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IRSO, Vancouver Canada

First purpose build research vessel for Northern Ireland

The story

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History of RVs

RV Lough Foyle	RV Corystes	Purpose build RV
		
1989	2005	2027
43m converted French fishing trawler	52.3m purpose built acoustically silent FRV (2nd hand)	52.8m multipurpose new RV

General principles/drivers informing design

- Operational requirements and capabilities (current & future)
  Fisheries focus → wider marine environment/multi-purpose
- Operational area, range, endurance
- Seakeeping abilities – stable working platform (roll reduction system)
- Silent notation (requirements of ICES 209), DP1
- Incorporation of latest, but proven technologies – support future science strategy
- Environmental sustainability - carbon emissions/environmental impact
- Financial sustainability:
  - *Maintenance and other cost over 30-year lifetime*
  - *Maintain or improve fuel efficiency*
  - *Minimise crewing requirements*
  - *Insurance cost – risk profile*
  - *Attractiveness to 3rd party charter*

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RV *Corystes vs New RV*

	RV Corystes	New Ship
Length	52.25 m	52.8 m
Breadth/Beam	12.80 m	14.00 m
Gross tonnage	1280 t	~1900 t
Draught	5 m	5.4 m
Accommodation	16 crew/11 scientist	12 crew/ 12 scientists
	25 cabins	19 cabins + hospital
Lab area	68 m^2	~104 m^2
Endurance	20 days	25 days
Range	9000 nm	6000 nm
Cruise speed	10	11
Max speed	12	12.5
Drop keel	No	Yes

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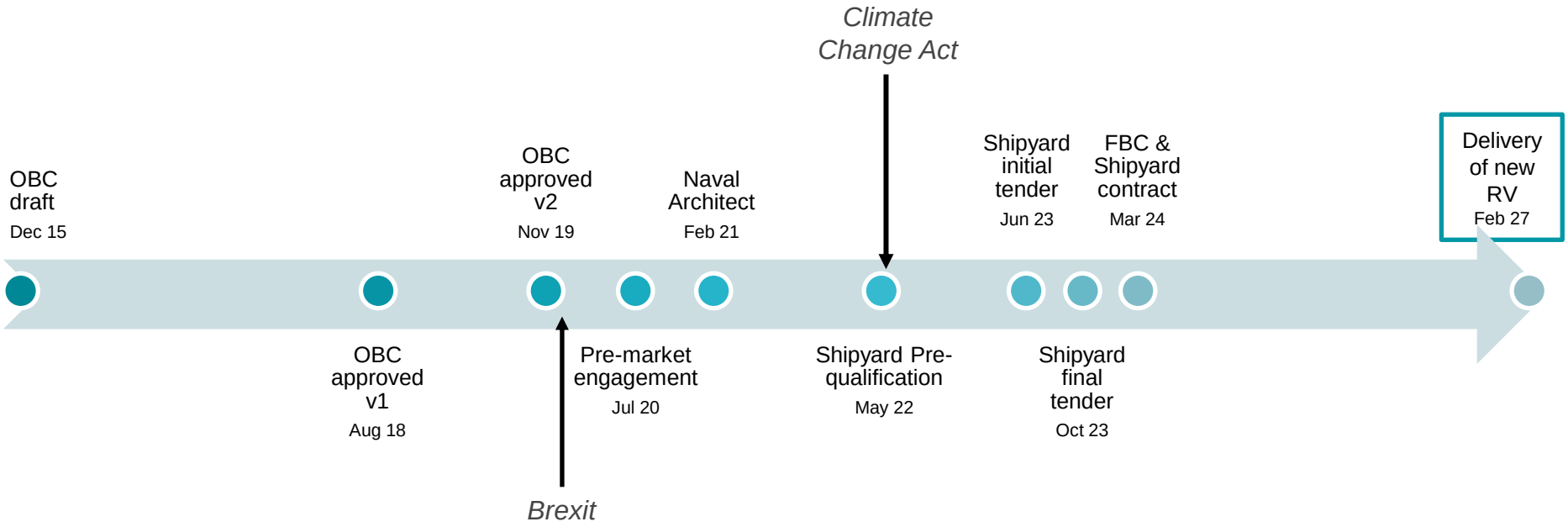
Timeline ~ 11 years!



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Challenges

- Priority for the project
- Governance and drivers for this (risks, VFM)
- Uniqueness of project – in-house expertise and associated risks to individuals, but also challenges from generalists
- Strategic context & assessment of need – policy change and timelines
- UK Ship building Strategy
- Decision making timelines and hoops
- Fisheries focus → wider marine environment
- Legislative vs policy strategy agenda

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Challenges

OBC Design Characteristic	FBC Design Characteristic
The vessel should be at least 45m in length	52.8 m length
Be capable of accommodating up to 9 scientists in single cabins	7 scientist cabins (2 single and 5 double)
Diesel-electric propulsion system >1000KW, twin engine, with either AC or DC propulsion system.	Hybrid propulsion system (battery and diesel-electric)

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Sustainability

- Cost
- Conducted review of alternative fuel (transition fuels to carbon net zero solutions)
- Review environmental impact of options and trade-offs
- Decision driven by available technology, operational profile, availability of supply

Hybrid with access to relatively green and improving electricity supply & recognised **need for significant midlife refit**

Best approach is still to **minimise fuel usage** (regardless of type)

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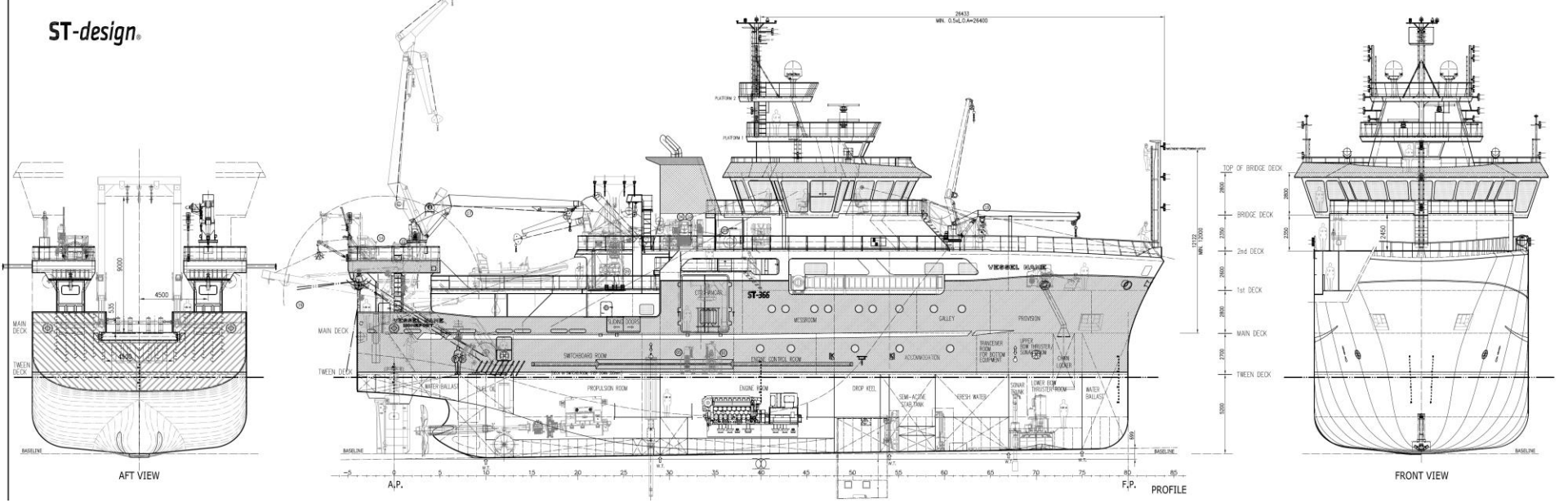
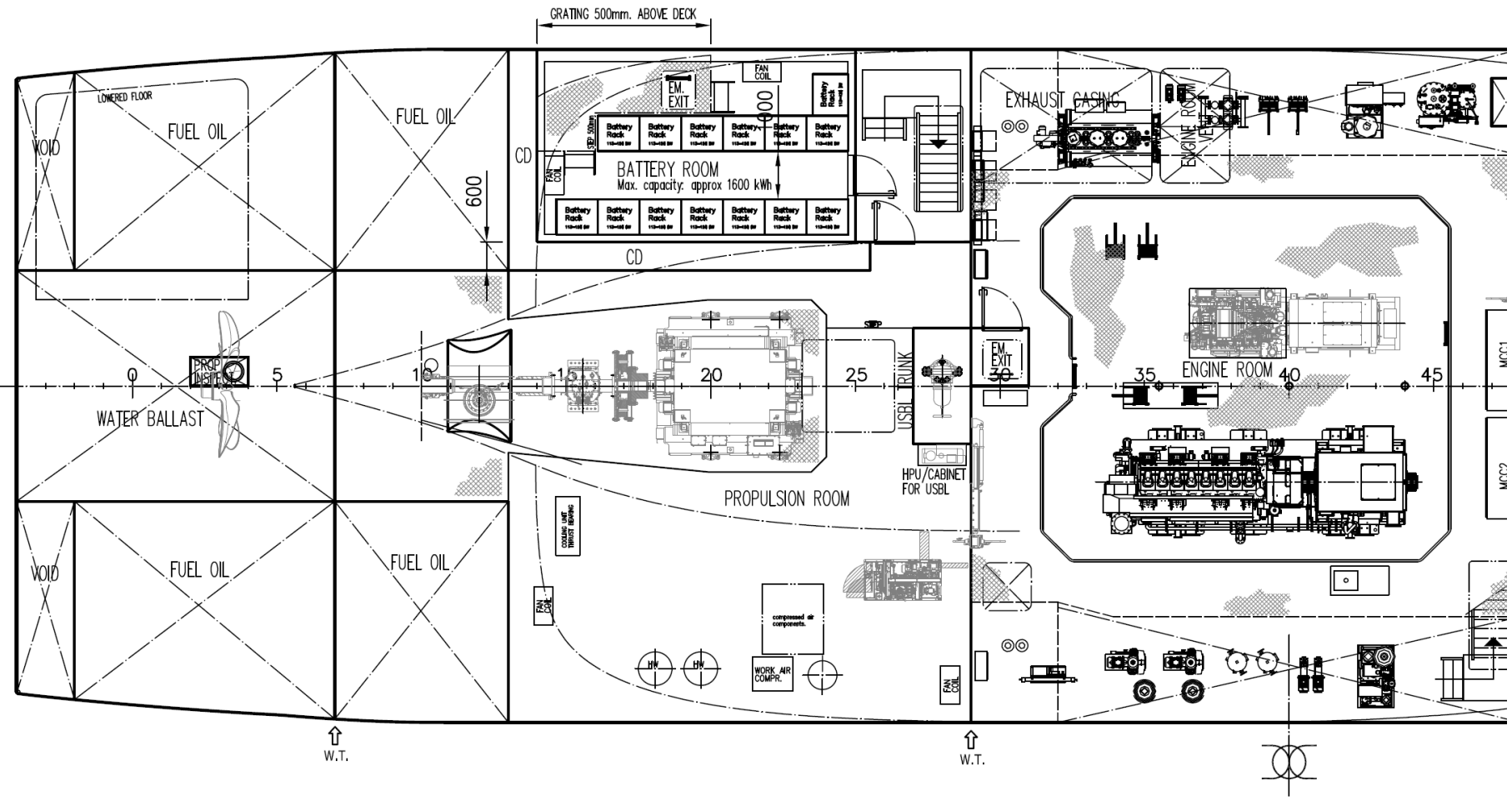


ST-366 design

- Classed under Lloyd's
- Build according to Ice Class 1E – no certificate issued
- DP1
- ICES 209
- Hybrid power (+)
- Able to run on both MDO and MGO


GRATING 500mm. ABOVE DECK
LOWERED FLOOR
VOID
FUEL OIL
FUEL OIL
600
CD
EM. EXIT
FAN COIL
Battery Rack
BATTERY ROOM
Max. capacity: approx 1600 kWh
CD
EXHAUST CASING
ENGINE ROOM VENT.
PROP. INSTL.
0
5
10
15
20
25
30
35
40
45
WATER BALLAST
USBL TRUNK
EM. EXIT
ENGINE ROOM
MCC1
MCC2
HPU/CABINET FOR USBL
PROPULSION ROOM
COOLING UNIT WITHOUT HEATING
FAN COIL
compressed air components.
WORK AIR COMPR.
HW
HW
FAN COIL
VOID
FUEL OIL
FUEL OIL
W.T.
W.T.

Notation...Notation...Notation ("The Bad")

- Hybrid power systems - integrating both traditional marine propulsion (diesel engines or gas turbines) with energy storage systems (ESS) like batteries
- System must provide redundancy in case of a failure of the main propulsion or auxiliary systems.
- Fail-safe modes should be implemented - ability to revert to traditional fuel-based power in emergencies.
- Sufficient redundancy in control, monitoring systems, and energy storage to maintain essential vessel operations.
- Vessels with the Hybrid+ notation must demonstrate significant energy efficiency improvements compared to conventional vessels. Data collection on fuel savings, emissions reduction, and overall system performance is encouraged, and it must be available for LR audits.
- Requires certain cyber resilience standards to ensure system security.
- Performance monitoring, testing, inspections? Periodic surveys required to maintain the notation.

*24.5.1 For **Hybrid Power** notation the performance of the system is to be such that in the event of a single failure operation of the system **may be interrupted** but is to be recoverable to a defined state bounded by time and magnitude.*
*24.5.2 For **Hybrid Power (+)** notation the performance of the system is to be such that in the event of a single failure operation of the system is to be **uninterrupted** with any degradation of performance agreed between the designers and Owners.*

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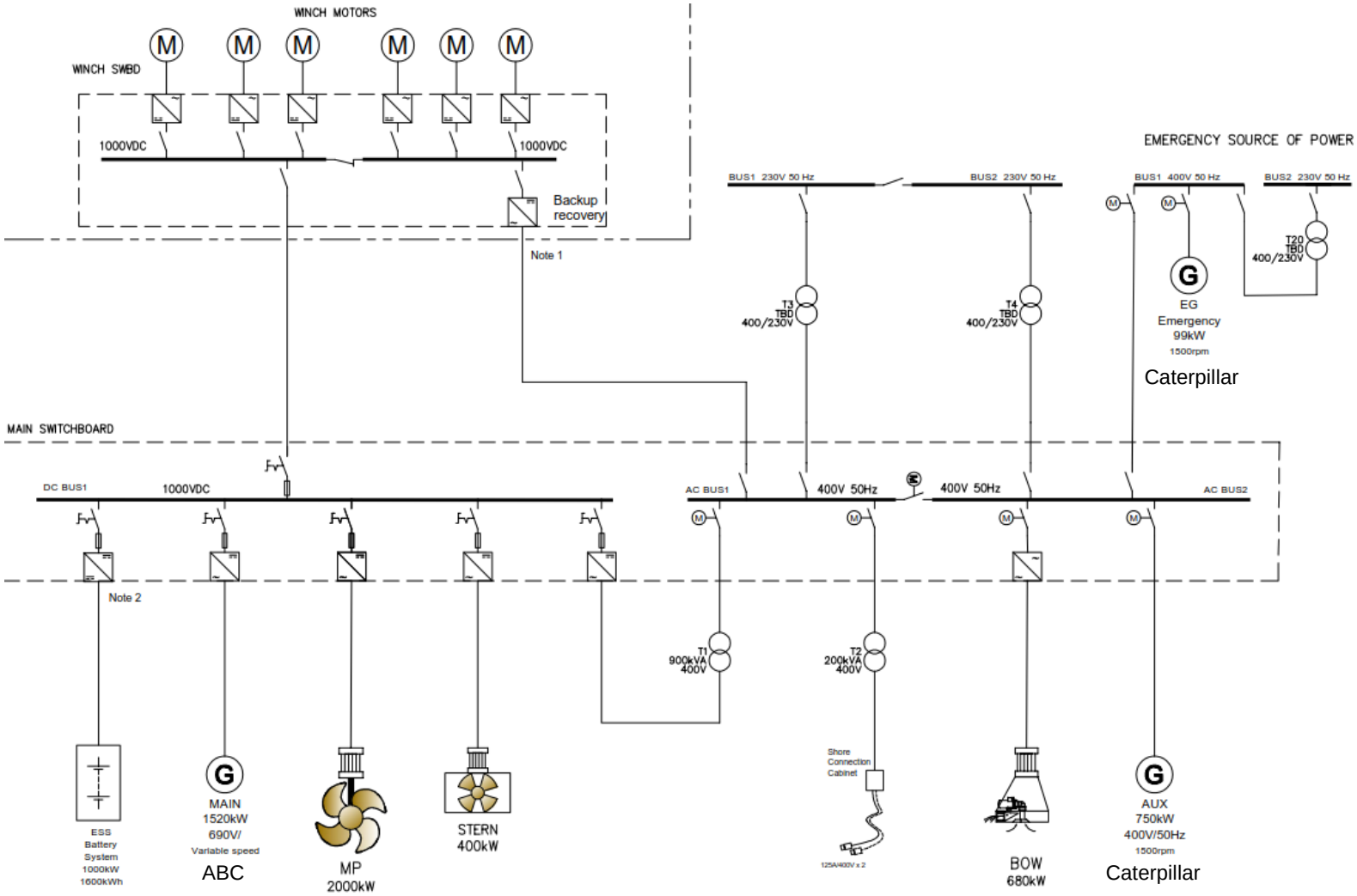
WINCH MOTORS
WINCH SWBD
1000VDC
1000VDC
Backup recovery
Note 1
EMERGENCY SOURCE OF POWER
BUS1 230V 50 Hz
BUS2 230V 50 Hz
BUS1 400V 50 Hz
BUS2 230V 50 Hz
T3 TBD 400/230V
T4 TBD 400/230V
T20 TBD 400/230V
EG Emergency 99kW 1500rpm
Caterpillar
MAIN SWITCHBOARD
DC BUS1
1000VDC
AC BUS1
400V 50Hz
400V 50Hz
AC BUS2
Note 2
T1 900kVA 400V
T2 200kVA 400V
ESS Battery System 1000kW 1600kWh
MAIN 1520kW 690V/ Variable speed
ABC
MP 2000kW
STERN 400kW
Shore Connection Cabinet
125A/400V x 2
BOW 680kW
AUX 750kW 400V/50Hz 1500rpm
Caterpillar

Risk mitigation - Expertise

Expertise always identified as risk and mitigated by:

- CPD to facilitate procurement
- Expert marine law firm to draft contract (Hayes&Boone), as well as general legal advice from CFR
- Naval architect/design consultant – Skipteknisk (one of the recognised top RV architects globally)
- Two independent marine consultants part of evaluation panel
- Specialist shipyard supervision
- Reputable shipyard through pre-selection that was heavily weighted on quality and proven experience
- Third party noise consultant through the shipyard contract
- Third party Paint/coating consultant through the shipyard contract
- Third party electrical consultant through the shipyard contract
- Third party EMC/EMI consultant (electromagnetic) through the shipyard contract
- Class authority for certification of build
- Marine Coastguard Agency (MCA) advice of conforming to health and safety requirements
- Technical advice is also available among the senior personnel appointed under the RV Corystes management contract (currently provided by Heyn Engineering).

International Research Vessel Operator (IRSO) Group– network and lessons learned
Gateway Review – internal peer review

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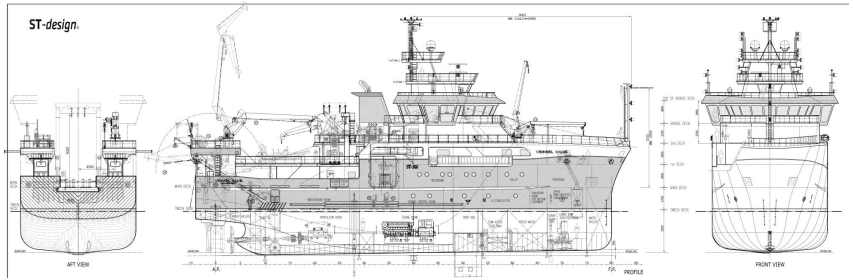
Risks mitigation – design, build, funding and operational

Design and build risk
- Naval architect, experienced project team in NI and other independent expertise
- Class certification requirements
- Robust specification
- Proven



Financial/funding risk
- Link to design and build risk
- Fixed price contract
- Builders Refund Guarantee for duration of build contract
- Builder's Risk insurance for duration of build contract
- Financial penalties defined in contract for late delivery or not meeting tolerance of key factors
- Contractual requirement to build against details within robust specification
- Weighted payment schedule

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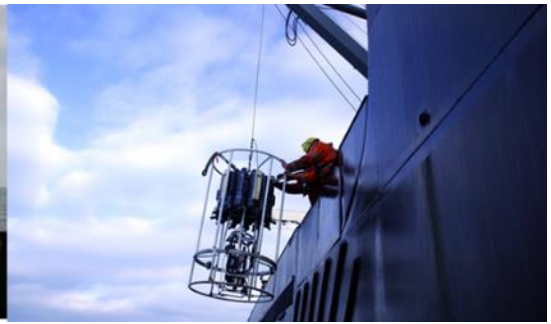
Risks mitigation – design, build, funding and operational

Defects post delivery
- Warranty period 12-24 months

Operational cost
- Key principles of design requirement
- Open tender
- Lower maintenance risk of new build

Technological obsolescence
- Design to provide maximum longevity
- Mid-life refit





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The good

- BC for provision of research vessel services for 30 years (Capital investment options – refurbish Corystes/2nd RV or fishing vessel, lease days at sea, new build/joint, 2nd hand RV, 2nd hand fishing vessel)
- Lessons learned from previous project(s) and proven success
  – RV Tom Crean take 2

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Lesson’s learned

- Pay attention to notification, especially if under development
- Budget enough for legal support
- Plan and budget for yard supervision
- Allocate sufficient internal staff resources
- Time – everything takes a lot longer than expected
- IT infrastructure
- Pros and cons to delays

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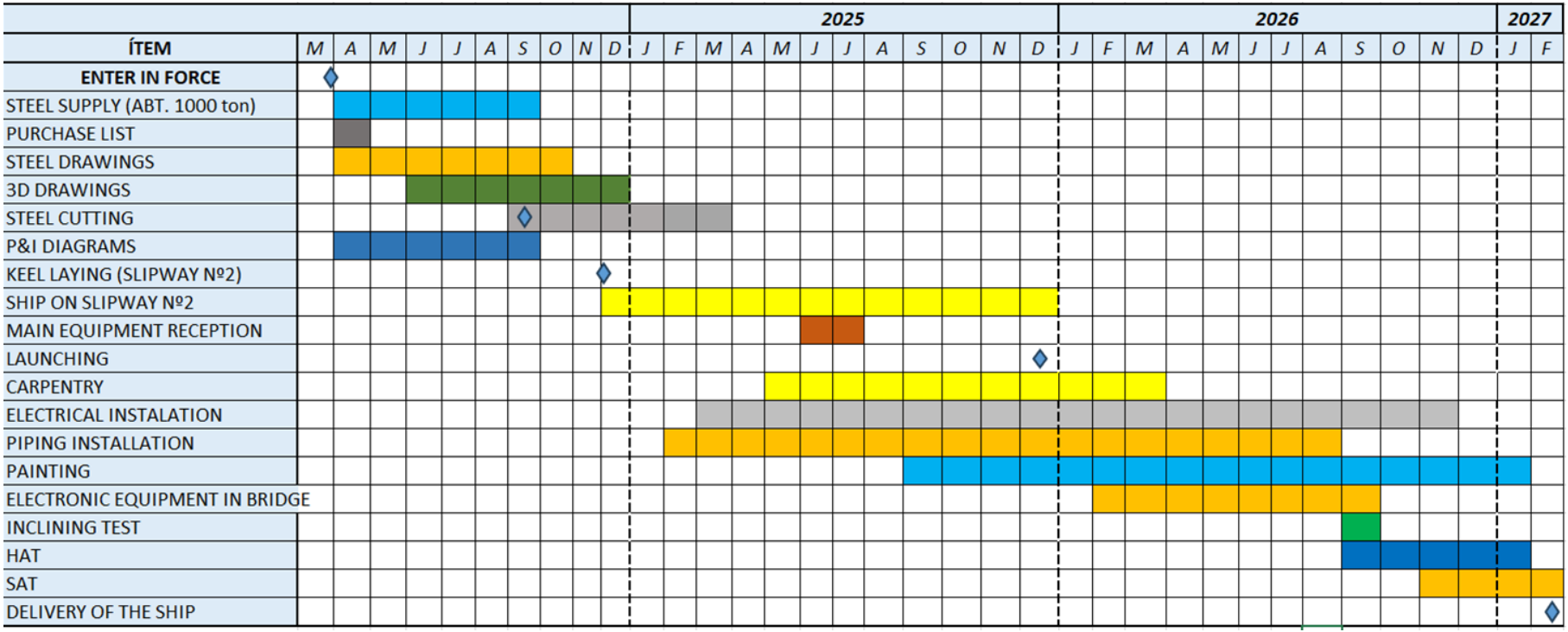
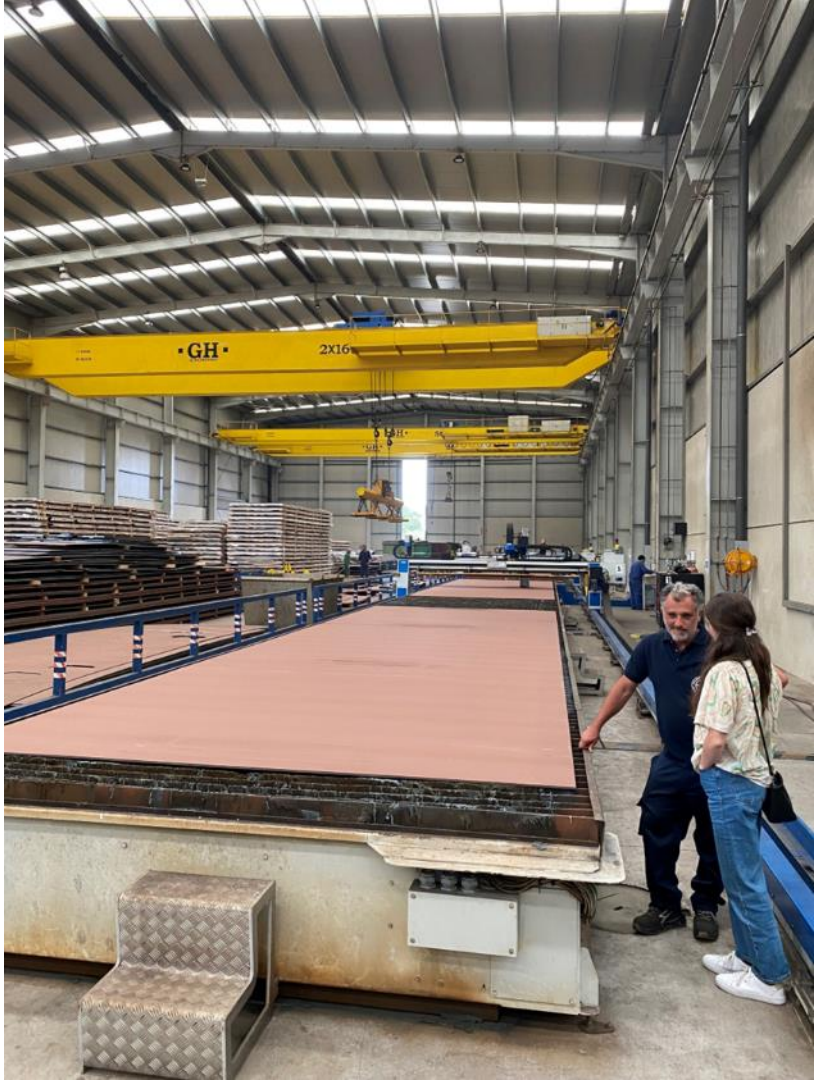
Shipyard - Armon

- £28.6M – 35 months

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Thank you

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