USMC Energy and Power Future

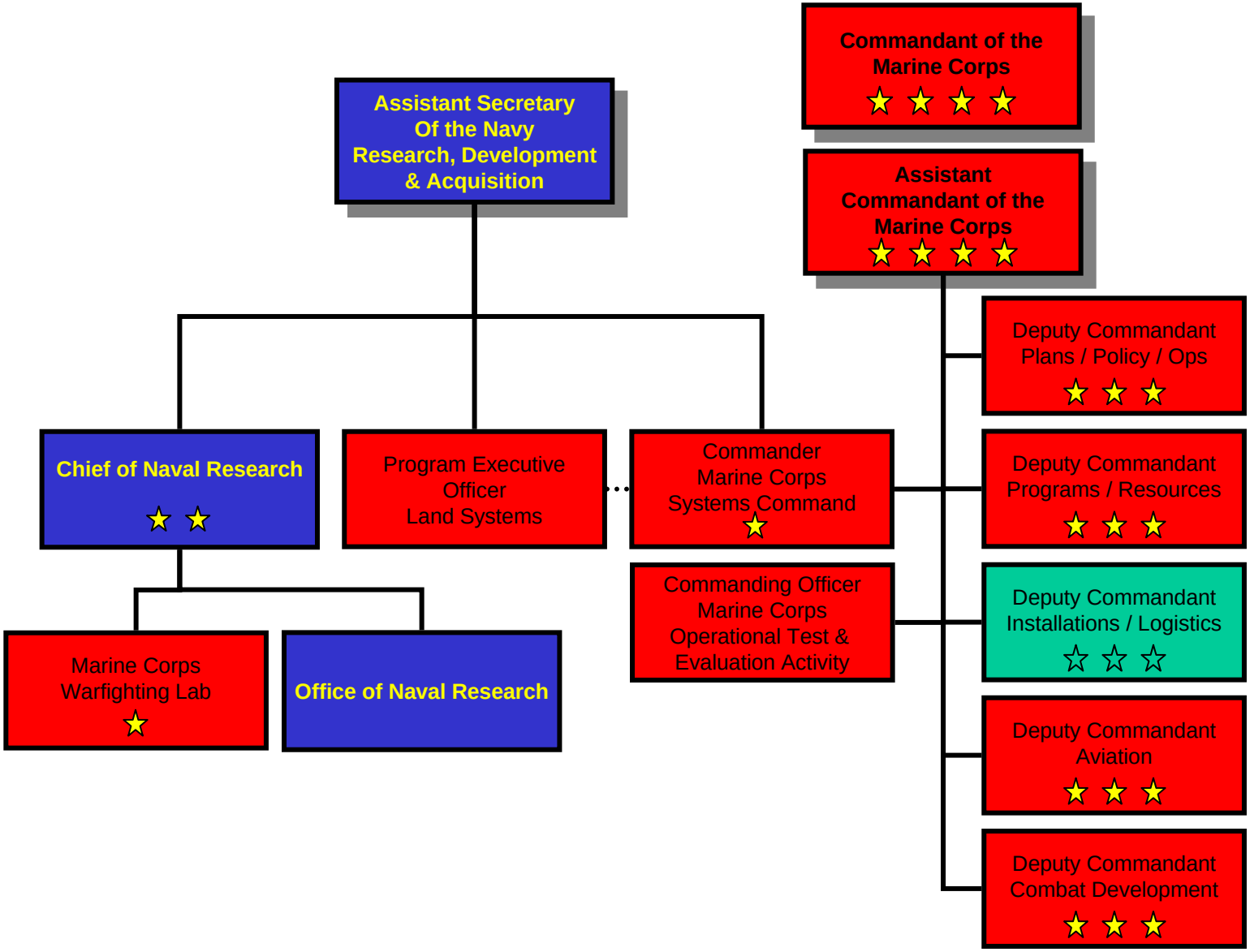
PRISON
Cook County Correctional Center

WORK
Pentagon Washington, DC

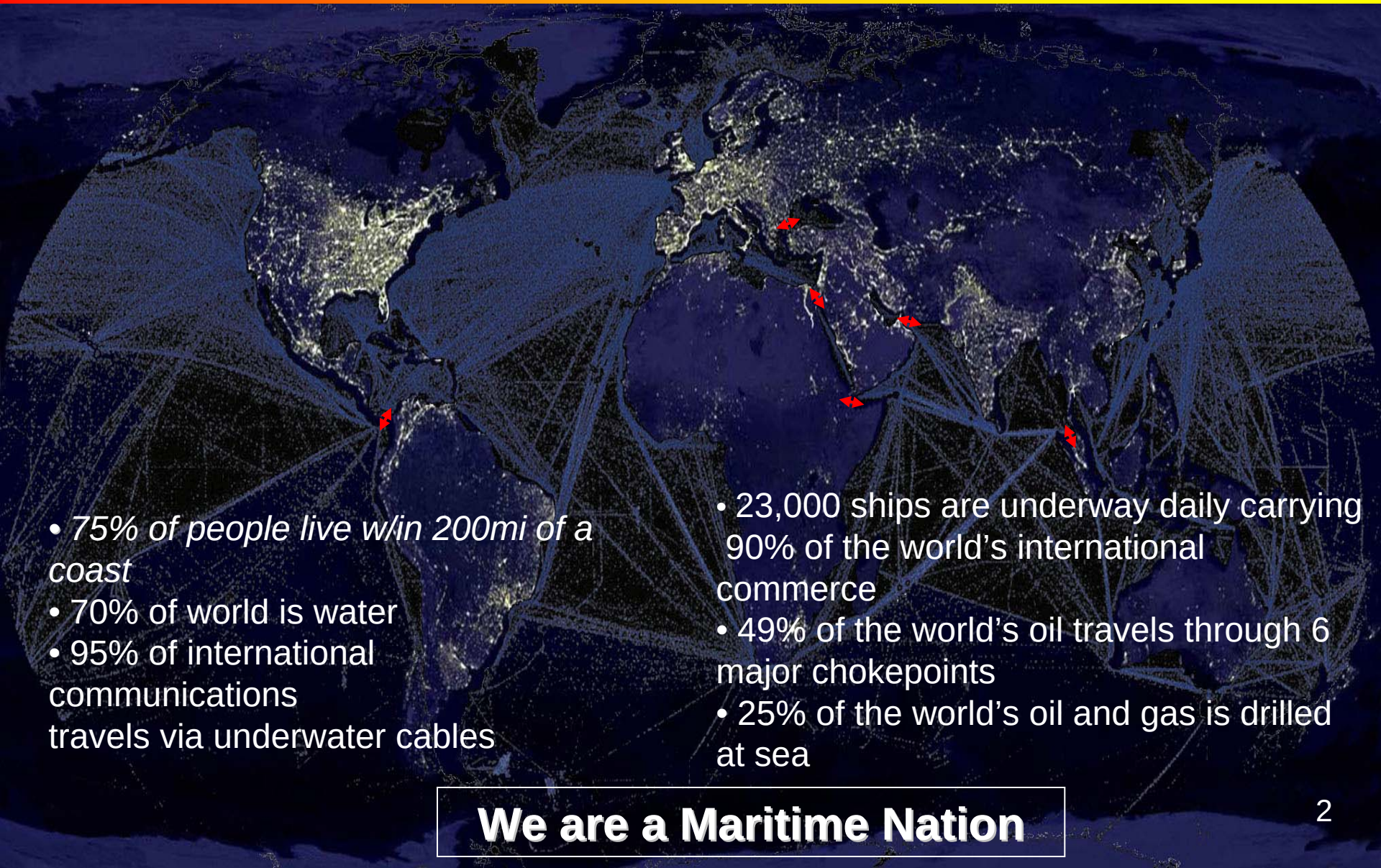
@ PRISON You spend most of your time in a 10X10 cell	@ Work - You spend most of your time in a 6X6 cubicle
@ PRISON You get three fully paid for meals a day	@ Work You get a break for one meal, and you have to pay for it
@ PRISON For good behavior, you get time off	@ Work For good behavior, you get more work
@ PRISON The guard locks and unlocks all the doors for you	@ Work You carry a security card and open all the doors yourself
@ PRISON You can watch TV and play games	@ Work You could get fired for watching TV and playing games
@ PRISON You get your own toilet	@ Work You share the toilet with people who pee on the seat
@ PRISON They allow your family and friends to visit	@ Work You aren't even supposed to speak to your family
@ PRISON All expenses are paid by the taxpayers with no work required on your part	@ Work You must pay all your expenses to go to work, and they deduct taxes from your salary to pay for prisoners
@ PRISON You spend most of your life inside bars wanting to get out	@ Work You spend most of your time wanting to get out and go inside bars
@ PRISON You must deal with sadistic wardens	@ Work They are called ‘”Generals and Admirals”

THERE IS SOMETHING SERIOUSLY WRONG WITH THIS PICTURE.

USMC Organizations involved in Research and Acquisition



Our Interconnected World



- *75% of people live w/in 200mi of a coast*
- 70% of world is water
- 95% of international communications travels via underwater cables

- 23,000 ships are underway daily carrying 90% of the world's international commerce
- 49% of the world's oil travels through 6 major chokepoints
- 25% of the world's oil and gas is drilled at sea

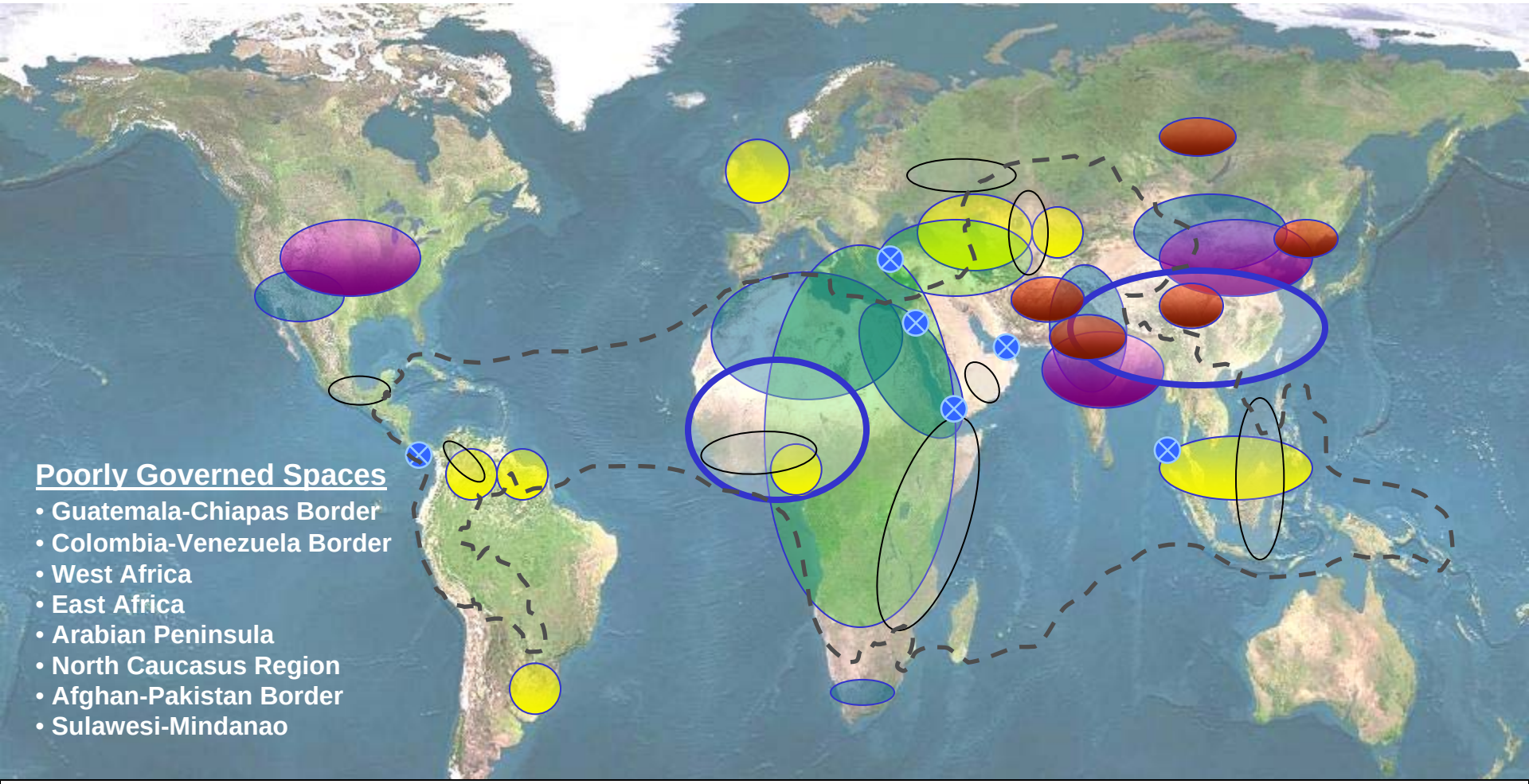
We are a Maritime Nation

Strategic Challenges

- Multipolar world
  - Economic volatility
  - Energy dependency
  - Global Commons accessibility
- Weakened states
  - Key region instability
  - Terrorist / Pirate sanctuary
  - WMD proliferation
- Transnational threats
  - Migration & Illegal immigration
  - Climate change
  - Increased competition for resources

Pirates – Argghhh!

Sources of Instability, Stress & Conflict



Hybrid threats, the blurring character of conflict,and complex environments lead to..

Wars Amongst the People

Hybrid Threat Capabilities

ARC OF INSTABILITY

- Emerging Global Powers
- Increasing Global Interdependence
- "Haves" vs "Have Nots"
- Anti-West attitudes

Access challenges…

- Terrorism/Crime
- Significant Drug Regions
- Ungoverned Spaces
- Nuclear Armed States
- Anti-access Weapons

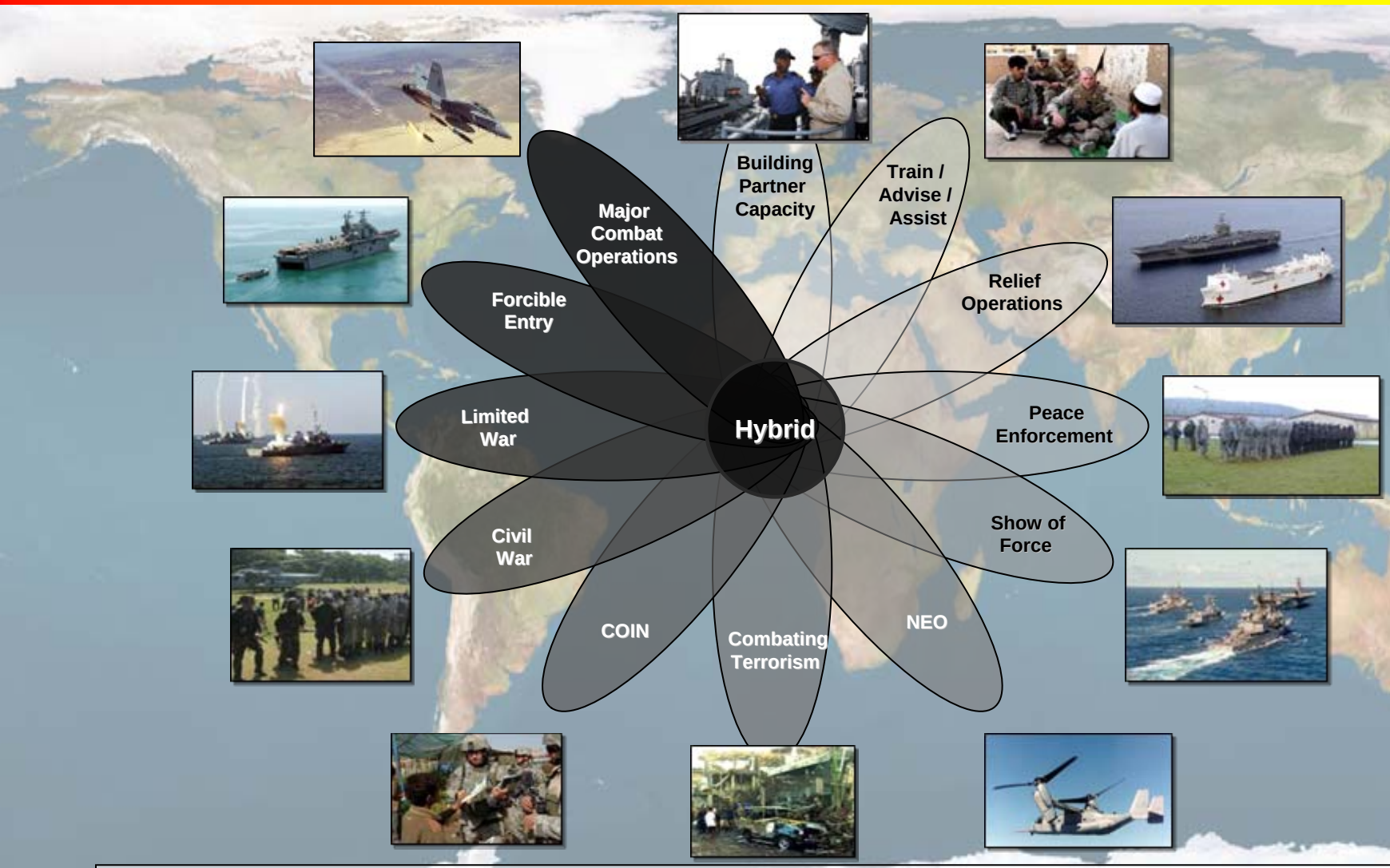
Largely in the Littorals

Complex Terrain

- Urbanization
- High Earthquake Risk Areas
- Famine and Disease
- Top Ten Oil Reserves

Information Environment

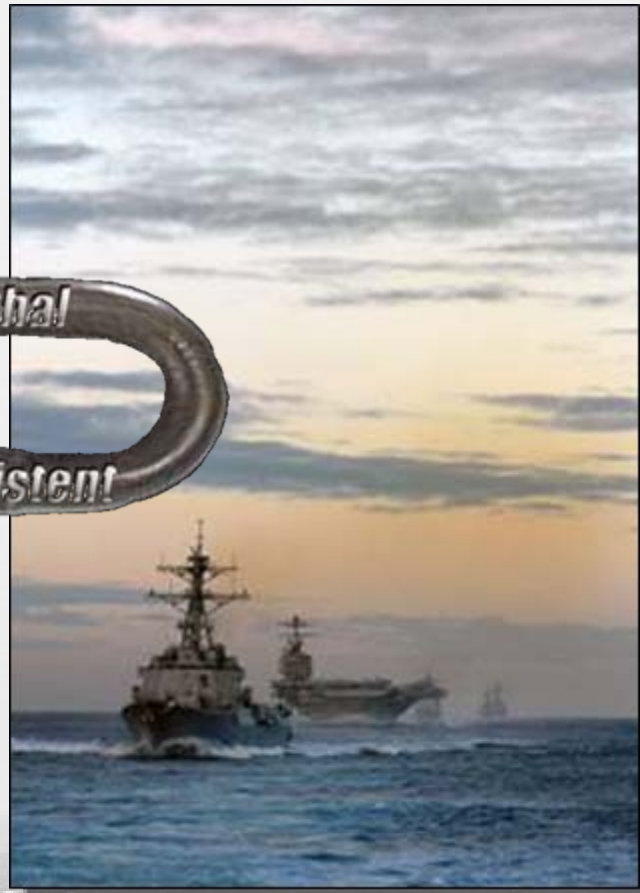
…thriving in an uncertain world



Conflict is not "irregular" or "conventional"

Requires "Smart Power" - combines soft and hard power

We are the Nation's Expeditionary Force



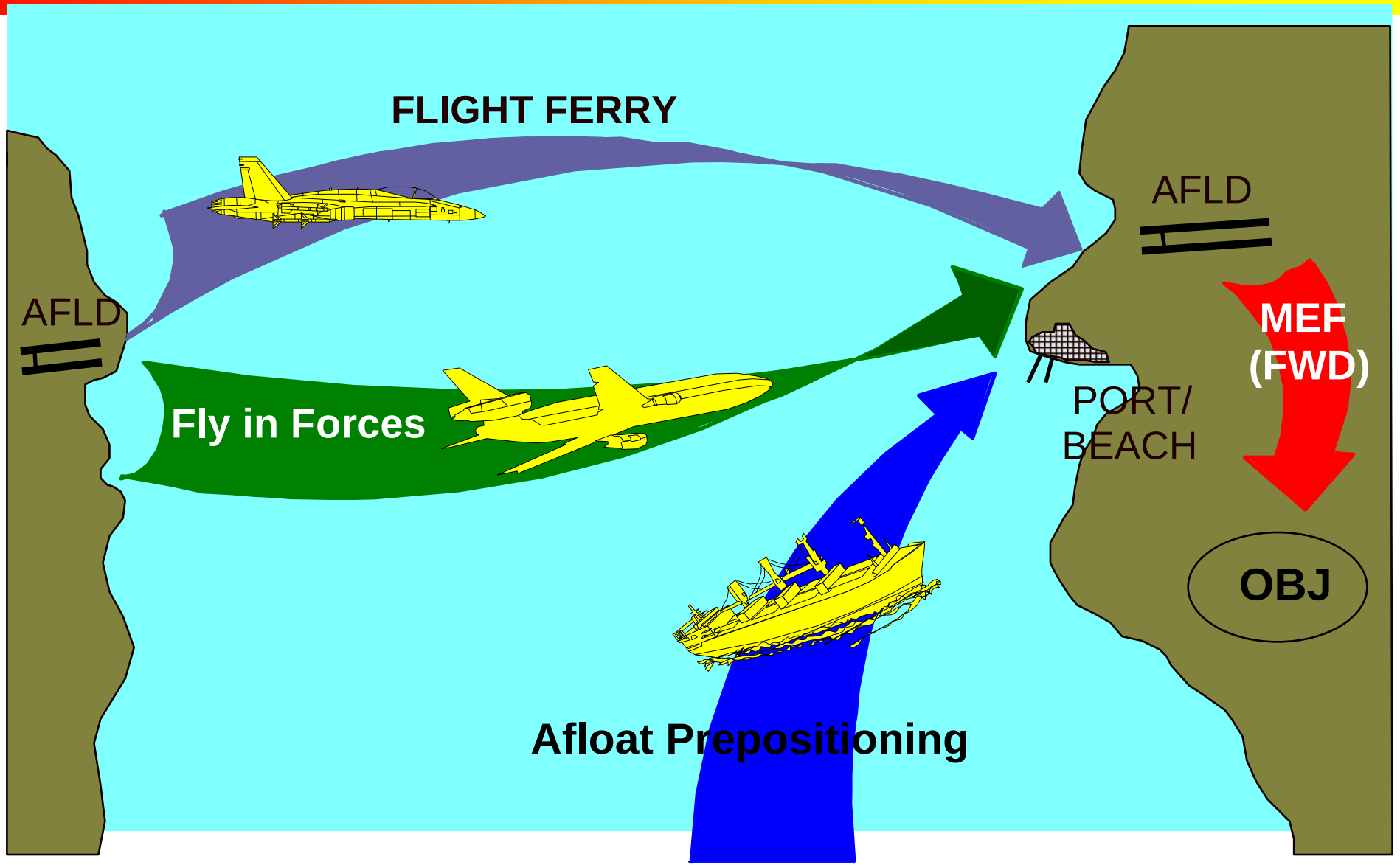
Certain Capabilities for an Uncertain World

USMC Energy Challenges

Philosophical Challenges

- Plan for Worst Case
  - “The Marine Corps will be ready when the rest of the Country is not”
- Evolving scale of Warfare
- Success on the side of Bigger Battalions
- Cost – Effectiveness vs ROI

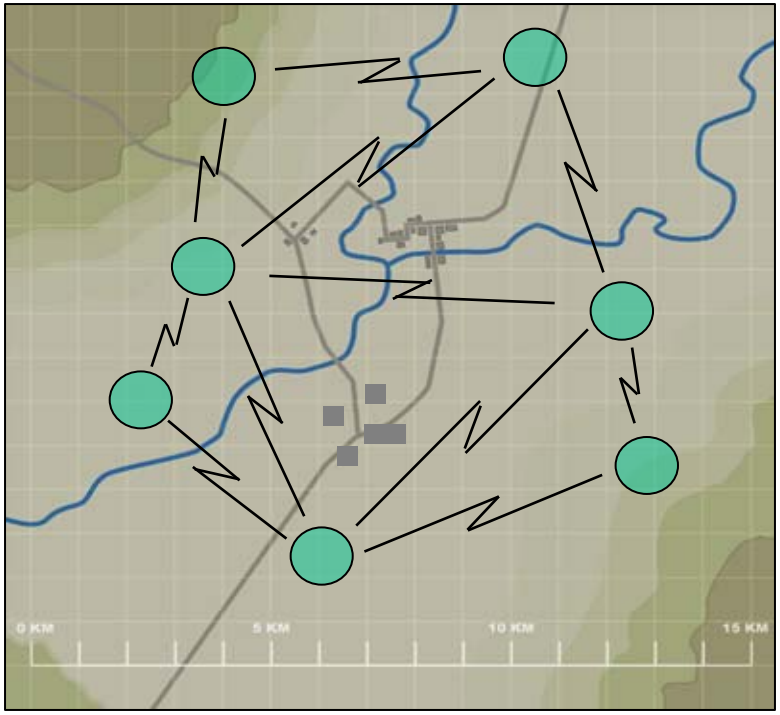
Current Deployment Concept



Future Seabasing and Expeditionary Maneuver Warfare
A Faster More Lethal Force

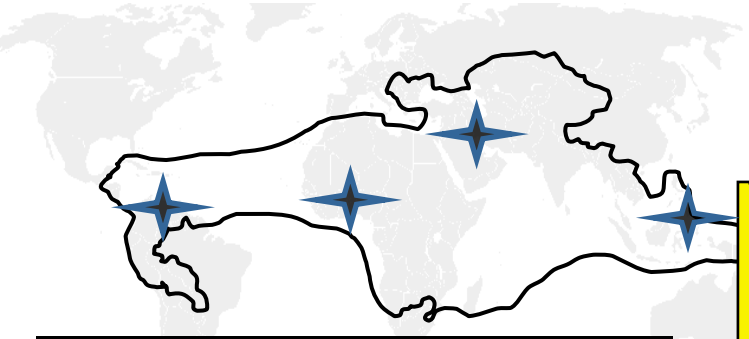
New Capabilities ... New Way to Fight

Distributed Operations



Security Cooperation MAGTF

Task organized to meet specific requirements



KEY to increasing forward presence and engagement

SC MAGTF

Additional capabilities / attachments as required:

- **Interagency Representatives**
- **Navy Expeditionary Combat Command**
- **U.S. Coast Guard**
- **Allies**
- **Info Operations / Civil Affairs**
- **Veterinary capabilities**
- **Band**
- **Others as needed**

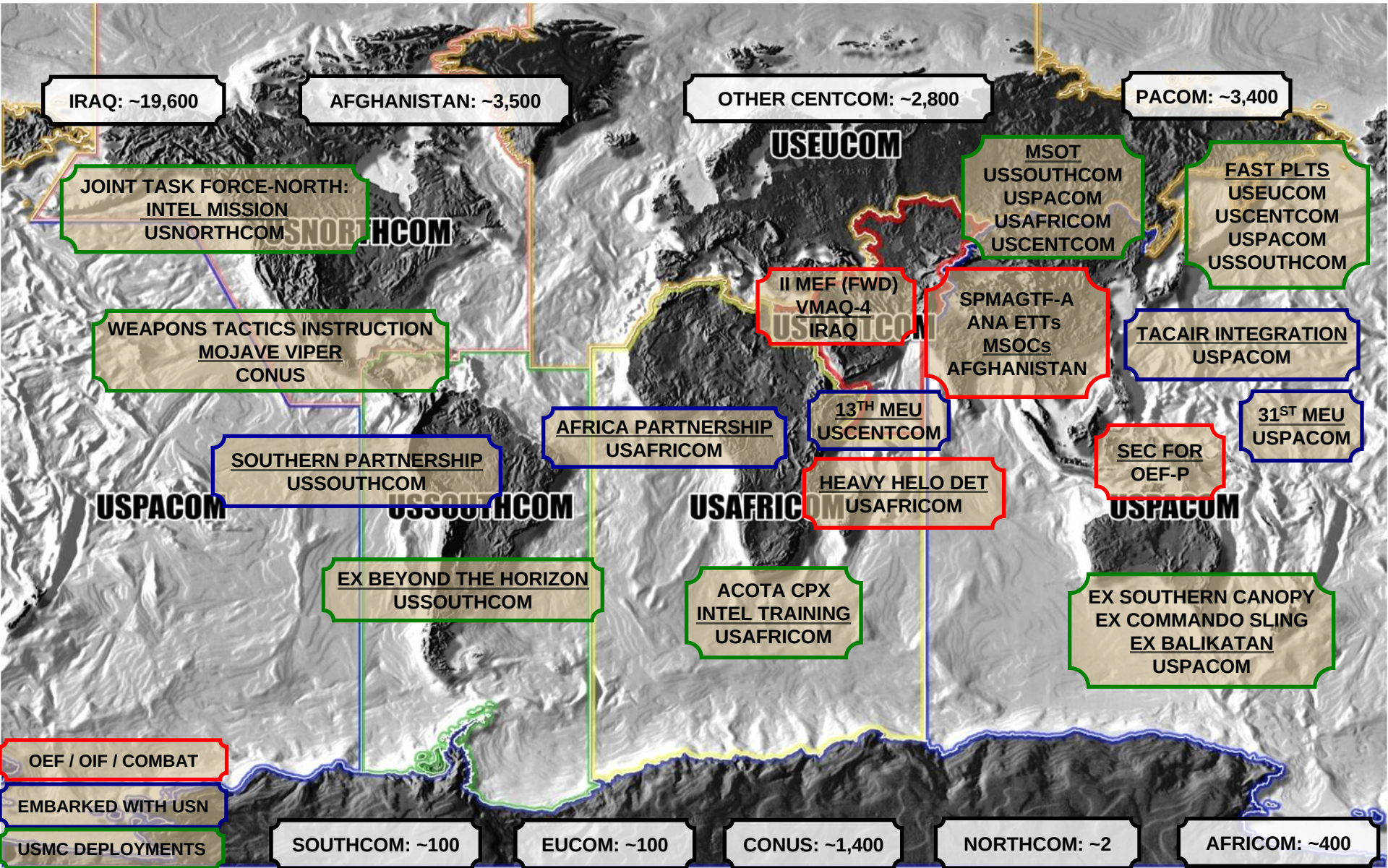
Reinforced Infantry Battalion

Task Organized Aviation Detachment

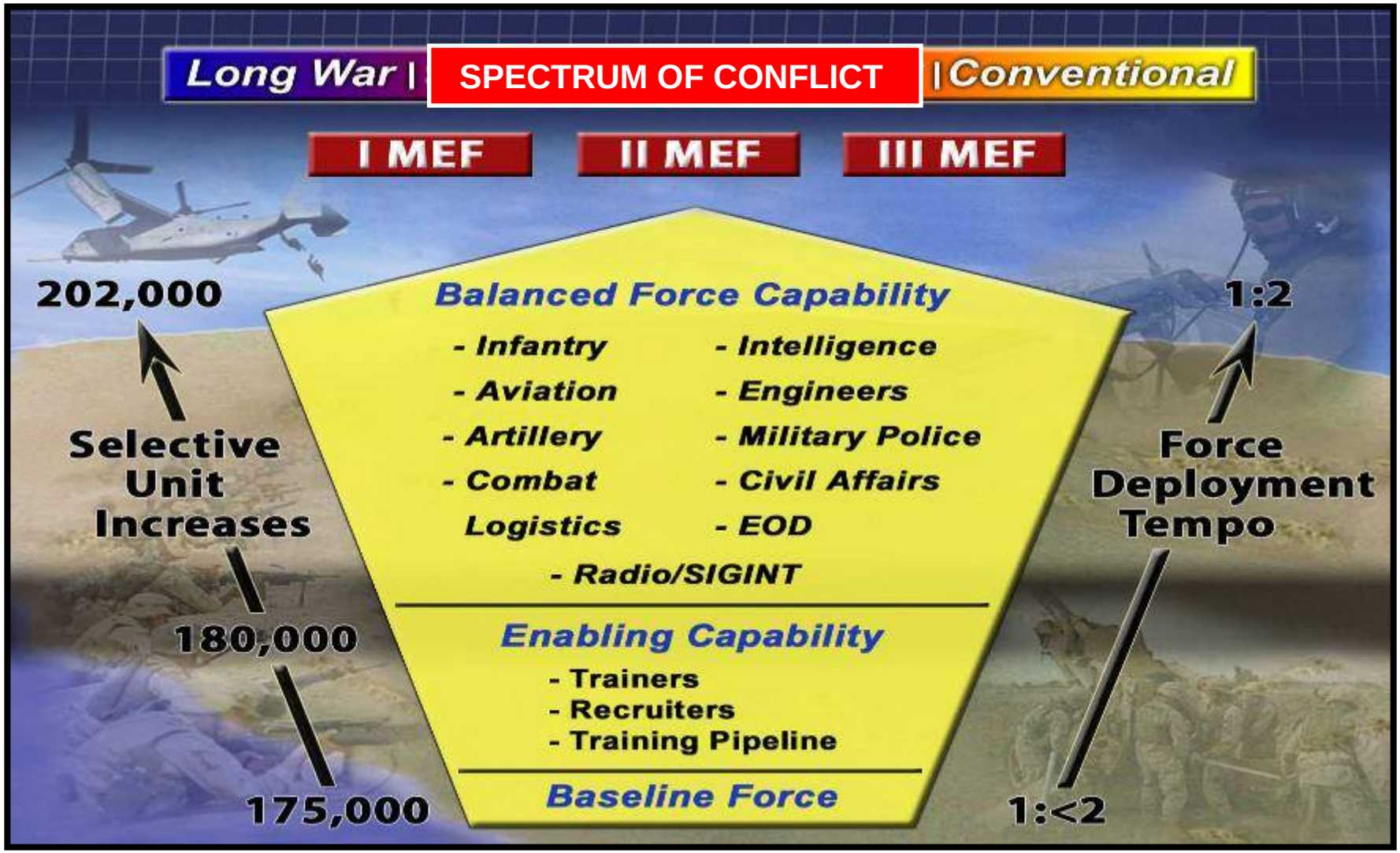
Task Organized Combat Logistics Element

Other Detachments

Current Global Force Disposition



Balanced Expeditionary Capability



Bigger Organizations

Sept 11th 2001	Iraq / Afghanistan	2006
Traditionally Focused	In Theatre	Distributed Operations Enabled
Table of Equipment	Table of Equipment	Table of Equipment

Radio Density
175 Per Battalion

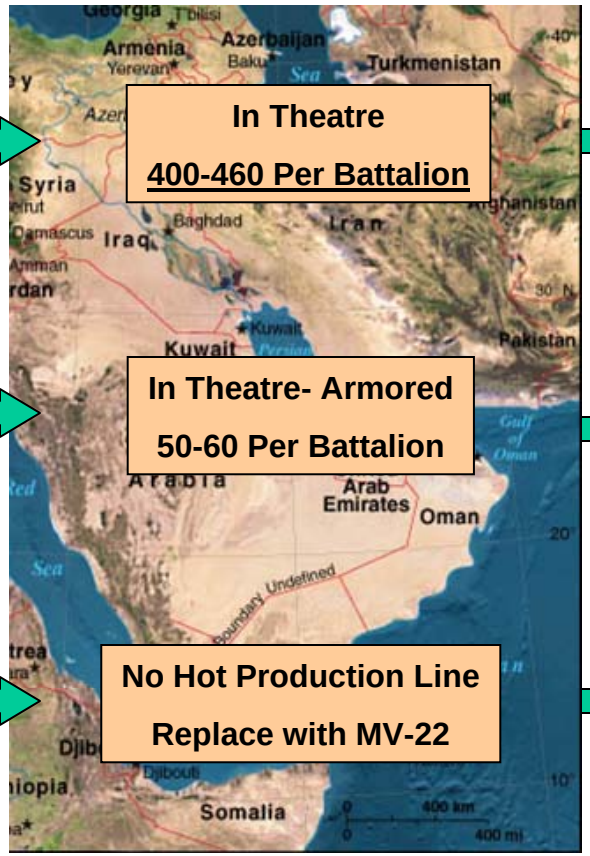
Radio Density
1220 Per Battalion

HMMWV Not Armored
32 Per Battalion

HMMWV Armored
55 Per Battalion

CH-46
12 Per Squadron

MV-22
12 Per Squadron



In Theatre
400-460 Per Battalion

In Theatre- Armored
50-60 Per Battalion

No Hot Production Line
Replace with MV-22

Meeting Theatre Demands, Responding to Lessons Learned & Replacing Destroyed Equipment with 2006 Technology

Infantry Squad Communication in the Old Days

AN/PRC-88 x 1

BB588/U x 1

Modern Infantry Squad Requirements

AN/GSC-68 M-DACT

x1

AN/PRC-117F

x2

AN/PRC-150

x2

BA-5590

IZLID

x4

AN/PVS-17

x1

AN/PVS-27 SSMRNS

x2

AN/PRC-153 + AA adaptor

x12

DL-123 3V

AN/PRC-148 + 3v adaptor

x1

AN/PAS-13D

x6

AN/PVS-14

x2

AN/PSN-13A Dager

x2

Handheld GPS

x2

DL-123 3v

VLI

x3

AN/PEQ-2

x2

AN/PSC-13 D-DACT

x8

x2

BA-560

AN/GSC-68 M-DACT

AA

Squad Systems Requiring Non-Compatible Rechargeable Lithium Batteries

AN/PRC-153 IISR

AN/PSC-13 D-DACT

MSIDS

AN/VSQ-2C EPLRS

Upgraded EPLRS with ENM

Squad Digital Camera

Tactical Computer

Health and Comfort Issues

No Problem in the Assault

But Austerity Goes Only So Far

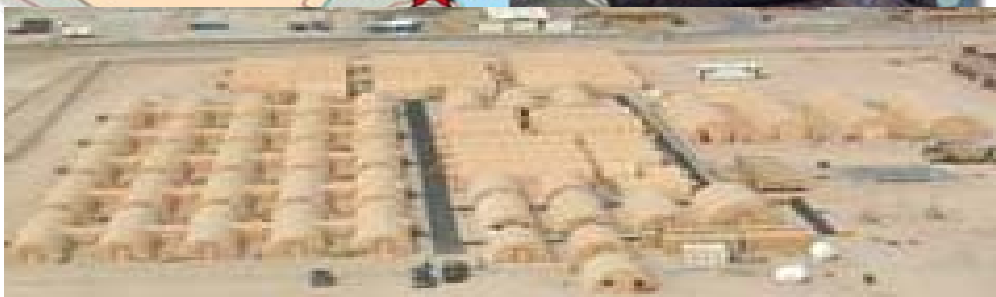










Capability vs Affordability

DoD **USMC**

2002 HMMWV Business Case

Stock **HMMVV**		**Hybrid HMMVV**
Top speed (mph)	70	85
Acceleration(0-50) (sec)	14	7
Fuel economy (mpg)	8	16
Range (miles)	275	380
Power Gen Source	None	55KW
Cost	***$50K***	***$200K***

Hybrid HMMWV 200% more fuel efficient

Army Transformation

USAF Transformation

Navy Transformation

Providing Energy not easy

Marine Corps Energy Solutions

Marine View of Change

2002 Fuel Efficiency Policy Memorandum

- Set forth following actions:
  - Acquisition:
    - **Achieve a 10% reduction of fuel requirements in replacement platforms**
    - **Consider Fuel Efficiency as a key requirement in each acquisition milestone decision**
  - RDTE: Continue Warfighting Laboratory efforts in emerging technologies to reduce fossil fuel use
  - Bases and Stations: Prosecute an alternate fuels program in non-tactical fleet

Operational Drivers

Maj. Gen. Richard Zilmer submitted an **urgent request for renewable energy systems** due to the vulnerability of American supply lines to insurgent attack by ambush or roadside bombs. The request said "**reducing the military's dependence on fuel for power generation could reduce the number of road-bound convoys**." …'Without this solution, personnel loss rates are likely to continue at their current rate. Continued casualty accumulation exhibits potential to jeopardize mission success…'"

Defense News, August 2006

Strategy and Vision 2025
January 2009

- Improve aggressive research, development, acquisition, fielding and sustainment of equipment that;
- Has inherent force protection capability,
- **Is lighter, easier to maintain, and promotes energy efficiency, and**
- Ensure interoperability with and between naval platforms and joint systems.

Changes in Equipment Fuel Efficiency

Old

New

Platform 0ld/ New	(Yr)	(Mi/Gal)	Cargo max (tons)	baseline Mi-Tons/Gal	Fuel Eff Incr %
HMMWV	1984	13	2.5	33	
JLTV	2015	17	2.5	43	25%
M813	1982	4.3	5	21.5	
MTVR	2002	4.5	7.1	32	50%
LVS	1990	2	12.5	25	
LVSR	2010	2.6	16	42.9	42%
CH46	1963	0.605	2	1.211	
MV22	2006	0.605	5	3.029	61%
F18/AV8B	1988	996 Gal/Hr	2	NA	
JSF	2012	794 Gal/Hr	2	NA	21%

Equipment Scalability Concept

D9

D8

D7

Multi-Terrain Loader

Skid Steer Loader

Water Purifier

LWP (125 gph)

TWPS (1500 gph)

Fuel Distribution

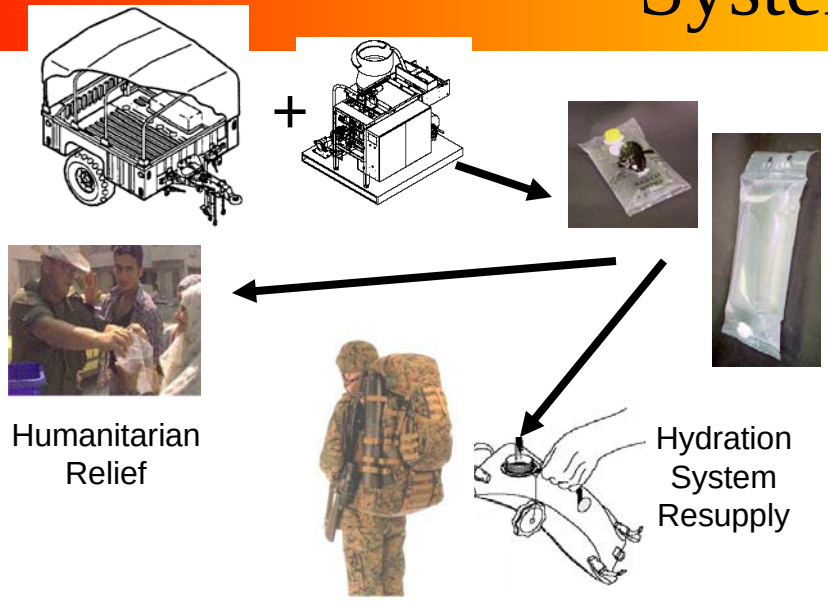
**Small System with (6)
28 Gal Bladders**

**Medium System with (4)
155 Gal Bladders**

DESCRIPTION

- Ground Expedient Refueling Systems (GERS) - fuel distribution equipment procured in two sizes (small – 168 gallons; medium – 620 gallons).
- Uses an electric air compressor vice liquid pumps to dispense fuel.
- Transportable by any vehicle (HMMWV or larger), incidental operators, easily set-up and operated.
- Capability to be “tailored” to use various logistics platforms as a fuel distribution vehicle, or as a range-extension capability for units possessing GERS.

Expeditionary Water Packaging System (E-WPS)



Description

- E-WPS places potable water into bags ranging from 1 to 3 liters.
- Serve as source of resupply for the existing Marine-on-the-move hydration system or stand alone packaged water for relief missions. Note: The E-WPS bag is not intended for replacement of the hydration system bladder, but to serve as a source of water to refill the bladder.
- Rugged, automated, and skid mounted so that it can be integrated on a standard M1102H HMMWV trailer without exceeding the towing capacity of the HMMWV

Foam for tents and Relocatable Buildings

End View

2-3”

Texture

Profile view

60-75% power requirement reduction to cool or heat

Increased Simulator Use

Research Development Testing and Evaluation (RDTE) Initiatives

- Inserted three Initiatives into POM08 ($15M)
- FY09 Plus-up Funding ($10M)
- Nominated five initiatives for Economic Stimulus Funding ($10M)

Participation in Joint Efforts

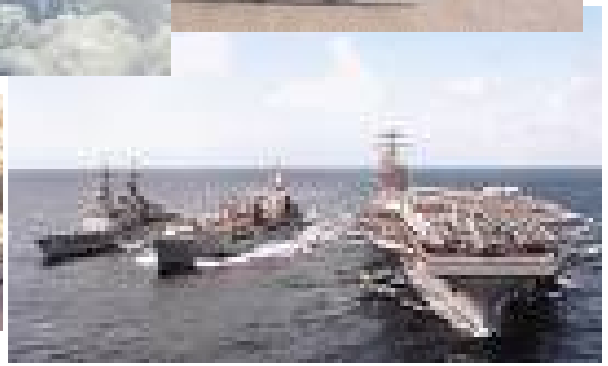
- Joint Staff Functional Capabilities Integration Board
  - Develop Joint Standards on Feeding/ Water/ Billeting/Hygiene
- Joint Expeditionary Base Working Group
  - Develop Joint Standards for Tent Camps between Army and Air Force
    - Energy Efficiency
    - Joint Interoperability/commonality of parts and maintenance and savings in costs

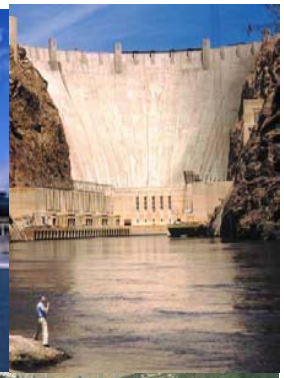
How much will be enough?

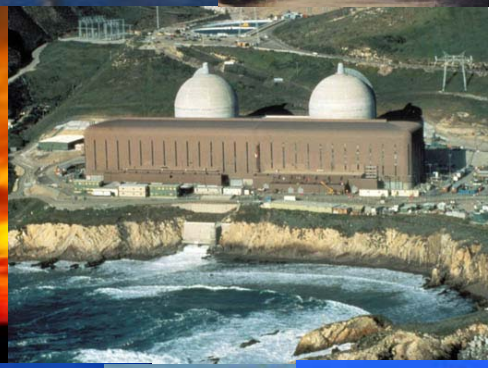
- Initiated studies on
  - Future of Bulk Fuel Consumption
  - Power
  - Equipment to maintainer Ratio












Navy Energy Strategy Efforts

Expeditionary Working Group 2020 Goals

Reduce operational energy consumption by 15%

Increase operational energy efficiency up by 15%

Increase use of non-petroleum fuel to 25-40% of operational energy generation

Fuels Working Group Efforts

Objective: Produce a JP-8 surrogate to reduce DoD dependence on petroleum-based fuels

Approach:

- Develop and demonstrate an affordable, highly efficient process for converting crop oils to JP-8
- Submit a final bio-derived JP-8 sample for government testing and evaluation
- Diversify portfolio of agricultural / aquacultural source feedstock to avoid competition with current crop oil / food markets

Highly-efficient conversion process to JP-8 from long chain oils

"Build-down" process:
cracking/isomerization of C12-C16 to JP-8

Highly-efficient conversion process to JP-8 from short chain biomass waste

"Build-up" process:
oligomerization of C2-C6 to JP-8

Highly-efficient system for cellulosic feedstocks and low-cost algal oil production and conversion to JP-8

Maximize algal oil production and process algal oil to JP-8

Finding the Marine Corps Way Ahead

- Include fuel effectiveness/efficiency in all requirements and acquisition processes.
- Aggressively explore/pursue alternative and renewable fuels and power technologies.
  - Commercial application efficiency improvements will benefit tactical applications
- Continue to leverage other Services and Commercial Sector Capabilities and efforts

…A Thought….A Goal??

….By 20XX, the Pentagon will be a NET ZERO PLUS installation.

"Hell is paved with good intentions, roofed in with lost opportunities."

- ***Portuguese Proverb***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