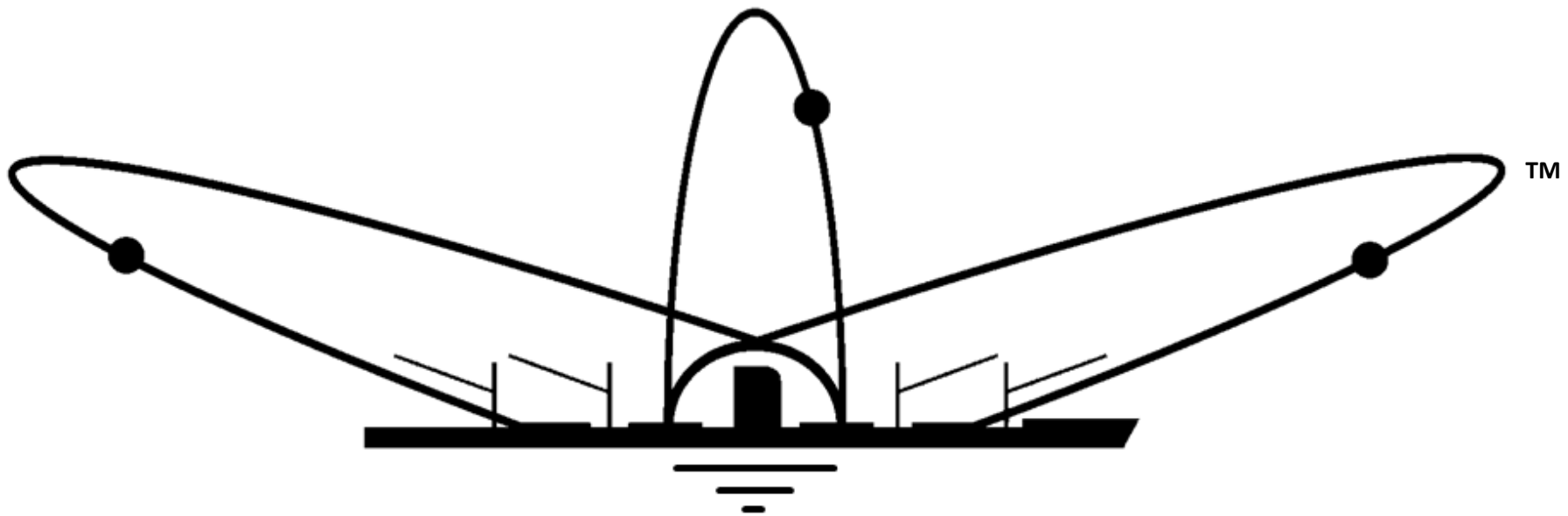


Nuclear Powered Shipping



How to Make it Happen

Benjamin S. Haas - SUNY Maritime

Why Use Nuclear Power?

- Safe
- Economical (**less** than \$5 mil per year in fuel)
- U.S. Merchant Marine revival
- Zero emissions

Build Upon NS *Savannah*

- Regulatory basis
- Accepted by major ports
- U.S. Flag



Port Visits – NS *Savannah*

- New York
- Philadelphia
- Baltimore
- Long Beach
- Seattle
- Galveston
- Honolulu
- Rotterdam
- Bremerhaven
- Southampton
- Le Havre
- Antwerp
- Barcelona
- Dublin
- Savannah
- Norfolk
- Panama Canal
- San Francisco
- Portland
- Houston
- New Orleans

U.S. Flag Currently too Expensive

- Dual nationality for crew
- Shipyards must **maximize efficiency** through:
 - Large order book
 - ONE type of ship
 - Federal assistance
 - JAPAN as model – similar labor costs, still competitive

Container Ships

13% of Seaborne Trade

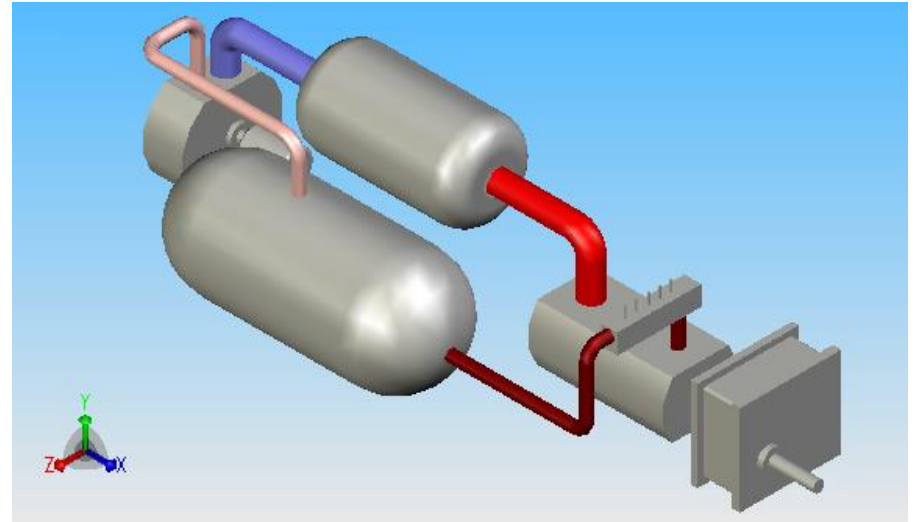


- Focus of U.S. program
- With nuclear power,
Significant fuel savings:
\$5 mil to >\$30 mil per year
- Overcome higher initial investment

What kind of Reactors?

Gas-cooled reactors

- Proven technology
- Simple to operate
- No melt down
- High efficiency

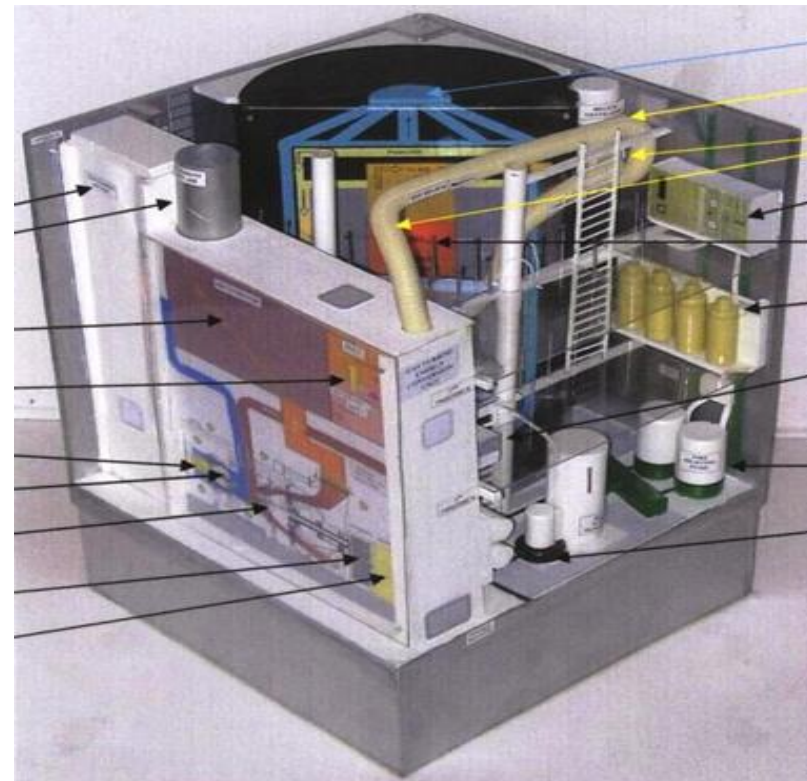
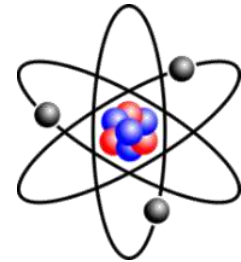


What Size Reactor?

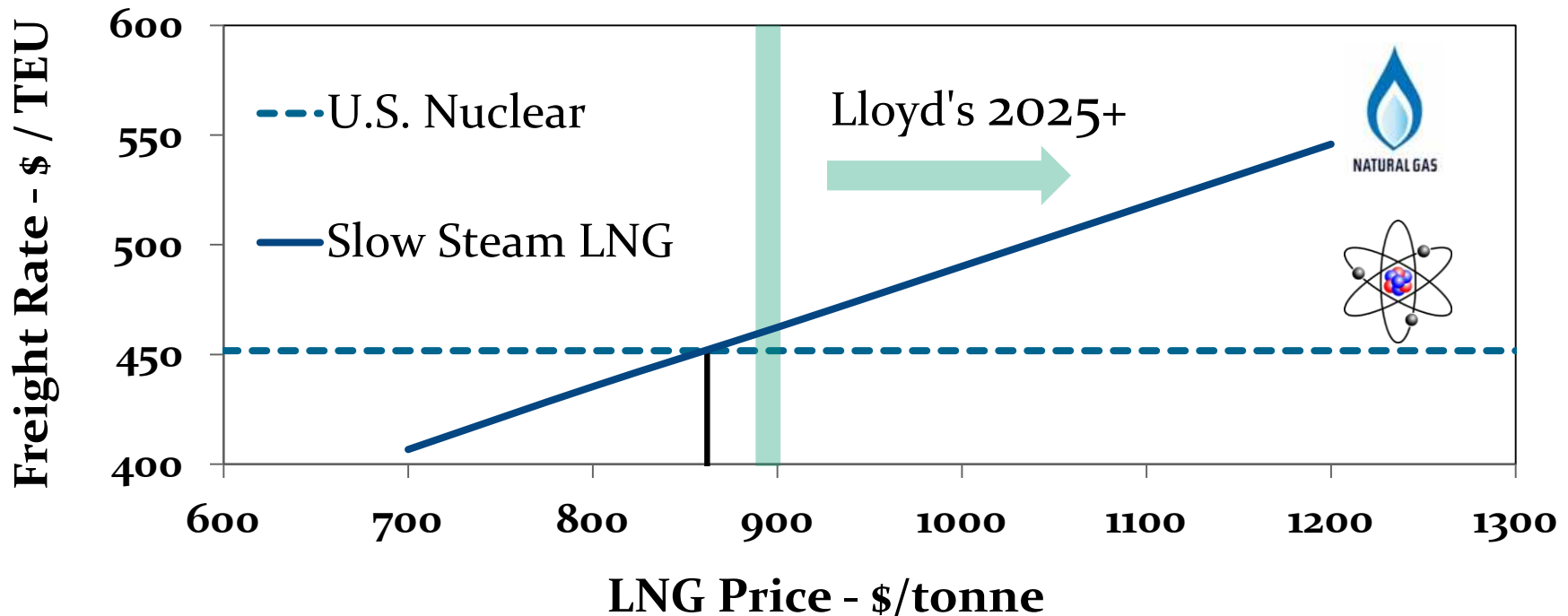
- Maritime nuclear market initially small
- Wide market potential
- Wartsila; 4 – 20 Megawatts popular
- 10 – 30 Megawatts for ships
- Installation of multiple reactors

Economic Study

- 10,000 TEU container ship – North Atlantic
- 25 knot design speed
- 2 reactors - \$48 mil. each
- Foreign slow steaming LNG



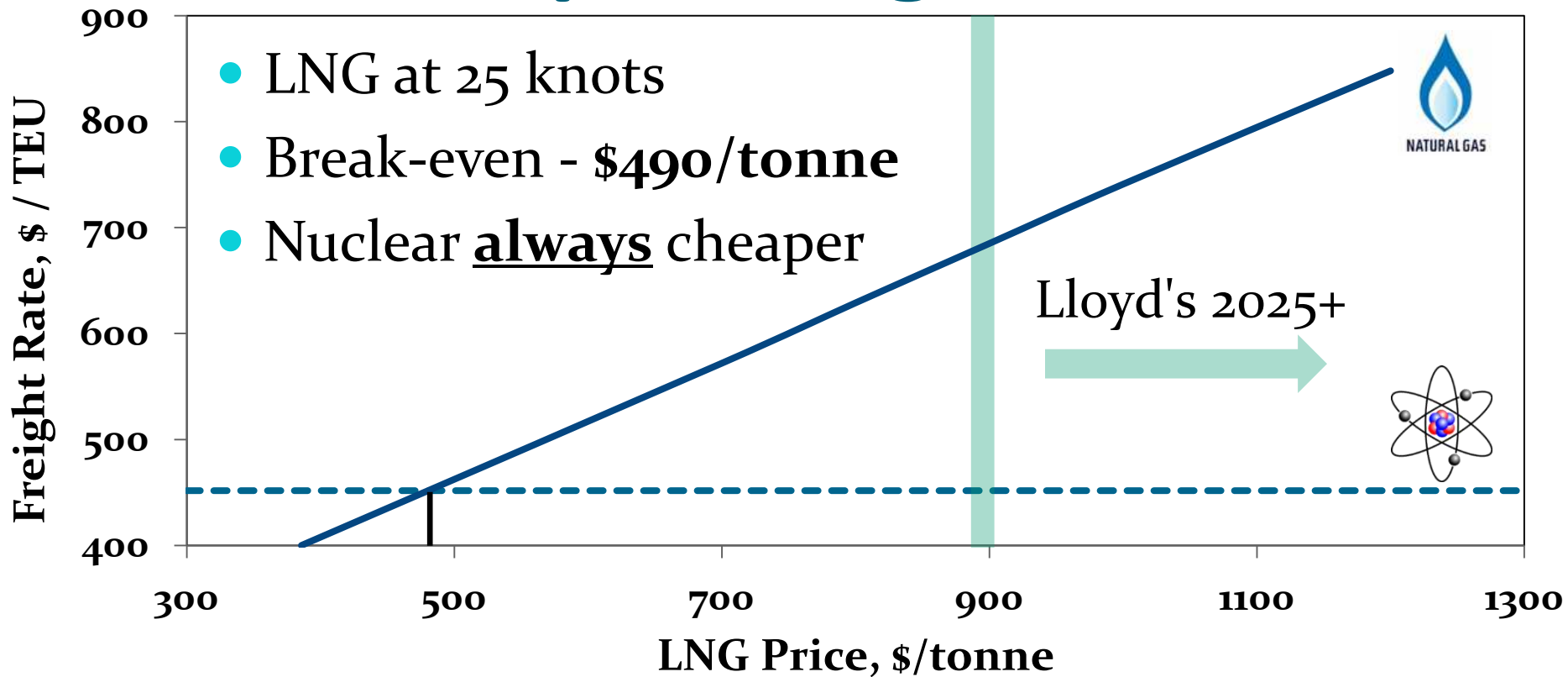
Break-Even Economics



- Nuclear vessel will generate additional **\$700,000/year**
- Nuclear = consistently higher speed = higher vessel utilization = higher rate of return = higher profit =

Higher Bottom Line

Normal Operating Economics



- Expected additional profits from nuclear

>\$7 million/year

Sensitivity

- **Fuel costs expected to rise**
 - IMO Sulfur limits by 2025
 - Overcapacity ends
- **Interest Rates**
- **Regulations must be efficient**

Opportunities

NATIONAL:

- Increase domestic materials and manufacturing
- Increased U.S. flag representation

STUDENTS:

- Nuclear growing in importance
- New job opportunities

INDUSTRY:

- Lower freight rates
- Stable fuel prices
- 100% emissions compliance

National Policy should support nuclear power

Questions?



- NS *Savannah* still exists
- Baltimore, MD
- Visits by appointment through MARAD