

DEVELOPMENT OF A TEMPERATURE-CONTROLLED CLIMATE CHAMBER FOR LI-ION BATTERY CELL TESTING

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DOMINIK HANKE (E-GNITION)

MOTIVATION



- **e-gnition Hamburg** (TUHH's Formula Student team) builds a fully electric race car every year for international competition
- Car performance and reliability depend on **lithium-ion cells**, whose internal resistance, capacity, voltage behavior, and efficiency are all **temperature-dependent**.

PROBLEM



- Cell tests are currently not always carried out under strictly controlled thermal conditions
- Measurements scatter and are difficult to reproduce
- Temperature effects cannot be isolated or quantified
- Battery and energy-management design rests on uncertain data
- Uncontrolled conditions increase the safety risk when working with Li-ion cells

TARGET SPECIFICATIONS



Electrical isolation of the controlled environment: **$\geq 600V$**

Min. cooling power: **500W**

Max. preheating time: **1 hour**

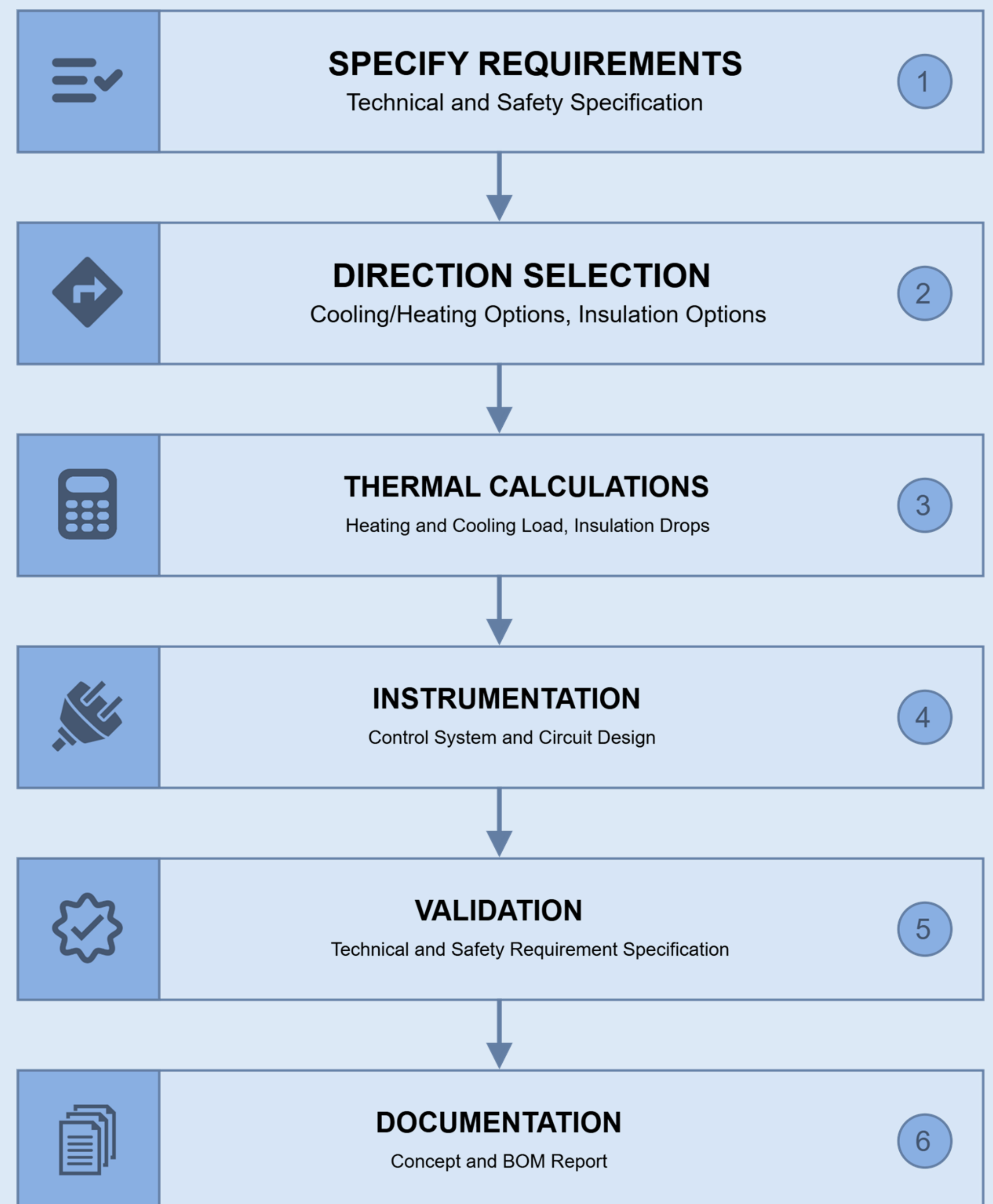
Min/Max temperature maintainable from 0-500W heat load: **$10^{\circ}C/50^{\circ}C$**

Max. BOM costs: **800 €***

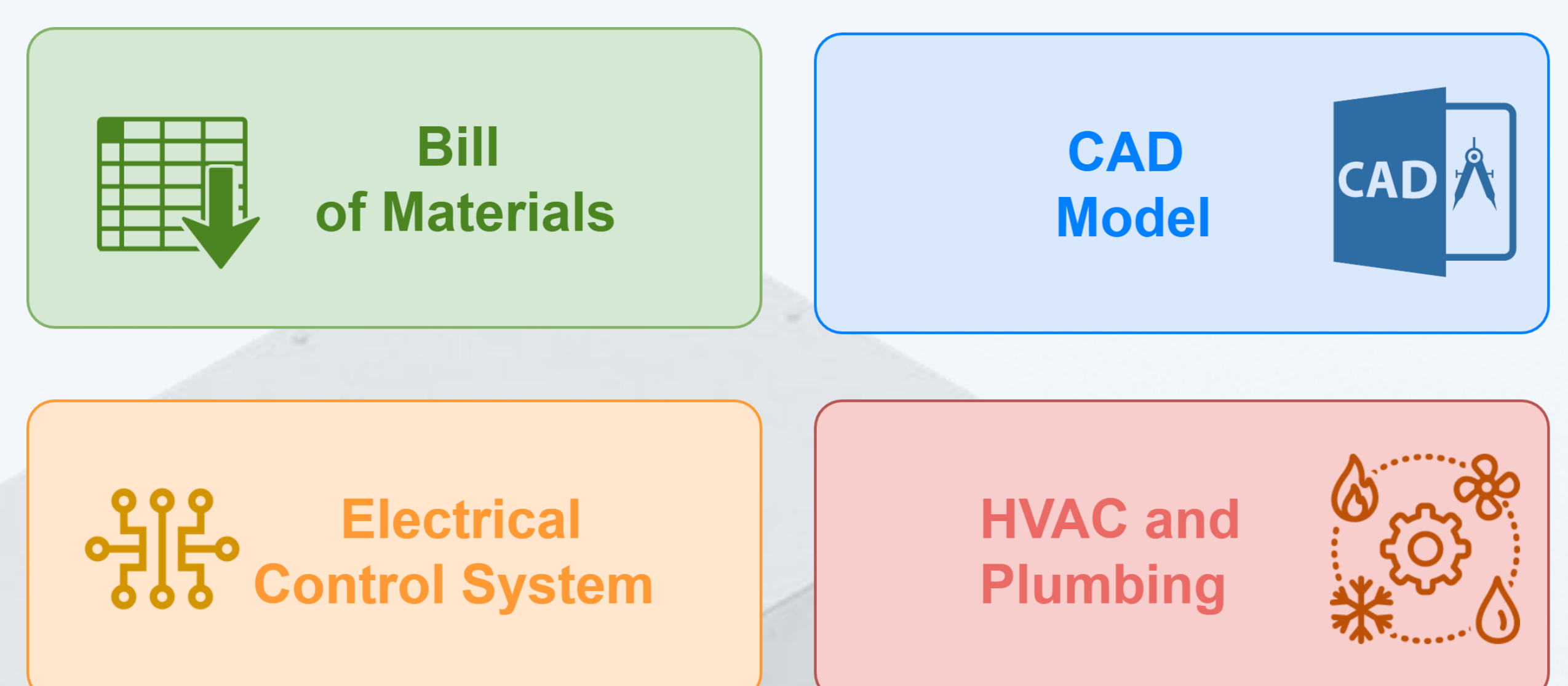
Temperature accuracy: **$\pm 0.5^{\circ}C$**

*Budget revised due to limitation concerning Refrigerants.

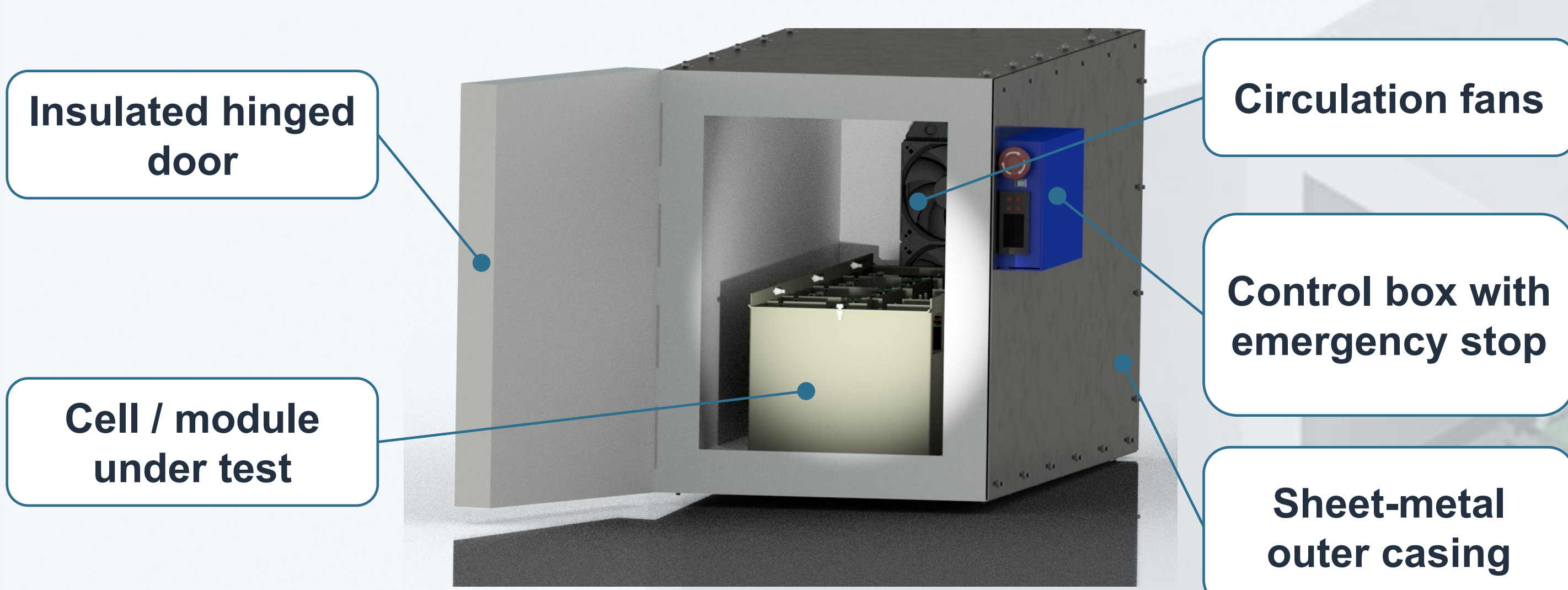
PROJECT FLOW



DELIVERABLES



DESIGN CONCEPT



- Insulated chamber body with heating and cooling
- Closed-loop temperature control with sensor feedback
- Safety interlocks and defined venting path

MEMBERS CONTRIBUTION



NOMAAN AKHTAR	Product Owner, Thermals
FARHAN AMIN	CAD Model, Thermals
SAHIL YADAV	Scrum Master, Electrical Design
JONY NATH	BOM and Pricing