Ice Management Operations

Barents 2020, Phase 4, Working Group 6, Moscow

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MANAGING RISK DNV

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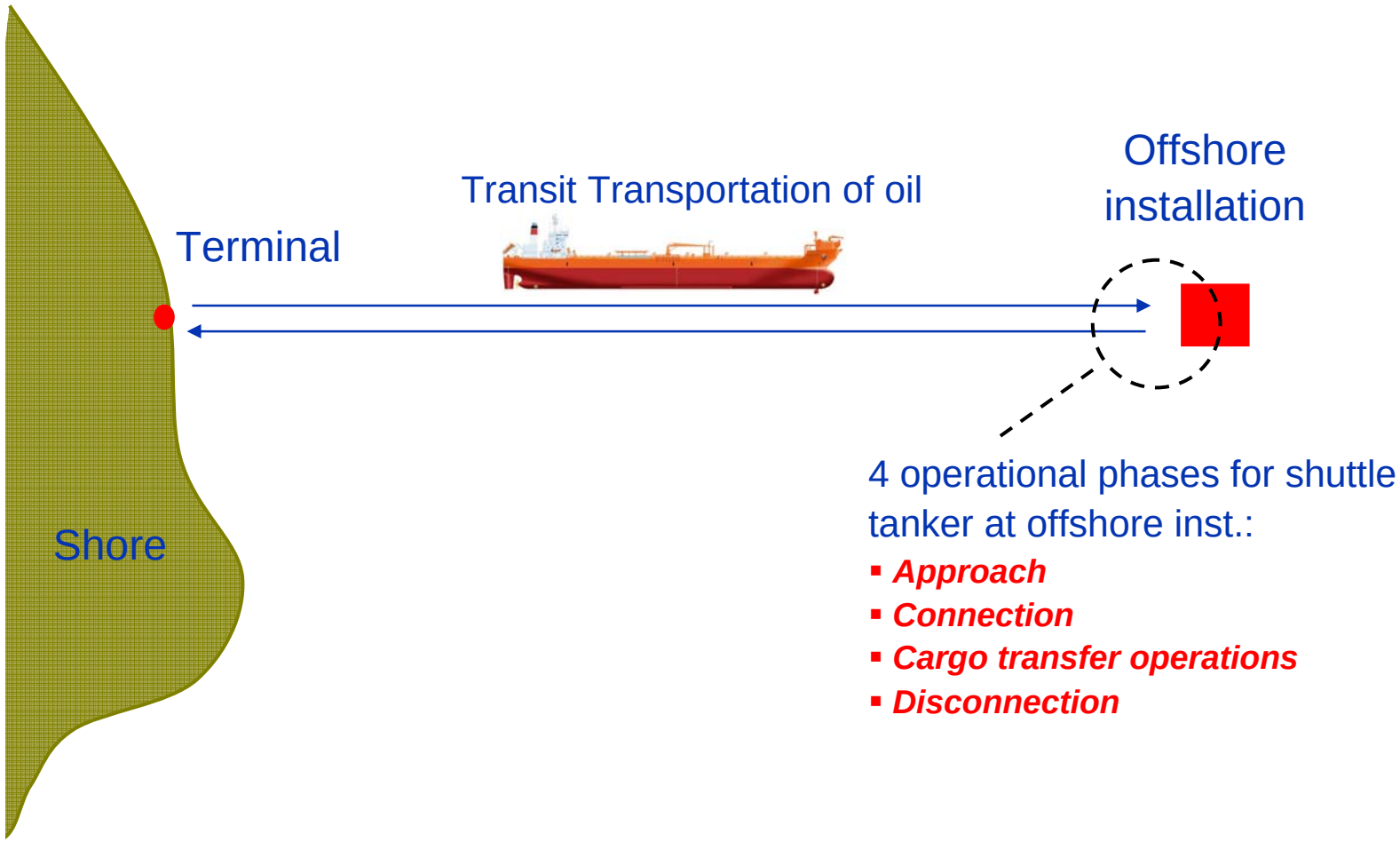
Content

- Background from phase 3
- Scope RN06
- Definition of Ice Management, IM
- Topics included in IM
- Further work

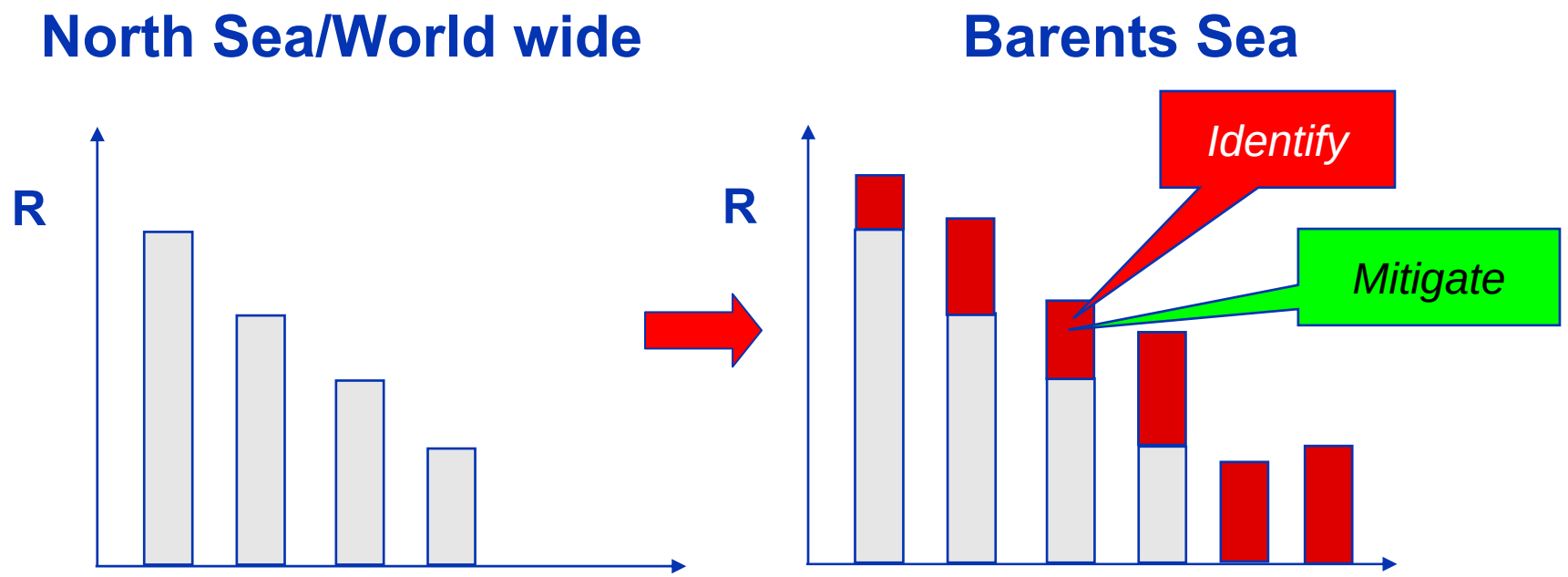
Scope of Work, phase 3



4 operational phases for shuttle tanker at offshore inst.:

- ***Approach***
- ***Connection***
- ***Cargo transfer operations***
- ***Disconnection***

Risk = Probability x Consequence



Ex. Maritime Risk:

- Collision with other vessel
- Contact
- Fire/explosion
- Structural failure
- Grounding
- Collision with installation
- Collision during Ship To Ship (STS) approach
- Accidental oil spill during loading/unloading

Additional risk

Identifying risk

- Focus on the relative **risk (Δ)** between North Sea and Barents Sea
- Identify the Barents Sea Challenges:
  - *Low temperatures*
  - *Ice (at least for parts of the year), including ice management*
  - *Darkness*
  - *Remoteness (less infrastructure available for clean-up of spills etc)*
  - *Vulnerable Environment*

Main Conclusions from the Risk Analysis:

- Ice Management
  - Procedures and Standards
  - Training
  - Competence
  - Capability of vessel
- Collision with ice, transit in open water
- Cargo transfer offshore
  - Procedures
  - Equipment standards

Covered by Ice Class

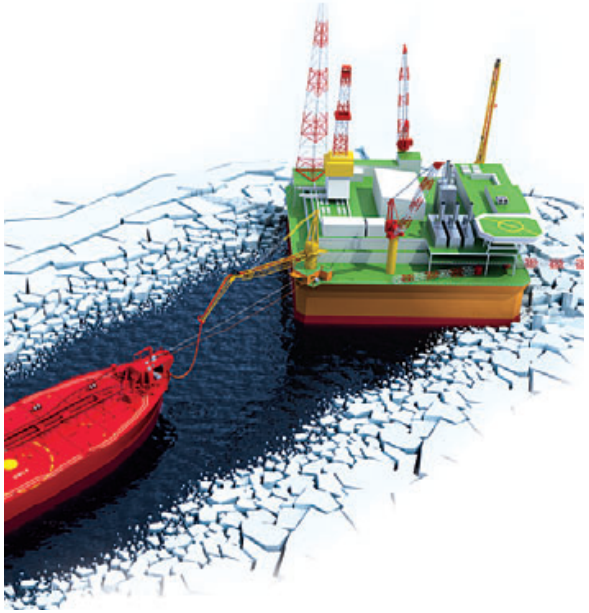
Covered by Guidelines, like OCIMF

Generally:

- Higher risk due to operational conditions and more severe consequences
- To be taken care of by operational standards and modification of equipment

Phase 4, Objective RN-06, IM

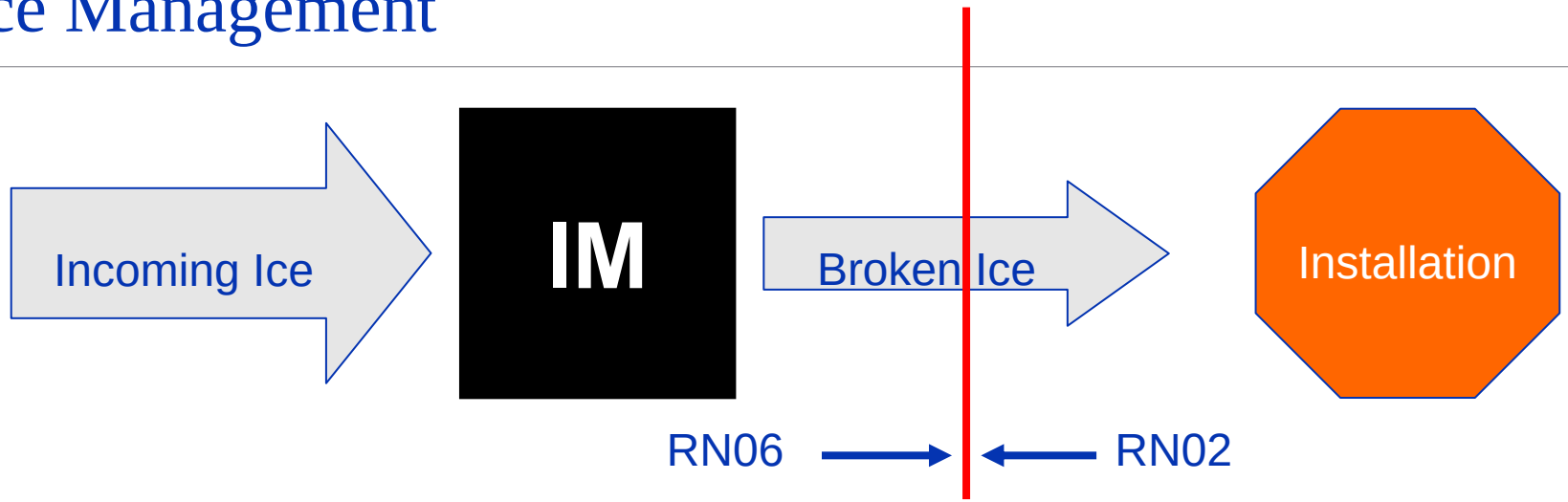
- The aim is to make the IM operation more safe and optimal from an economical and environmental point of view
- ISO 19906 gives a good description of IM in general and what to do, but not always how to do it



- identify relevant IM parameters
- content of IM Manual
- propose updates of ISO 19906

IM for Arctic Offshore Activities

Ice Management



Need to document Performance, Efficiency and Reliability of IM Transfer Function

ISO 19906 definition of ice management:

"*Active processes used to alter the ice environment with the intent of reducing the frequency, severity or uncertainty of ice actions*"

Ice Management

IM primary objectives are:

- Ensure installation safety from sea ice and iceberg hazards
    - by proper surveillance (detection, tracking, forecasting) and alerting
- Minimize shutdown and disconnections
    - by performing proper ice management

Secondary objectives are:

- Assist during EER, connection/disconnection, logistics

Some identified Ice Management Challenges

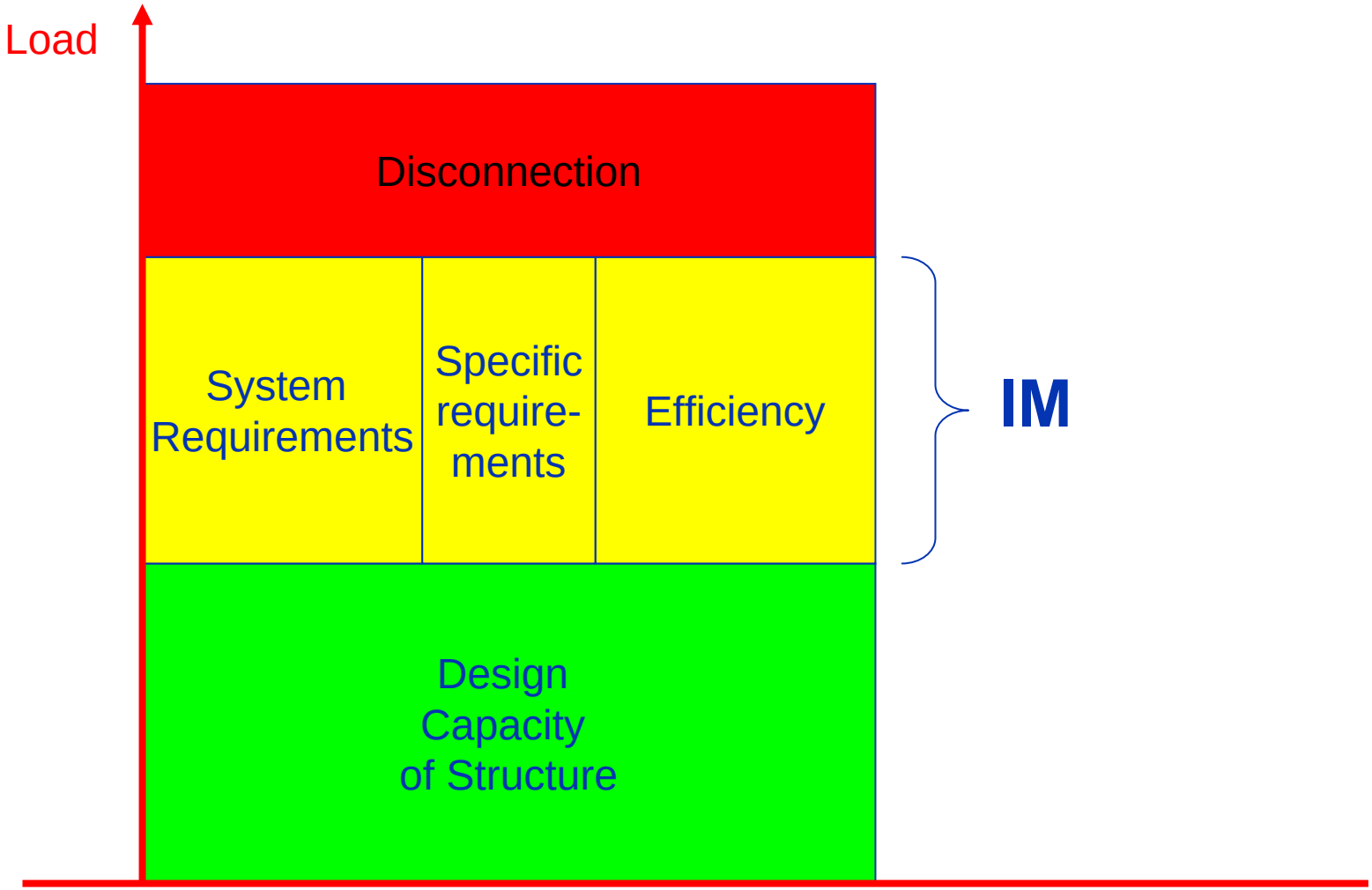
Design stage:

- Limited documented experience
  - few cases and limited official data
- Lack of good prediction methods
  - efficiency and reliability of IM
  - design criteria

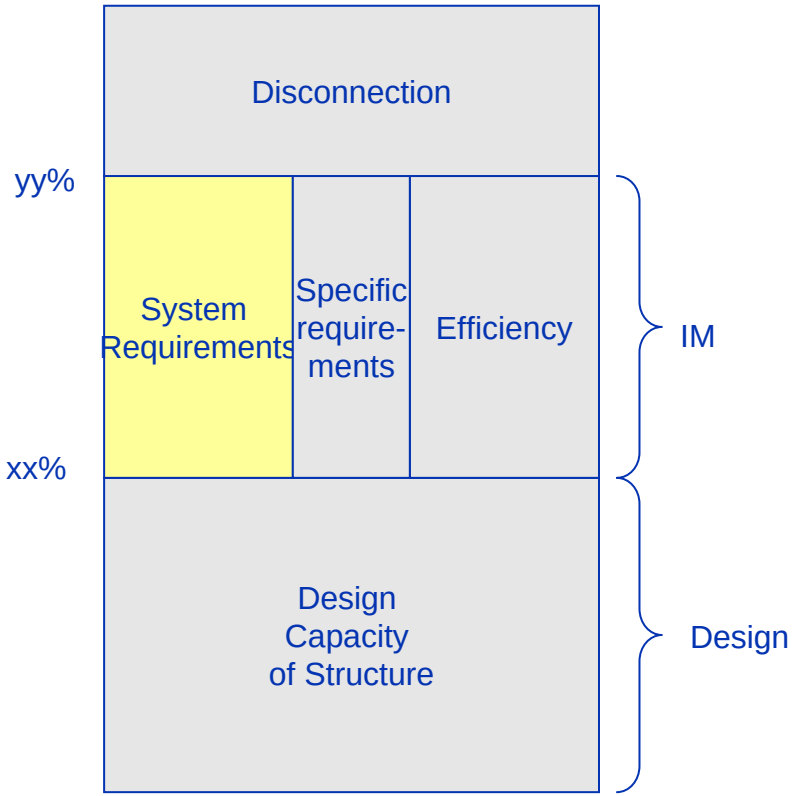
Operational stage:

- Lack of Ice information and evaluation of actual situation
- Depends on human operation
  - human fatigue
  - need continuous attention
  - man can only reduce effectiveness of a tool (here i.e. ice breaker)
  - communication
  - etc.

Ice Management – need to document reliability



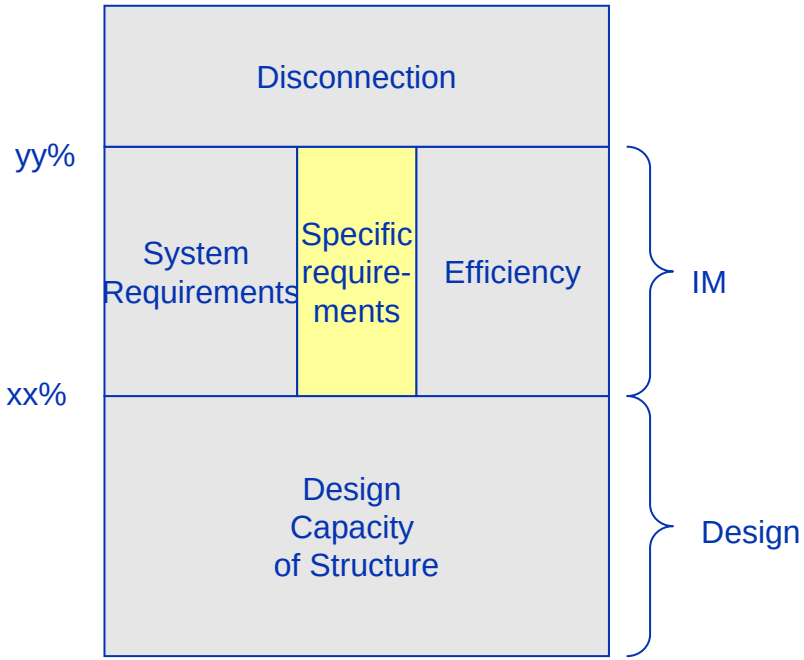
Ice Management



System Requirements:

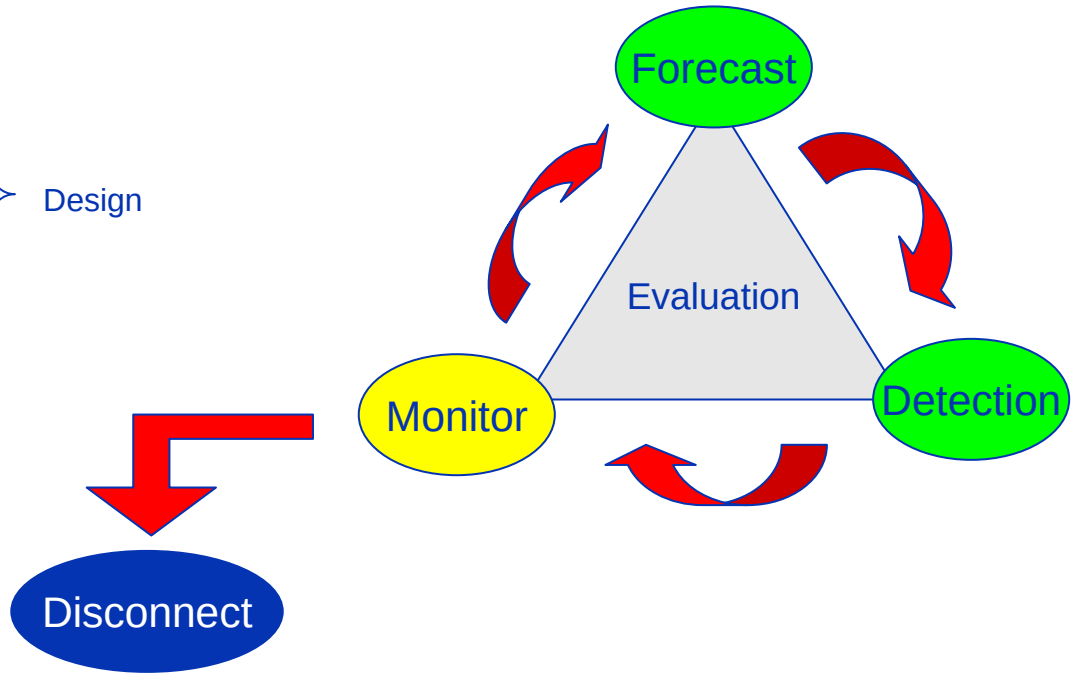
- Icebreaker capability
  - Ice-class, power, manoeuvrability etc
- Mooring capacity

Ice Management

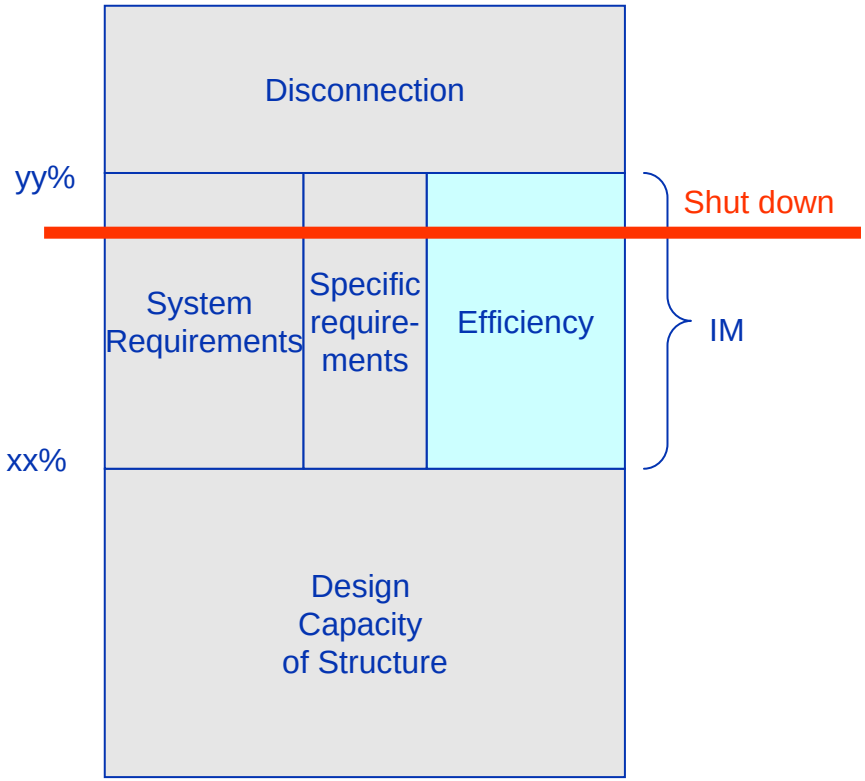


Specific Requirements:

- The IM operation will depend on the specific requirements to the **Forecasting**, **Detection** and **Monitoring** of actual result of the IM operation.



Ice Management



Efficiency:

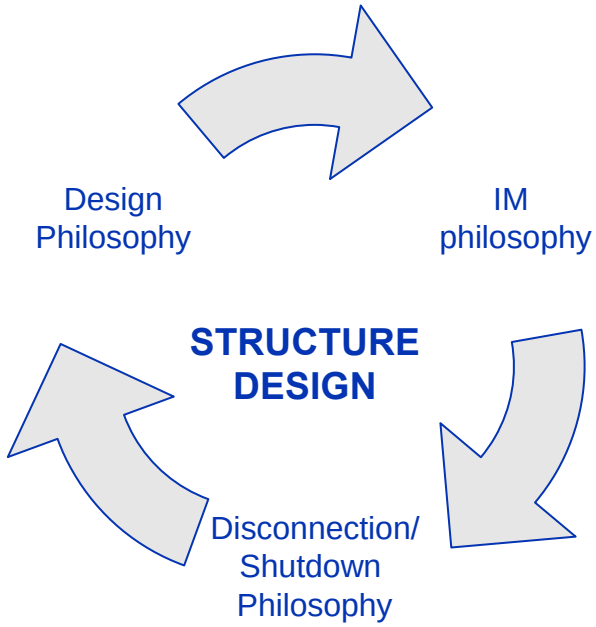
- The efficiency of the IM operation will depend on the specific requirements and how the actual IM is carried out.
- The ice breaker will brake the ice according to the available information and capacity of vessel
- The ultimate manoeuvring of the icebreaker will be decided by the commanding officer onboard the ice breaker.
- Definition of xx and yy level will depend on actual design.
  - below xx, ok to operate without icebreaker
  - between xx and yy, IM in operation. A level where shutdown is initiated has to be defined.
  - at yy, disconnection is initiated

Review of ISO 19906

- The requirements to actually document the efficiency (performance in ISO 19906) is clear, but no specific requirements to the documentation.
- ISO merely states that you shall do it, not how or what.
- The normative provisions do not address how or whether the knowledge and methods are available to meet the requirements
- Clause 17.2.4 addresses the ice management system reliability and states:
  - *“Design and operational considerations shall be used to assess the overall reliability of an ice management system.”*

Some issues to be considered

- The ice load capacity of the managed structure depends on the actual design, and the philosophy behind.
- A strong structure with a robust mooring system will require a higher investment at design stage, (capex), but less operational cost (opex).



Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and Procedures
- Shutdown production
- Procedures for disconnection

Considered as design parameters

Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and simulation

- State of art with regard to forecast different types of ice, ice cover etc.
- Weather forecast
- Information related to tide currents
- Possible ice bergs and drift directions

Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and simulation

- State of art with regard to detection technology:
  - Air borne, plane and helicopters
  - Unmanned Aerial Vehicles
  - Radar
  - IR Cameras
- Find most severe ice condition

Ice Management includes following topics to be considered

- Forecasting
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- State of art with regard to tracking technology:
  - Air borne, plane and helicopters
  - Unmanned Aerial Vehicles
  - Radar
  - IR Cameras
  - GPS transducers
  - Radio transducers

Ice Management includes following topics to be considered

- Forecasting
- Detection
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- Training and simulation

- Analyse actual ice condition and evaluate degree of manageability
  - global loads
  - local loads
  - ability stay in position
  - ability to orient towards incoming ice
- Evaluate Risk and Probability of success
- Decide procedure for IM

Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and simulation

- Based on the IM vessels capabilities, carry out IM according to predefined procedures.
  - operational envelopes for systems
- IM should be carried out according to the predefined procedures as far as possible
- Risk evaluation
- Common understanding of the situation and ongoing IM operation

Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and simulation

- Monitoring should include:
  - the broken ice, i.e. the ice moving towards the installation
  - local and global loads at installation, forward and along hull in case of reduced ability to vain
  - trends of loads
- In case of risk of failure or exceeding load limits, necessary actions according to procedures for emergency operations have to be initiated.
- This includes:
  - alteration of physical IM
  - shutdown
  - disconnection

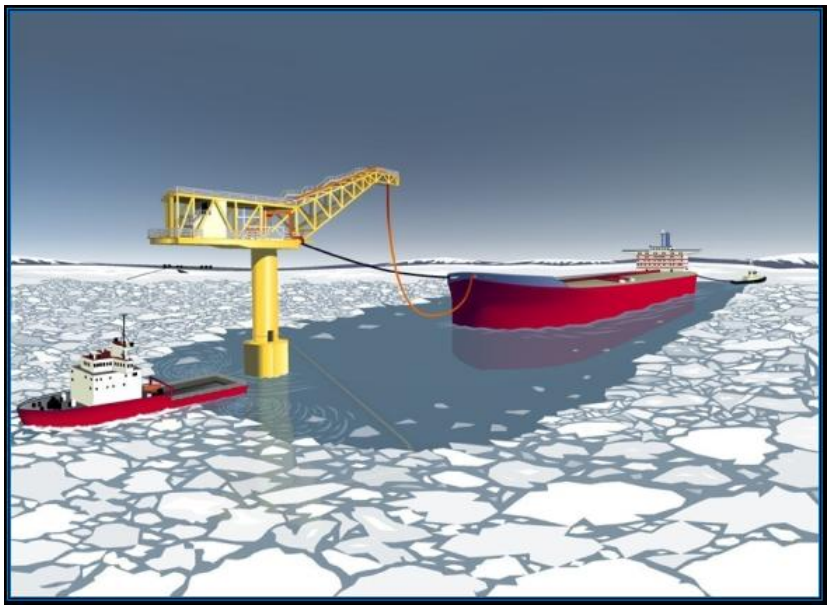
Ice Management includes following topics to be considered

- Forecasting
- Detection
- Tracking
- Threat evaluation
- Physical Ice Management
- Monitoring
- Training and simulation

- Includes
  - procedures
  - requirements and documentation of competence
  - simulator training
  - emergency training

Further work RN06

- Carry out a IM Hazid workshop (February)
- Fill in ISO 19906 gap analysis table
- Draft content of IM report, State of Art
  - including gap analysis of ISO 19906
- Circulate draft for input/comments (March)
- Next meeting in May, -agree upon final text



Safeguarding life, property and the environment

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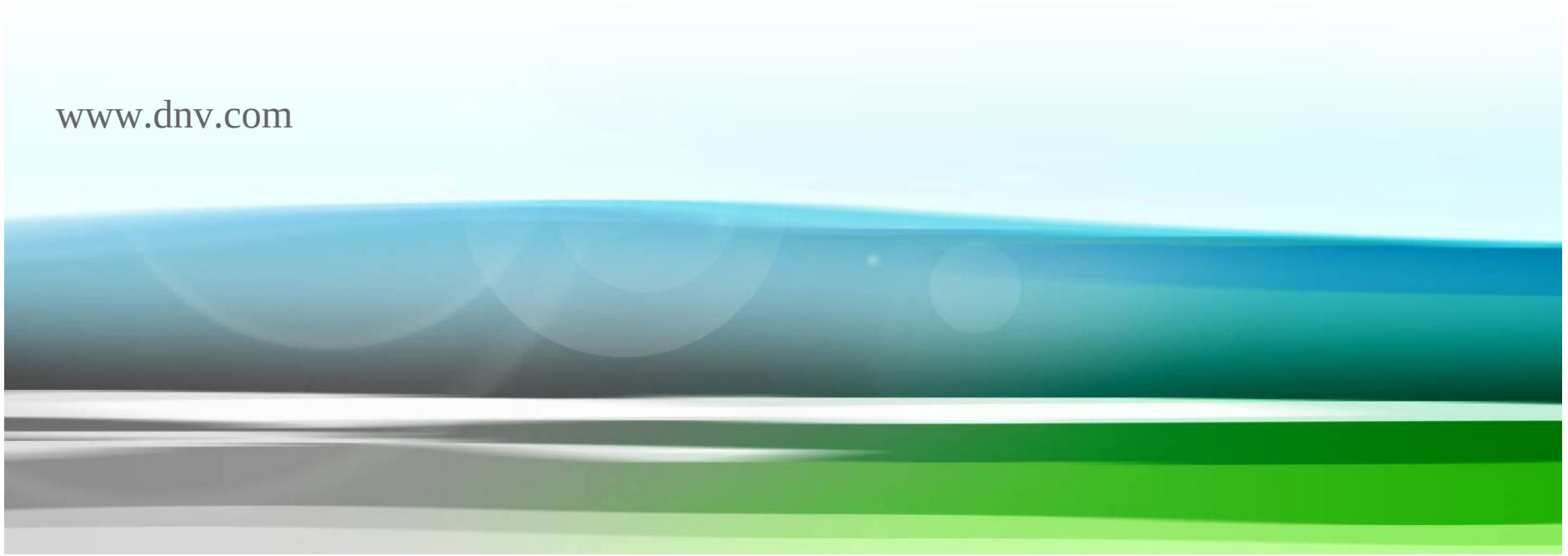

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