



# Long Tie-back Controls Technology in the Barents Sea

Subsea Controls Down Under 2018

Perth, 24th October 2018

Rodrigo Lima, Specialist Engineer

# Agenda

- Industry trends
- NCS2017+ project
- Johan Castberg
- Askeladd
- Technical details

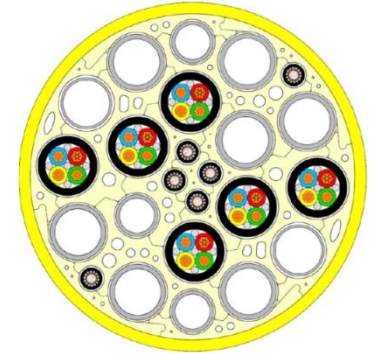
# Subsea Power Delivery Industry Trends

- Long step-outs are becoming more common
- Power consumption is increasing
  - More instrumentation
  - Instrumentation more complex
- Higher load + longer step-out
  - Less efficient power distribution
- Move towards
  - Higher voltages and/or
  - DC distribution

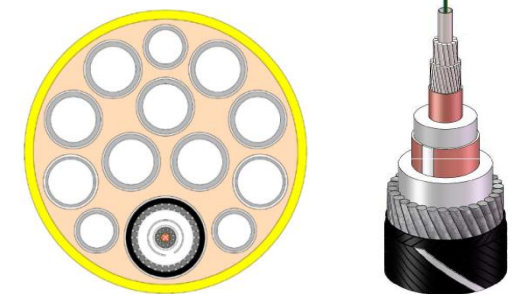
Low Voltage AC  
( $<1\text{kV}$  1-ph.)



Low Voltage DC ( $<1.2\text{kV}$ )



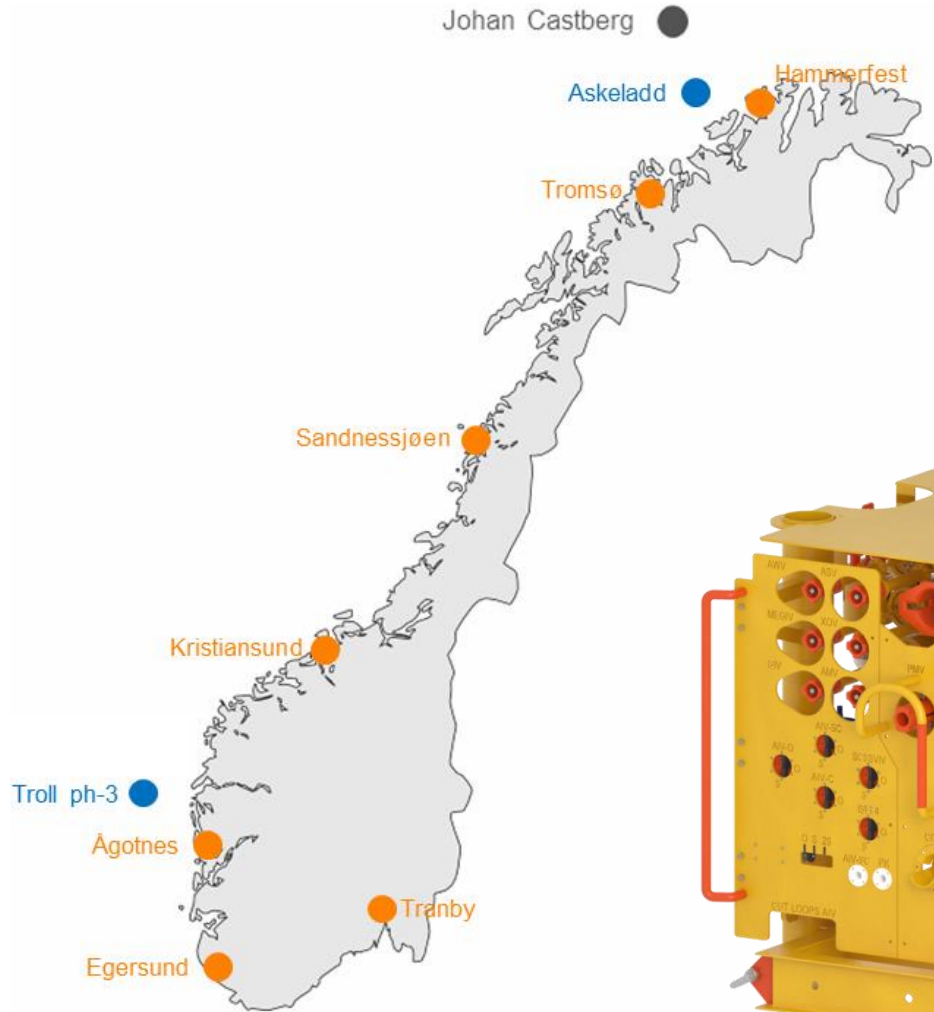
AC Highway  
( $3\text{kV}$  3-ph.)



DC/FO ( $3\text{-}10\text{kV}$ )



# SPS NCS 2017+ project



## EPC Call-offs

Johan Castberg

31 off 7"x5" VXT / 10 off Templates+manifolds

Askeladd

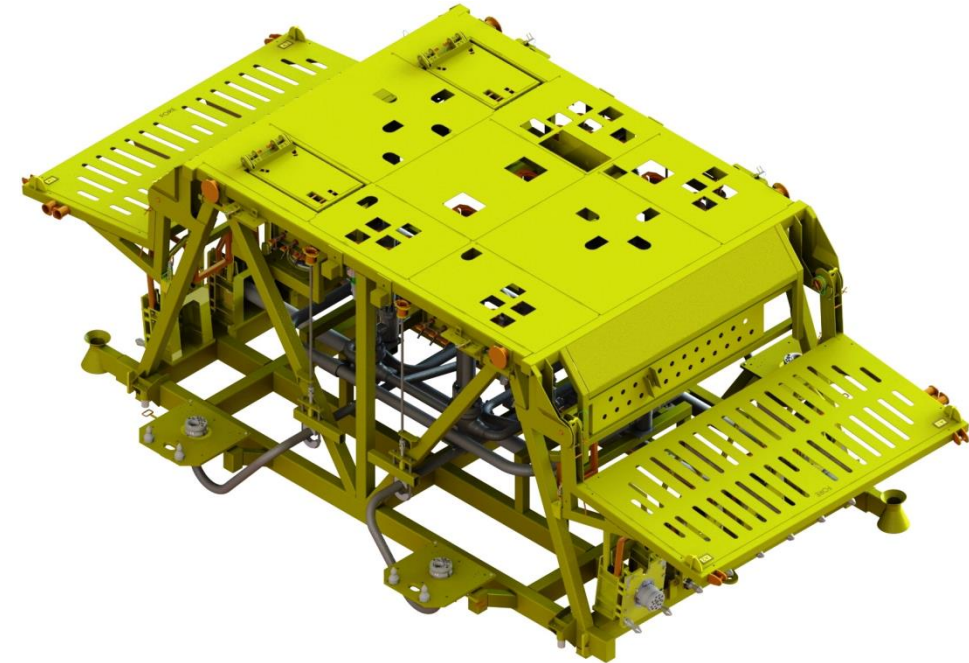
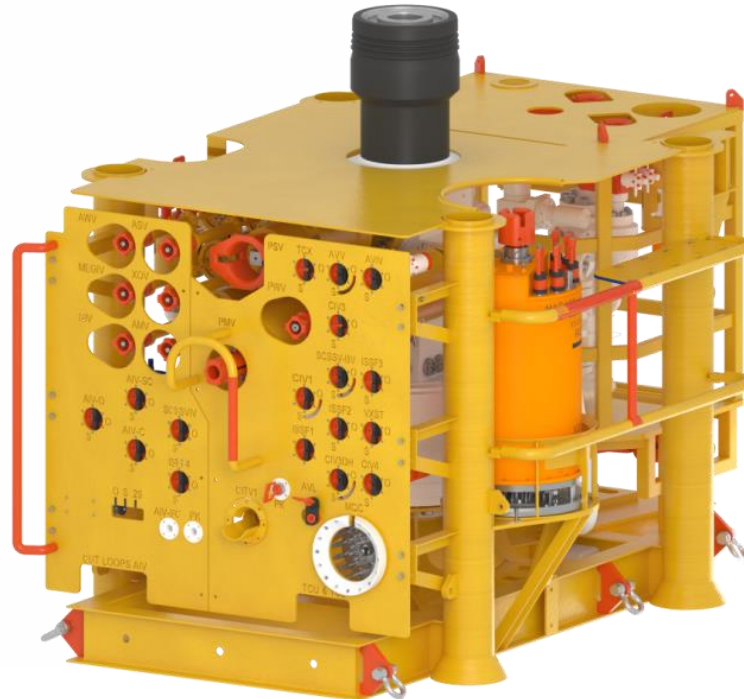
4 off 7"x7" VXT / 2 off Templates+manifolds

Troll Phase 3

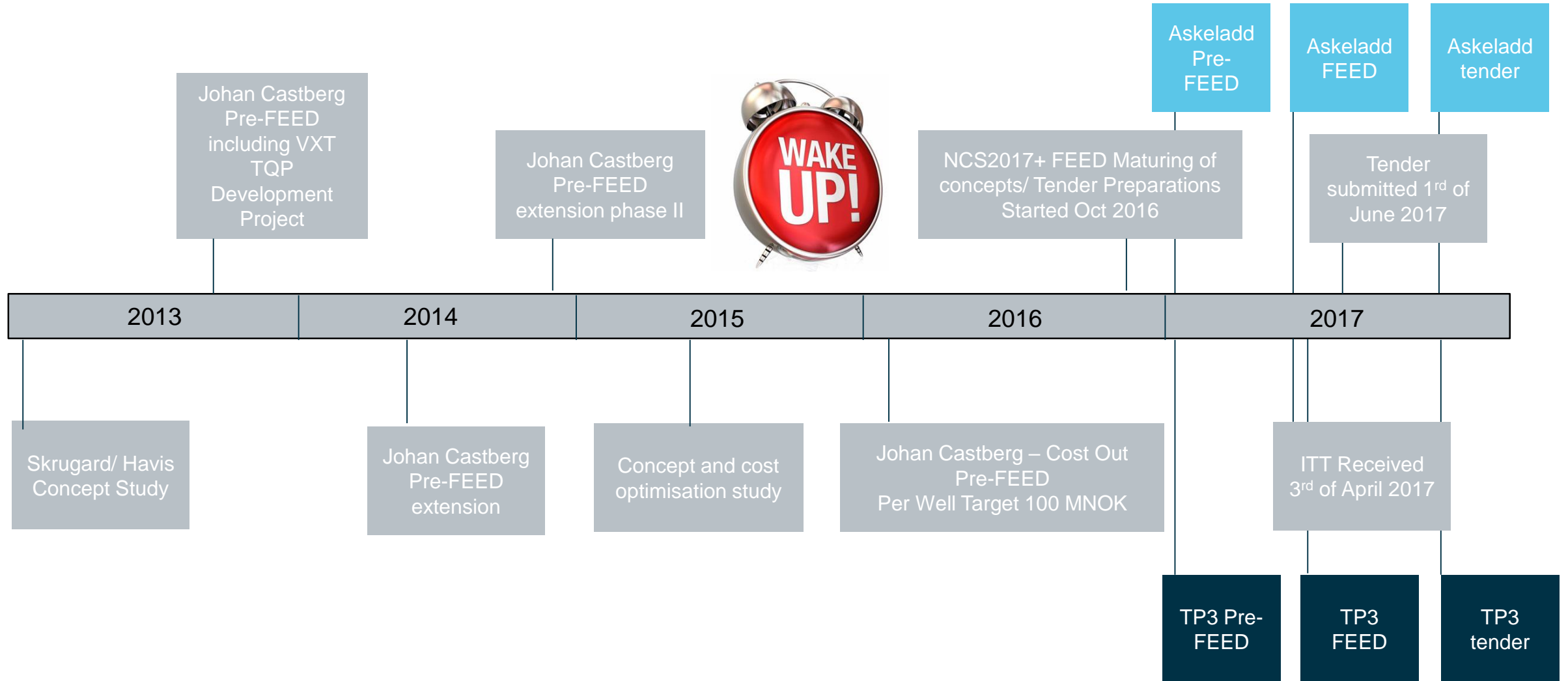
9 off 7"x7" VXT / 2 off Templates+manifolds

**Total**

**44 off VXT / 14 off Templates+manifolds**

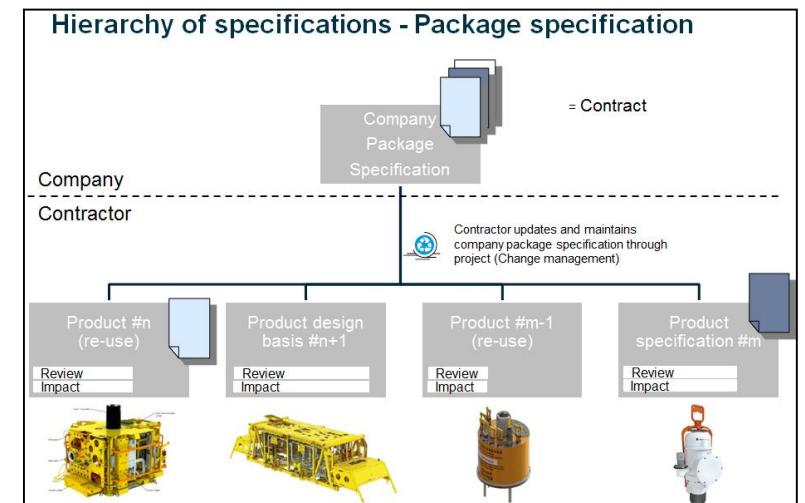
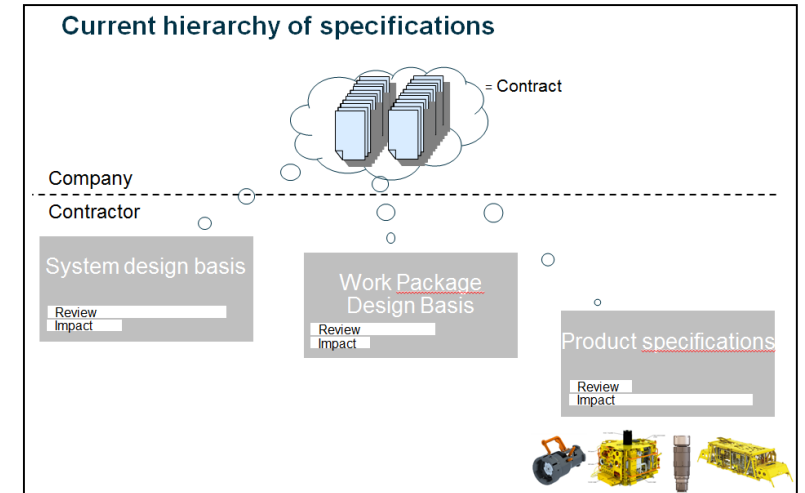


# Our involvement on NCS2017+

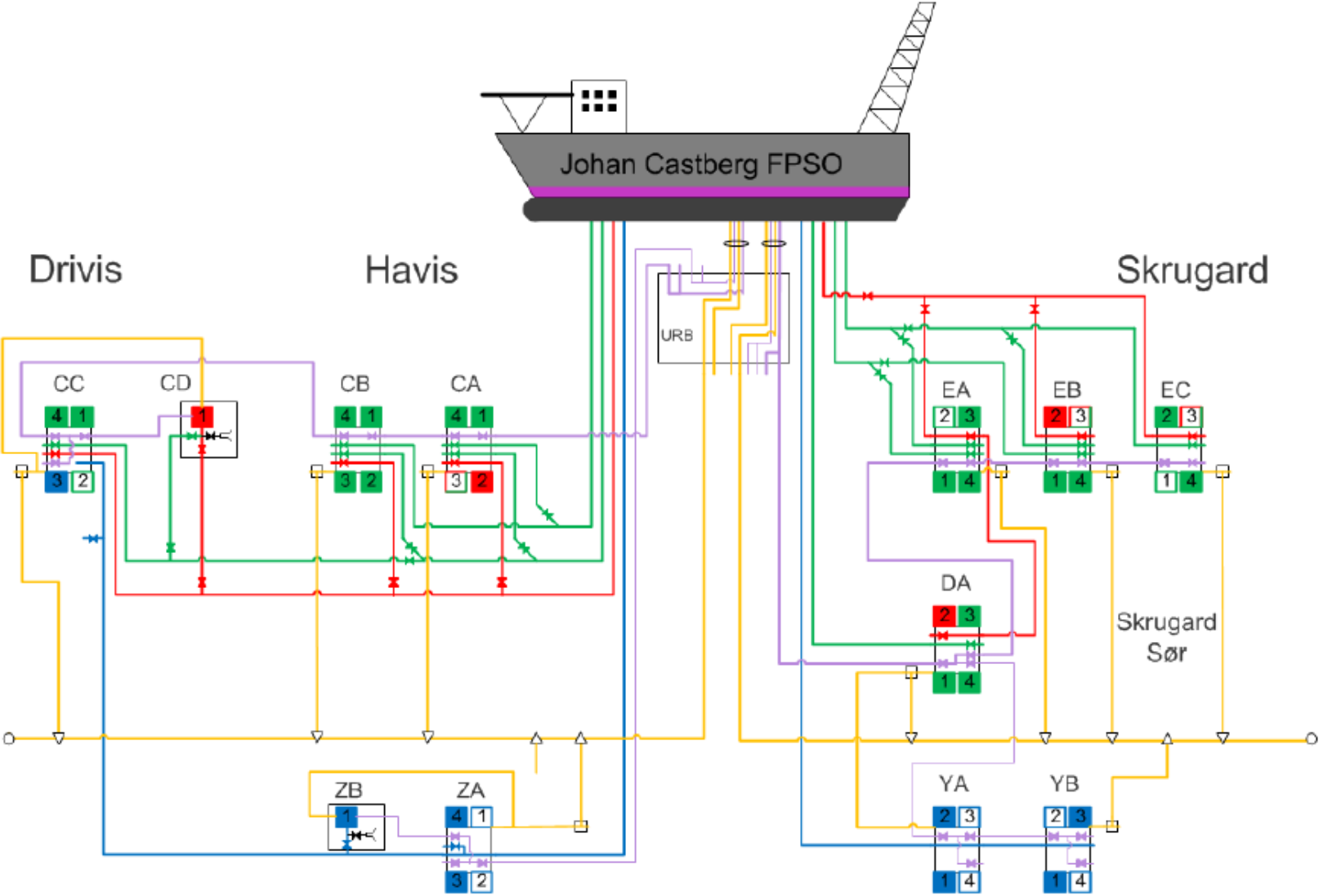


# SPS Package Specification implications

- Clarifies requirements and makes them more accessible
- Reduces documentation with duplicated requirements
- An engineering team more engaged with contractual requirements
- New way of distribute requirements to discipline engineers
  - Some will always prefer the way it “used to be”
  - Challenging with new team members joining as new way of thinking requires closer project induction



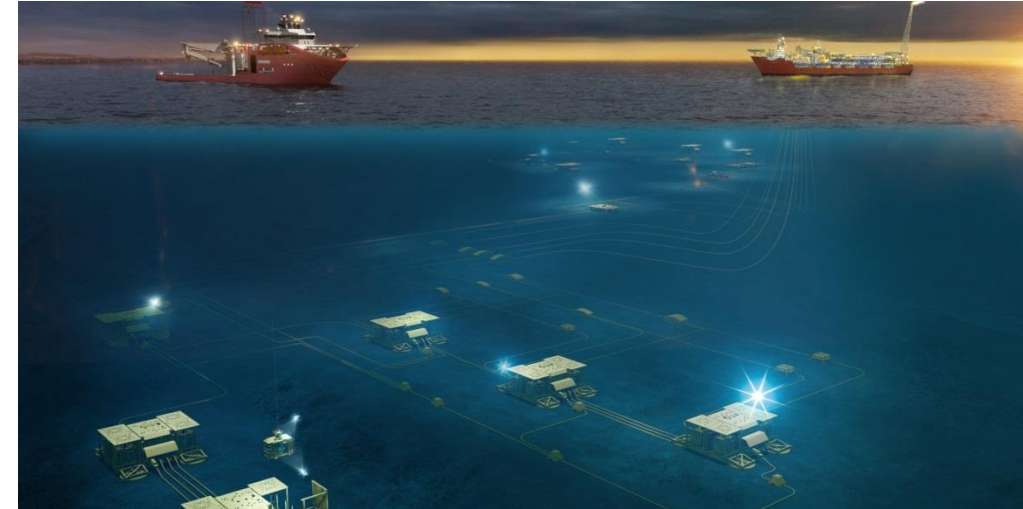
# Johan Castberg



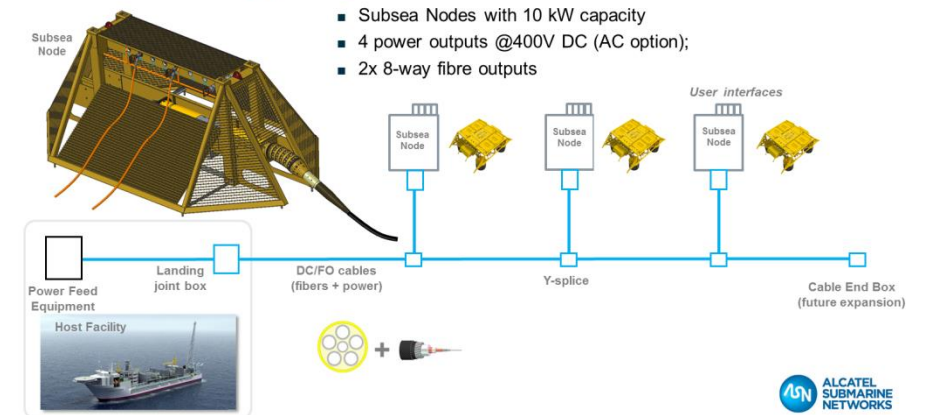
- Development: **New FPSO**
- Oil field
- Design life: **25 years**
- Design water depth: **500m**
- Actual water depth: **344 – 398m**
- Design pressure: **345/345/690bar**
- Design temp: **-18°C +121°C**
- Manifold header/branch: **10" ID/6"**
- Max. step-out: **14 km**

# Johan Castberg – Controls Highlights

- Scope of Supply
  - Topside cabinets prepared for and equipped with hardware for **70 wells**
  - **87 Vectus™ SEMs** (33 SCMs & 21 SRMs)
  - ~550 instruments
  - ~500 EFLs and OFLs
  - 84 RIMS
- New interface to SAS
  - **MDIS - ABB** as interface party
- New and extensive **Cyber security and Network** specifications
  - External consultants part of execution team
- Interface to Alcatel DCFO
- Aker Solutions has EPma contract (FPSO)
  - Aker synergies continuously exploited
  - Agreed on shared Functional Safety approach to remove duplication of work
  - EPma, SPS and ABB located in the same building

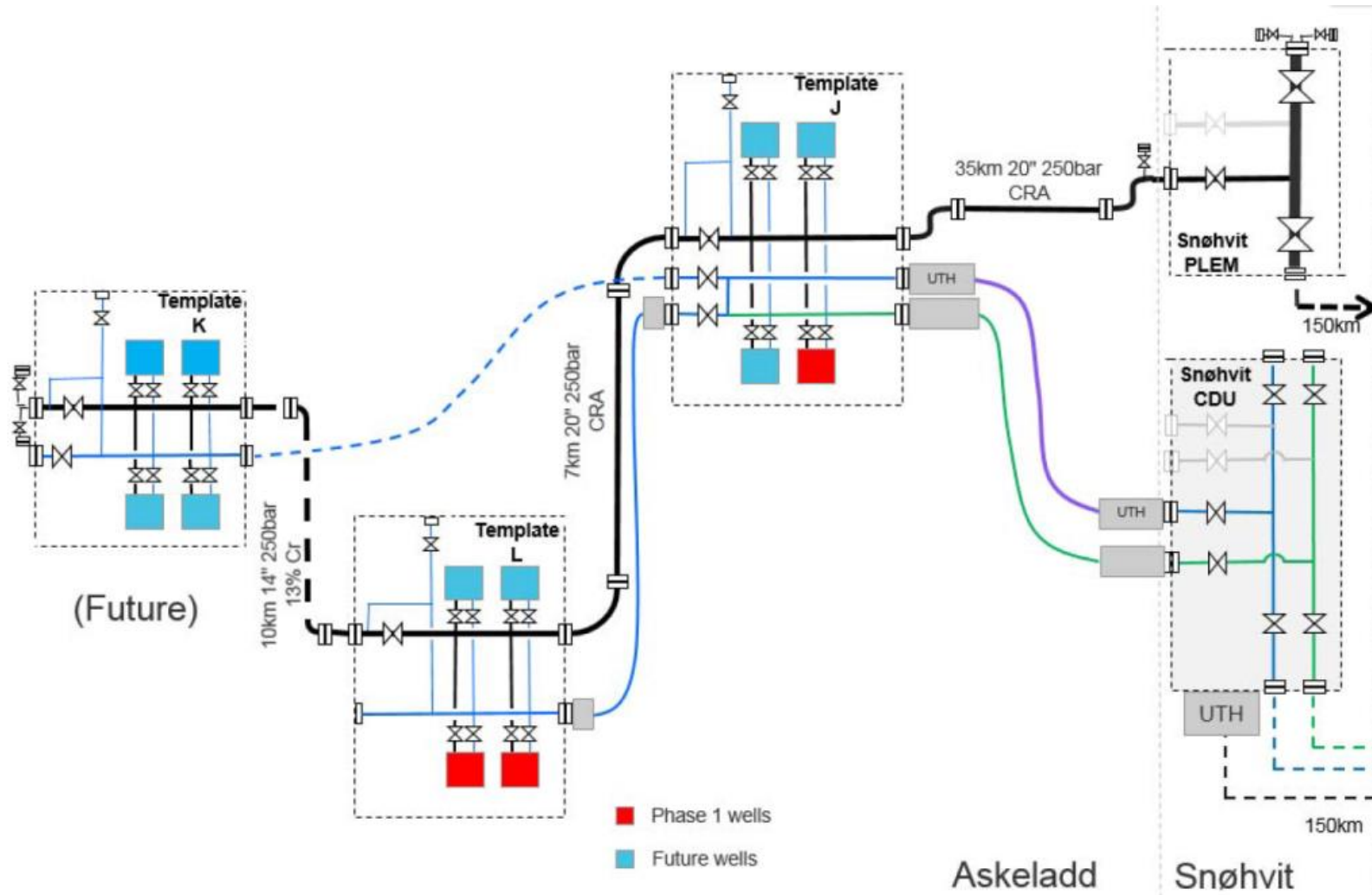


## DC/FO Technology – System Overview





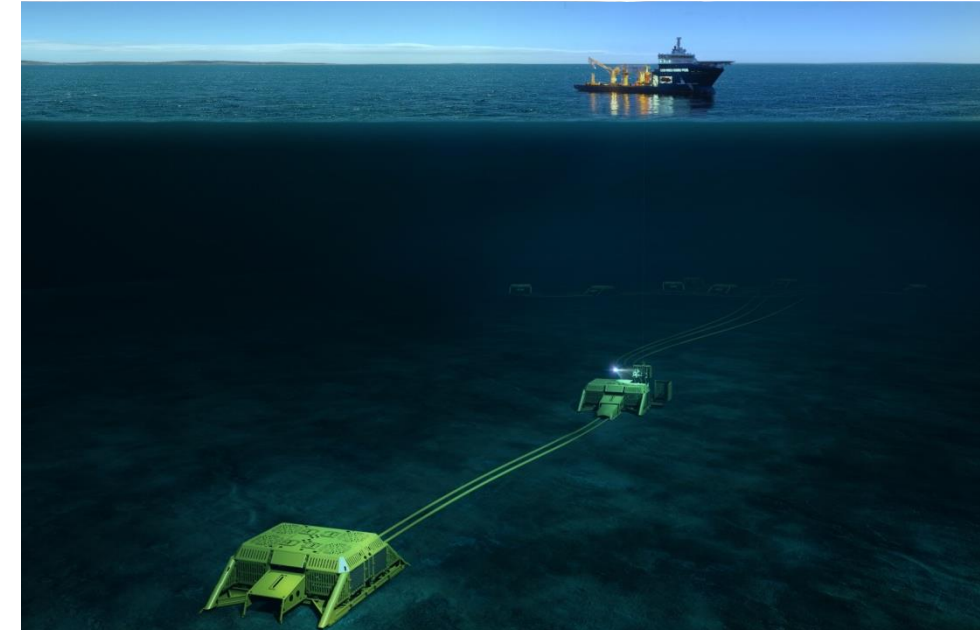
# Askeladd



- Development: **Tie-back to Snøhvit PLEM and CDU**
- Gas condensate field
- Design life: **25 years**
- Design water depth: **500m**
- Actual water depth: **250 - 330m**
- Design pressure: **345/430/690bar**
- Design temp: **-18°C +121°C**
- Total step-out: **194 km**

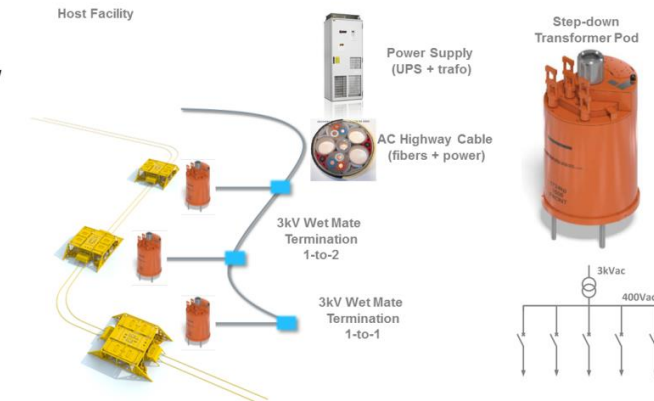
# Askeladd – Controls Highlights

- Scope of Supply
  - Topside cabinets inc SCU, topside copy for Melkøya test system and input to production simulator
  - **14 Vectus™ SEMs** (4 SCMs & 6 SRMs)
  - **12 ELDRIVE™**; AKSO Electric Actuators
  - ~50 instruments
  - ~70 EFLs and OFLs, inc **HV electrical distribution**
  - ~ 17 RIMS
- New **AC Highway™** 3kV 3-phase AC power transmission
  - Expansion from Snøhvit
  - New **3kV/500V Subsea Trafo Unit (STU)**
- Limited fibre optic cores available
  - Expansion from Snøhvit
  - **Fibre multiplexer** in Subsea Router Module (SRM)

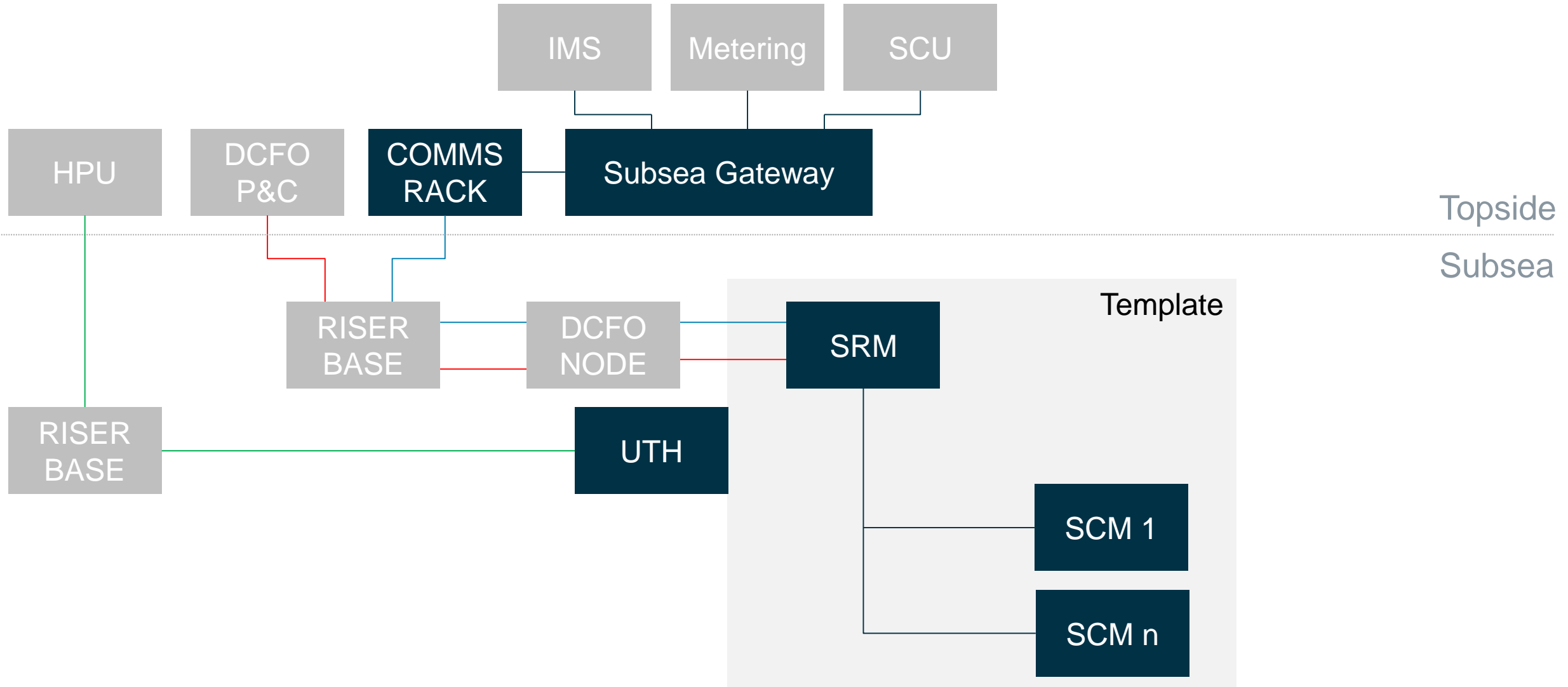


**AC Highway™ Technology – System Overview**

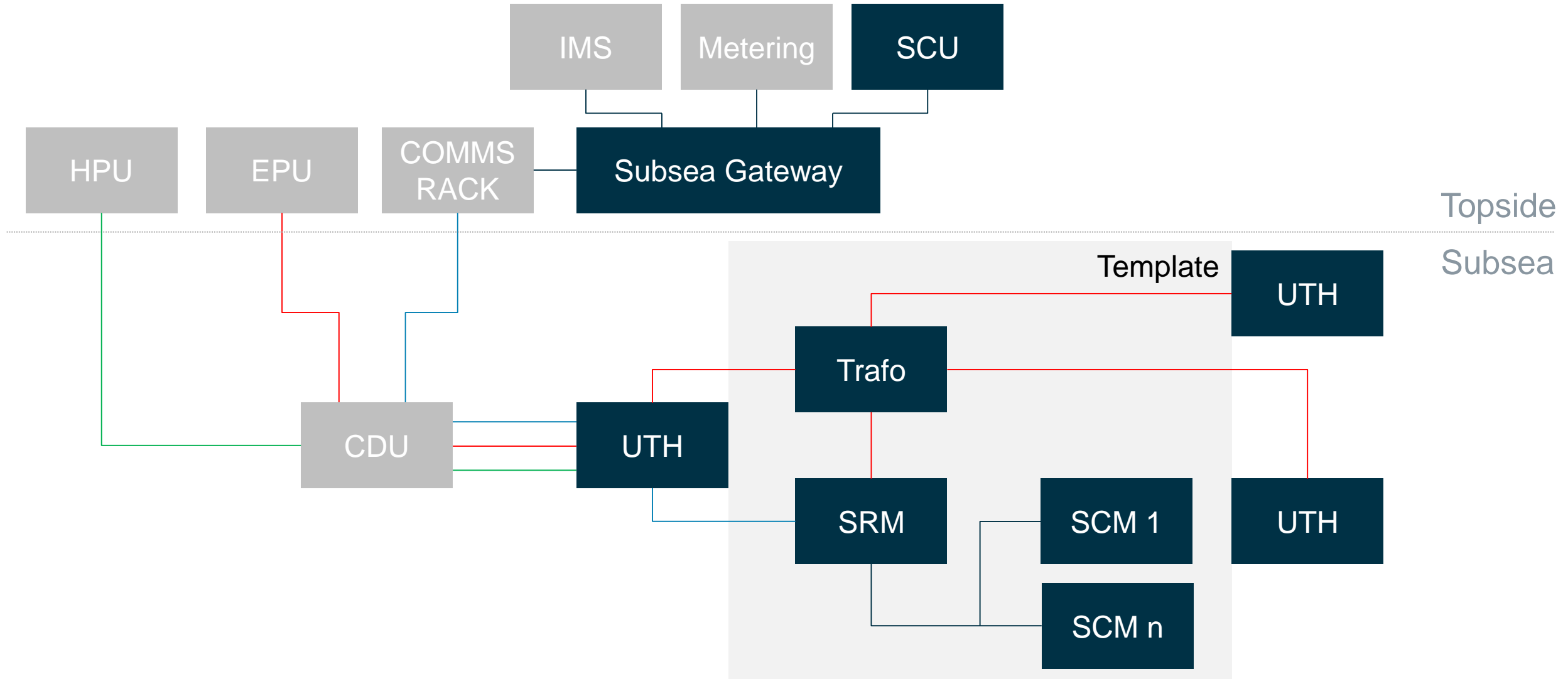
- AC Highway = AC/FO
- 250 km reach capability
- Total system capacity of 20kW
- 3kV AC 50/60Hz
  - 3-phase (triad)
  - Single phase (quad)
- 3kV J-box with wet mate termi
- Subsea Trafo Pod
  - 3kV to 400V/500V
  - 500V switches and local distr
  - FO router



# Johan Castberg SPCS

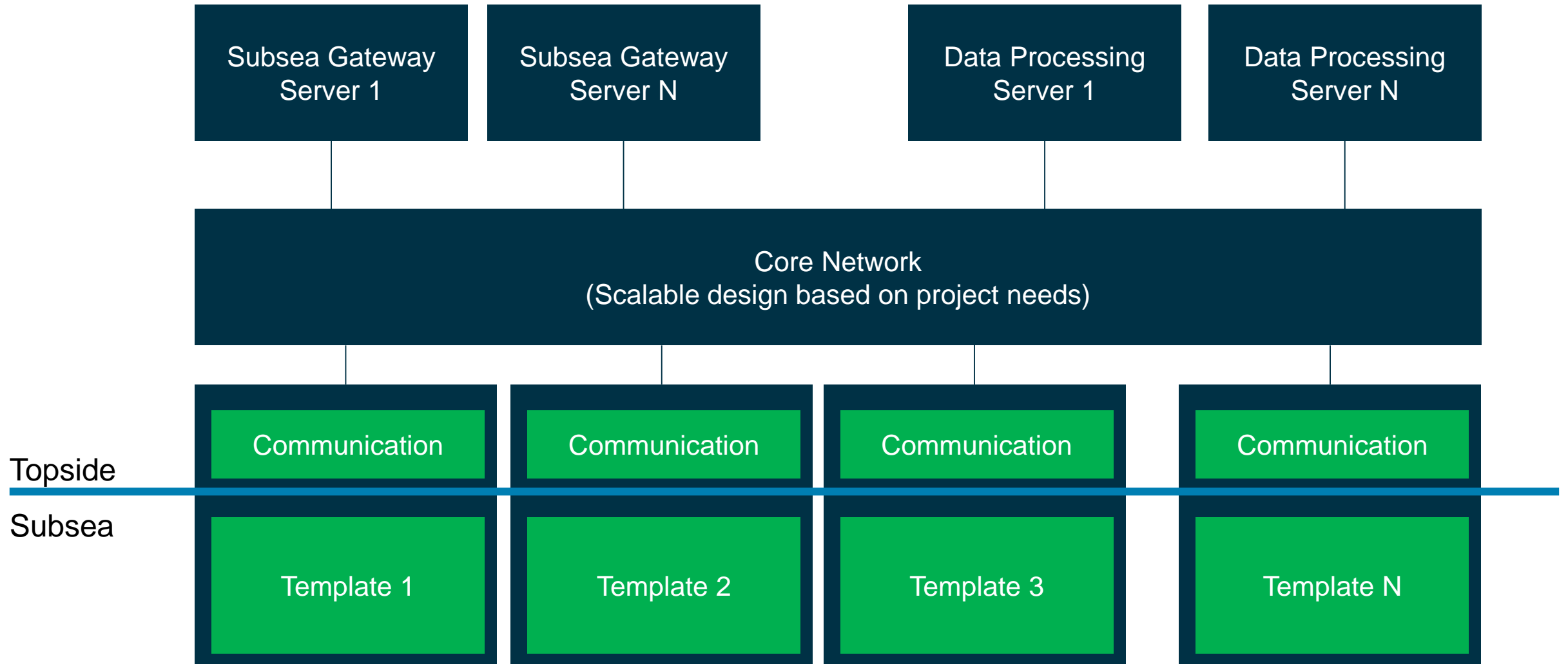


# Askeladd SPCS



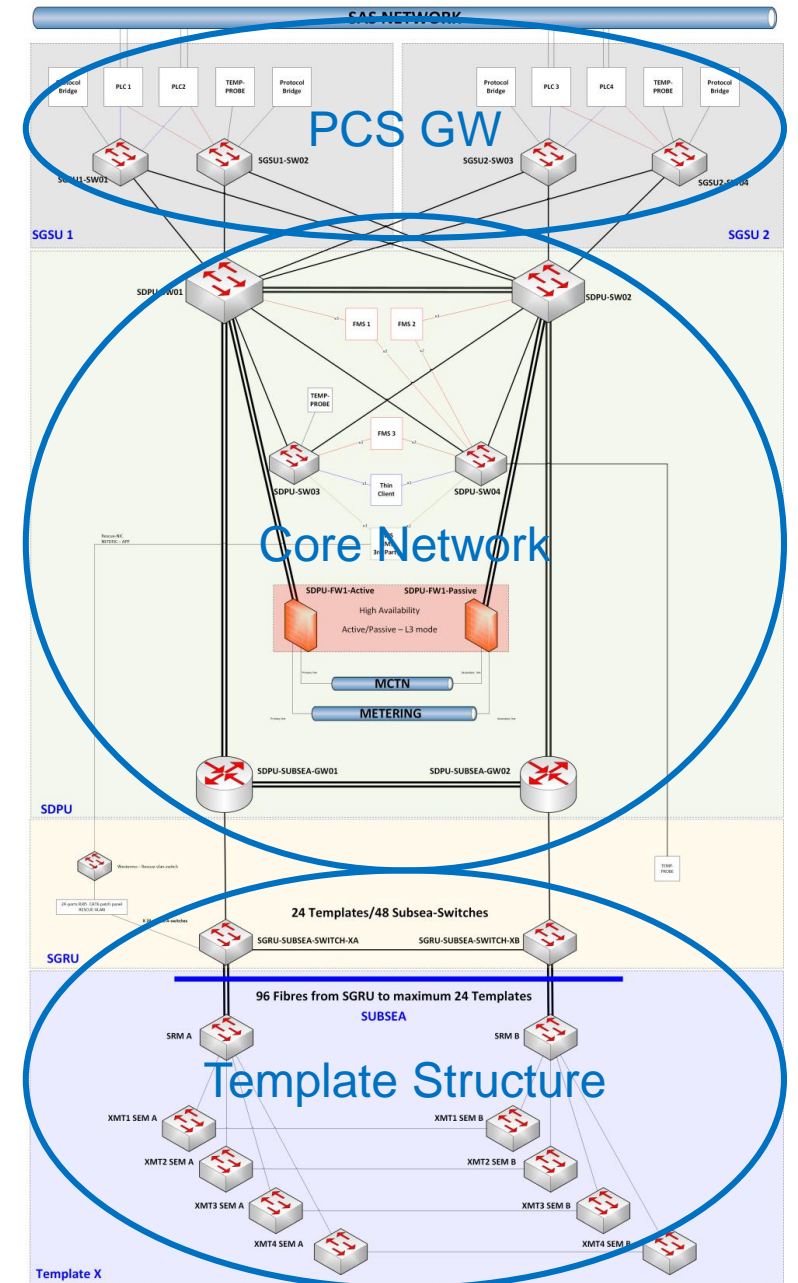


# Scalable System Architecture



# Scalable System Architecture

- Goal is to have a functional split of the system to cater for a scalable architecture.
- Each domain can be scaled and/or duplicated based on the functional design
- E.g. Subsea template structure is duplicated for the number of templates, while the core network is scaled to support the required connections and throughput.
- Clear interfaces is kept between the functional domains to be able to keep the overall architecture the same.
- Scalable between small and big projects.
- Duplicated domains can be managed with minimal configuration and testing effort.
- Scaling simplifies documentation and testing. Flexibility in terms of HW used during testing



# Power systems

Johan Castberg

DCFO  
Power Feed Equipment

DCFO  
Power

12kV DC

Topside

DCFO  
NODE

400V DC

SRM

400V DC

SCM

DCFO  
NODE

400V DC

SRM

400V DC

SCM

Subsea

Askeladd

EPU

3kV AC – 3 phase

Topside

TRAFO

600V AC

SRM

500V AC

SCM

600V AC

SRM

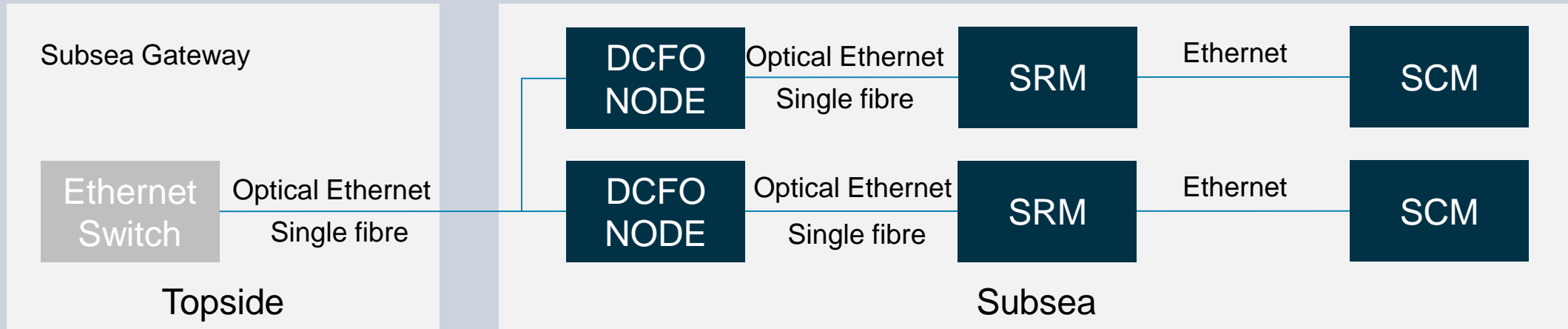
500V AC

SCM

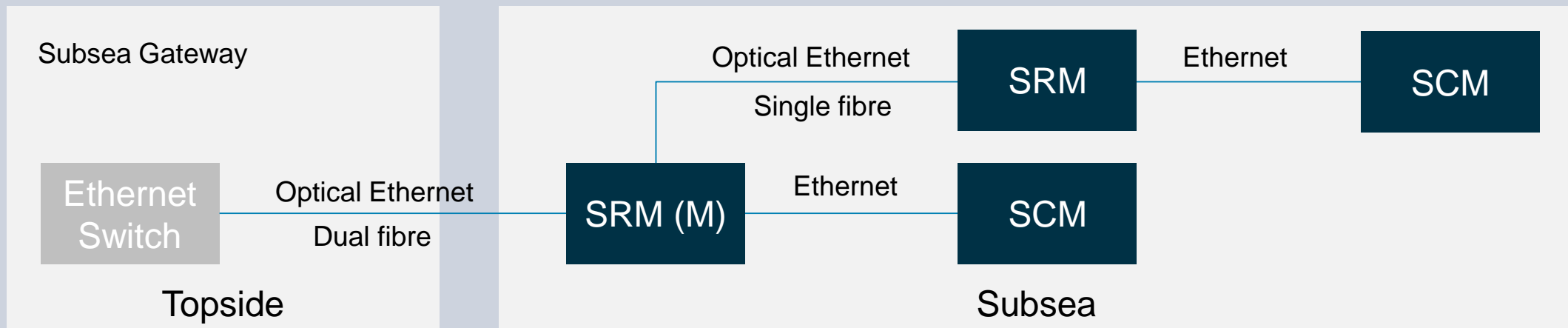
Subsea

# Comms systems

Johan Castberg



Askeladd





# Vectus Power & Communications

## Power Supply Module

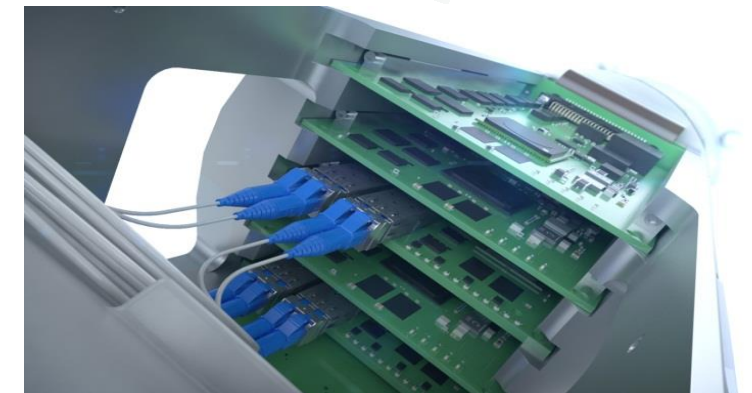
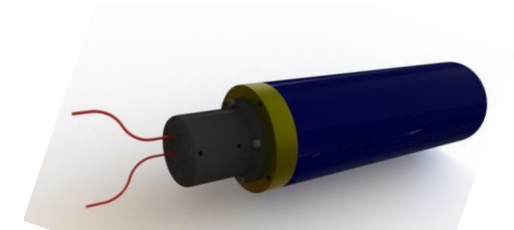
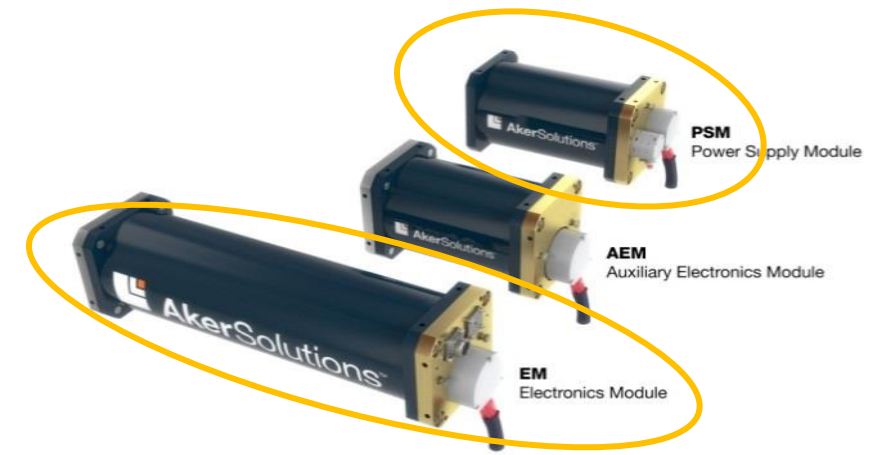
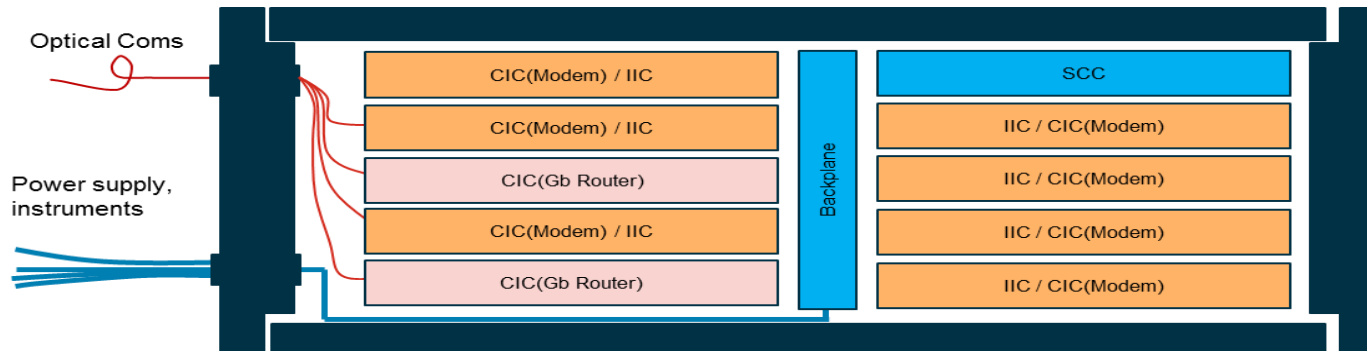
- Wide Range Input power
- 200 to 900V AC / 280 to 1200V DC

## Power Filter Module

- Contains the power filters for CPS
- 600V AC Rated

## Electronics Module

- Contains modems & communications routing electronics
- Multiple modem options/configurations including Optical & Copper



# Vertical XT Standardization



XT

## Johan Castberg (5in x 7in)

### Oil Production FCM

- MPFM
- PT/TTs
- Erosion probe
- SPFM
- Sand detector
- Chokes position

### Water Injection FCM

- SPFM
- PT/TT
- Choke position

### Gas Injection FCM

- SPFM
- PT/TT
- Choke position

### Gas Production CBM

- WGFM
- PT/TT
- Corrosion-erosion monitor
- Sand detector
- Choke position
- El. actuators

- Standard XT with well specific configuration in FCM
- Standard SCM with SIIS L1, SIIS L2, SIIS L3 and IWIS interfaces to cater for different needs

# Questions?



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