A fleet of naval ships is shown at sea. In the foreground, a dark-hulled destroyer is moving towards the left, creating a white wake. In the background, a large aircraft carrier is visible, also moving towards the left. The sky is overcast and grey, and the water is a deep blue-grey. The overall scene is a depiction of a modern naval fleet.

**NUCLEAR PROPULSION FOR NAVAL
PLATFORMS - THE NAVY'S PERSPECTIVE**

SCOPE



INTRODUCTION

NUCLEAR PROPULSION FOR NAVAL PLATFORMS

COMPONENTS OF A TYPICAL MARINE NPP

CHALLENGES

INTEGRATION OF NPP

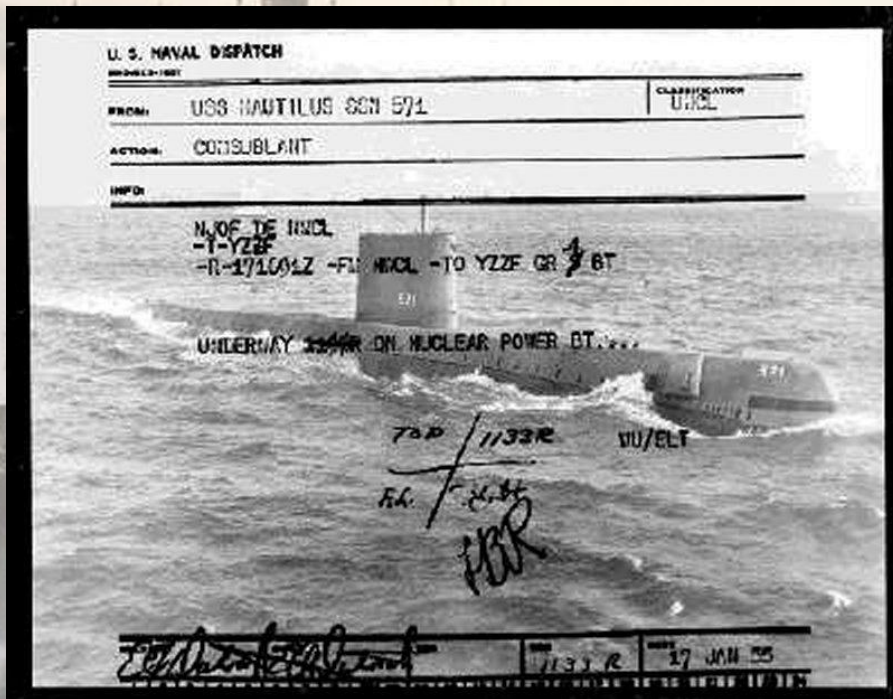
REGULATORY ASPECTS

WAY AHEAD

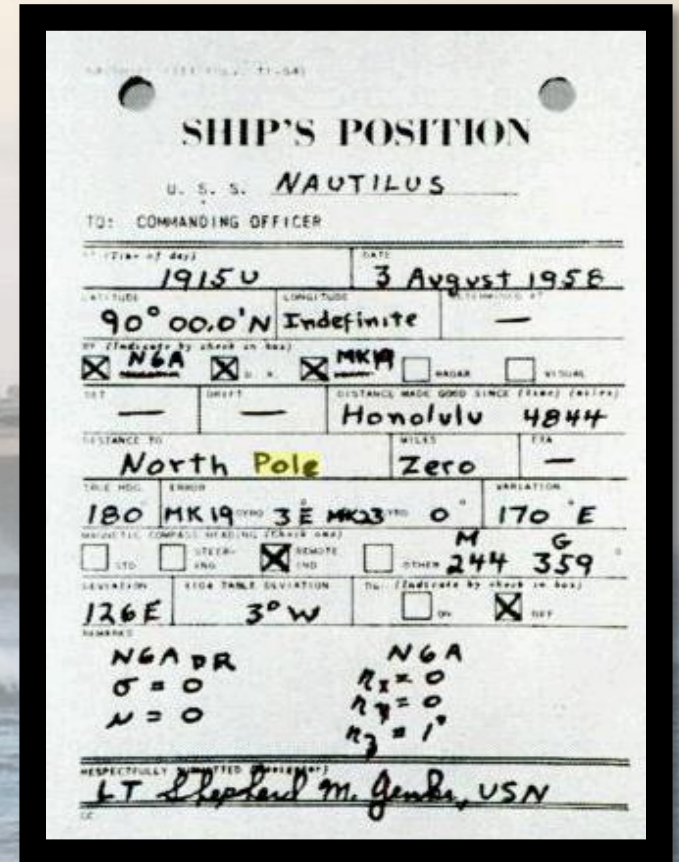
- AREAS FOR INDUSTRIAL PARTICIPATION

INTRODUCTION

BIRTH OF NUCLEAR PROPULSION

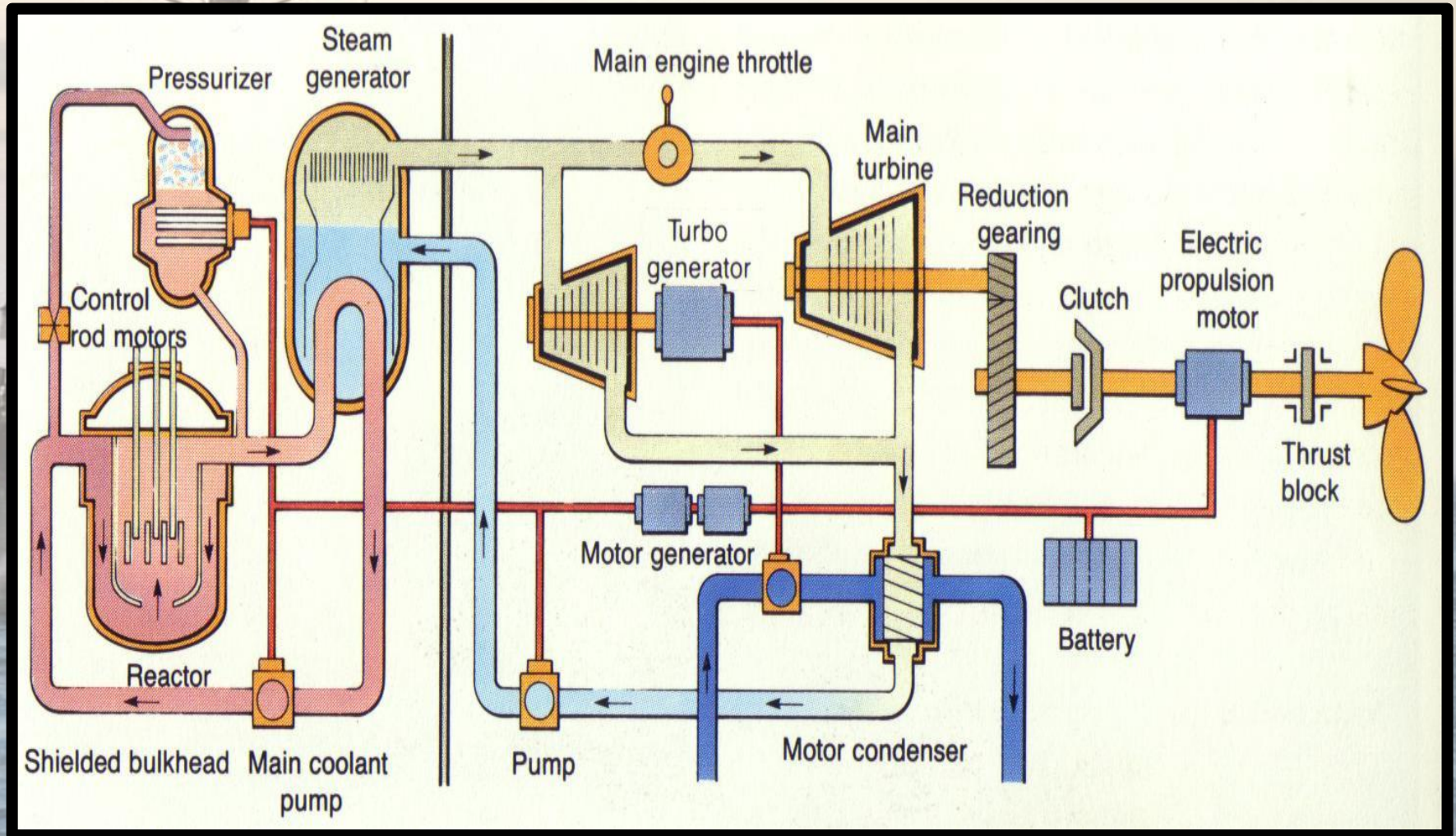


"UNDERWAY ON NUCLEAR POWER"



'OPERATION SUNSHINE'

NUCLEAR PROPULSION PLANT FOR NAVAL PLATFORMS

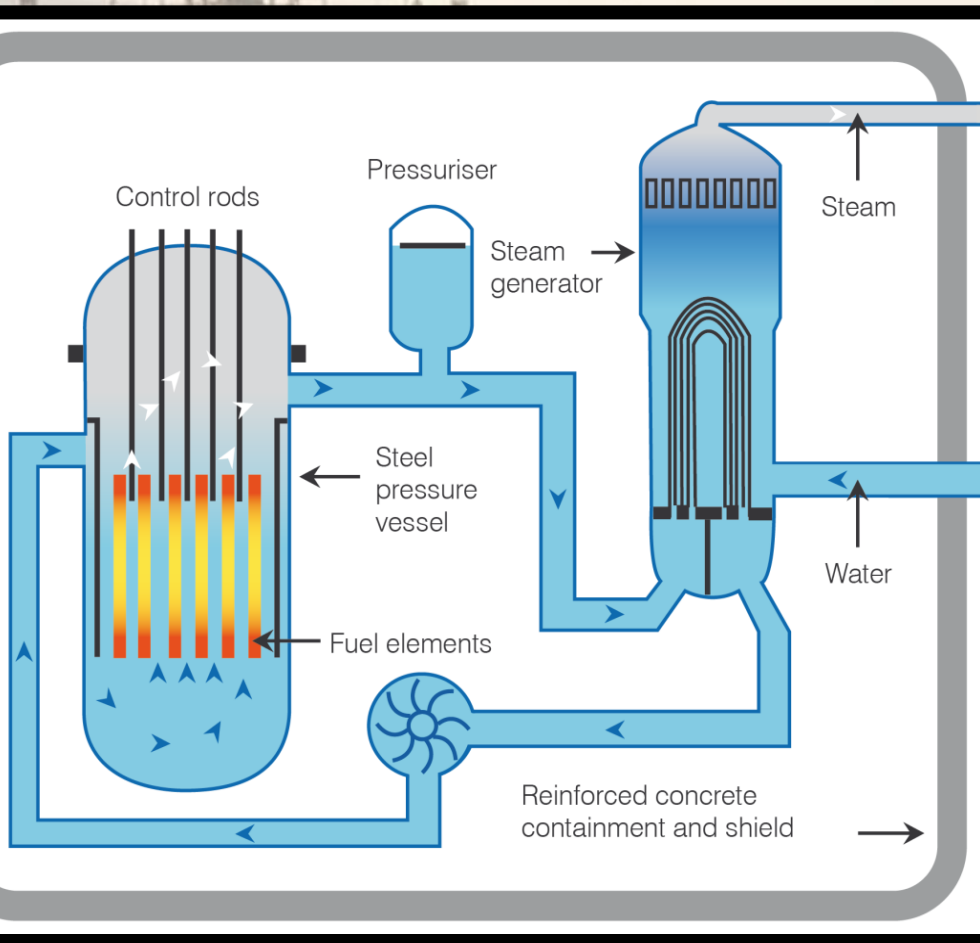


TYPES OF REACTORS

- PRESSURISED WATER REACTOR (PWR)
 - PRESSURISED HEAVY WATER REACTOR (PHWR)
 - BOILING WATER REACTOR (BWR)
 - LIQUID METAL COOLED REACTOR
 - GAS COOLED REACTOR
- MOST SUITABLE FOR NAVAL PLATFORMS
 - PRESSURIZED WATER REACTOR

COMPONENTS OF MARINE NPP

PRESSURIZED WATER REACTOR



KEY COMPONENTS

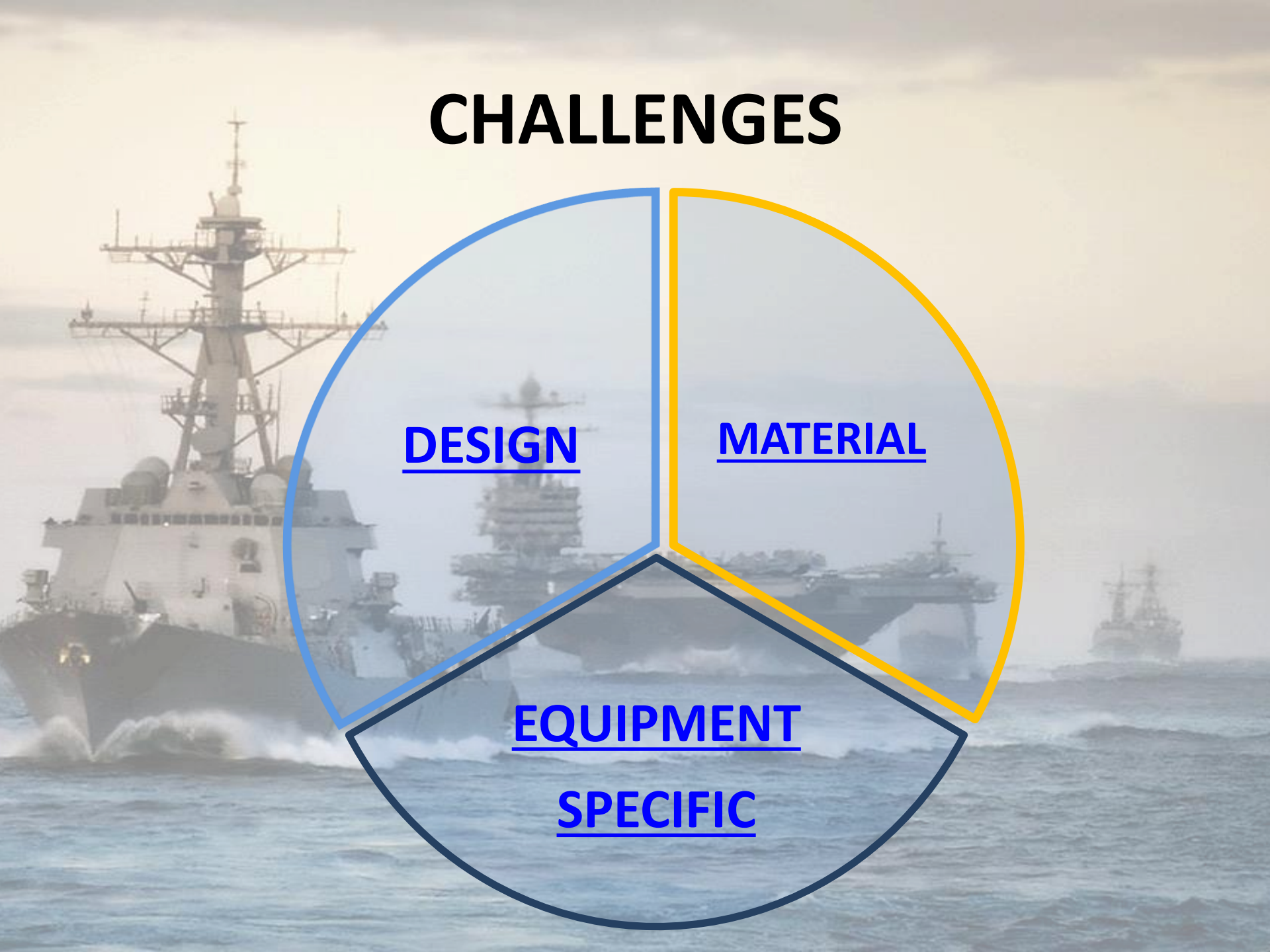
- RPV
- STEAM GENERATOR
- REACTOR COOLANT PUMP
- PRESSURIZER
- CONTROL RODS & CONTROL ROD MECHANISM
- ASSOCIATED PIPING

CHALLENGES

DESIGN

MATERIAL

EQUIPMENT
SPECIFIC



CHALLENGES

- **DESIGN CHALLENGES**

- **CODES AND STANDARDS**

- [NUCLEAR STANDARDS](#)

- [NAVAL STANDARDS](#)

- **NUCLEAR PROPULSION ON NAVAL PLATFORM DEMANDS CONFORMITY TO BOTH**



CHALLENGES

The background of the slide is a photograph of a large naval ship, possibly a destroyer or cruiser, at sea. The ship is viewed from a low angle, showing its complex superstructure with various masts, radar domes, and antennas. The sea is dark blue with white-capped waves. The sky is overcast and grey. The overall tone is serious and industrial.

- **MATERIAL CHALLENGES**

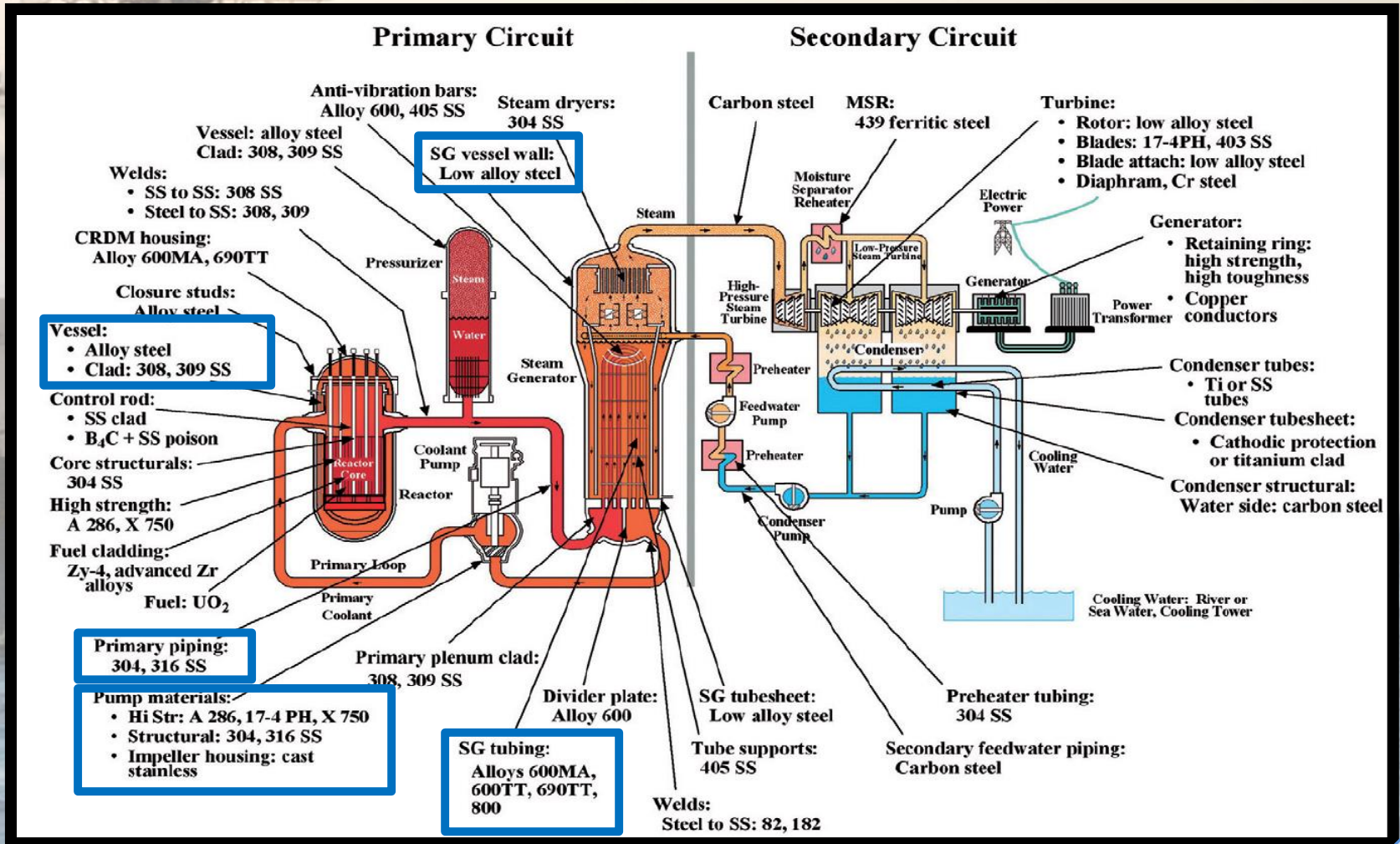
- **STRESS CORROSION CRACKING**
- **HYDROGEN EMBRITTLEMENT**
- **NDT TEMPERATURE**
- **RADIATION SWELLING**

- **ALTERNATIVES**

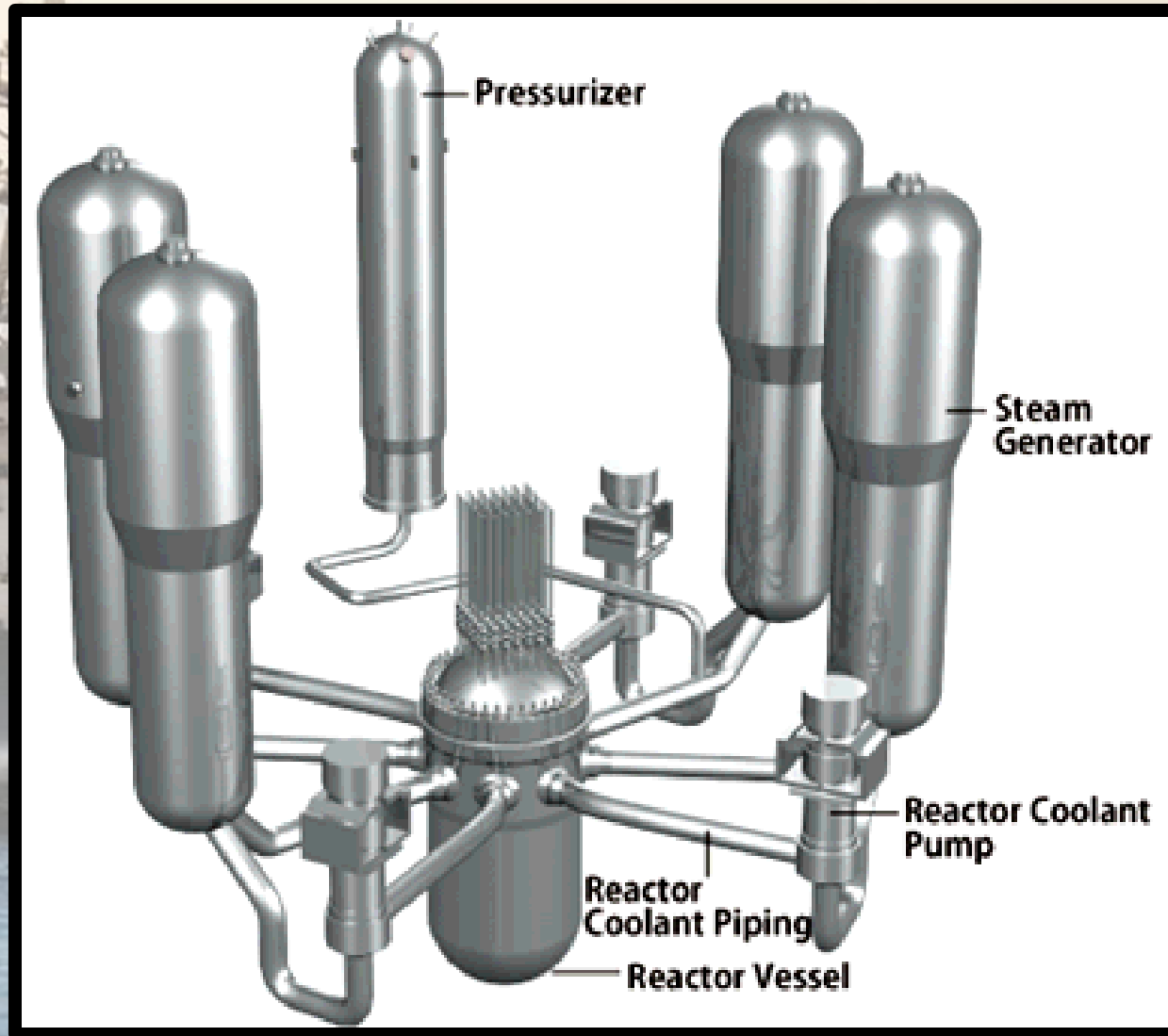
- **SELECTION OF HIGH QUALITY MATERIALS**
- **HIGHER STANDARDS OF FABRICATION TECHNIQUES**
- **LEAK BEFORE BREAK PHILOSOPHY**
- **CONCEPT OF AGGREGATE**

CHALLENGES

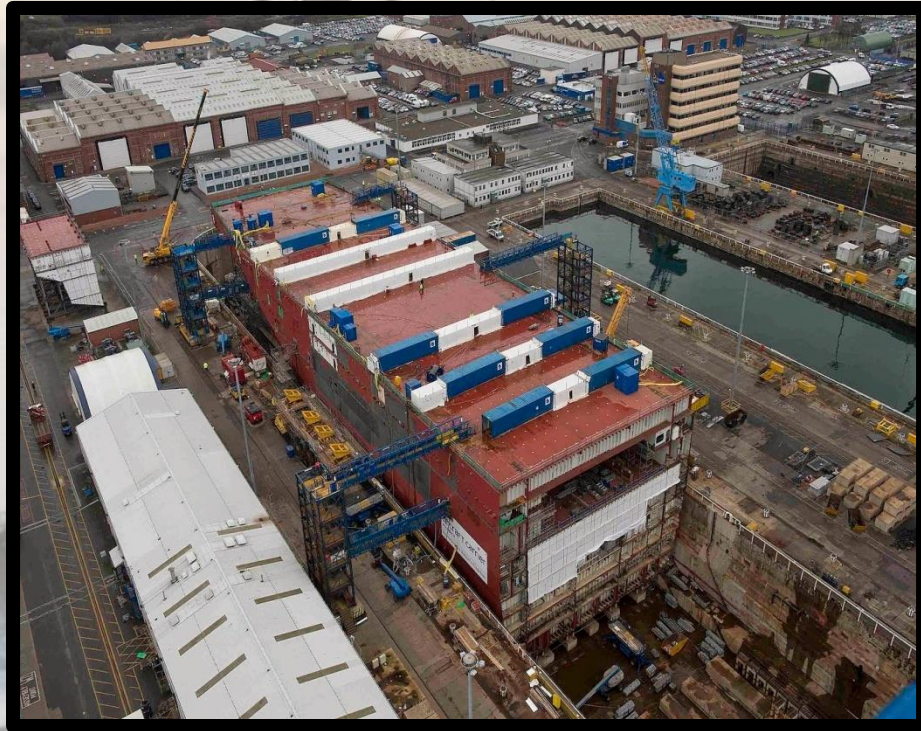
- MORE THAN 25 METAL ALLOYS FOR THE NPP



INTEGRATION OF NPP



INTEGRATION OF NPP

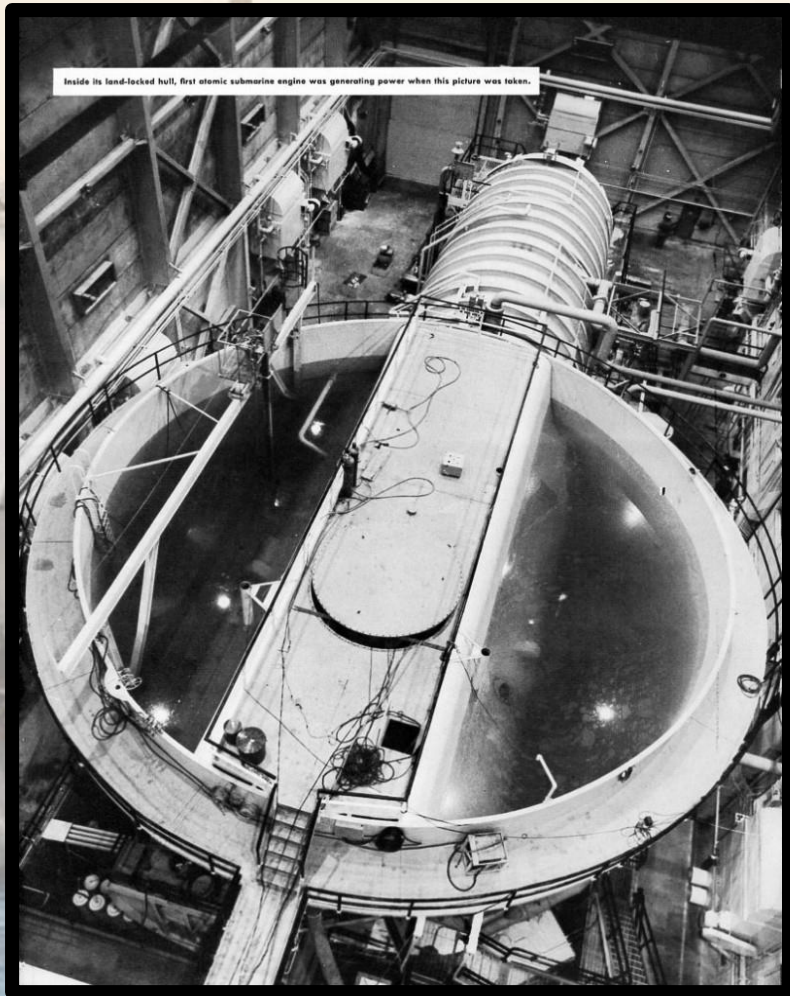


SHIFTING OF AGGREGATE
- MARINE VESSEL

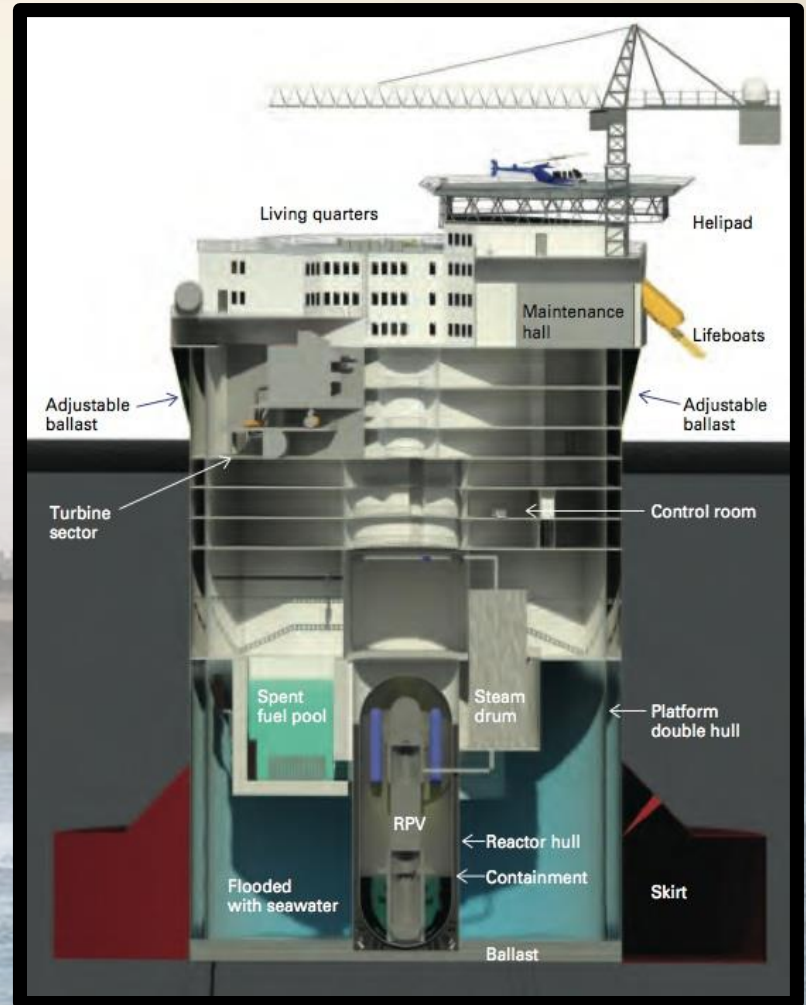


SHIFTING OF AGGREGATE
- USS JIMMY CARTER

INTEGRATION OF NPP



S1W REACTOR- PROTOTYPE
FOR NAUTILUS



REACTOR COMPARTMENT
-SURFACE VESSEL

REGULATORY ASPECTS

The background of the slide is a photograph of a large naval ship, possibly an aircraft carrier, at sea. The ship is viewed from a low angle, showing its complex superstructure with various masts, antennas, and radar equipment. The ship is moving through the water, creating a white wake. The sky is overcast and grey, and the water is a dark blue-grey color. The overall tone is somewhat somber and industrial.

- **AERB (ATOMIC ENERGY REGULATORY BOARD)**
 - **REGULATORY BODY UNDER DEPARTMENT OF ATOMIC ENERGY**
- **ROLE OF INSPECTOR**
- **AERB GUIDELINES**
 - **SAFETY CODES AND STANDARDS**
 - **SAFETY GUIDES AND GUIDELINES**
 - **SAFETY MANUALS**
 - **TECHNICAL REPORTS AND DIRECTIVES**

WAY AHEAD

- **AREAS OF INDUSTRIAL PARTICIPATION**
 - **ADVANCED METALLURGY**
 - **PRODUCTION OF LOW ALLOY STEEL FORGINGS**
 - **TITANIUM WELDING AND FABRICATION TECHNOLOGY**
 - **DEVELOPMENT OF BELLOW-SEAL VALVES**
 - **DEVELOPMENT OF CANNED MOTOR PUMPS**
 - **MANUFACTURING AND TESTING FACILITIES FOR CONTROL ROD DRIVE MECHANISMS**
 - **HARDWARE & SOFTWARE DEVELOPMENT FOR POWER PLANT CONTROL SYSTEMS**
 - **NUCLEAR INSTRUMENTATION**

WAY AHEAD

- **MAKE IN INDIA**
- **SELF RELIANCE**
- **BLUE WATER NAVY**
- **BIGGER ROLE BY INDUSTRY**
- **WIN-WIN COMBINATION**

A fleet of US Navy ships is shown at sea. In the foreground, a grey destroyer is moving towards the viewer, creating a white wake. In the background, a large aircraft carrier is visible, also moving through the water. The sky is overcast and grey. The text "THANK YOU" is overlaid in the center of the image.

THANK YOU