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Equipment Procurement and Final Design for the MARVEL High-Grade Heat Extraction System (HGHES)

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Changing the World's Energy Future

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MARVEL Reactor: Design and Requirements

- MARVEL or Microreactor Applications Research Validation and Evaluation, is to be a first-of its kinds reactor that will create a testbed for future microreactors.
- One of the prime requirements for the MARVEL reactor is the ability for it to deliver high grade heat to end-users, in the form of the HGHES.

Design and Equipment Challenges

- All equipment involved with the system had to handle the high pressures (51 bar) and high temperatures (450C-530C) associated with the helium coolant.
- Due to the small scale, the thermal storage unit had to be specially designed to fit the smaller thermal output of the reactor
- Major collaborations were done with vendors on all major equipment pieces:
  - Blowers
  - Heat Rejection Units (HRU)
  - Commissioning Heater (H-1)
  - He/He Recovery HX
  - Thermal Storage Unit

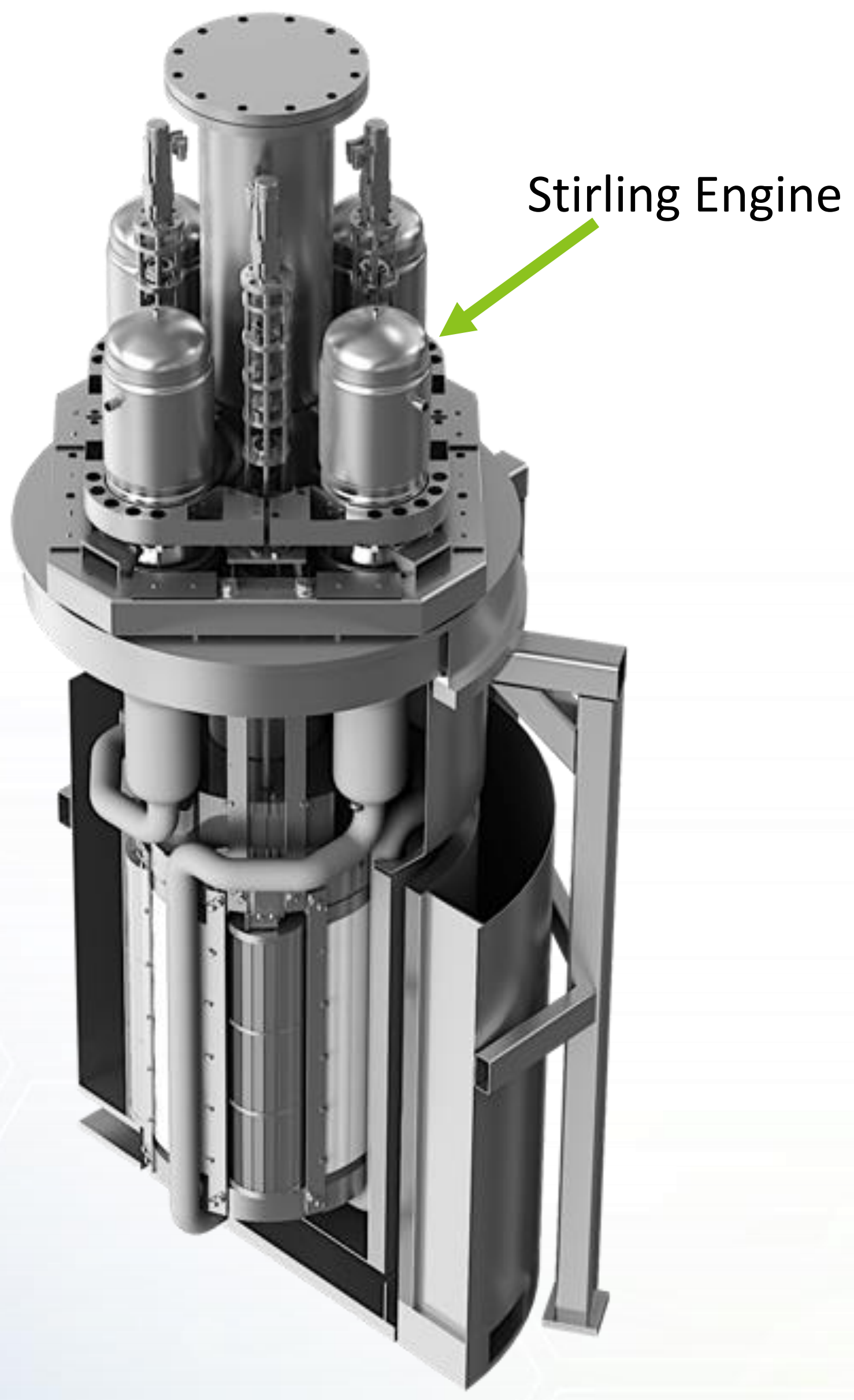

Figure 1: MARVEL reactor 3D model

HGHES Breakdown and Design

- The HGHES is designed to attach to the reactor at one of the Stirling engine locations as show in Figure 1. The heat from the reactor is then transported to a Thermal Storage Unit (TSU) through a helium coolant system.
- Shown in Figure 2, the system has two loops: a main thermal transport loop from the High-Grade Heat Exchanger (HGHX) to the TSU and a secondary blower loop to maintain the flow of the entire system.

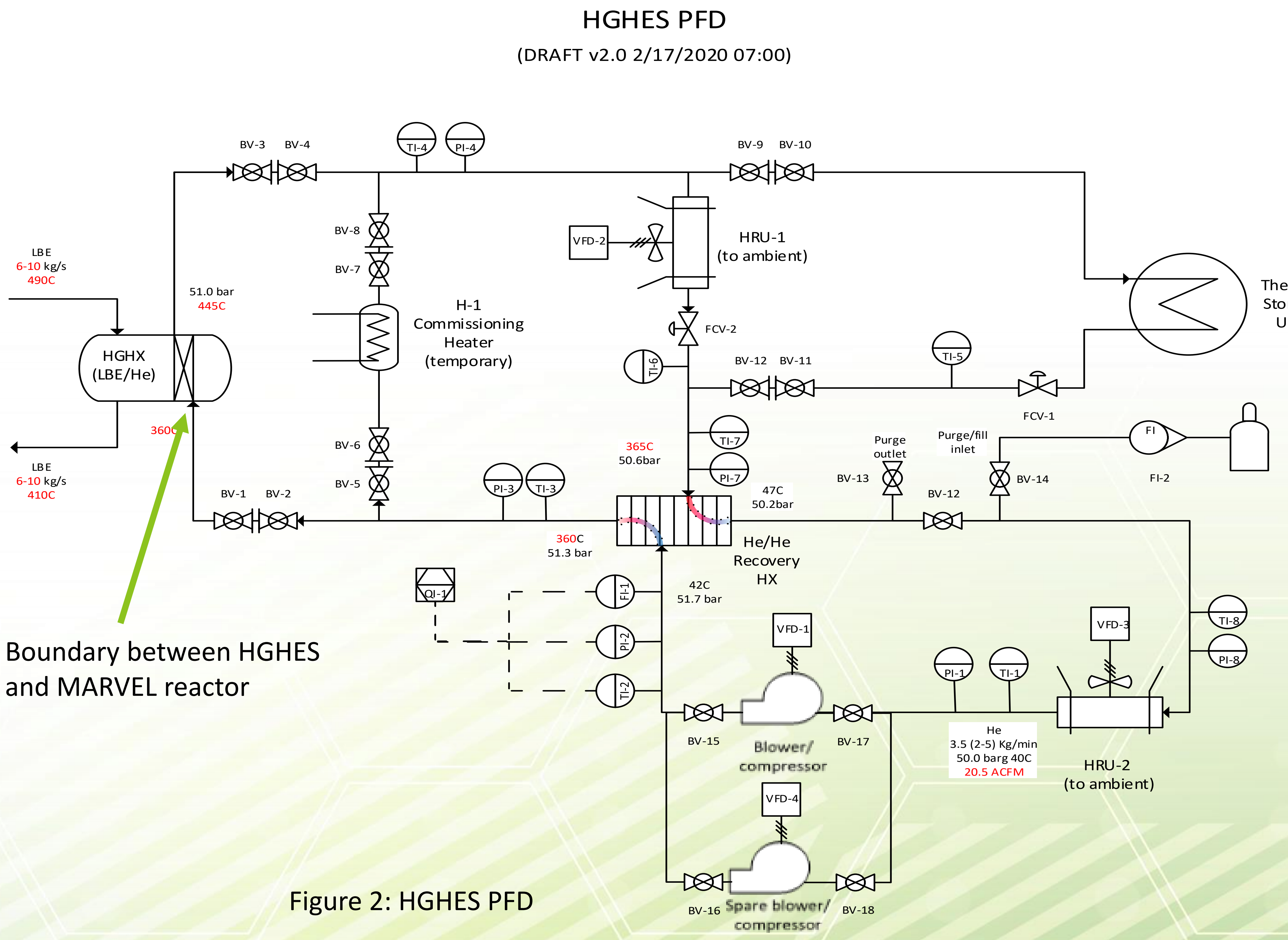

Figure 2: HGHES PFD

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MRP Microreactor Program

MARVEL

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