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Flight crew performance during emergencies – Cockpit Display

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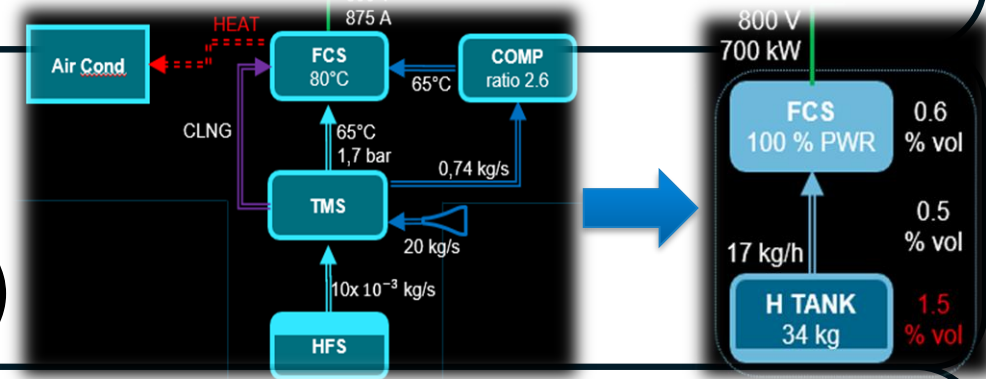


Objective

Develop usable cockpit displays and pilot procedures for a regional aircraft powered by batteries and a hydrogen fuel cell

Primary focus: Ensure safe aircraft management in abnormal and emergency situations

- electric engines
- electric system (Batteries, FCS, transfer and power control)
- cooling and heating
- indication and warning



- overheating battery
- malfunction of 2 batteries
- hydrogen leak

Cockpit Display

System pages

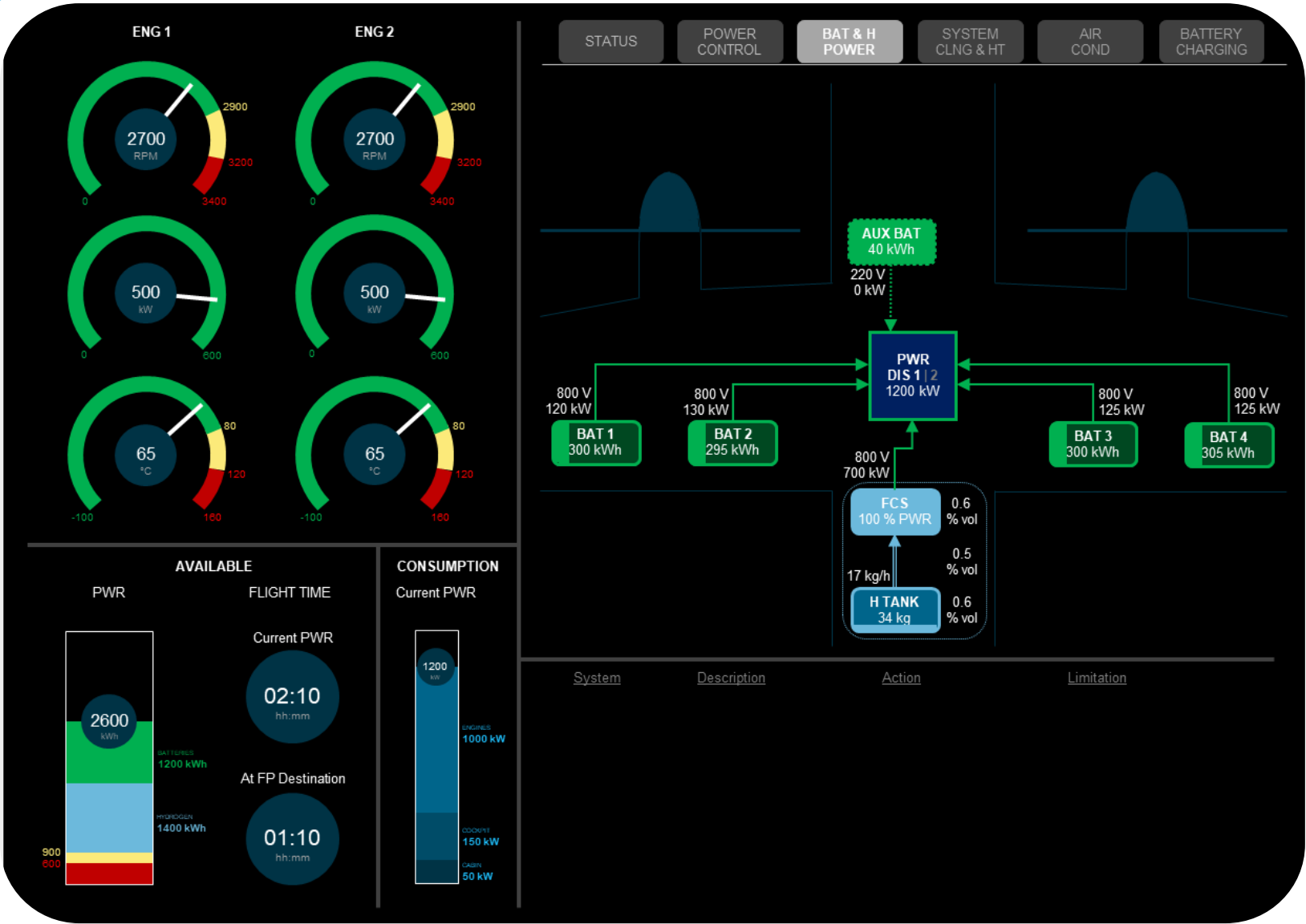


Engine indications

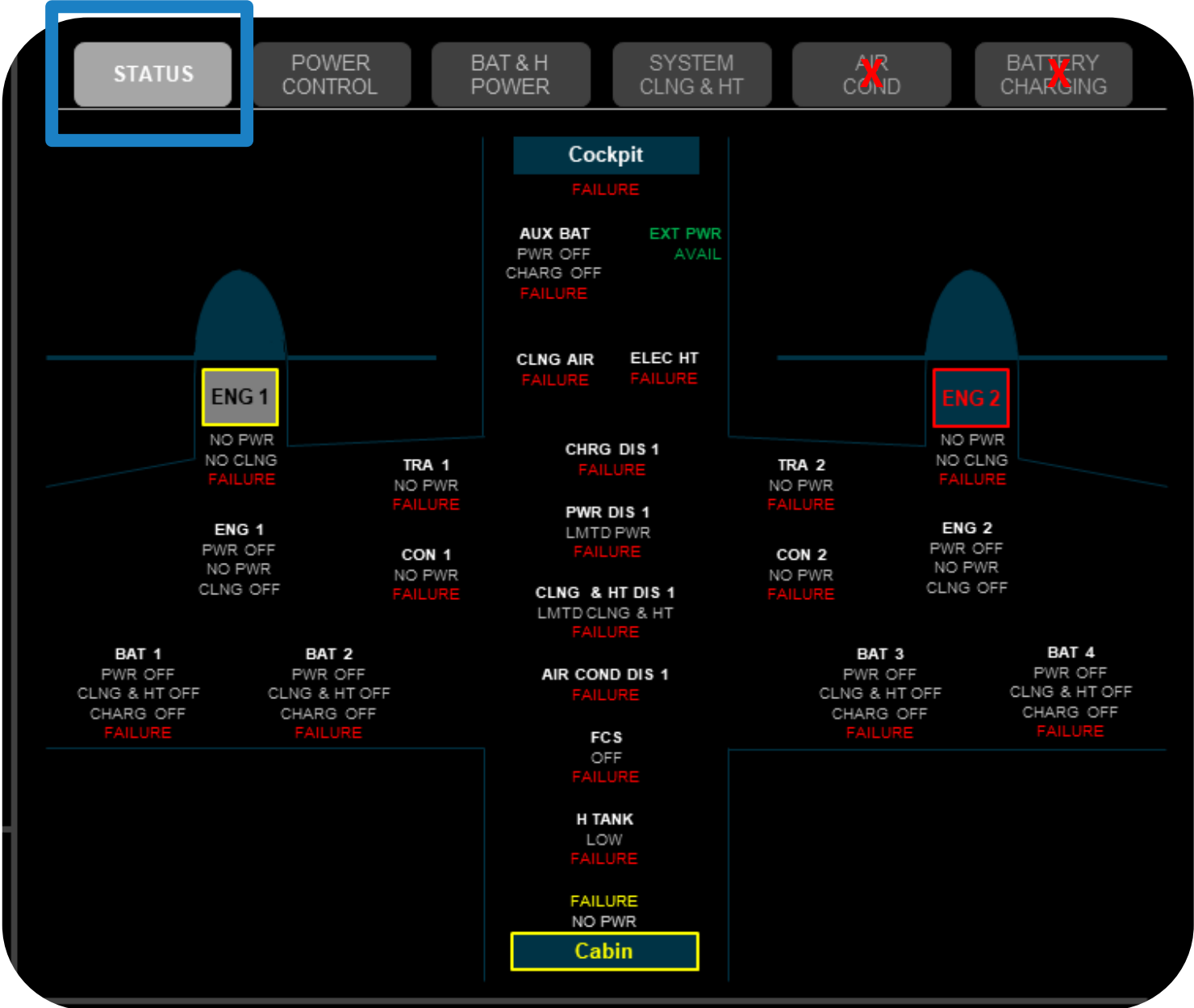
Hydrogen and Electric Power Indications

System indications

Warning, Action and Limitation Indications

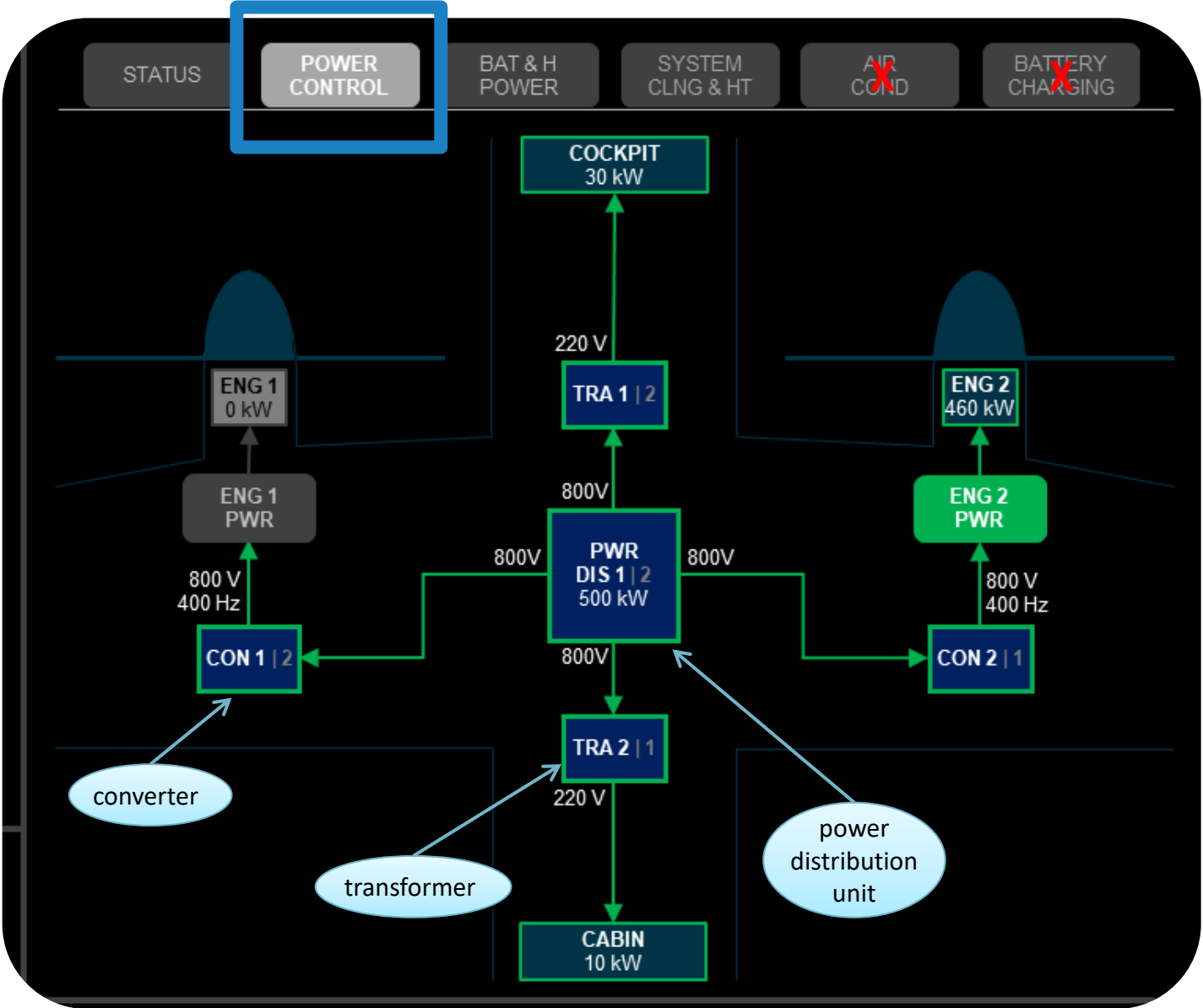


Cockpit Display – System Pages



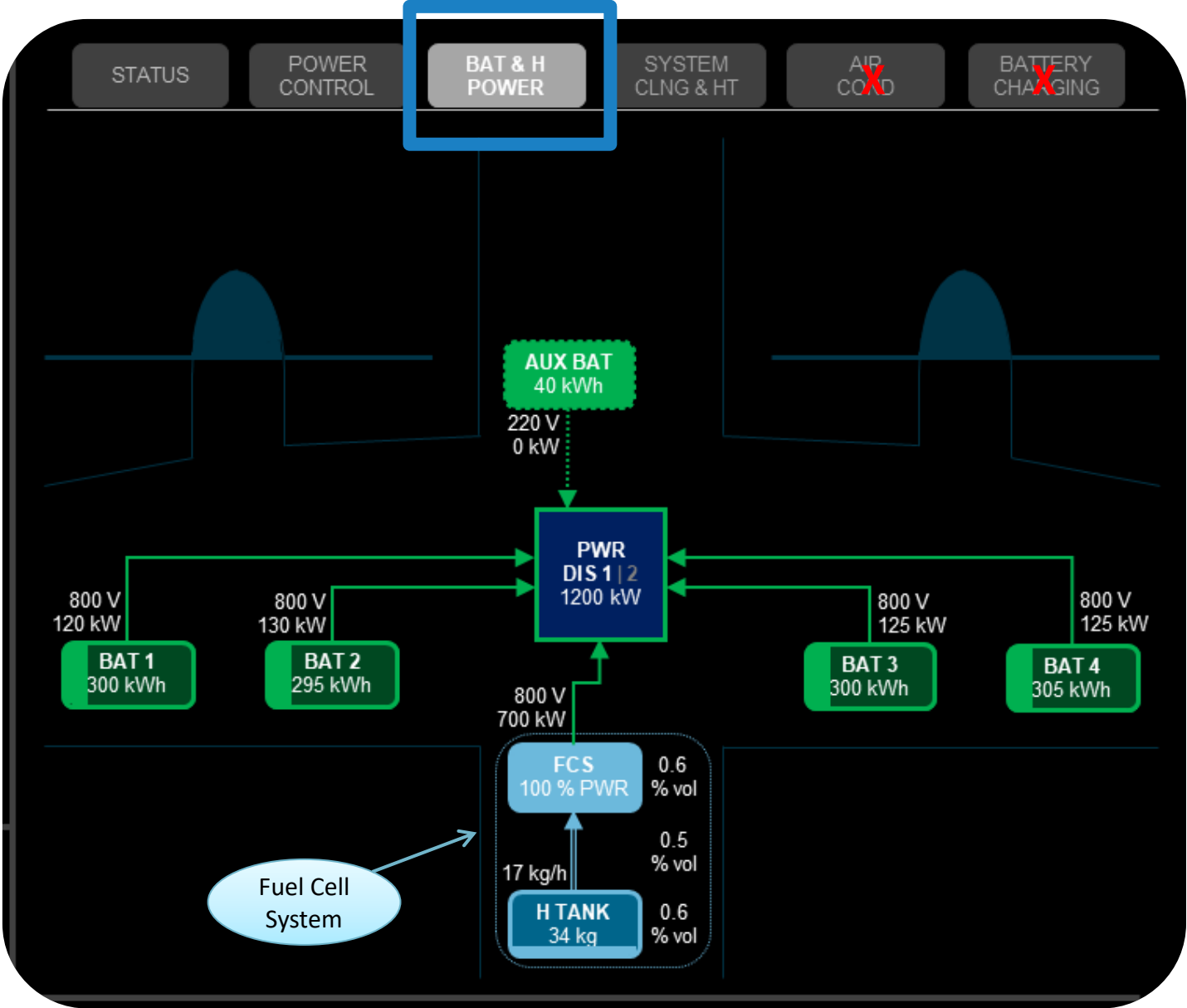
Quick
overview of all
system
components

Cockpit Display – System Pages



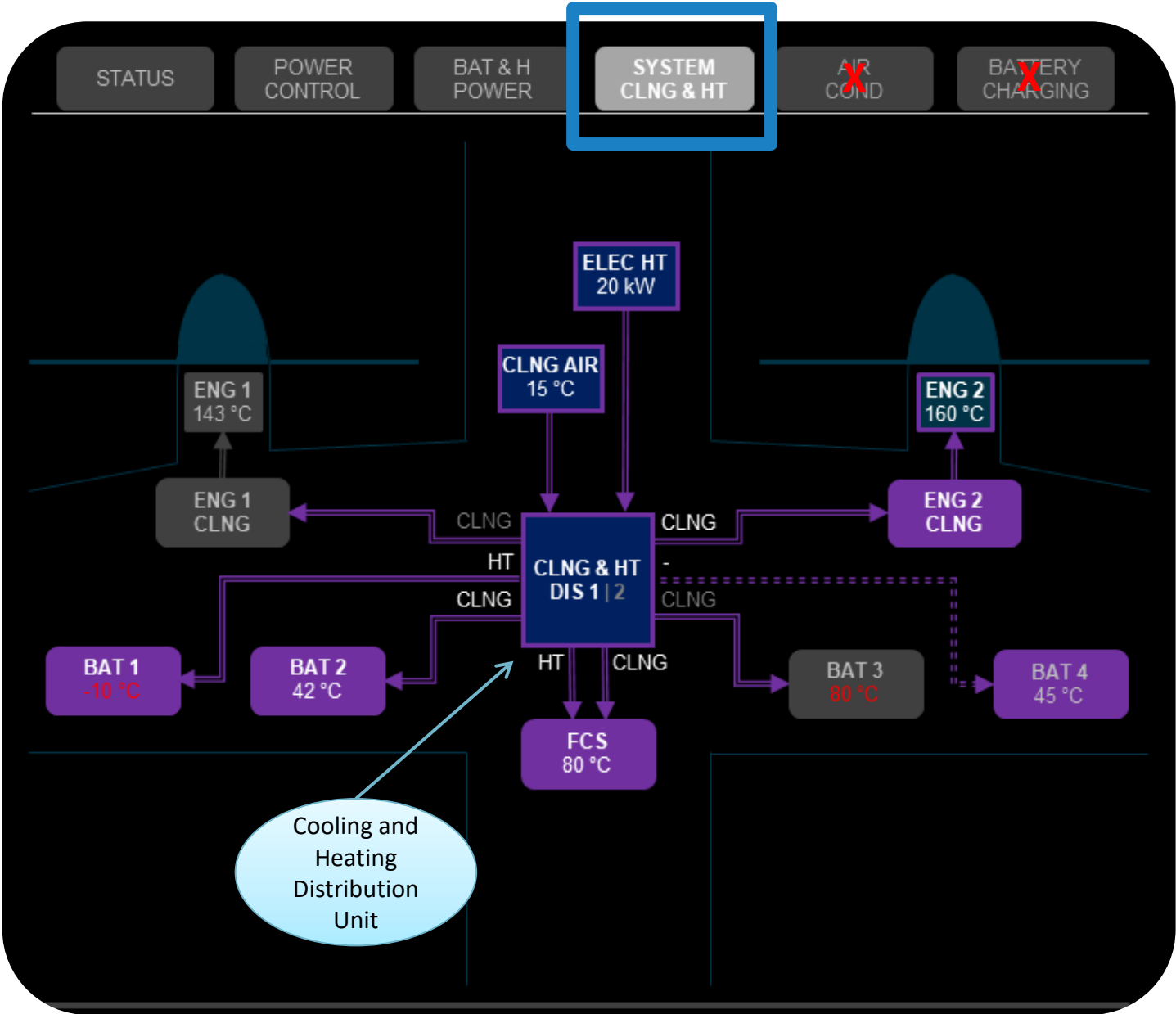
electrical
distribution and
transformation
system

Cockpit Display – System Pages



Battery and hydrogen supply to PWR

Cockpit Display – System Pages



Regulation of temperature (fuel cell, batteries, engines) via Cooling and Heating Distribution unit

Results

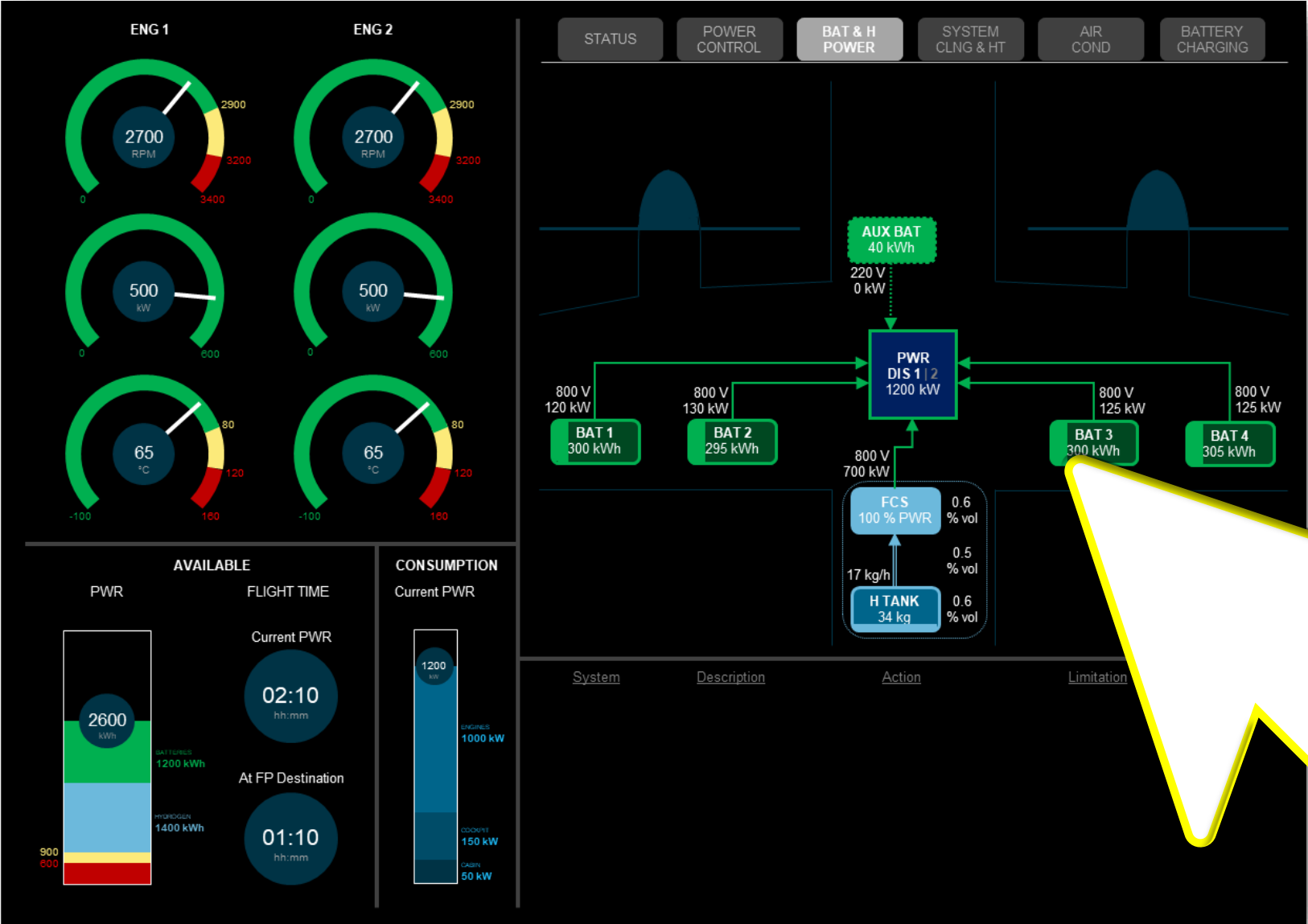
Pilots:

- responded positively to the setup
- were always aware of the current situation
- interpreted information on the display correctly
- followed the recommended procedures

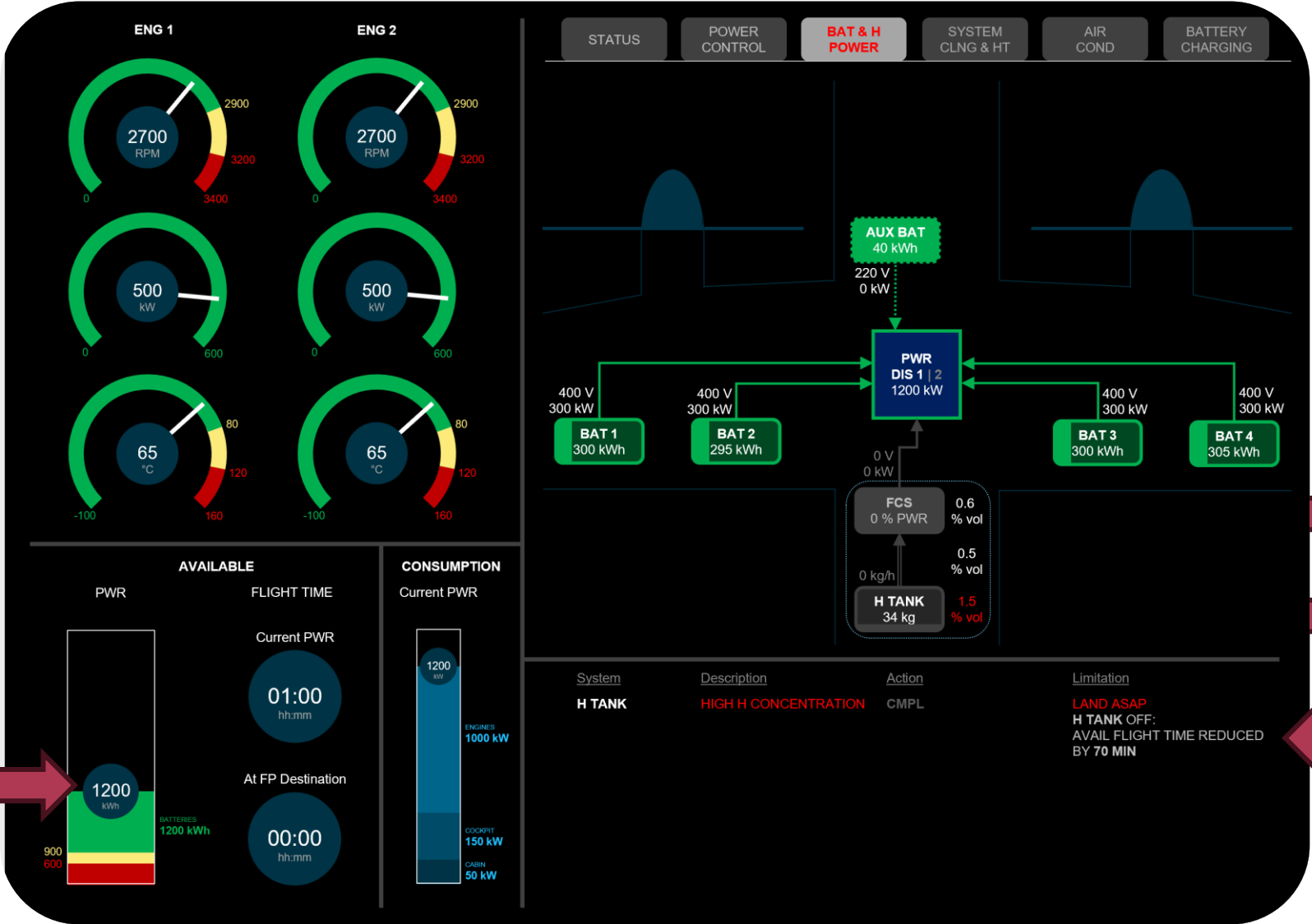
But:

- sometimes earlier guidance wished when threshold values are exceeded (to react more proactively)
- missing capability to disconnect specific consumer from the electric system to save energy
- more background information desired to assess situations to better support situational awareness and decision making

Cockpit Display- H₂ Leakage



Cockpit Display- H₂ Leakage

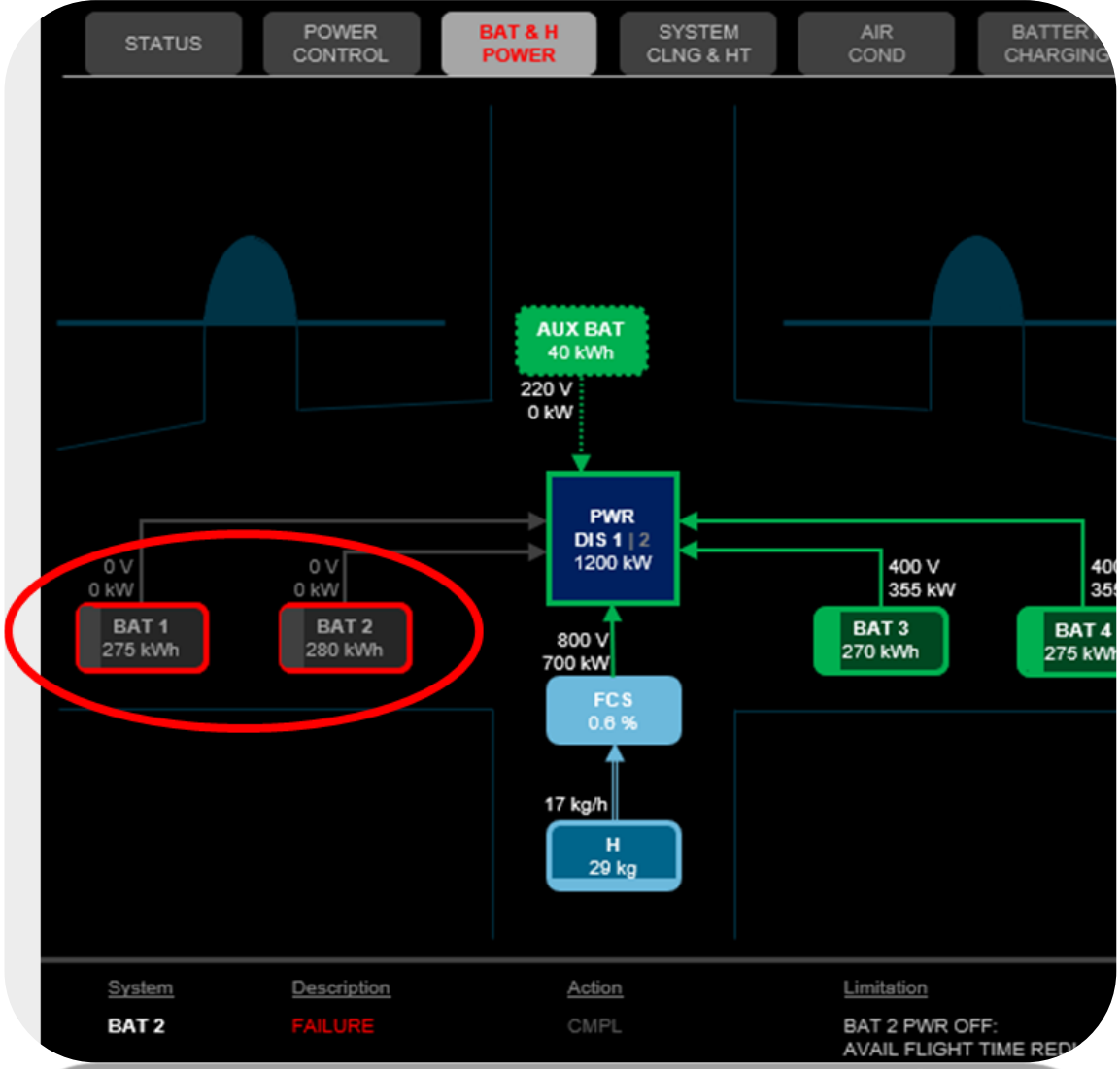
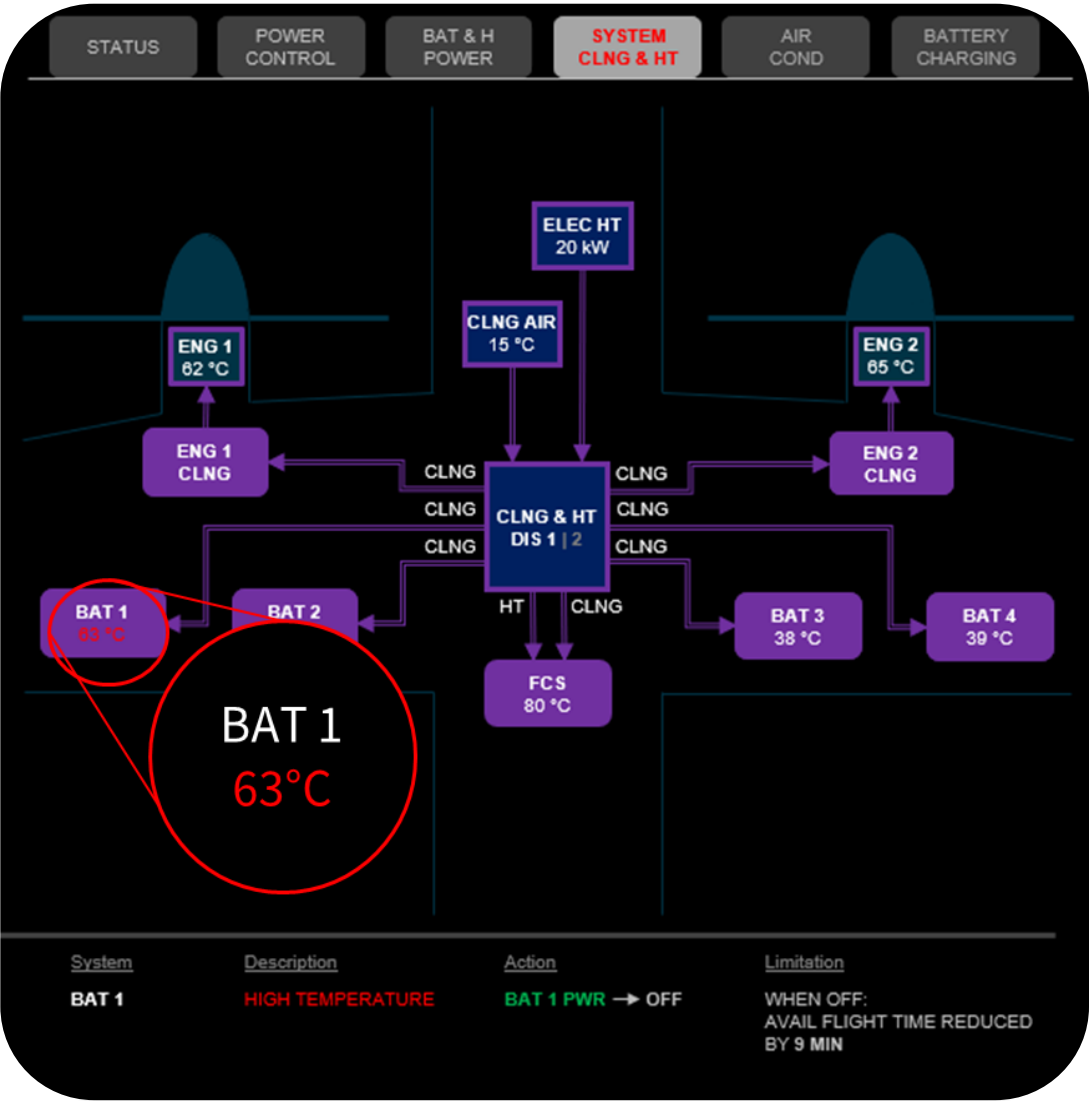


Reduced available power

Shut off FCS and H Tank

Flight Time reduced

Cockpit Display – 2 more scenarios





Consortium

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