

Navy Energy Program

Bridging the Energy Gap

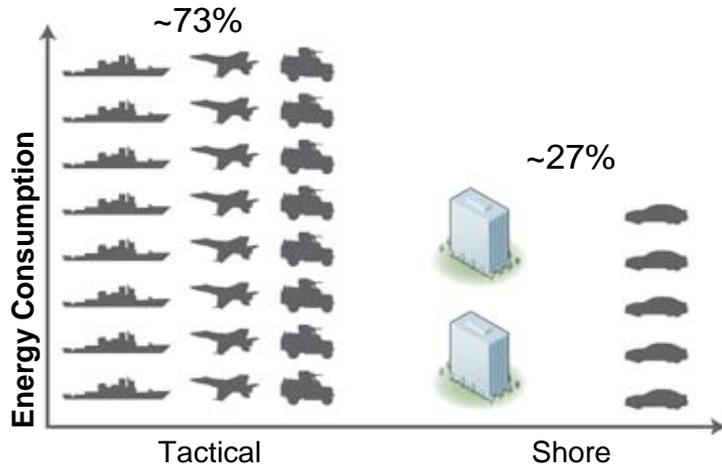
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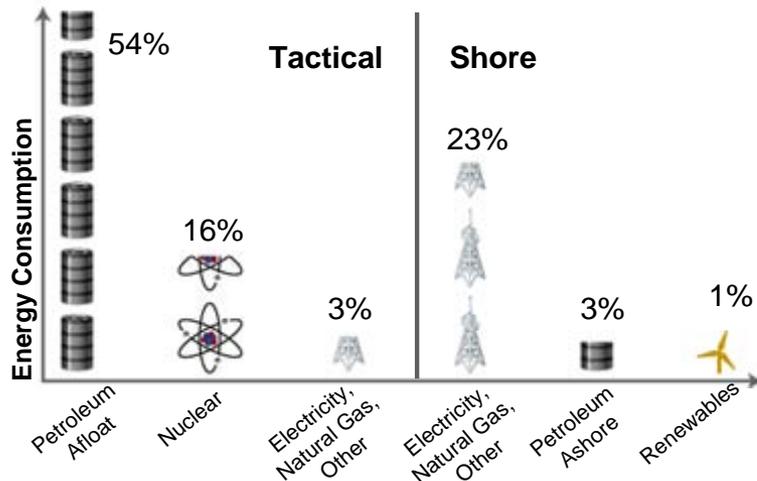


The Energy Challenge

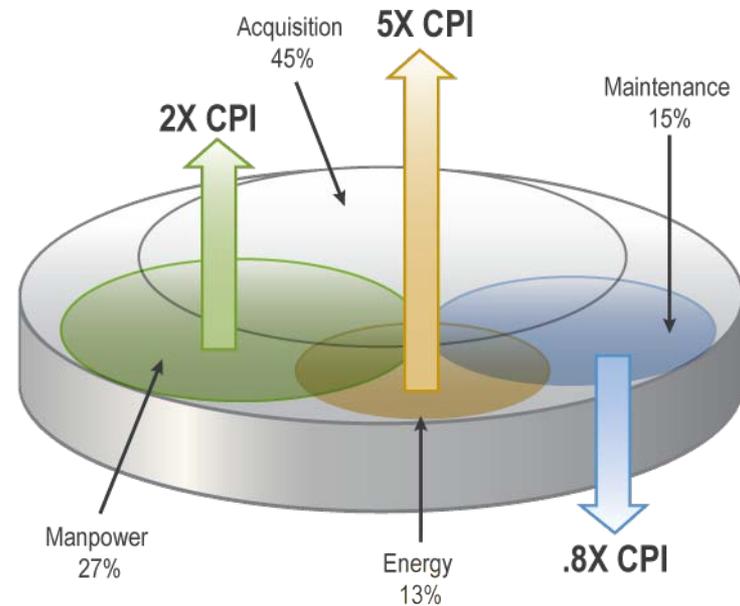
Overall Energy Consumption



Overall Energy Sources



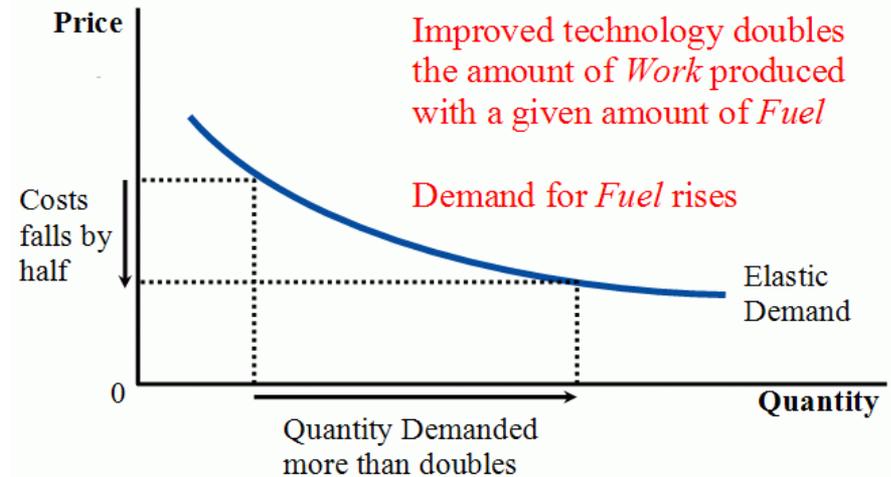
Surface Combatant Total Ownership Cost (1991-2009)



- CPI increased by 59% from 1991-2009
- Private sector depot port rates increased 49%... *Slightly less than CPI*
- Military Manpower costs increased 114%... *Almost double CPI*
- Energy Costs increased 292%... *Five times CPI!*



Jevons' Paradox



In the long term

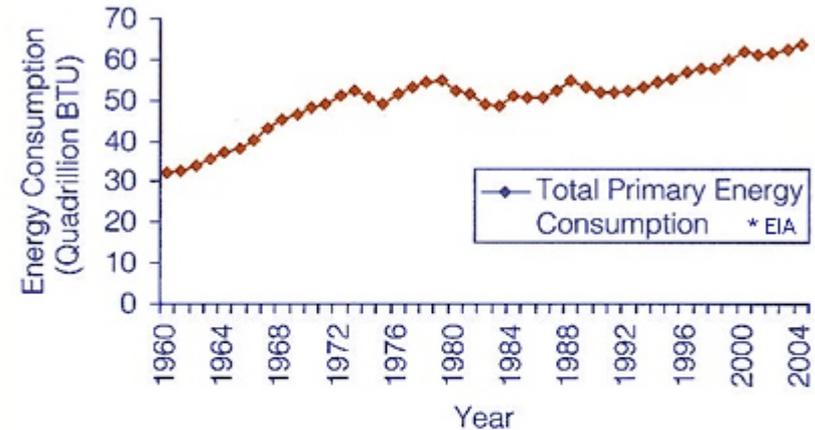
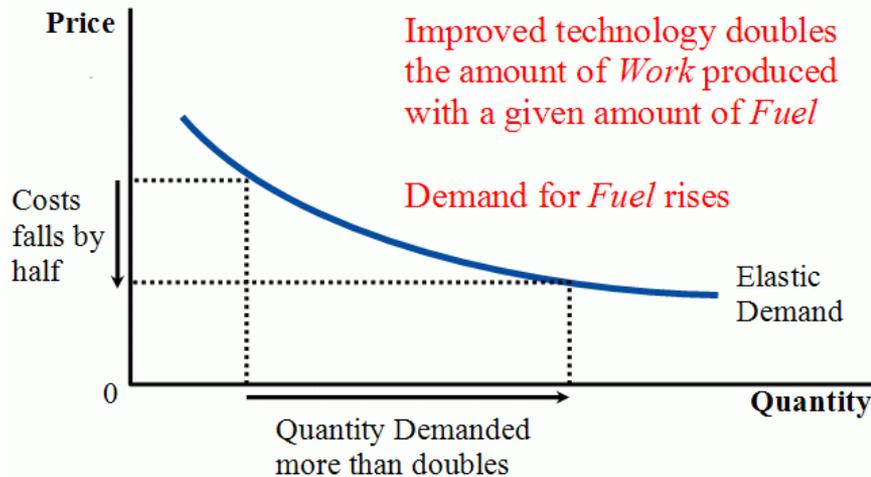
- 19th Century England
 - Coal mines were being depleted
 - Concern existed on resourcing and moving heavy materials
 - Industrial productivity was being expanded
- In 1865, the English economist William Stanley Jevons observed:
 - We were becoming more efficient
 - But we used more coal
- Argued that, contrary to common intuition:
 - Technological improvements did not help solve resource limitations

Paradox: As efficiency improved, we used more energy



Jevons' Paradox

In Perspective Today



Energy consumption in the US, 1960–2004

- Paradox: as energy machines became more efficient, consumers consumed more.
- Efficiency alone will not help...if energy is cheaper, people will not save, they will *use more*.
- Jevons' Logical Conclusion:
 - Improved business efficiencies do not yield the complete answer
 - Government intervention and changes in culture and awareness may be necessary
- Same dynamics observed today by modern economists looking at the impact of energy efficiency on consumption rebound

The Real Challenge: Reducing consumption

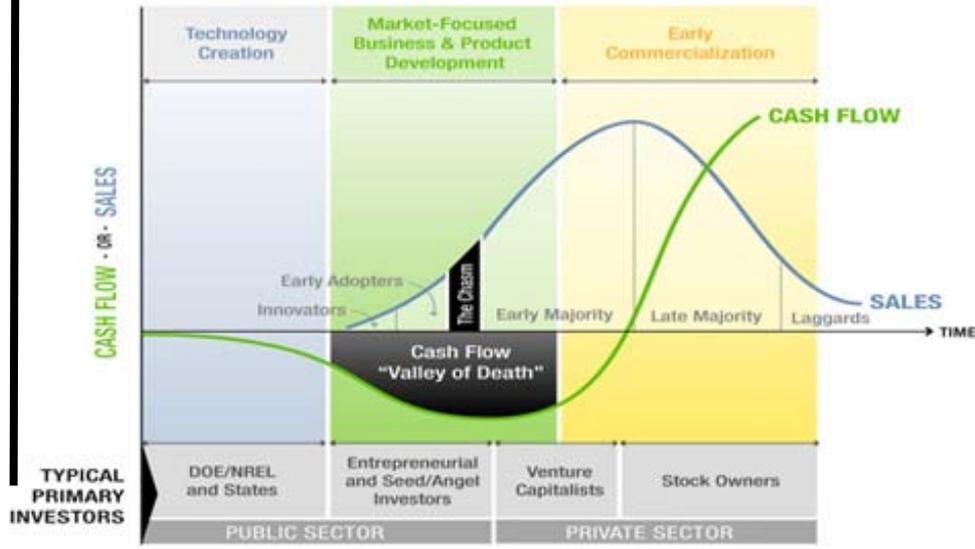


1 – System Optimization

Technology



2 – New Technology



Culture Change

Behavior changes are a force multiplier

- Needed to overcome paradox
- Value energy as a strategic resource

Optimal Design / Technology + Policy / Culture Change → Jevons' Paradox





Maritime: Initiatives



Efficient Ship Systems
Example: Solid State Lighting

- Utilizes Light Emitting Diodes (LEDs) for platform illumination
- LED lights in commercial applications:
 - Last almost 6 times longer than Incandescent and Fluorescent lights
 - Provide the same illumination requiring 25% of the energy
- Currently testing on DDG-108 and LSD-52
- Payback estimated at approximately 2 years, depending on model



Improved Hydrodynamics
Example: Stern Flaps and Hull Coatings

- Stern flaps are shown to have an average payback period of <1 year on FFG/CG/DDG platforms
 - Currently undergoing testing on L-class ships to
- Easy release hull coating system allows Navy ships to shed hull bio-fouling once underway
 - Reduces costly periodic hull cleanings



DDG-51 Hybrid Electric Drive
USS TRUXTUN Test Platform

- Land based prototype to begin testing at end of 2010
- USS TRUXTUN (DDG 103) scheduled to be first operational installation in FY12 as an afloat test platform
- Estimated fuel savings at 8,500 Bbls/ship/year
 - Fuel savings by securing LM2500 propulsion turbines at low speed while loading gas turbine electric generators to more efficient operating condition



Aviation: Initiatives



Science & Technology

- Investment focusing on variable cycle engine development



Research & Development

- Engine efficiency technologies
- Drag reduction coatings
- Light weight composite munitions



Operations and Policy

- Increased simulator use
- Air Energy Conservation (ENCON) Program

Technology Change

Culture

Aviation initiatives expand tactical reach by improving efficiency of existing platforms and reducing midair refuelings



Biofuel Testing



NAS PATUXENT RIVER
April 22, 2010

- The Navy's F/A-18 Green Hornet, flew a maximum speed profile as part of the test and certification process
- In this successful test the aircraft achieved nearly MACH 1.2, demonstrating the viability of biofuel as an off ramp to petroleum while preserving full combat capability of the aircraft



RCB-X
October 22, 2010

- Tested algae based biofuel on a much larger scale
- Test was 100% successful, the craft had same performance as petroleum counterpart
- Speeds exceeded 40 knots



MH-60
November, 2010

- First test flight to be conducted the last week of NOV 2010
- Will be flying on Camelina based biofuel
- Once asset has completed testing satisfactorily will use asset to fly for a full year on biofuel



Changing Paradigms  ***Tactical Advantage***

