# ***Ensuring America's Freedom of Movement: A National Security Imperative***

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# *MAB National Security Framework*

- Economic Strength
- Geopolitical Stability
- Military Capability
- Environmental Sustainability

**National Security and the Threat of Climate Change**

**Powering America's Defense**: Energy and the Risks to National Security

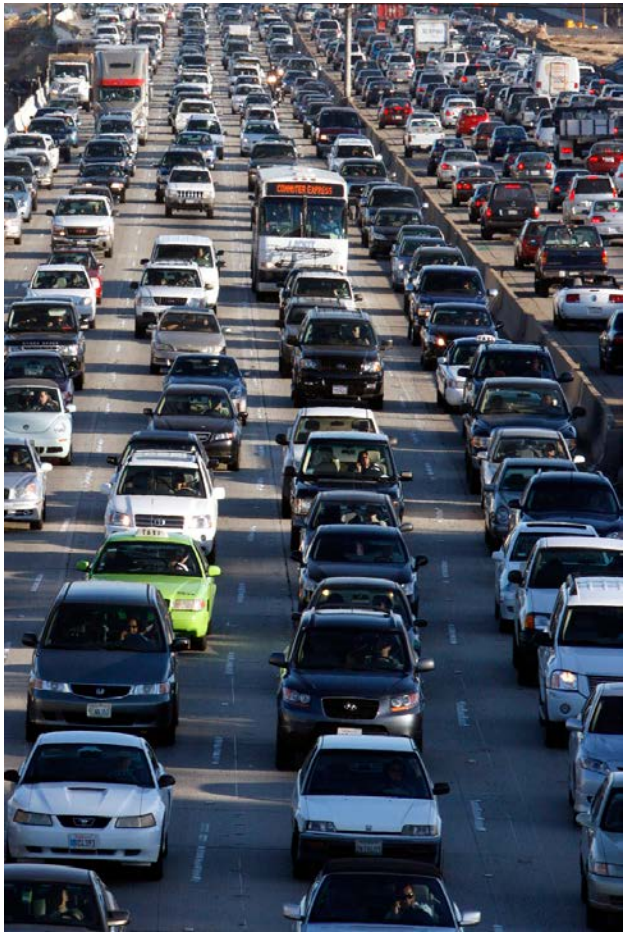
**Powering America's Economy**: Energy Innovation at the Crossroads of National Security Challenges

**Ensuring America's Freedom of Movement:** A National Security Imperative to Reduce US Oil Dependence.

**National Security is more than DOD**

# Oil - The Facts

- U.S. uses ~ 20 million barrels/day
- About ½ is imported
- About ½ of imported is from OPEC
- Global commodity – price set by global supply (OPEC) and demand (ROW)
- China is world 2nd largest importer and growing at 7% each year
  - Will exceed US imports in 10-15 years



**Oil supply is finite**

# MAB #1 Finding

## America's dependence on oil constitutes a significant national security threat

**Economy** -- Completely reliant and vulnerable
Transportation system totally dependent (food, jobs, etc)
Price volatility stifles investment

**Geopolitics** -- Limits our options
Sizeable Mid-east presence
China will be competing for same oil– raise tensions

**Militarily** -- High oil price limits investment in capability and capacity
Single source– increase venerability, long logistics tails

**Environment** - Climate change linked to GHG and fossil fuel
Grandkids need oil for things beside fuel
Not in my back yard – limits further US production

# Goal to Kick the Habit

## *Cold Turkey Not Required*

**Finding #2**

**30% reduction in our use of petroleum would significantly improve our national security**

**Analytically Derived**



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# How to Kick the Habit


100 mpg SmartCar

## Efficiency


Biofuel Pump

## Alternative Fuels

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# Alternatives are Better than Oil

| | Algae-based biofuels | Cellulose-based biofuels | Compressed natural gas | Electric vehicles | Fischer-Trophsch derived fuels | Food crop-based biofuels | Traditional gasoline | Hydrogen fuel cells | Methanol | Propane |
|---|---|---|---|---|---|---|---|---|---|---|
| Economic security | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs and new industry. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs and new industry. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs, depending on competitiveness of U.S. auto makers. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs. | Reliance on gasoline contributes to trade deficit. Subsidies to oil and gas include military protection of supply chain, limited taxes, emergency funds for oil spills, and use of public lands. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs and new technologies could have spillover effect for new industries. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs. Energy density is half that of gasoline–more refuelings. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs. |
| Geo-political security | Fuels can be produced in non-agricultural areas, diversifying supplies. Rising demand for phosphorus could complicate pricing, supplies. | Benefits accrue to U.S. and other grain producers. Production from indigenous biomass sources can diversify and stabilize global supplies. | Global gas reserves are plentiful, including within the United States. Gas reserves tend to occur alongside petroleum reserves, so many oil producers would benefit. | Current advanced batteries require lithium and some rare earth minerals, the supplies of which could become constrained due to market or political forces. Some substitutes available. | Coal and gas reserves are relatively plentiful around the world. | Benefits accrue to U.S. and other grain producers, mostly stable democracies. Food vs. fuel tradeoff for grains could cause global political rift. Rising demand for phosphorus could complicate pricing, supplies. | Reliance on gasoline restricts foreign policy, underpins enduring military engagement in the Middle East, and profits countries and groups who oppose U.S. | Offer prospects for abundant transport fuels. Enormous start-up costs may limit technology to wealthy countries. | Methanol is relatively easy to produce from gas, coal, or nuclear power and blends with traditional gasoline. Production possible around the world, which would diversify global energy supplies. | Global gas reserves are plentiful, including within the United States. Gas reserves tend to occur alongside petroleum reserves, so many oil producers would benefit. |
| Environmental security | Relatively low GHG emissions. Total GHG impact depends on type and means of algae cultivation, input supplies. Could require intense use of phosphates, $CO_2$, and water. | Relatively low vehicle GHG emissions. Cultivation requires fewer inputs than food crops (could be waste). Grasses, crop residues affect land values less than food crops. | Burns cleaner than oil, but releases much more GHG than ethanol. Large-scale gas extraction has environmental hazards similar to oil drilling. | EVs emit no greenhouse gases. Total impact would depend on source for electricity. | Requires $CO_2$ sequestration, or another means of reducing or storing $CO_2$ to keep GHG emissions at acceptable levels. Coal-burning F-T plants require large volumes of water. | Relatively low vehicle GHG emissions. Rising cropland values can lead to deforestation. Cultivation can require intense use of energy, phosphates, and water, increasing "well-to-wheel" GHG impact. | Burning gasoline from oil using internal combustion engines emits significantly more GHGs than any alternative fuel produced from natural gas or biomass or from gas-powered electricity plants. | Offer cleanest known technology, with no emissions. Total impact would depend on need for electricity and its source. | Diversification of fuel supply reduces price volatility and vulnerability to shocks. Domestic production would create jobs and new technologies could have spillover effect for new industries. | Propane burns cleaner than oil, but releases much more GHG than ethanol. |
| Military implications | Sound for permanent installations in the continental U.S. (CONUS). Good potential for expeditionary use. | Sound for permanent installations, CONUS. Good potential for expeditionary use. | Sound for permanent installations, CONUS. For expeditionary use, volatility a challenge. | Sound for permanent installations, CONUS. Poor for expeditionary use because of limited, unreliable electric capacity at front lines. | Sound for permanent installations, CONUS. Good potential for expeditionary use. | Sound for permanent installations, CONUS. Good potential for expeditionary use. | Optimal power per weight, but costs for delivery in expeditionary use can be very high. | Volatility a challenge. Additional weight and size for fuel tank unsuitable for expeditionary use. | Sound for permanent installations, CONUS. Good potential for expeditionary use, but twice as many fuel convoys. | Volatility a challenge. Additional weight and size for fuel tank unsuitable for expeditionary use. |
| Technical or economic challenges | Technology unproven at commercial scale. Costs uncertain. Could be mixed into gasoline, or dropped in as alternative without major engine alteration.<br><br>5-10 years to commercial availability | High initial facility costs. Uncertainty about optimal source materials. Requires modified delivery and storage systems. Can be mixed into gasoline, or dropped in as alternative without major engine alteration.<br><br>0-5 years to commercial availability | Best for fleets with central refueling points. Wider delivery systems require special compression systems. High potential as source material for further refinement into fuel via F-T process or into methanol. Lower GHG than gasoline.<br><br>0-8 years for wide commercial availability | Already commercially available, but cost of vehicles high. Designing smaller, more powerful, affordable batteries is the key challenge. Recharging at massive scale could increase pressure on U.S. energy grid.<br><br>0-5 years for wide commercial availability | Technology proven and commercially operative in other countries. Costs of new F-T plants are extremely high, though lower if source material is natural gas (instead of coal).<br><br>0-5 years for wide commercial availability | Technology established. Less efficient than biofuels from cellulose. As stand alone fuel requires modified delivery and storage. Can be mixed into gasoline, or dropped in as alternative without major engine alteration.<br><br>0-5 years for wide commercial availability | Technology established. High price volatility controlled by cartel. Mostly imported. Poses significant national security vulnerability. High GHG.<br><br>Widely available now | Commercially available, but in small numbers and at high cost. Weight and size of fuel tanks presents design challenges. Would require new hydrogen delivery infrastructure.<br><br>5-15 years for wide commercial availability | Technology is established from natural gas and coal, under development from biomass. High start-up costs for new plants. Can be mixed into gasoline, or dropped in as alternative without major engine alteration.<br><br>0-5 years for wide commercial availability | Less efficient per volume than gasoline, requiring frequent fuel tank replenishment. Most efficient for specialized fleets of small vehicles. Requires compressed storage and delivery. High GHG.<br><br>Widely available now |

= Good = Area of concern = Area of higher risk

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# MAB Recommendations

## We Must Take Action

- Need Strategic Roadmap
- Reduce Consumption
- Promote Alternatives
- DOD should continue to lead

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# Shared Commitment

***Pay <u>now</u> with a little bit of economic sacrifice***

***Pay <u>later</u> with lives of our son's and daughters***

# Questions


BOMBS AWAY!
"We must have millions of gallons of gasoline a day to do our job!"
Stick to your job-
OIL IS AMMUNITION

# Back-up