lobbying"

~~Lobbying~~ Advocacy

Advocacy = Communication + Information + Education
- Public
- Media / Influencers
- Government

Lobbying = Advocacy for/against **Specific Legislation**
- **Outside Lobbying** = talking to Media + Public
  - Example: The Federalist Papers
- **Inside Lobbying** = talking to Government directly
  - Likely requires disclosures, registration, expenses
  - Non-Profit can't spend >20% budget on lobbying activities
  - Complicated rules but ANYBODY can lobby: just pick up the phone

(**Campaign Contributions** = irrelevant)

Conclusions:
- We (the "NH3 fuel movement") have barely begun to engage and educate on a meaningful level
- We have no coordinated campaign for reaching the public, the legislators, or corporations
- No need to spend money on lobbying until we've started basic advocacy outreach

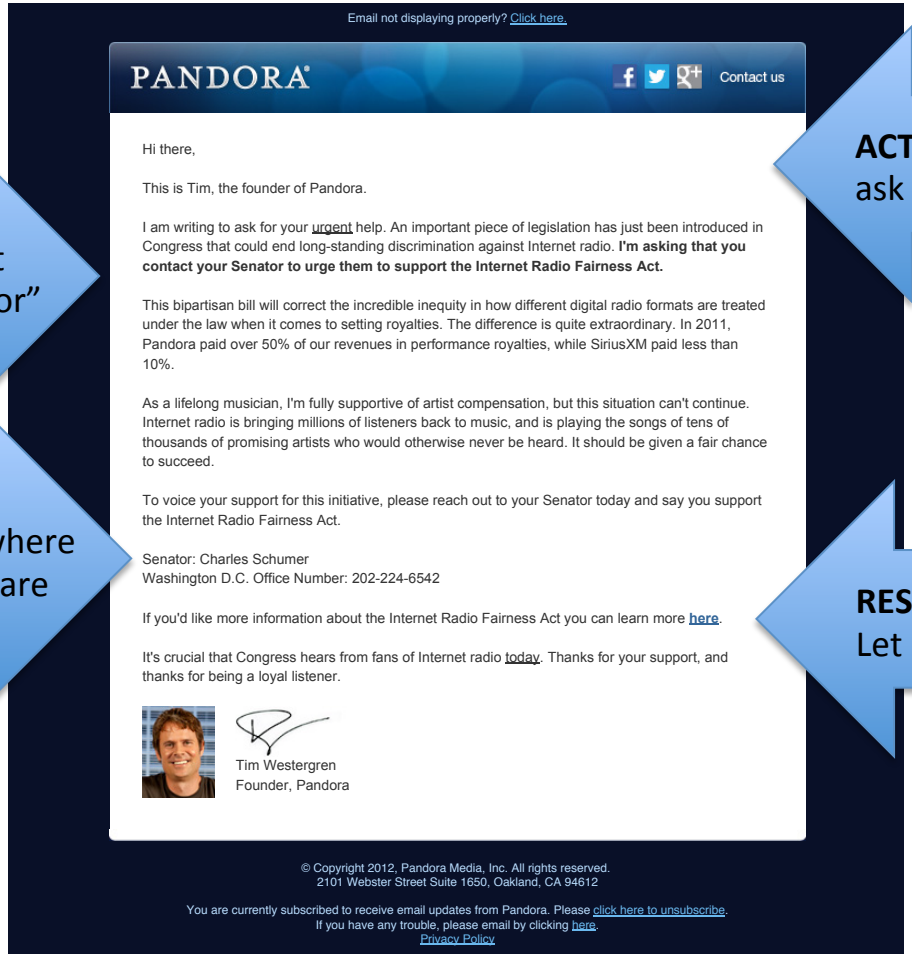
Outside Lobbying: Example 1

LOBBY! "I'm asking that you contact your Senator"

PERSONAL! Tim knows where I live + who my Senators are

ACTION! "I am writing to ask for your urgent help."

RESPECT! "Learn more here" Let me make up my own mind



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PANDORA

Contact us

Hi there,

This is Tim, the founder of Pandora.

I am writing to ask for your urgent help. An important piece of legislation has just been introduced in Congress that could end long-standing discrimination against Internet radio. **I'm asking that you contact your Senator to urge them to support the Internet Radio Fairness Act.**

This bipartisan bill will correct the incredible inequity in how different digital radio formats are treated under the law when it comes to setting royalties. The difference is quite extraordinary. In 2011, Pandora paid over 50% of our revenues in performance royalties, while SiriusXM paid less than 10%.

As a lifelong musician, I'm fully supportive of artist compensation, but this situation can't continue. Internet radio is bringing millions of listeners back to music, and is playing the songs of tens of thousands of promising artists who would otherwise never be heard. It should be given a fair chance to succeed.

To voice your support for this initiative, please reach out to your Senator today and say you support the Internet Radio Fairness Act.

Senator: Charles Schumer
Washington D.C. Office Number: 202-224-6542

If you'd like more information about the Internet Radio Fairness Act you can learn more here.

It's crucial that Congress hears from fans of Internet radio today. Thanks for your support, and thanks for being a loyal listener.

Tim Westergren
Founder, Pandora

Personalized mass e-mail (I must have subscribed once) received from Tim Westergren on September 26, 2012

Outside Lobbying: Example 2

This is from a coalition:

- Methanol Institute
- American Coalition for Ethanol
- US Energy Security Council
- … et al

http://www.openfuelstandard.org/

Inside Lobbying

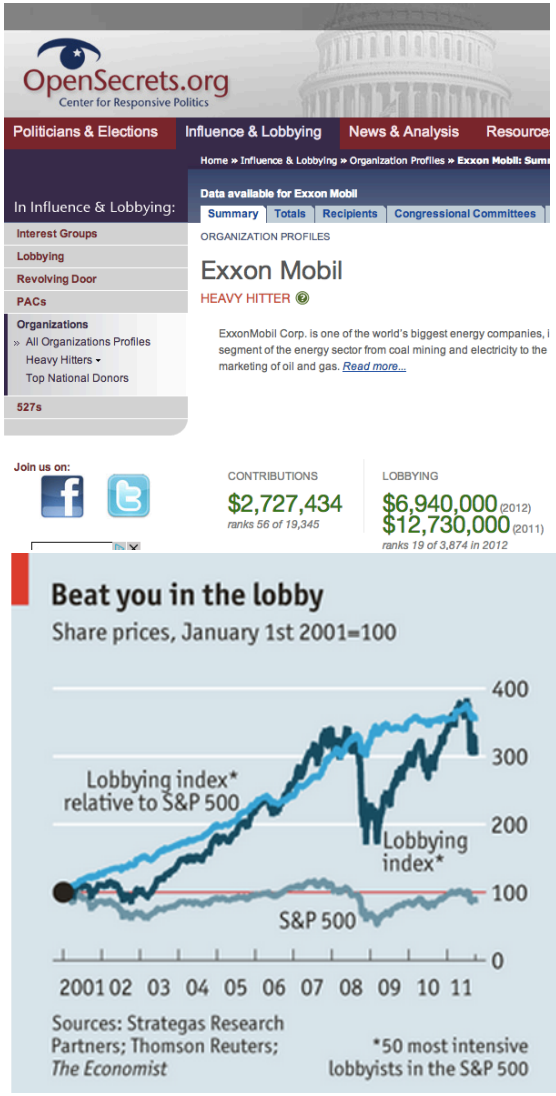
- You can send books
  as long as inside cover is inscribed with the recipient's name and the name of your organization
- You can give awards

- Lobbying is a known quantity
  - Last year, one of us in this room spent $520,000
  - Last year, Exxon spent $12,730,000
    see: www.OpenSecrets.org

- Does the investment in lobbying pay back?
  - Companies that lobby have outperformed the S&P500 by 11% a year since 2002
    see: Strategas Index, http://www.economist.com/node/21531014

- Does lobbying work?
  - Of course, but don't forget:
  - Lobbyists LOSE 50% (every bill is lobbied for and against)
  - so **don't be daunted**

- But remember: Easiest lobbying victory is DELAY



Industry Opposition

- A British innovator & entrepreneur launched alternative fuel vehicles for public transport …
  - He charged less than the competition …
  - Existing businesses lobbied against him …
  - British Parliament taxed his fuel …
  - and swiftly bankrupted his business.

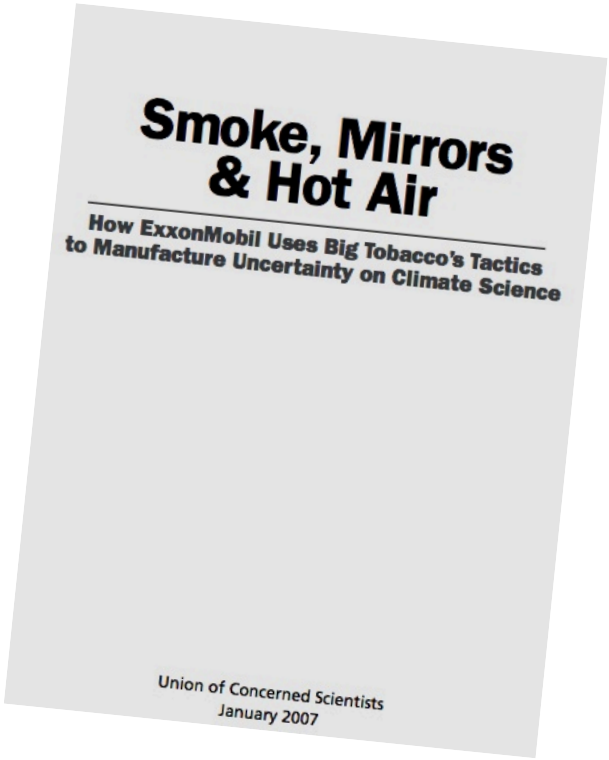
- The Year: 1830s
- The Alternative Fuel: steam
- The Lobby Group: horse drawn carriage industry
- The Entrepreneur: Goldsworthy Gurney
  See House of Commons select committee (1831 to 1835), final report: **On Mr. Goldsworthy Gurney's Case**
- **Inventor of the first ammonia engine** (?)
  "Mr. Goldsworthy Gurney … made an ammonia engine —probably the first ever made—and worked it so successfully, that he made use of it in driving a little locomotive."
  A History of The Growth of The Steam-Engine by Robert H. Thurston http://en.wikipedia.org/wiki/Goldsworthy_Gurney

Opposition: A Known Quantity

My point:
- Industry opposition has always existed, and always will
- But we know what it looks like, so we can defend against it

Here's a simple guide to how it works in the US today:

1. **Manufactured uncertainty**
   … raising doubts about even the most indisputable scientific evidence.
2. **Information laundering**
   … using seemingly independent front organizations to publicly further its desired message and thereby confuse the public.
3. **Promoted spokespeople who …**
   … misrepresent peer-reviewed scientific findings or
   … cherry-pick facts or
   … persuade the media and the public that there is still debate among scientists
4. **Shift the focus away from meaningful action**
   eg, with misleading charges about the need for "sound science"
5. **Extraordinary access to government**
   … to block federal policies, shape government communication



Provocative Quote: "*Unless 'climate change' becomes a non-issue, meaning that the Kyoto proposal is defeated and there are no further initiatives to thwart the threat of climate change, there may be no moment when we can declare victory for our efforts*."

From an internal memo "discussion item within Shell" re American Petroleum Institute's global warming campaign, April 1998, taken from page 40 of Union of Concerned Scientists January 2007 report on Industry Opposition to climate change legislation: "Smoke, Mirrors & Hot Air" http://www.ucsusa.org/assets/documents/global_warming/exxon_report.pdf
Is this "Shell memo" real of fabricated? I don't know.

Misinformation

- On one hand:
  "*We're not going to let our campaign be dictated to by fact-checkers*"
  Neil Newhouse, referring to Mitt Romney's 2012 Presidential Campaign, said at a panel organized by ABC News
  http://www.huffingtonpost.com/2012/08/23/mitt-romney-_n_1836139.html
- On the other hand:
  "*Are there mistakes that are made, areas where no doubt that somebody could dispute how we are presenting things? You know, that happens in politics*."
  President Barack Obama on "60 Minutes," CBS
  http://www.cbsnews.com/8334-504803_162-57518524-10391709/unaired-excerpts-from-the-obama-romney-interviews/?pageNum=10
- But on Global Warming ONLY:
  21% of Americans trust Mitt Romney
  47% trust Obama
  George Mason University, Center for Climate Change Communication / Yale University, School of Forestry & Environmental Studies, March 2012
  http://www.climatechangecommunication.org/images/files/Climate-Beliefs-March-2012.pdf

- This is empowering. Why? In a "Post-Fact" information age:
  - People don't trust the "traditional" voices of leadership (govt, corp, or media).
  - Access to data & information has never been greater, and it's trending up.
  - We can rely on transparency: inform, engage, and empower.

The Mythical Place

- We seek political action, but feel surrounded by impasse in the US.
- If only we lived in ***"A mythical place … it is stable, democratic, peaceful, prosperous, inclusive and has extremely low levels of political corruption."***
  Francis Fukuyama, Stanford professor
- (Denmark)
- *"How is it possible to whisk such an initiative through parliament, the courts and company boardrooms in a way that makes the population see its advantages?* ***How do you plant a major technological innovation in people's minds?"***
  Richard Vanderveen, Wind Resources LLC http://cleantechnica.com/2012/09/28/communities-do-change-the-world
  http://www.midwestenergynews.com/2012/06/08/michigans-largest-wind-farm-goes-online/

- **The Command Economy**:
  - some suggest NH3 Fuel could launch in Asia/Africa
  - Great! Go for it. Make sales, prove technology. But at the same time …
- Live in a Democracy? Need Government to Act? Government at an Impasse?

A metaphor for Creating Change: two MUTUALLY COMPATIBLE approaches

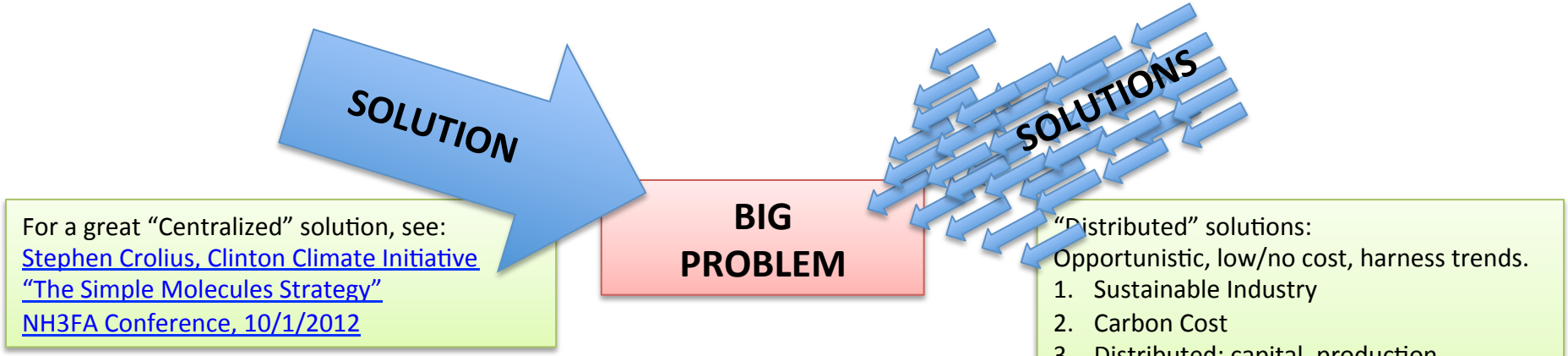
Carpets

- **1. Wall-to-wall Carpets:** "Centralized" solution
  One big intricate design. Long lead time.
  This is one of my favorite stories about planning. It is likely apocryphal but came from David Greig's play "Albert Speer," in which Hitler praises Speer as his favorite architect because he knew to order the carpets for the Reichkanzlei before starting construction, knowing that it would take longer to deliver the carpets than it would to erect the building. I acknowledge that one should rarely look to the Third Reich for lessons in ethical efficiency.

- **2. Carpet Tiles:** "Distributed" solution
  Modular design, small incomplete parts that fit together. Immediate delivery.

Approach 1: "Centralized" Strategy

Approach 2: "Distributed" Strategy



For a great "Centralized" solution, see:
Stephen Crolius, Clinton Climate Initiative
"The Simple Molecules Strategy"
NH3FA Conference, 10/1/2012

"Distributed" solutions:
Opportunistic, low/no cost, harness trends.
1. Sustainable Industry
2. Carbon Cost
3. Distributed: capital, production, communications – decentralize, localize.

Three trends to inform a "distributed" strategy:

Trend #1

Sustainable Industry

- **An introduction:**

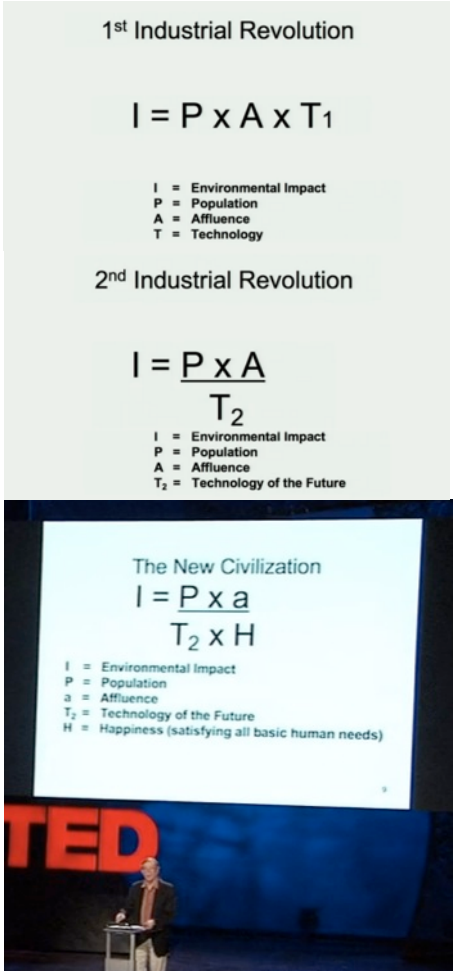
- **Ray Anderson, CEO of Interface**
  Interface is the world's largest designer and maker of carpet tile. Sales in 110 countries, manufacturing on 4 continents. Was a petroleum intensive industry until Ray Anderson remade Interface as a sustainable business.
  "The industrial system is destroying the planet and only industry leaders are powerful enough to stop it."

- **Goals of sustainable industry are to STOP**:
  - "accelerating the rate that we draw down capacity"
  - "buying or degrading other people's environment"
  - "displacing other species by taking over their habitats"

  From Ray's inspiration: "The Ecology of Commerce" (1993) by Paul Hawken, http://www.paulhawken.com/

- Interface **increased sales and doubled profits** by reversing the old "take / make / waste" industrial model

Ray Anderson, *Confessions of a Radical Industrialist: Profits, People, Purpose: Doing Business by Respecting the Earth* (2009, paperback 2011 under the title: *Business Lessons from a Radical Industrialist*). See his TED talk "The business logic of sustainability" (May 2009) here: http://www.ted.com/talks/ray_anderson_on_the_business_logic_of_sustainability.html
http://www.interface.com/
http://www.raycandersonfoundation.org/
RIP Ray Anderson.



Three trends to inform a "distributed" strategy:

Trend #1

Sustainable Industry

- **Read the CREX report (these ~~are~~ will be our customers)**
  Global Corporate Renewable Energy Index (CREX), 2012
  Bloomberg New Energy Finance / Vestas Wind Systems A/S
  http://www.businessgreen.com/digital_assets/5821/CREX_report_2012.pdf

- "Much of the demand for renewable technologies **has been** driven by specific energy policies. But there is also **a growing awareness** of the benefits of generating and using clean energy **over and above the incentives provided by governments**, especially among corporate energy users"

- "Companies are increasingly **shifting the focus** of their sustainability strategy **from energy efficiency to renewable energy**"

- "Companies … calling for an **expansion in regulatory support** for renewable energy, through mechanisms such as liberalising power markets, supporting incentive schemes or taxes on carbon dioxide emissions"

Evolving trend:

Was: Driven by **gov't**
Now: Driven by **profits**

Was: Cuts for efficiency
Now: Investment in energy

Was: Responding / avoiding
Now: Driving change

So: we want help with lobbying for NH3 Fuel?
Demonstrate to corporations that this is a product they need … and let them lobby on our behalf

Three trends to inform a "distributed" strategy:

Trend #1

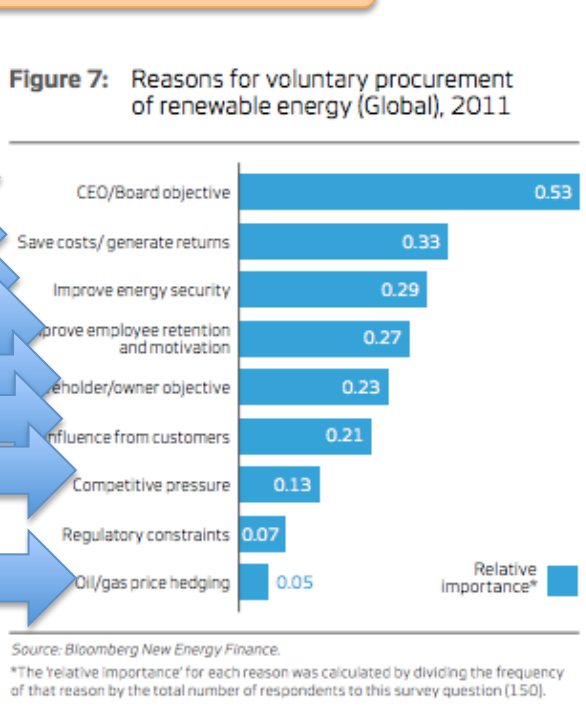
Sustainable Industry

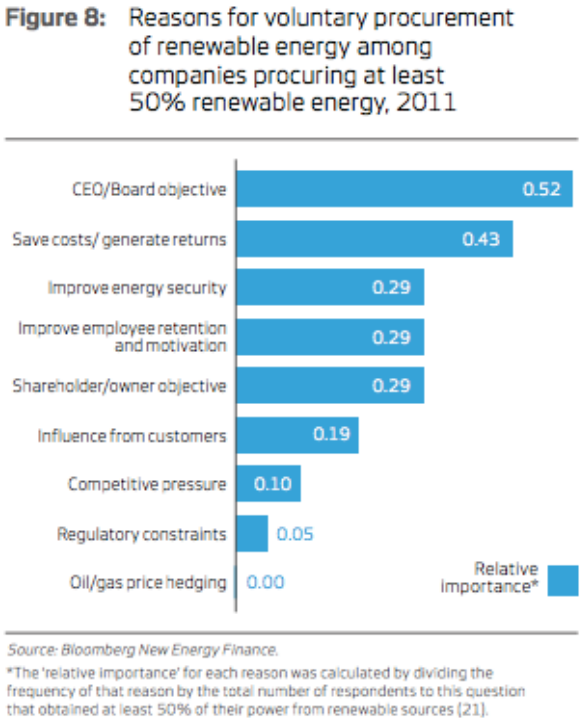
- **Corporate strategy is shifting toward long-term, sustainable profit**

I disagree with an important editorial aspect of Bloomberg's CREX Report: their analysis uses the word "**Marketing**" 19 times and "**Brand**" 21 times, but "**Profit**" only 2 times. This characterization of business strategy is now **out of date**, as shown by the CREX's own data.

Was: Sustainable = **Greenwashing** (marketing)
Now: Sustainable = **Profit**

1. **CEO / Board**
2. **Save / Profit**
3. **"Security" ie less risk**
4. **Talent: beat competition**
5. **Shareholders**
6. **Customers**
7. **Competition**
9. **Hedge**





Global Corporate Renewable Energy Index (CREX), 2012
Bloomberg New Energy Finance / Vestas Wind Systems A/S
http://www.businessgreen.com/digital_assets/5821/CREX_report_2012.pdf

Three trends to inform a "distributed" strategy:

Trend #1

Sustainable Industry

- How this trend is unfolding:
  1. **Quantifying the Problem**
  2. **Motivating Change down the Supply Chain** (=marketing reach)
- http://corporation2020.com/
- **Puma:**

  1. Environmental Profit & Loss Report.
  2. This uncovered **issues in global supply chain**, which, now quantified, **can be addressed.**
  The whole report, in its various sections including Methodology, is extremely interesting and worth reading:
  http://about.puma.com/puma-completes-first-environmental-profit-and-loss-account-which-values-impacts-at-e-145-million/

- **Intel:**

  1. Developed analysis of global supply chain.
  2. Tied salary to environmental performance.
  "*Since 2008, we have linked a portion of* ***every employee's variable compensation****—from front-line employees to our CEO—****to the achievement of environmental sustainability metrics****. The 2011 metrics focused on carbon emission reductions in our operations…"*
  See: http://csrreportbuilder.intel.com/PDFFiles/CSR_2011_Full-Report.pdf

PPR HOME

PUMA

PRESS KIT

PUMA E P&L Table & Visual Break-Down

	Water use	GHGs	Land use	Air pollution	Waste	TOTAL	
	€ million	€ million	€ million	€ million	€ million	€ million	% of total
	33%	32%	26%	7%	2%	100%	
TOTAL	47	47	37	11	3	**145**	100%
PUMA operations	<1	7	<1	1	<1	**8**	6%
Tier 1	1	9	<1	1	2	**13**	9%
Tier 2	4	7	<1	2	1	**14**	10%
Tier 3	17	7	<1	3	<1	**27**	19%
Tier 4	25	17	37	4	<1	**83**	57%
EMEA	4	8	1	1	<1	**14**	10%
Americas	2	10	20	3	<1	**35**	24%
Asia/Pacific	41	29	16	7	3	**96**	66%
Footwear	25	28	34	7	2	**96**	66%
Apparel	18	14	3	3	1	**39**	27%
Accessories	4	5	<1	1	<1	**10**	7%

Three trends to inform a "distributed" strategy:

Trend #2

Carbon Pricing

- In the Strawpoll, I asked **"What one thing could gov't do to support NH3 Fuel?"**
- My personal answer would be: **Enact an Efficient Carbon Policy**
  (it'd do more than anything else to **make NH3 Fuel immediately competitive**)
- Specifically: adjust the **Discount Rate** down from 3.5%, closer to 1.4%
  - Discount Rate: economics term, simple idea: compound interest, time-value of money.
  - For example, would you prefer me to give you $100 today, or $100 in ten years time?
  - One of those options is worth more to you, probably the one where you don't wait 10 years to get paid.
  - The Discount Rate is simply a measurement of that loss in value.

  Know this stuff, it's really important: http://grist.org/article/discount-rates-a-boring-thing-you-should-know-about-with-otters/
- **Internalize the Externalities**

  Ask: How much damage will one ton of CO2 do?
  What is it worth (to us, today) to avoid this?
- See previous slide: Environmental Profit & Loss report. Sustainable Industry trends toward counting these costs, taking accountability (literally) down the supply chain.

Three trends to inform a "distributed" strategy:

Trend #2

Carbon Pricing

1 ton carbon = anywhere from $8 to $1,500

- **The Social Cost of Carbon**
  Read Richard Tol for a comprehensive analysis
  The Economic Effects of Climate Change
  Journal of Economic Perspectives—Volume 23, Number 2—Spring 2009—Pages 29–51
  http://www.econ.yale.edu/~nordhaus/homepage/documents/Tol_impacts_JEP_2009.pdf

- **$21 per ton CO2 (US Gov't 2010)**
  But … new paper suggests Gov't wrong: should be x 2.6 to >12 higher
- **$55 to $266 per ton CO2 (closer to true cost)**
  Laurie Johnson (Natural Resources Defense Council) and Chris Hope (Judge Business School, University of Cambridge
  "The social cost of carbon in U.S. regulatory impact analyses: an introduction and critique"
  Journal of Environmental Studies and Sciences, September 2012
  http://www.springerlink.com/content/863287021p06m441/fulltext.html?MUD=MP

Table 2
The Social Cost of Carbon
(measured in $/tC)

	Sample (unweighted)				*Fitted distribution (weighted)*			
		Pure rate of time preference				*Pure rate of time preference*		
	All	*0%*	*1%*	*3%*	*All*	*0%*	*1%*	*3%*
Mean	105	232	85	18	151	147	120	50
Standard Deviation	243	434	142	20	271	155	148	61
Mode	13	—	—	—	41	81	49	25
33rd percentile	16	58	24	8	38	67	45	20
Median	29	85	46	14	87	116	91	36
67th percentile	67	170	69	21	148	173	142	55
90th percentile	243	500	145	40	345	339	272	112
95th percentile	360	590	268	45	536	487	410	205
99th percentile	1500	—	—	—	1687	667	675	270
N	232	38	50	66	—	—	—	

Note: Numbers in the table show the social cost of carbon measured in 1995 dollars per metric ton of carbon ($/tC). Estimates are based on sample statistics and characteristics of the Fisher–Tippett distribution fitted to 232 published estimates and to three subsets of these estimates based on the pure rate of time preference.

- **Cost of carbon is too low / markets dysfunctional**, today
  EU: now at record low of ~5 Euros per ton.

- **But carbon will be priced**, eventually
  China: 12th 5 Year Plan: reduce CO2 by 17%, Australia, EU airlines.

- Sure: not everyone wants this. Eg: "*Whoever has control of the Arctic route will control the new passage of world economics and international strategies*"
  Li Zhenfu, Dalian Maritime University, quoted by Linda Jakobson, Stockholm International Peace Research Institute survey, The Economist, September 1, 2012

Three trends to inform a "distributed" strategy:

Trend #2

Carbon Pricing, in US

- *"The governmental working group used a very empirically based discount rate, which **seems very concrete**, but over the long term runs into an **ethical brick wall**.*

- *A human life is often estimated to be worth around $10 million, but if you apply a **three percent discount rate** to this, that means that a human life five hundred years from now is only worth $3.81 today.*

- *Ultimately, we can't rely on only numbers — we have to make really hard value judgements. We should stop pretending this is a science and admit it is an art and talk about this in terms of **ethics and fairness, not what we can observe in the markets**."*

  Frank Partnoy, professor of Law and Finance, University of San Diego
  http://green.blogs.nytimes.com/2012/09/18/the-social-cost-of-carbon-how-to-do-the-math/

- ***"The art of reimagining the epic face-palm of a fail you and I call the status quo"***

  Udair Haque, http://blogs.hbr.org/haque/2012/09/if_you_were_the_next_steve_job.html

Three trends to inform a "distributed" strategy:

Trend #3

Distributed

- See: Total Energy USA conference
  Houston, Nov 27-29, 2012 http://totalenergyusa.com/

- Keynote 1:
  "A New Energy System: The Internet, Renewable Energy, Distributed Generation, Power Plant Buildings and New Vehicles"

- Abstract:
  "***When distributed communication converges with distributed energy generation, a new energy regime will be created, loaded by buildings, partially stored in the form of hydrogen, distributed via smart intergrids and connected to plug in zero emission transport. The entire system is interactive, integrated and creates new cross-industry relationships. There will be a new era of "distributed capitalism" in which millions of existing and new businesses and homeowners become energy players***"

Three trends to inform a "distributed" strategy:

Trend #3

Distributed

- An Ammonia Economy could look like our current Fossil Economy (centralized production, cartels, global commodity)
  … but **there's no reason to impose a centuries-old model on NH3**.

- **Helpful Disruptors:** innovations in finance, communications, international trade, corporate governance, consumer trends, communities seeking independence.

- **Major Disruptor:** the **properties of ammonia** + **renewable energy**

- **What can be Distributed?**
  - **Generation**: small scale, niche markets, stranded assets, island mode, production at place of consumption.
  - **Ownership**: local, crowd, community, corporate, consumer, debt, leasing, power purchase agreements.
  - **Delivery**: marketplace innovation, sharing economy, dynamic supply/demand, smart grids … and the traditional freight / pipeline already exists.

Three trends to inform a "distributed" strategy:

Trend #3

Distributed Capital

Local Investment:

"National prosperity — even global prosperity — begins at the local level. By connecting entrepreneurs who are re-thinking their industries, funders who are investing in the local economy movement, and network organizers who can mobilize on a broad scale, we can — and will — create a stronger, more resilient, and fair economy" http://bealocalist.org/

Local Marketplace (think smart grid):

- **Mobile Devices:** universal access democratic
- **Social:** portable personal participatory
- **Big Data:** transparent global immediate

Three trends to inform a "distributed" strategy:

Trend #3

Distributed Production

For a great paper on the economics of distributed ammonia production, see Glen Buckley: [NH3 Transportation Challenges and a Solution – Distributed Production], 10/1/2012

Frugal Innovation / Minimum Viable Product

Early Feedback (listening) gives you:

- Product development
- Customer Base
- Publicity
- Cashflow

Examples:

- Tata nano, consumer car: $2,000
- M-PESA, mobile banking: 70% market share, Kenya
- **PowerCube**, ammonia fuel in field trials, Namibia

NH3 fuel starts here

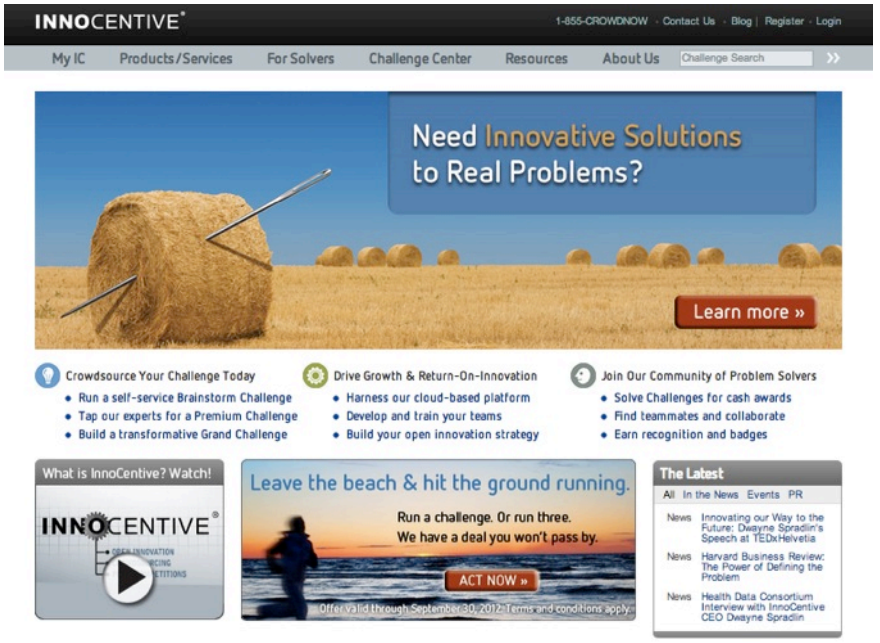
"Collaboration is the new competition"

Andrew Liveris, CEO Dow Chemical

Quoted by Ben Hecht, President & CEO of Living Cities, http://www.livingcities.org/ http://www.fastcoexist.com/1680570/5-transformational-forces-that-should-be-driving-the-social-sector-but-aren-t

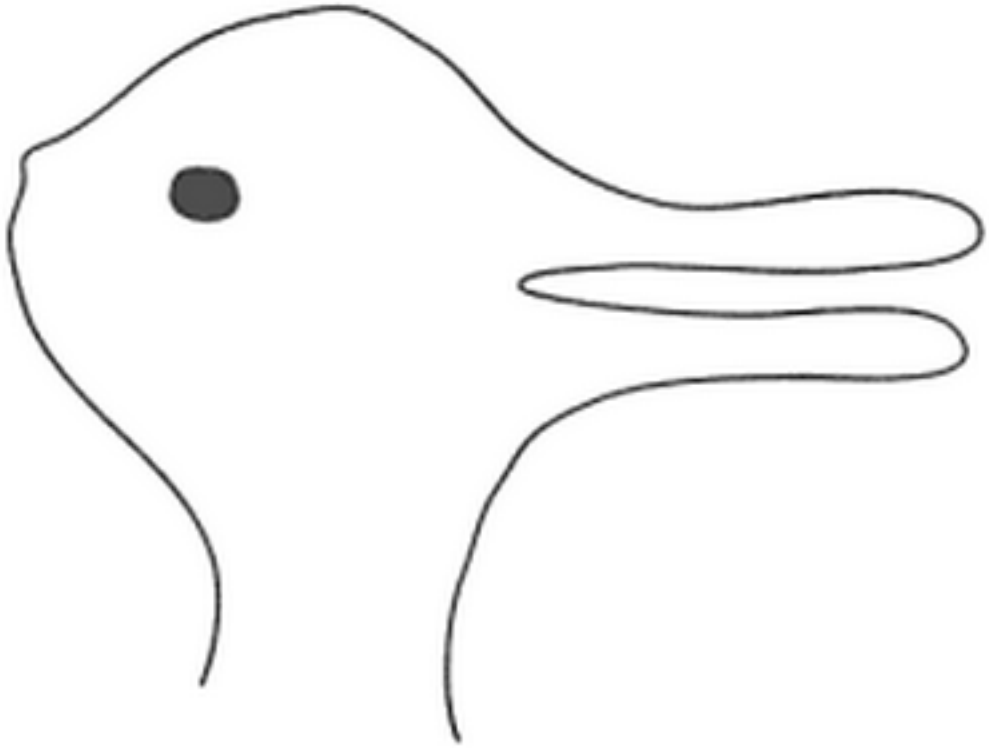
Examples:

- **Innocentive**: crowd-source innovation
- **Kickstarter**: crowd-source financing



Changing the Debate

A duck or a rabbit?



Changing the Debate

- **Producing and using clean, sustainable energy is NOT a Left v. Right issue**
  … but that "story" is closing down action and intelligence in the US.
  So how do we change this debate?

- ***"Stories are more powerful than data*** *because they allow individuals to identify emotionally with ideas and people they might otherwise see as 'outsiders'"*

- *"It is not the objective world that influences us but* ***how we represent and interpret the world***"
  eg: Duck or Rabbit? Conservative or Liberal argument?
  Is your data partisan?
  How does your audience perceive your communications?

- **For more, read "Redirect" by Timothy Wilson**
  The Surprising New Science of Psychological Change, Sept 2011, by Timothy D. Wilson (University of Virginia) http://www.hachettebookgroup.com/books_9780316051880.htm
  "A scientifically-based approach called story editing: redirecting the stories we tell about ourselves and the world around us, with subtle prompts, in ways that lead to lasting change."

Changing the Debate: example 1

What is your "story"? …

For example: "**Carbon Tax is a Republican idea**"

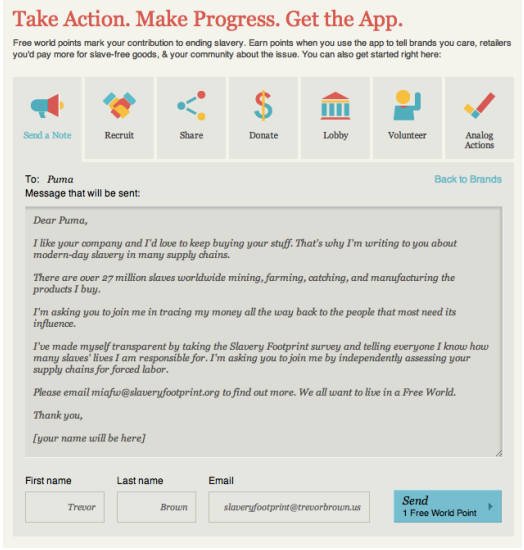
- **Energy & Enterprise Initiative**
  A Conservative non-profit run by Bob Inglis (former R-SC)

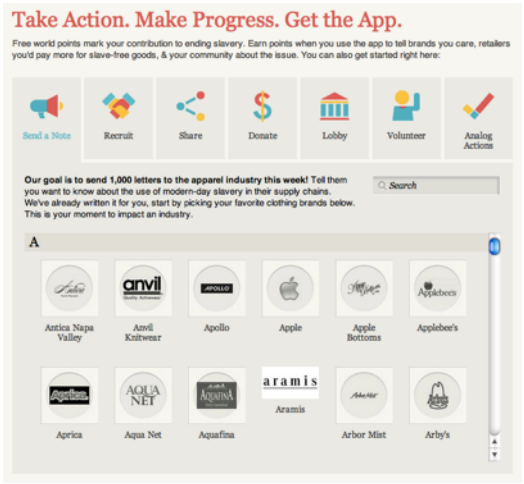
- "*Economists have long understood that the key to smart environmental policy is aligning private incentives with true social costs and benefits. That means putting a price on carbon emissions, so households and firms will have good reason to reduce their use of fossil fuels and to develop alternative energy sources*."

- A Free-Enterprise Solution **…**
  - Eliminates all subsidies for all fuels
  - Attaches all costs to all fuels
  - Ensures revenue neutrality to prevent the growth of government

Changing the Debate: example 2

How do you use your data to tell a "story"?





Slavery Footprint: using the Free Market to Free People

It all began with Justin Dillon, a onetime musician who got involved in the anti-slavery movement hosting benefit concerts. Justin made abolitionism his full-time job, making his directorial debut in the human-trafficking documentary, "CALL+RESPONSE." The **U.S. State Department** saw the film and approached Justin for his help developing a narrative that would allow individuals to understand their connection to modern-day slavery. From that conversation, Slavery Footprint was born. On September 22, 2011, Slavery Footprint launched a website that asked a single question: "How Many Slaves Work For You?" The response was so overwhelming that our site couldn't keep up with the traffic. Since then, millions of people from 200 countries have visited www.slaveryfootprint.org

Changing the Debate: example 3

Who is your best Storyteller? (who is your "surprising validator"?)

- **Jim Gandy: WLTX TV weatherman in South Carolina**
- "*I'm not from a red state, I'm from a dark red state*"
- Gandy began speaking out about climate change fully prepared to face **backlash from his politically conservative audience**. But a funny thing happened: The backlash never came. Rather than facing an onslaught of angry phone calls, Gandy found that many **viewers were fascinated by his reports connecting climate change with their daily lives**.

http://grist.org/climate-energy/meeting-the-bruce-springsteens-of-climate-communication/
By Jordan Haedtler, Campaign associate with http://ForecasttheFacts.org "Seeks to ensure Americans receive accurate information about climate change."

Communications Cheat Sheet 1:
10 Reasons Why People Resist Change

- **Loss of control**
  Power and status, but also self-determination
  - Empower: let people make choices
  - Give them ownership: involve in planning
- **Excess uncertainty**
  Better the devil you know …
  - Create a sense of safety: certainty in process
  - Steps and timetables
  - Inspire, so that the reward is worth the risk
- **Surprise**
  Decisions imposed suddenly, no time to prepare
  - Plant seeds: hint and seek input
- **Everything seems different**
  Too many changes, confusing / distracting
  - Minimize the number of differences
  - Keep as many things as possible familiar
  - No change for change's sake
- **Loss of face**
  Those associated with the past are likely to be defensive, dread the perception that they must have been wrong.
  - Maintain dignity by celebrating the past
  - Emphasize world has changed: let go, move on
- **Concerns about competence**
  People feel stupid / obsolete: skepticism
  - Structural reassurance: information, education, training, support systems
  - A period of overlap to ease transition
- **More work**
  But we just built that one! Now you want us to …
  - How to motivate?
  - How to reward sacrifice?
- **Ripple effects**
  Disruption out of scope: pushback, rebellion against interference
  - Consider all affected parties, however distant
  - Engage with them to minimize disruption
- **Past resentments**
  Risk management: old wounds, personality clashes
  - Gestures to heal the past
  - Reputation management
- **The threat is real: it's a zero sum game**
  New displaces old: investments wiped out, jobs lost.
  - Be honest, transparent, fair, and fast

Adapted from Rosabeth Moss Kanter, Harvard Business School, author of "Confidence" and "SuperCorp," http://blogs.hbr.org/kanter/2012/09/ten-reasons-people-resist-chang.html

Communications Cheat Sheet 2:

6 Ways to Hurt Your Own Cause

- **The Black and White scenario**
  Idealize / Demonize … creating an impasse
  - Don't try to scare people into following our vision
- **Uninvited opinion**
  Instead, use positive engagement
  - Create reasons for people to seek out your expertise
- **Assuming you know others' opinions**
  Aiming to re-educate can appear fanatical. Undermines credibility
  - Listen
- **Ad Hominem**
  Don't attack. For one thing, you'll put lots of people off.
  - Use honey not vinegar
- **Sticking to the script**
  One tune, all the time, not listening, not learning.
- **Why are other people so damn bureaucratic?**
  Because <u>we</u> don't see what they see, or understand their reality
  So we get frustrated

- **Conclusion**: Strategic engagement

Adapted from http://blogs.hbr.org/cs/2012/09/are_you_hurting_your_own_cause.html
Image source: http://grist.org

An example of poor communication: this self-congratulatory image from Grist reinforces an echo-chamber of opinion, the black v white impasse, neither informing nor empowering.

Conclusion …

- "**Good decisions depend on good measurement**. More subtly, what we decide to measure, or are able to measure, has important effects on the choices we make …
- Economics [is defined as] the allocation of scarce resources. That definition may be the 'what,' but it **certainly is not the 'why'** …
- The ultimate purpose of economics, of course, is to understand and promote the enhancement of well-being. **Economic measurement** accordingly must encompass measures of well-being and its determinants"

  Ben Bernanke, Federal Reserve Chairman, speaking to the International Association for Research in Income and Wealth, August 6, 2012
  http://www.federalreserve.gov/newsevents/speech/bernanke20120806a.htm

- Instead of asking "What's stopping us?"
- I'd like to ask "What's stopping sustainable industry?"
- Answer: "**There must be a clear alternative**" Ray Anderson
- I think it's you – the NH3 fuel movement. You are the clear alternative.

Thank you

- This year, theory
- Next year, I hope, results

"Hope is not the conviction that something will turn out well,
but the certainty that something makes sense,
regardless of how it turns out."
Vaclev Havel