

# Silver Buckshot

By Daniel Emmett

»THERE IS no simple solution to our petroleum dependence. The answer is not conservation or increases in fuel economy standards. Nor is it hybrids, plug-in hybrids or battery electric cars. It is not hydrogen or fuel cells, and it certainly isn't natural gas, biogas, biodiesel or ethanol either. The bottom line is that there is no silver bullet that will save us from our petroleum dependence and deliver us from the devastating public health effects, environmental wreckage and economic spasms caused by oil. What is the answer then?

All of the above. Silver buckshot.

The massive scale and urgency of the challenge demands a solution that is diverse and inclusive. No single alternative fuel or advanced vehicle technology will solve the energy equation alone. Instead we need to employ a suite of vehicle technologies, alternative fuels and conservation policies that together hold the promise of reducing oil dependence, stopping global warming and cleaning up our air and water.

Take ethanol for example. While a promising renewable fuel that can directly replace gasoline in internal combustion engines with only minor modifications, ethanol has limitations, among them an inferior fuel economy, some increases in smog-forming emissions and competition with food crops for feedstock and arable land.

Likewise, biodiesel is a renewable fuel that replaces diesel fuel and dramatically lowers greenhouse gas emissions, but has liabilities in the form of increased air pollution and competition for land with food crops.

Hydrogen fuel can be derived from water using myriad energy sources ranging from renewable power (clean) to coal (dirty) to nuclear (scary). The same hydrogen used in a fuel cell is twice as efficient as an internal combustion engine and has zero tailpipe emissions. However, the technology is expensive and requires new fueling infrastructure.

Natural gas used in an internal combustion engine is the cleanest option on the road today in terms of criteria pollutants. But it's still a fossil fuel that needs to be extracted and imported.

Hybrids increase vehicle efficiency by capturing otherwise wasted energy from braking and return it to the car in the form of electrical power to support a conventional gasoline engine. Plug-in hybrids perform the same function. However, they have a bigger battery and an all-electric range that can result in overall fuel economy of 100 mpg. While



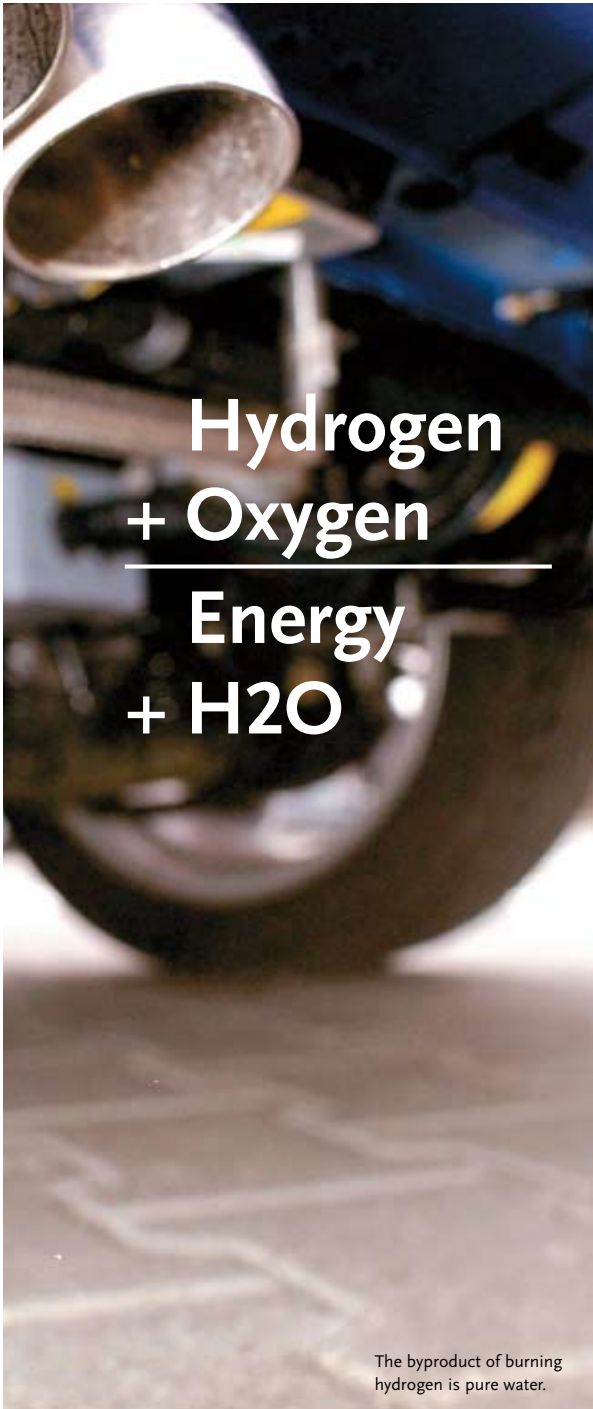
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these technologies dramatically increase fuel efficiency, they still rely on burning conventional fossil fuels, and even if every car magically became a hybrid tomorrow, increases in the number of new vehicles and miles traveled would erase these efficiency gains in a matter of years.

While pure battery electric vehicles have zero emissions and are extremely efficient, battery technology still remains just out of reach for automakers to deliver a vehicle that is safe, affordable and with a driving range and refueling time that would be acceptable to the average consumer.

Mass-transit is a key solution to achieving significant petroleum reductions. However, while some commuters' travel needs can be met through

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# Hydrogen + Oxygen Energy + H<sub>2</sub>O

The byproduct of burning hydrogen is pure water.

existing local mass-transit or commuter rail, cars and trucks will continue to remain important for individuals and for commerce.

Clearly we have a lot of options. The best way to achieve the goal of reducing petroleum dependence and its attendant problems is to deploy these fuels and technologies in tandem and in a way that maximizes their benefits, exploits their synergies and minimizes their liabilities. For example, a plug-in fuel cell hybrid fueled by hydrogen made from rooftop solar power could be a good choice in California or Florida. A plug-in hybrid burning ethanol made from organic waste could make great sense in Iowa or Idaho. Battery power might be the right choice for a taxi in Manhattan and a biodiesel big



rig could be a good choice for long haul truckers.

We will need to have performance and sustainability standards for all fuels to ensure we achieve environmental benefits from a transition to alternative fuels and don't wind up backsliding on air quality or have unintended adverse impacts on water quality, biodiversity or global warming.

So the solution is really all about choice and diversity. Americans love choice. Just think about the peanut butter or cereal shelf in a grocery store. Why shouldn't we have real options when it comes to transportation fuels? And imagine if your financial advisor recommended you put all of your net worth in pork belly futures. You'd laugh, then fire her. There is strength and security in diversity whether you're talking about your investment portfolio or the future of transportation fuels.

The fueling station at the Regional Transportation Center in San Diego embodies this vision of diversity and choice. Here customers can choose from ethanol, biodiesel, natural gas, liquid propane gas, electricity, as well as conventional fuels. This vision of clean fuel choice is real and attainable. We have choices that will work for us today, and we need to demand that the energy companies, auto companies and our leaders make them available.

Taken together, better conservation strategies, advanced vehicle technologies, and a range of domestically-sourced fuels produced from renewable sources will drastically reduce our dependence on oil, address global warming and air pollution, insulate our economy from oil-based market spikes, create and expand business opportunities for farmers and industries, and protect public health. These solutions can provide relief from the damages resulting from dependence on petroleum. However, none of these solutions is a silver bullet; we need silver buckshot. [w](#)



Waterkeepers unload a zero emission bus at the 2006 conference in San Francisco.