



# Greenhouse Gases, Climate Change and U.S. Energy Policy -- *Navy's Current & Emerging Challenges*

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October 15, 2009

# Bottom Line

- Energy and greenhouse gas (GHG) – related but distinct issues
- GHG reduction mandates are coming
- Innovative energy/GHG solutions needed

# CNO N45 Mission



# Energy and Environmental Vision

**POTUS:** "As the largest consumer of energy in the U.S. economy, the federal government can and should lead by example when it comes to creating innovative ways to reduce greenhouse gas emissions."



**SECNAV:** "The Department of the Navy can mitigate the impact of energy volatility, use energy as a strategic resource for operational advantage, and become a leader in environmental stewardship."



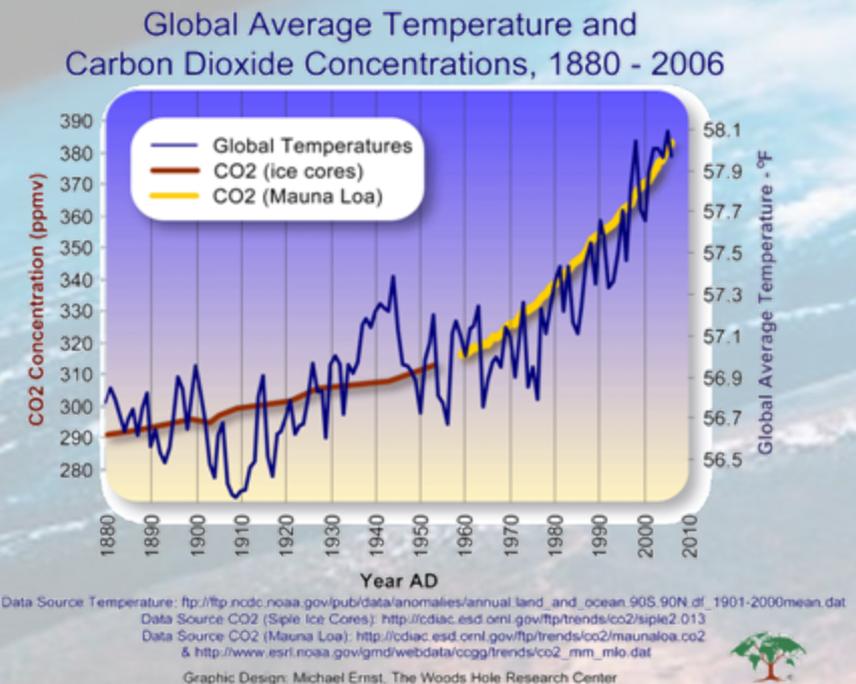
**CNO:** "The importance of environmental stewardship in the Navy today is about our future and what we will leave to our children and their children...it's about ensuring that we can be effective, and at the same time, be efficient and protect the environment."



**Navy will lead  
in energy and environment**

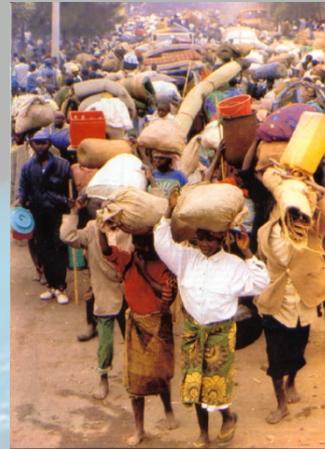
# Global Climate Impacts

- Global CO<sub>2</sub> levels & temperature are increasing
- Potential impacts
  - Shifted precipitation patterns
  - More severe weather
  - Melting sea ice
  - Rising sea levels
  - Ocean acidification



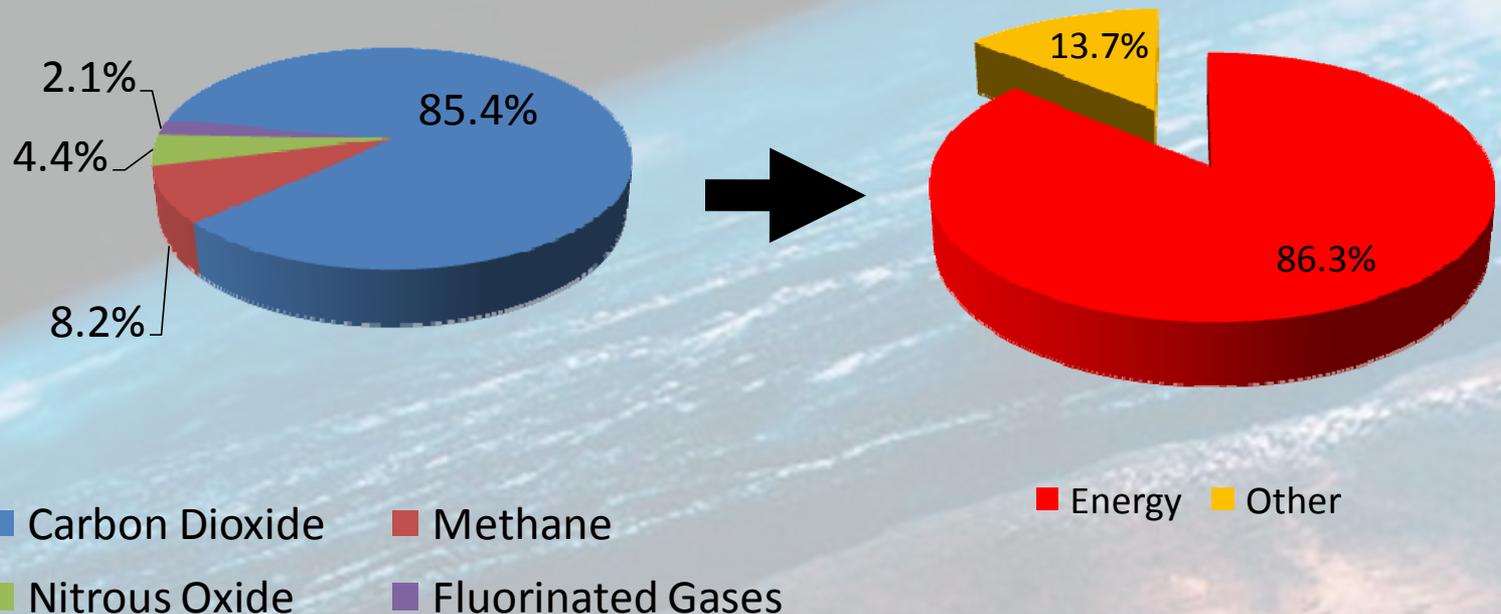
# Security Impacts

- Climate change impacts security
  - Humanitarian assistance/disaster relief missions
  - Political destabilization & armed conflict
  - Ice-free Arctic
  - Coastal infrastructure flooding



# Energy and GHG Linkage

## *Total 2007 U.S. Greenhouse Gas Emissions*

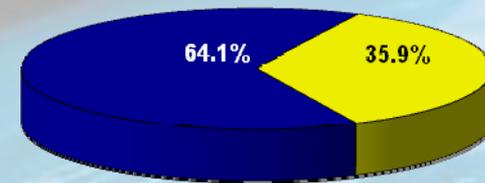


**Energy is at the Heart of the GHG Challenge**

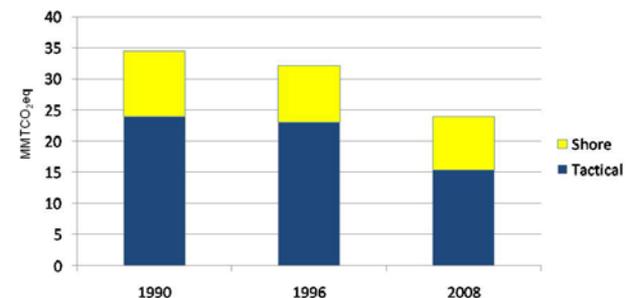
# Navy GHG Emissions

- Energy use comprises  $\approx 98\%$  of estimated Navy GHG emissions
- Tactical emissions predominate
  - Mobility Fuels
- Navy GHG emissions down  $>30\%$  since 1990

Overall Navy Energy GHG Emissions



Trends in DoN Energy GHG Emissions



Emissions have been reduced by over 30% since 1990

# International Response

- **IPCC established by UNEP in 1988**
  - Scientific experts
- **UN Framework Convention on Climate Change (UNFCCC) adopted in 1992**
  - U.S. ratified 1994
- **Kyoto Protocol negotiated in 1997**
  - Controls “Basket of Gases”
  - 5.2% GHG emissions reduction for developed nations
  - International aviation, shipping, and military operations excluded
- **UNFCCC conference to consider post-2012 emission reductions**
  - December 09 meeting in Copenhagen
  - Proposals for 20%-30% reductions by 2020 for developed nations



# International Response

## Ozone Depletion and GHG

### Montreal Protocol

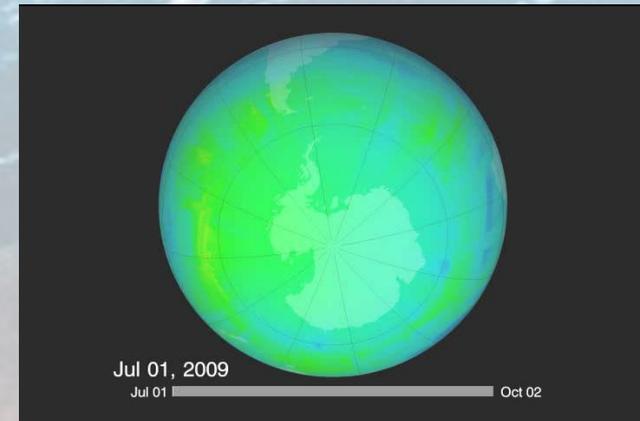
- Phases out certain halogenated chemicals (CFCs, HCFCs, Halons)
- U.S. a party
- Navy stockpiles

- **Climate & Ozone Linkage**

- Principal ODS alternatives are fluorinated gases (HFCs, PFCs, SF<sub>6</sub>)
- F-Gases are potent GHG

- **Proposal to add HFCs to Montreal Protocol**

- Phase-down HFCs 85% by 2033 (2043 for developing nations)
- November 09 discussion



*Antarctic Ozone "Hole"*

# Domestic Response

- **Energy Legislation & Policy**
  - EPCA 2005, EISA 2007, EO 13423
  - Not tied explicitly to GHG emissions
- **Climate Regulations**
  - Supreme Court clarifies EPA GHG authority
    - GHGs are CAA “pollutants”
  - Since April 2009, EPA has issued:
    - Proposed and final GHG mandatory reporting rule
    - 2 proposed GHG rules
    - 1 guidance document on low GHG vehicles



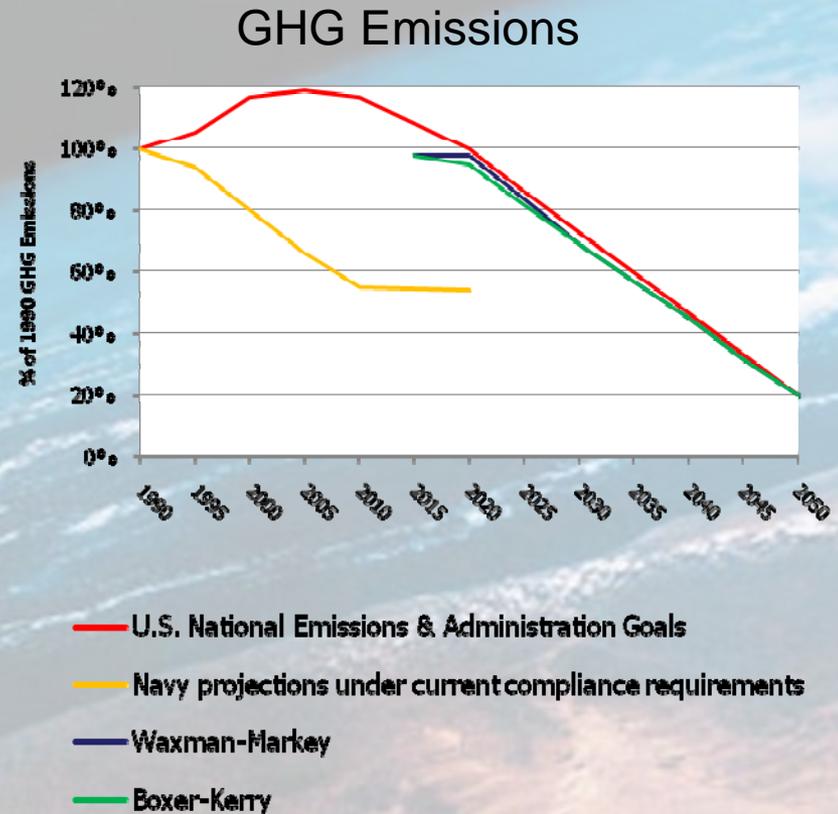
# Domestic Response

- **Executive Order 13514**
  - Issued 5 Oct 09
  - Inventory & report federal agency GHG emissions (direct & indirect)
  - Agency GHG reduction goals by Jan 10
- **Pending Climate Legislation**
  - **American Clean Energy & Security Act (Waxman-Markey)**
    - Passed in House 26 June 09
    - Cap-and-Trade – 83% reduction in GHG emissions by 2050 from a 2005 Baseline
  - **Senate Clean Energy Jobs and American Power Act (Boxer-Kerry)**
    - Draft released 30 Sept 09
    - Companion bill to the American Clean Energy & Security Act
    - May reach Senate Floor by end 09



# National GHG Reduction Goals

- Candidate Obama called for 80% GHG reductions by 2050 from 1990 baseline
- House-Passed American Clean Energy & Security Act (H.R. 2454):
  - Uses a 2005 Baseline
  - 17% Reduction by 2020
  - 83% Reduction by 2050
- Proposed Senate Clean Energy Jobs and American Power Act
  - Uses a 2005 Baseline
  - 20% Reduction by 2020
  - 83% Reduction by 2050



# Navy Challenges

- **GHG emissions driven by OPTEMPO**
  - Nature of national security threats
  - Combat mission requirements
  - Humanitarian assistance & disaster relief missions
- **Alternative energy sources must include GHG considerations**
  - Not emit more GHG than fossil fuels
  - Not compete with food
- **Budgetary constraints**
  - Balancing GHG reduction requirements with readiness
- **Unique requirements for F-gases**



# Tackling the F-Gas Challenge

- **Military Applications Include**
  - Shipboard & aircraft cooling (HFCs)
  - Shipboard, aircraft, and combat vehicle fire suppression (HFCs)
  - Radar waveguides & high power electronics (SF<sub>6</sub> and PFCs)
- **Stringent Military Specifications**
  - Enclosed spaces
  - Submarine atmosphere
  - Space, weight, and acoustics
- **Available alternatives problematic**
  - Flammable
  - Toxic
  - High Cost?
  - Efficiency?
- **Innovation Needed**



# GHG Challenge Summary

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