



# ***Nuclear Thermal Propulsion Engine Technology Maturation Plan***

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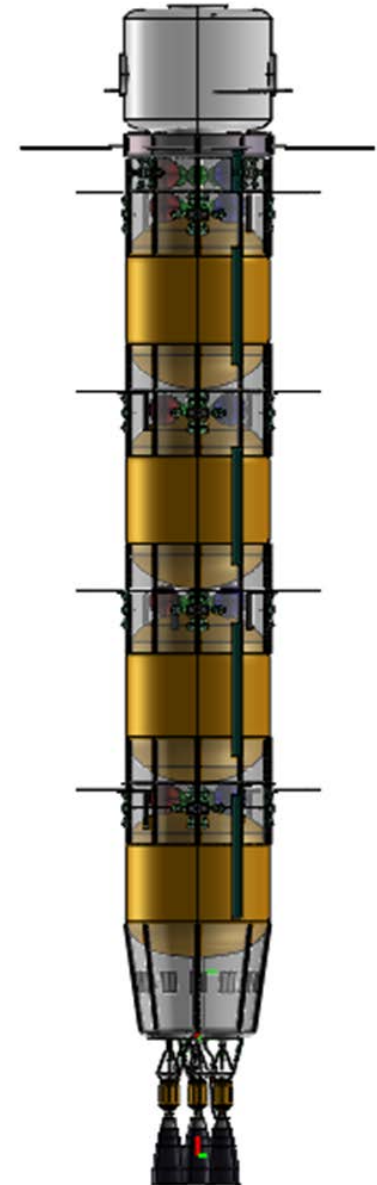
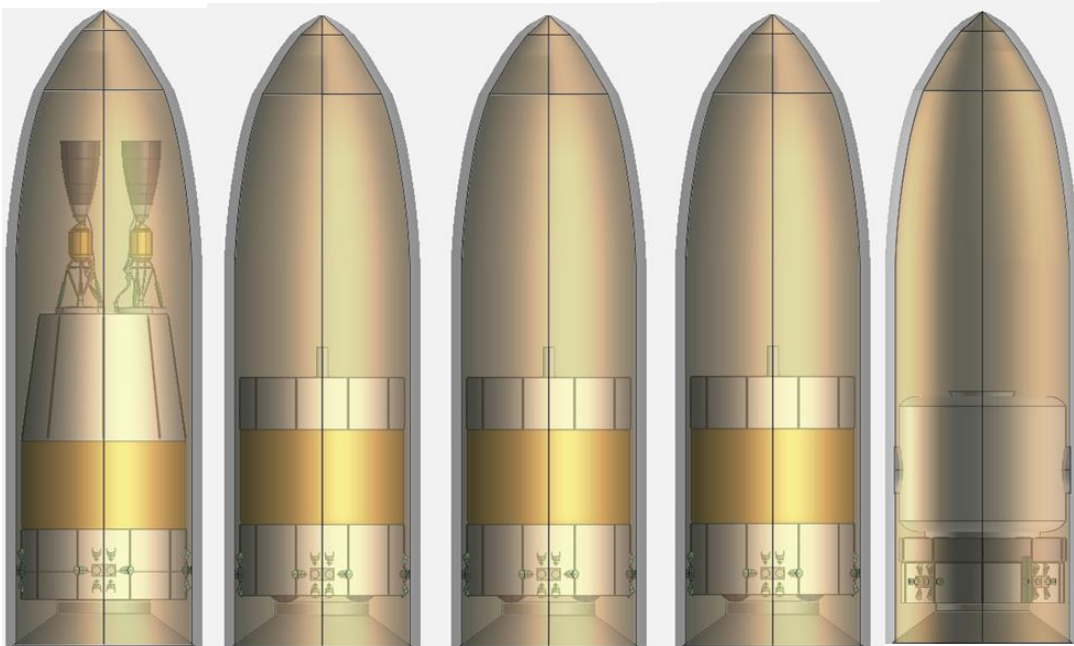


# Partners and Participants



- Support and Funding
  - This work is being done under the Nuclear Propulsion Project Office (NPPO) at NASA Marshall Space Flight Center
  - The NPPO is funded through the NASA Game Changing Development (GCD) Program of the Space Transportation Mission Directorate (STMD)
- This Technology Maturation Plan has been created with the hard work of:
  - Nuclear Propulsion Project Office
  - Aerojet Rocketdyne
  - BWX Technologies

- Engine requirements derived from a series of potential Mars missions:
  - Lunar Gateway aggregation/assembly
  - LDHEO departure
  - SLS 8.4m fairing
  - Three 25,000 lbf engines, Isp of 900s



## TMP Objectives

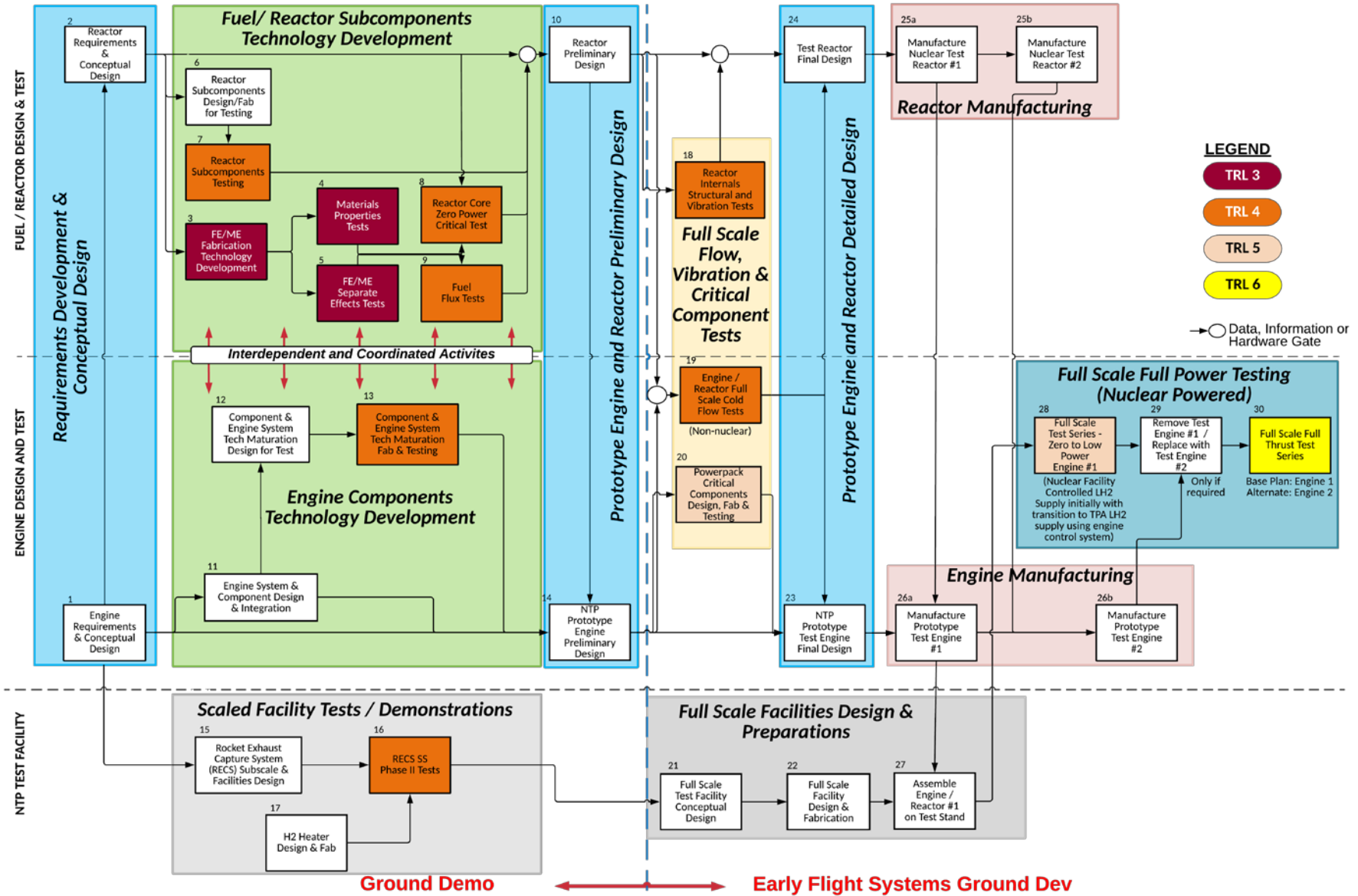
- The TMP is a potential development plan for NTP technologies that includes current technology development and potential growth into the ground test of a protoflight NTP engine system.
  - General approach is to minimize early costs while systematically eliminating risks
  - Early focus on reactor fuel development
  - Technology gaps between current liquid engine state of the art and NTP engine needs
  - Ground test facility technologies



# Technology Maturation Plan (TMP)

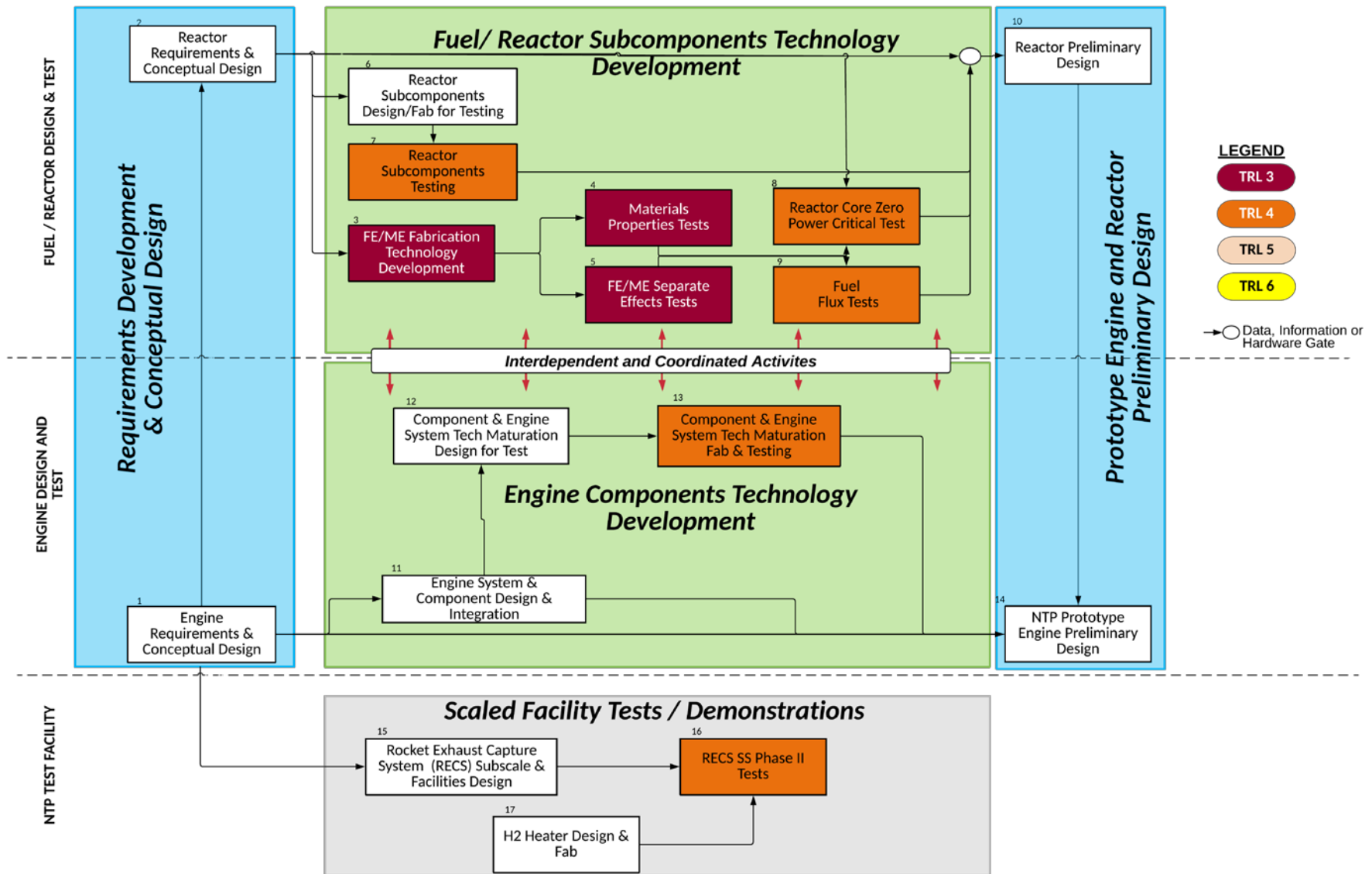


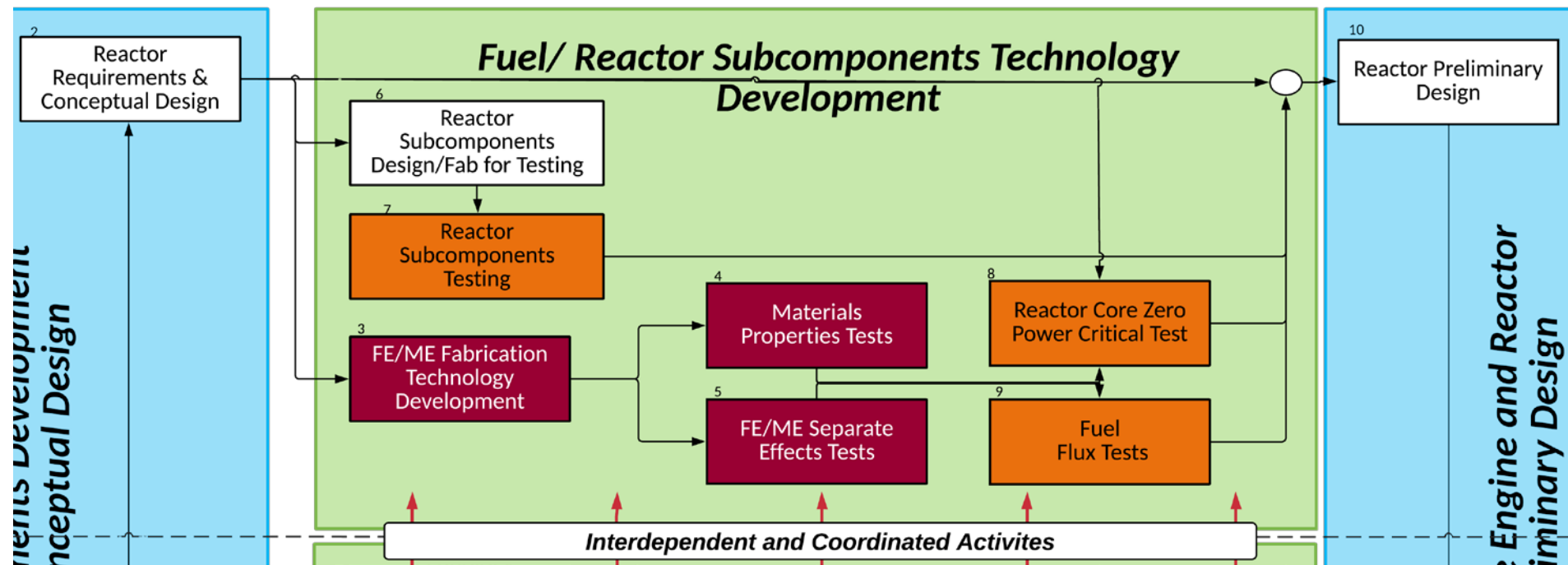
## Nuclear Thermal Propulsion Engine Technology Maturation Plan



## Nuclear Thermal Propulsion Engine Ground Demonstration Plan

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## Scaled Facility Tests / Demonstrations

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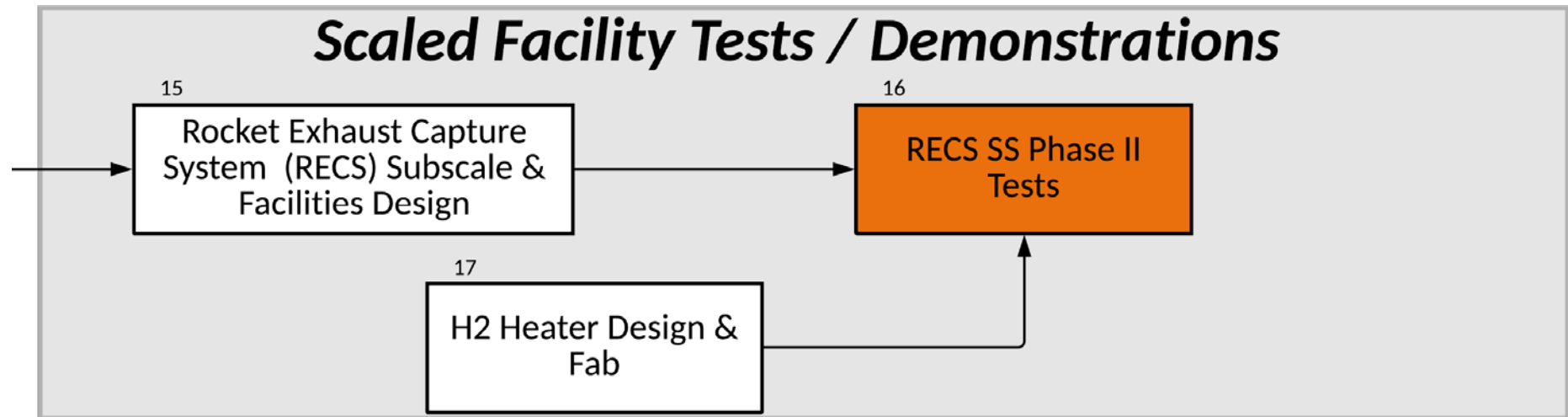
Rocket Exhaust Capture System (RECS) Subscale & Facilities Design

16

RECS SS Phase II Tests

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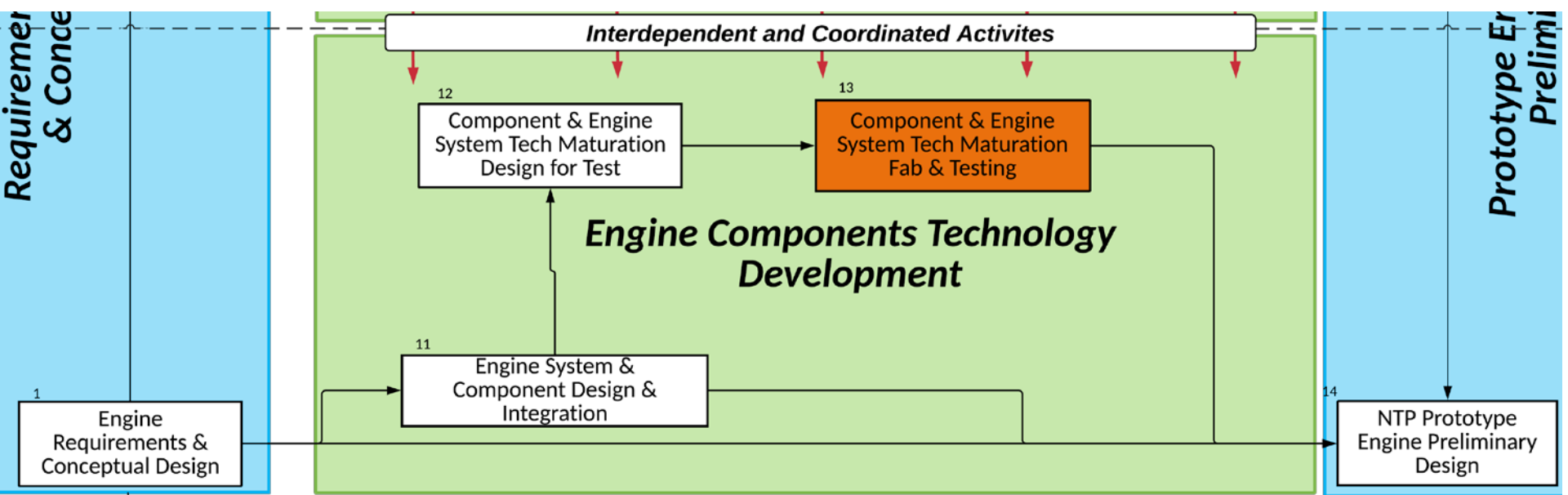
H2 Heater Design & Fab







# TMP, Early Technology Maturation (Engine)





# TMP, Prototype Engine Development/Test

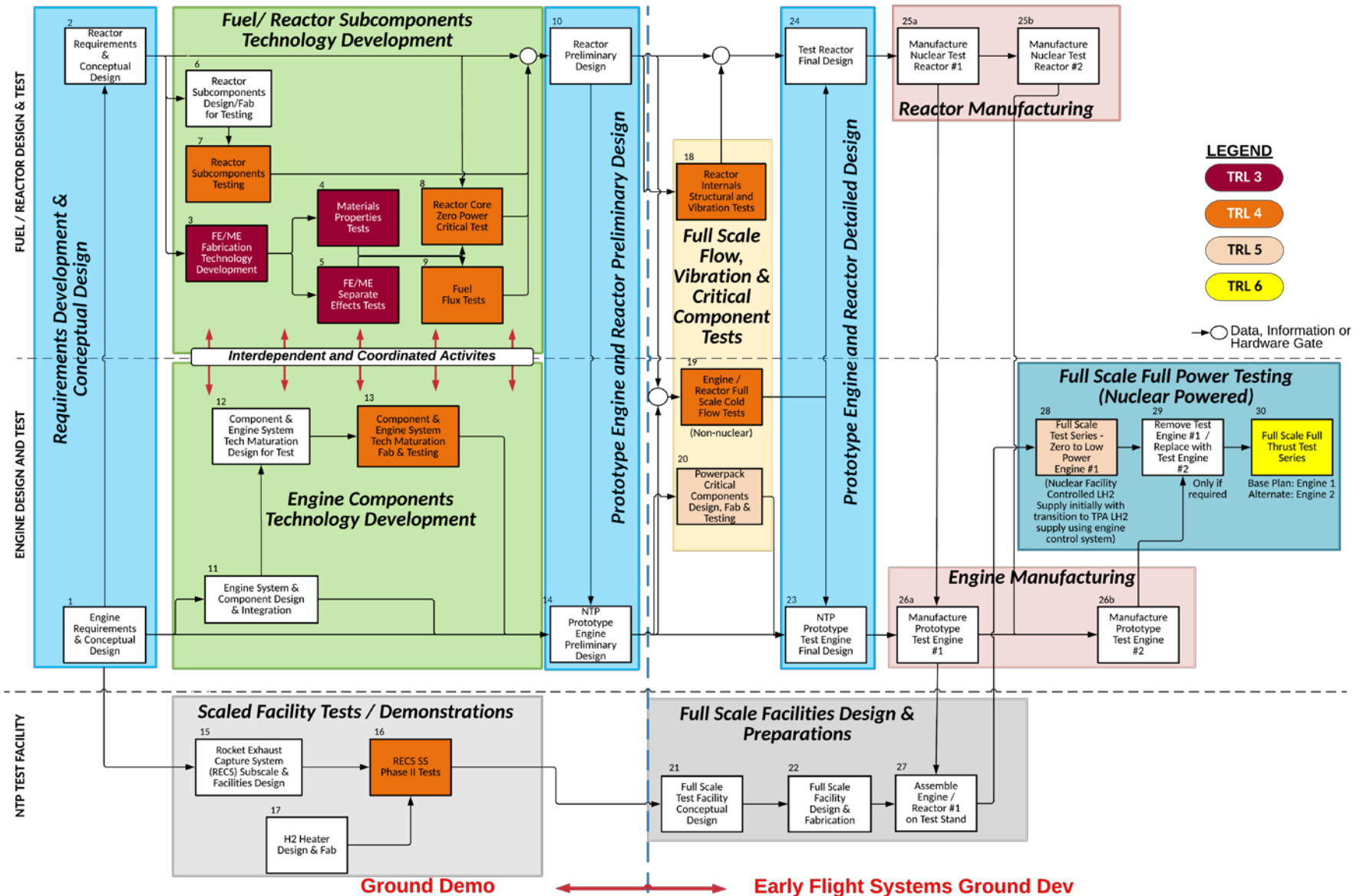


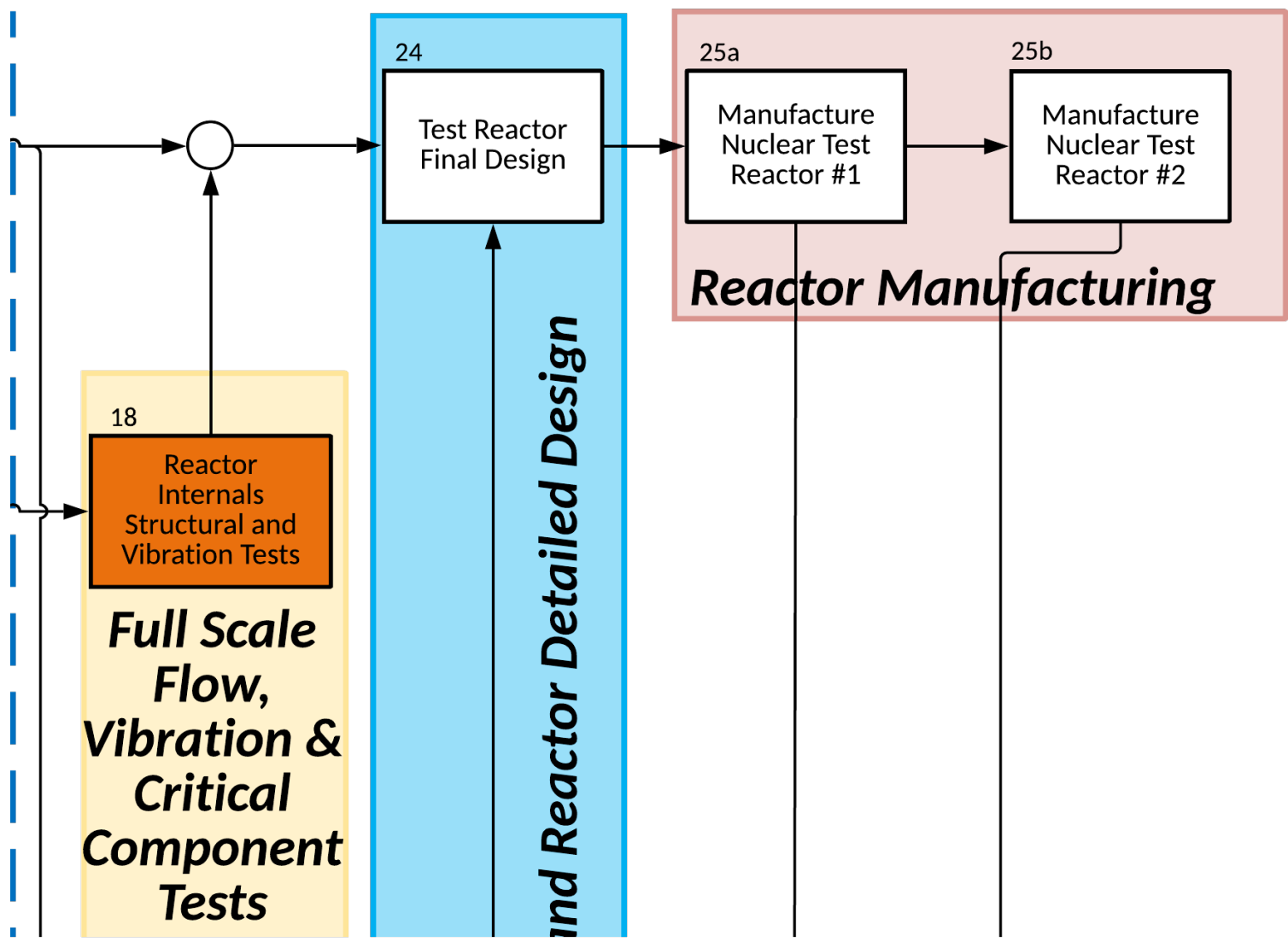
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Propulsion Systems Department

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## Nuclear Thermal Propulsion Engine Technology Maturation Plan





## Full Scale Facilities Design & Preparations

21

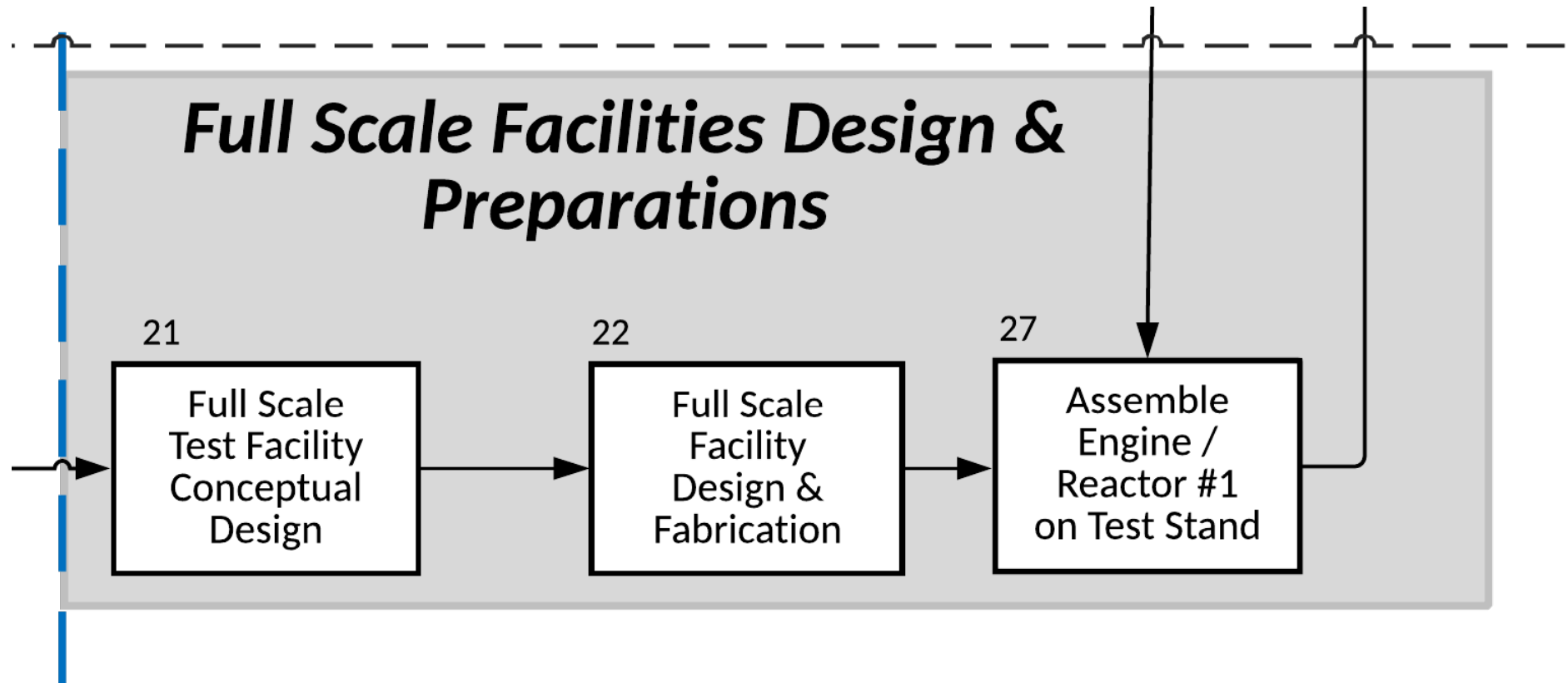
Full Scale Test Facility Conceptual Design

22

Full Scale Facility Design & Fabrication

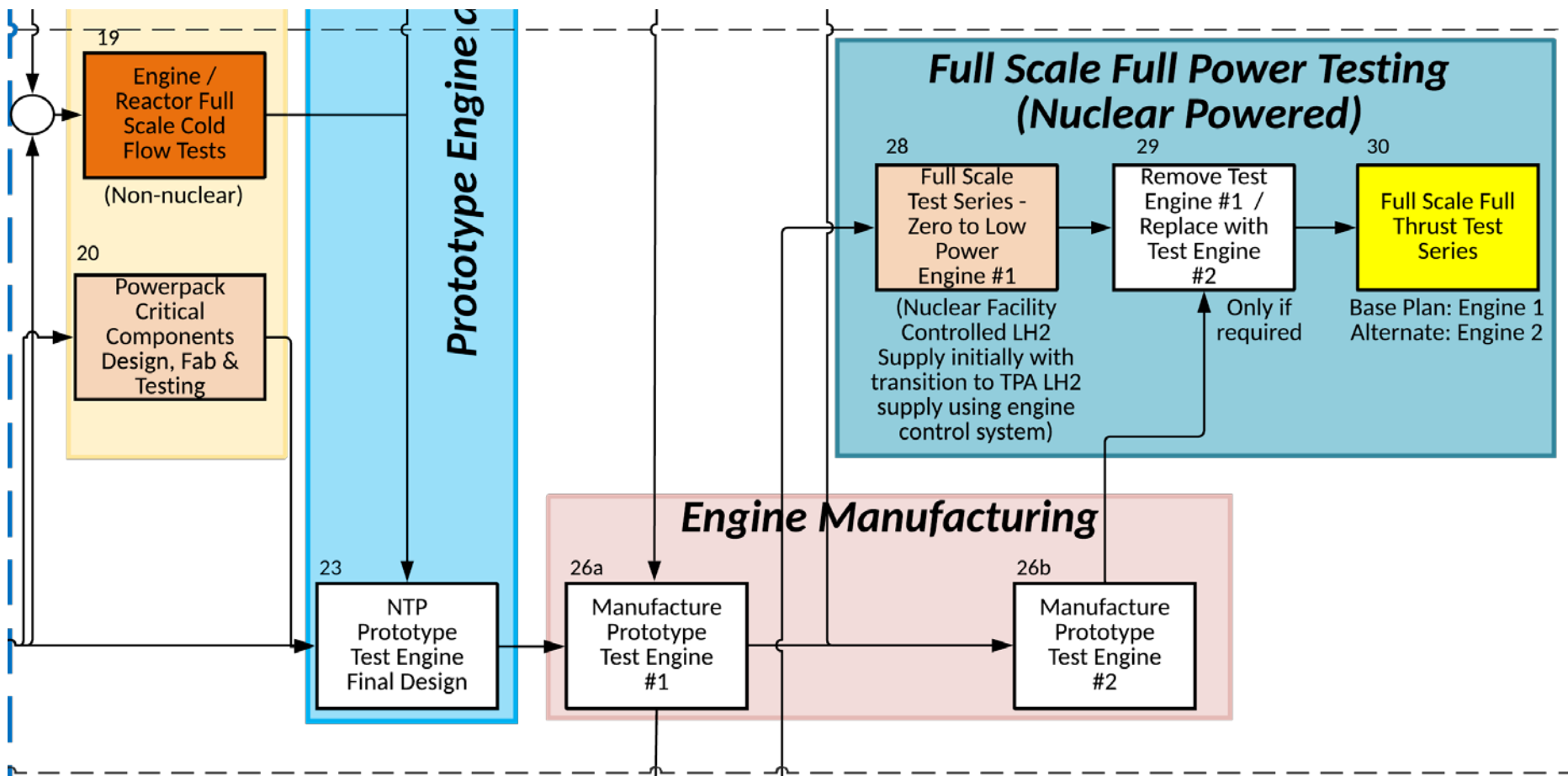
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Assemble Engine / Reactor #1 on Test Stand





# TMP, Prototype Engine Development and Test



## NTP Technology Maturation Plan Summary

- The TMP is a potential development plan for NTP technologies that includes current technology development and potential growth into the ground test of a protoflight NTP engine system. The integrated approach to technology maturation, prototype engine development and a ground test demonstration offers a pathway to change NTP from an “advanced” propulsion concept forever waiting for its chance, to a demonstrated propulsion technology ready for flight engine development.