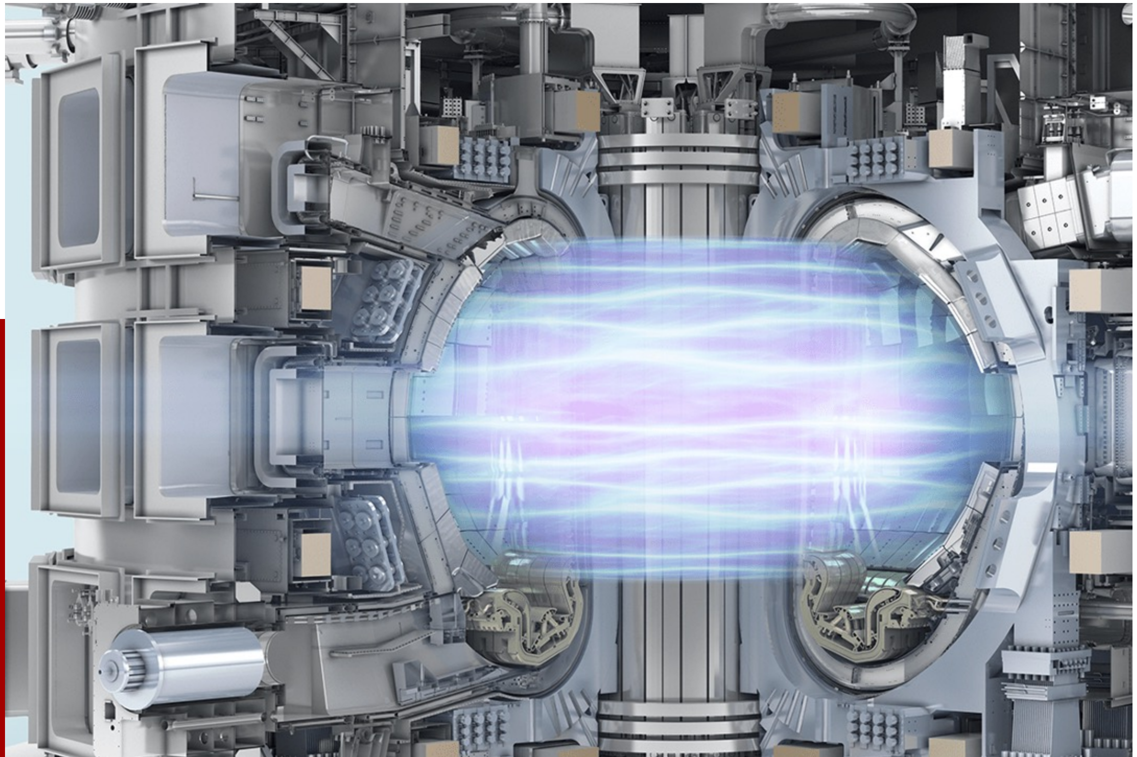
INPROCAP

Training 5

Exercise handouts



OMC: Exercise

Based on real challenges from the Lund AIMday Big Science Technology event

OMC exercise

Each group receives one challenge scenario.

Online:

- Group 1 – Scenario A
- Group 2 – Scenario B
- Group 3 – Scenario C

Onsite:

- Group 4 – Scenario D
- Group 5 – Scenario E
- Group 6 – Scenario F

Your task is to design a complete **Open Market Consultation (OMC) strategy** for your assigned case:

1. **Objectives** — What specific questions do you need the market to answer?
2. **Format** — Which OMC method(s) would you use? *(online/physical meetings, questionnaire, demos, etc.)*
3. **Timeline** — When would you conduct the OMC in your procurement timeline?
4. **Key Questions** — Draft **3–5 critical questions** to ask potential suppliers
5. **Risk Mitigation** — How will you ensure equal treatment and avoid conflicts of interest?

⏱️ **Time: 15 minutes for group work - 3 minutes per group for presentation**

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OMC Exercise

- **Only one member from group fill in the handout in google forms**

- **When filling out the form:**
  - **Scan QR code**
  - **Write your group number**
  - **Choose the given scenario from drop down menu**
  - **Fill in questions**
  - Only **one submission per group** — the coordinator submits on behalf of the team

- **Coordinator submits** the Google Form

- **Prepare a short presentation** (3 min) covering:
  - Your chosen OMC format and **why**
  - Your **top 3 questions** for suppliers
  - How you handle **equal treatment**

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Scenarios

Scenario	A: AI-Enhanced Quality Assurance	B: Cost-Efficient Antenna Panel Production	C: Scalable Time-of-Flight Detection System
BSO	European Spallation Source (ESS)	European Southern Observatory (ESO)	FAIR/GSI
Context	ESS is transitioning its Integrated Management System (IMS) from the project phase to long-term operations. Quality assurance documentation must be easily searchable, accurate, and consistently applied across projects and departments. Current systems lack intelligent search, cross-referencing, and document consistency checking capabilities.	Sub-millimetre radio telescopes like ALMA require parabolic reflector antennas with extreme surface accuracy (RMS deviation < 5–10% of operating wavelength). Future upgrades (ALMA2040) require at least a 3-fold increase in total antenna collecting area (~6,500 m² currently), making cost-effective antenna design and manufacturing critical.	The FAIR facility needs a Time-of-Flight (ToF) system for large apertures (40 cm diameter) at beam intensities too high for conventional scintillator-based detectors. Other accelerator facilities face similar challenges, creating significant market potential for a reliable and scalable solution.
Requirement	An AI-based solution that can perform qualitative document reviews, assess consequences of document changes in a large document structure, identify compliance gaps by comparing internal processes to regulatory frameworks, and support role-based task management. The solution must integrate with existing documentation systems.	Novel antenna design and manufacturing concepts that reduce normalised production costs to substantially less than 25% of current ALMA antenna costs (~120 k€ per effective m² at 3 mm wavelength). Target total collecting area: 20,000 m². Primary reflector diameter range: 10–30 m. Solutions may include off-set parabolic configurations, additive manufacturing, or 3D metal printing of precision panels.	A commercially viable Cherenkov-based ToF detector system with large aperture capability, suitable for high-intensity beams. The system should include a mechanism for constant liquid exchange in the radiator material. Manufacturing methods and materials must enable commercial production at scale.
Challenge	The transition from project to operations involves challenges in documentation, role assignments, and regulatory compliance. No off-the-shelf AI tools are optimised for the specific context of a large research facility's quality management system. The solution must handle scientific, technical, and administrative documentation simultaneously.	Current production methods (CNC milling) are expensive and generate significant waste. The required surface precision is extreme, and scaling production while reducing costs demands fundamentally new manufacturing approaches. Drive system costs must be factored in to find the optimal reflector diameter.	Existing prototypes (tested at GSI) demonstrate feasibility but are not production-ready. No commercial supplier currently offers such a system. The transition from laboratory prototype to commercially manufacturable product requires identifying the right technologies, materials, and value chain partners.

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Scenarios 2

Scenario	D: PFAS-Free Cooling System Transition	E: Data-Driven Legionella Treatment in Cooling Towers	F: arge-Scale Carbon Fibre Vacuum Chambers for Neutron Experiments
BSO	FAIR/GSI	CERN	European Spallation Source (ESS)
Context	Upcoming EU regulations on PFAS and F-gases will restrict or ban many refrigerants currently in use. FAIR and GSI's complex infrastructure relies on large-scale, highly reliable cooling systems where the choice of refrigerant has major implications for system design. Replacing refrigerants later is difficult and costly.	CERN operates water-based cooling systems at 40–55 °C — a temperature range optimal for recovering waste heat but also favourable for Legionella growth. Current treatment relies on chemical biocides and is not data-driven, leaving room for optimisation in terms of reducing unnecessary maintenance stops, chemical usage, and environmental impact.	The HIBEAM/NNBAR experiment at ESS requires a 200 m long high-vacuum chamber with a 2 m diameter experimental section. Traditionally, beryllium is used for such chambers due to its low atomic mass and high particle transparency, but it is toxic, expensive, and difficult to machine — with no willing local suppliers.
Requirement	A comprehensive risk assessment of existing and planned installations, evaluation of PFAS-free and low-GWP refrigerant alternatives, and a strategic roadmap combining regulatory compliance, sustainability (including waste heat recovery and energy optimisation), and operational reliability. Solutions must be scalable across multiple cooling systems.	A measurement system and ecological population model to enable adaptive, AI-based Legionella treatment strategy. The solution should predict Legionella risk, optimise chemical dosing based on actual conditions, and reduce both costs and environmental impact while ensuring safe operation at flow rates exceeding 150 m^3/h — entirely without chemical additives if possible.	A large-scale vacuum chamber (2 m diameter, 6 m length experimental section) manufactured from carbon or carbon fibre composites, compatible with ultra-high vacuum (UHV) conditions. The solution must ensure structural integrity, vacuum tightness, and minimal wall thickness while maintaining performance. Vacuum-compatible coatings or surface treatments must be applicable without traditional baking methods.
Challenge	Different refrigerants require significant changes to system design, making later replacements difficult. The facility must balance regulatory compliance, environmental sustainability, operational reliability, and cost. Knowledge of natural refrigerant-based alternatives for large research infrastructure applications is limited.	Conventional chemical mitigation carries environmental and operational drawbacks. No existing commercial system combines real-time monitoring, predictive modelling, and adaptive dosing for Legionella control in large-scale research infrastructure cooling towers. Technologies of interest (UV-LED, ultrasonic, antimicrobial surfaces, hydrodynamic cavitation) have not been validated at this scale.	Manufacturing carbon fibre structures at this scale that meet UHV requirements is unproven. Key unknowns include outgassing behaviour of composite materials, scalable joining techniques for UHV applications, and surface treatment compatibility. No commercial supplier currently offers such a product for particle physics applications.

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OMC Exercise

Group presentations and discussion:

- Each group presents 3 minutes summary

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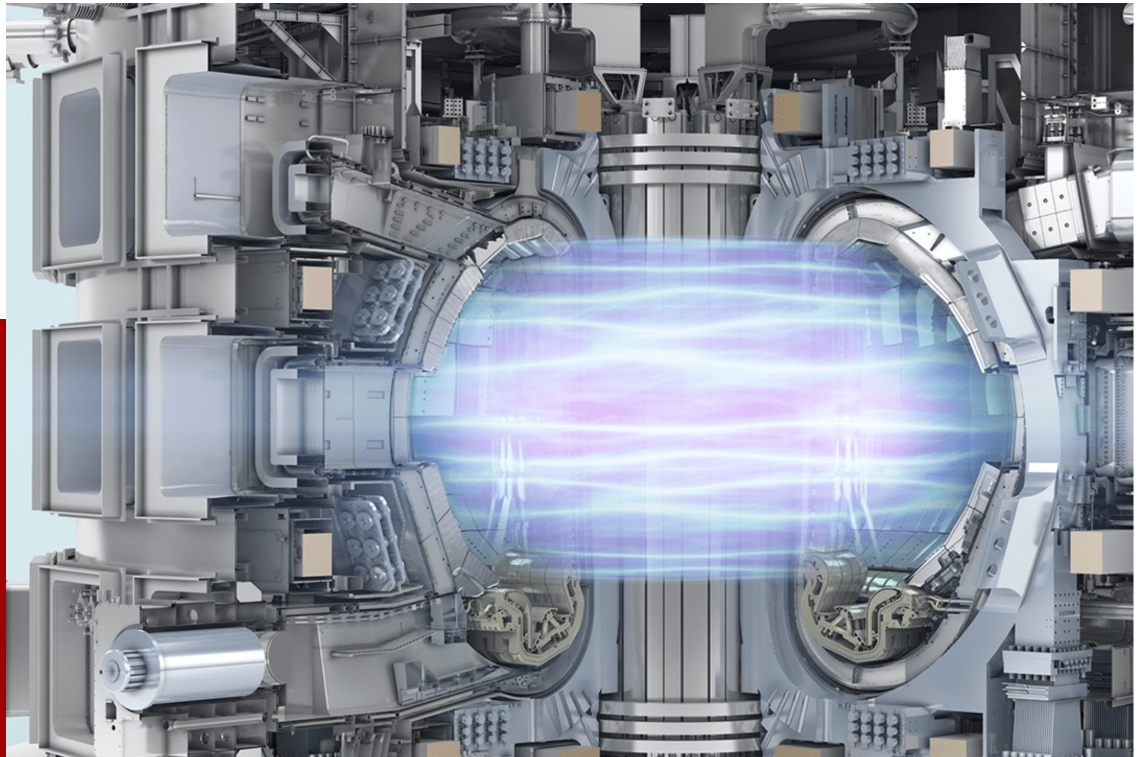

Business case exercise

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Business case exercise

All groups work on the **same scenario**: **Adaptive Legionella Control at CERN**

Objective:

- Build a convincing **business case** that would justify CERN management approving an **innovation procurement** for this challenge

Instructions:

- Open your group's number **Google Sheet** (onsite same/online based on received number)

https://docs.google.com/spreadsheets/d/1UCgnYkUnvdEFxmPrhv_xICikVehqfLUoV70xBSiBmTU/edit?usp=sharing

- Work only in your sheet.
- **Fill in the input cells only** (do not change formulas).
- Use the **Year 0–8 timeline** in the sheet:
  - **Years 0–2: PCP (R&D procurement)**
  - **Year 3: PPI (deployment procurement + implementation)**
  - **Years 4–8: Operations**

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Business case exercise

What to deliver:

Your sheet must show:

- Completed **Costs** table (Years 0–8)
- Completed **Benefits** table (Years 0–8)
- Automatic result: **NPV** (discount rate is pre-set at **3.5%**)

Time plan:

- **30 min** fill in the sheet
- **4 min** presentations - 4 **min per group**

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Assumptions

- Use this timeline for your sheet:
- **Years 0–2: PCP (R&D procurement)**
  - Put PCP supplier R&D contract payments here (plus buyer-side procurement/management effort).
  - In most cases, assume **no benefits yet** during PCP.
- **Year 3: PPI / deployment procurement + implementation year**
  - Put rollout costs here: integration, hardware, training, change management.
  - Benefits may start late in the year. For simplicity, you can start benefits in Year 4.
- **Years 4–8: Operations**
  - Put recurring OPEX here (support, maintenance, licences, staffing).
  - Benefits are typically strongest here.

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Assumptions

- **Year 0 is NOT buying an already developed solution.**
- With this exercise setup, **Year 0 is the start of the PCP**, meaning you are paying for **R&D and testing**.
- The "buying/rolling out" step happens later (here: **Year 3 PPI/implementation**).

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Scenario: Data-Driven Legionella Treatment in Cooling Towers

Scenario	**Data-Driven Legionella Treatment in Cooling Towers**
BSO	CERN
Context	CERN operates water-based cooling systems at 40–55 °C — a temperature range optimal for recovering waste heat but also favourable for Legionella growth. Current treatment relies on chemical biocides and is not data-driven, leaving room for optimisation in terms of reducing unnecessary maintenance stops, chemical usage, and environmental impact.
Requirement	A measurement system and ecological population model to enable adaptive, AI-based Legionella treatment strategy. The solution should predict Legionella risk, optimise chemical dosing based on actual conditions, and reduce both costs and environmental impact while ensuring safe operation at flow rates exceeding 150 m^3/h — entirely without chemical additives if possible.
Challenge	Conventional chemical mitigation carries environmental and operational drawbacks. No existing commercial system combines real-time monitoring, predictive modelling, and adaptive dosing for Legionella control in large-scale research infrastructure cooling towers. Technologies of interest (UV-LED, ultrasonic, antimicrobial surfaces, hydrodynamic cavitation) have not been validated at this scale.

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Business case exercise

Group presentations and discussion:

- Each group presents 4 minutes summary

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