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CONTENT

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01

OBJECTIVES AND EXPECTED IMPACT

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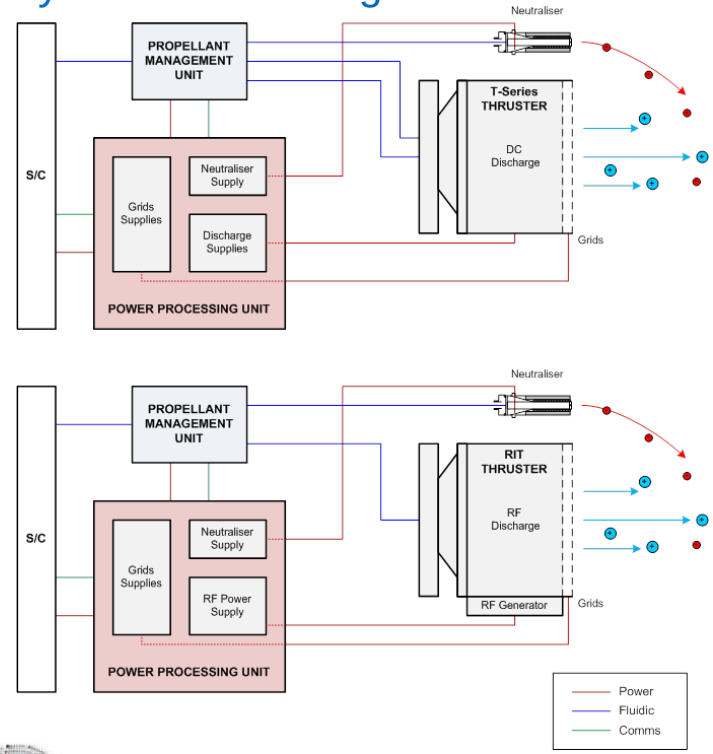
GIESEPP – OBJECTIVES (1/2)

Develop, build and test the first European Plug and Play **G**ridded **I**on **E**ngine **S**tandardized **E**lectric **P**ropulsion **P**latforms (**GIESEPP**) including

- Gridded Ion Engines (GIE),
  both from ArianeGroup and QinetiQ Space,
- Xenon Propellant Management System (XPMS),
- Power Processing Unit (PPU),

to meet the future needs of the

- GEO Telecoms, Navigation
- LEO Constellation markets
- Space Transportation, Exploration and Interplanetary Missions.



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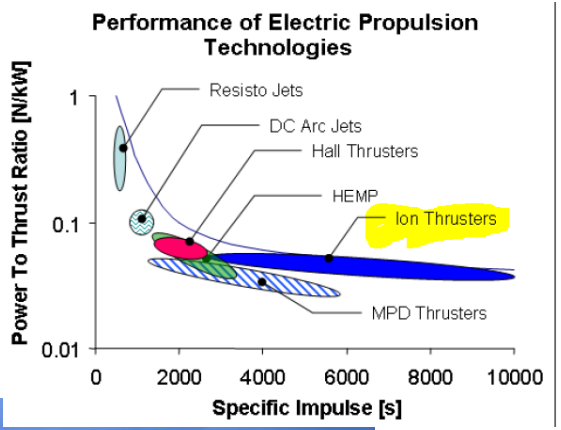
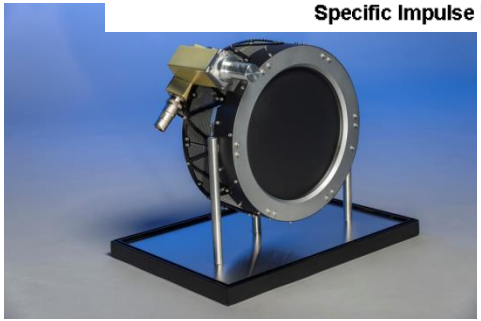
GIESEPP – OBJECTIVES (2/2)

In particular GIESEPP aims at

- Worldwide **technology leadership** in the fields of **high ISP** electric propulsion by incremental development, e.g.
  - **Dual mode** functionality (EOR – SK)
  - **Modular** and multifunctional PPU (Power Processing Unit)
  - **Miniaturize**d propellant management system
- Maintaining and securing **European non-dependence**
- Ensuring **competition and risk mitigation** through modularity and interchangeability
- Solid **competitiveness** through significant **reduction of the EPS cost** by 30+% by
  - Maximized **mass reduction** on EPS level
  - Foster **industrialization** to fast and in-time mass-production
  - **Standardization** of testing sequences and methods
  - Maximize **commonality** on equipment, interfaces and components
  - **Sourcing asset** by common batch procurement and maximized OTS use
- Assessing and verifying an **alternative (cheaper) propellant**





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GIESEPP - AMBITION AND IMPACT

Ambition:

- Create first ***standardised all European*** cost and commercial competitive EPS – ITAR-free
- Improve ***European technological EP capabilities*** – GIE as strong pillar near HET, HEMPT et.al.
- Provide ***market solutions ready for sale*** with adequate production capabilities and processes
- Provide ***most economic EPS*** solution with both high thrust and high ISP in one product

Impact:

- Provide qualified OTS system within few years to be able to ***address worldwide highly competitive markets***
- Strengthened ***EP core competences***: system – thruster - propellant management - power processing to compete worldwide
- Propose ***most cost efficient EPS*** over lifetime: dual mode for high thrust and high ISP, while only 3% of lifetime need high thrust
- Faster production process by increased and ***optimised production capacities***, thus higher market availability
- Promoted ***EP diversity*** and stronger interaction between different technologies
- Enable customers ***use-as-is*** option though modular OTS approach with different thruster types to chose
- Consolidated ***procurement efficiency*** through appropriate sourcing activities and make-or-buy trade-offs
- Combine ***highest mass savings*** for platform integrators through highest ISP (half xenon, smaller tanks/lower pressure) while ***highest growth potential*** as best to cope with increasing platform power
- Robust design with high stability transiting from empiric verification to more predictive through improved ***performance models***
- Available and confirmed ***alternative propellant*** to ensure maximized flexibility

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02
CONSORTIUM AND COMPETENCIES

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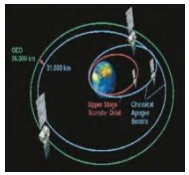
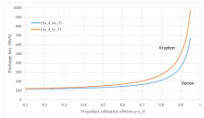
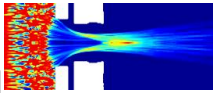
CONSORTIUM AND COMPETENCIES





Alternative Propellants
University of Southampton



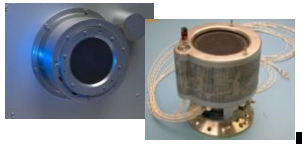
Analytical Design and Test Support
Mars Space

Satellite System Requirements
OHB

Testing
QinetiQ / ArianeGroup

GIESEPP
Project Needs
and
Team Involvement

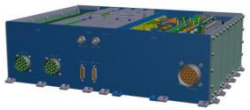
Thrusters
ArianeGroup / QinetiQ



Propellant Control
AST

System Engineering
ArianeGroup / QinetiQ

PPU
CRISA / Airbus DS



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GIESEPP CONCEPTS

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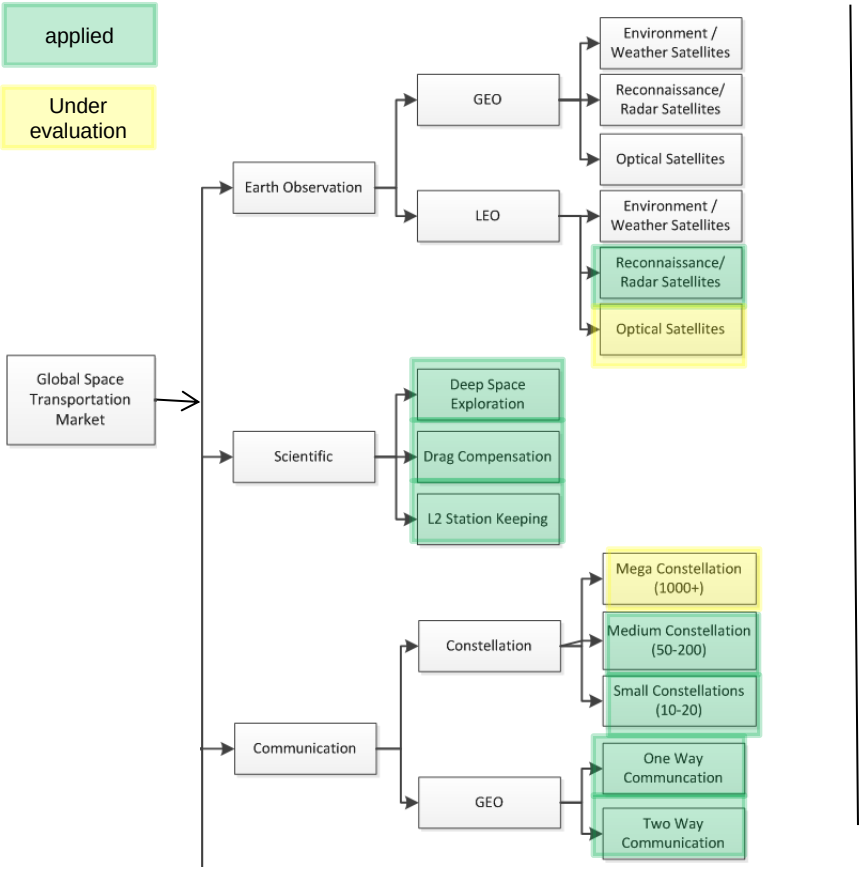
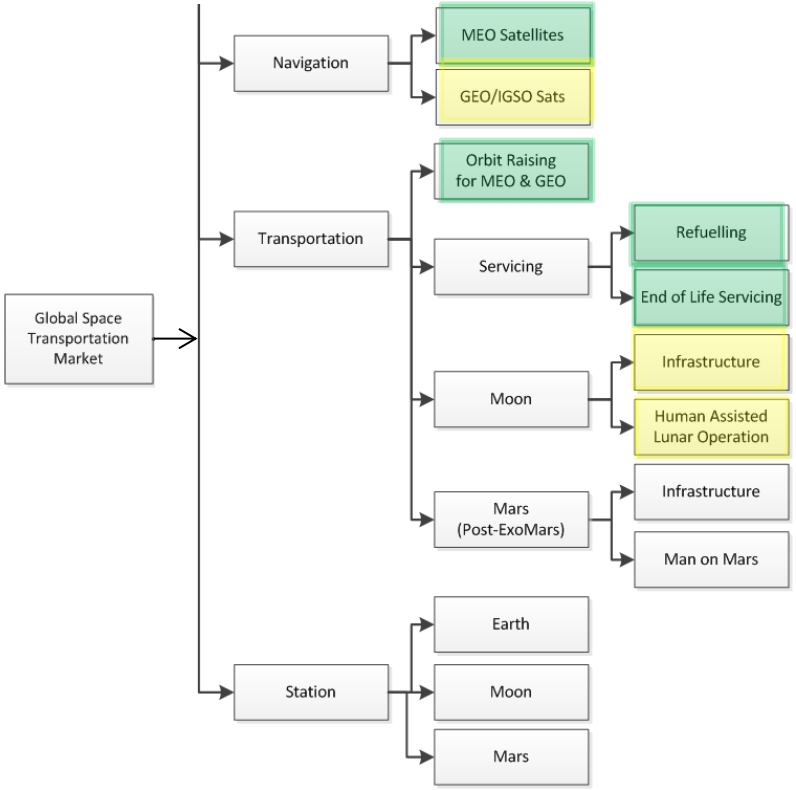
GIESEPP MISSION SCENARIOS

applied

Under evaluation





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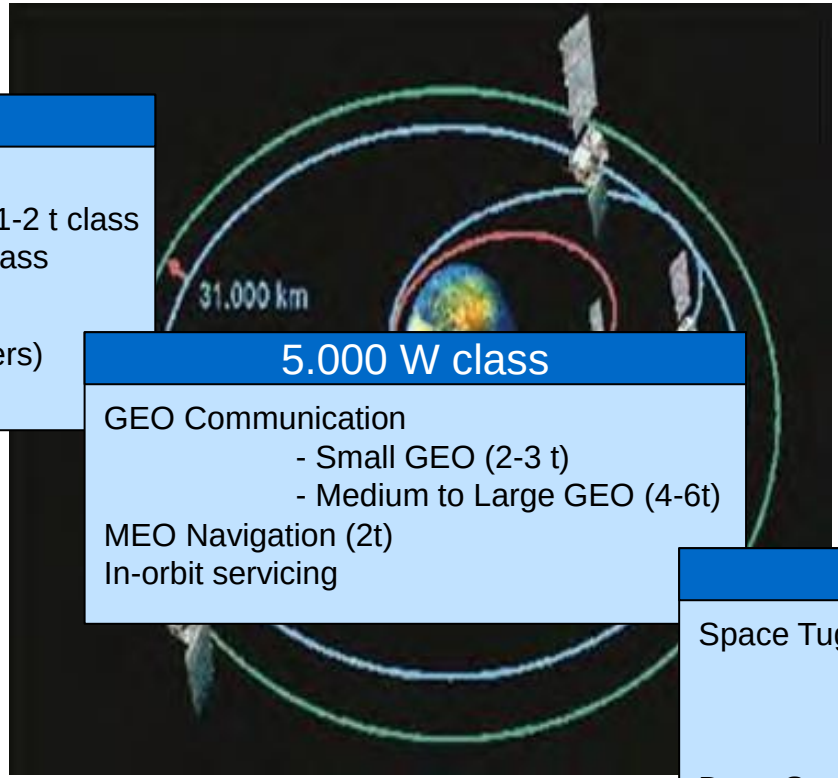
GIESEPP - CONSIDERED PLATFORMS



500 W class

LEO Constellations
- Small/Medium – 1-2 t class
- Mega – 200 kg class

LEO EP Platform (500kg)

GEO Station Keeping (8 Thrusters)

In-orbit Servicing

5.000 W class

GEO Communication
- Small GEO (2-3 t)
- Medium to Large GEO (4-6t)

MEO Navigation (2t)

In-orbit servicing

20.000 W class

Space Tug
- Navigation Sats
- GEO Sats
- Moon Station

Deep Space Exploration

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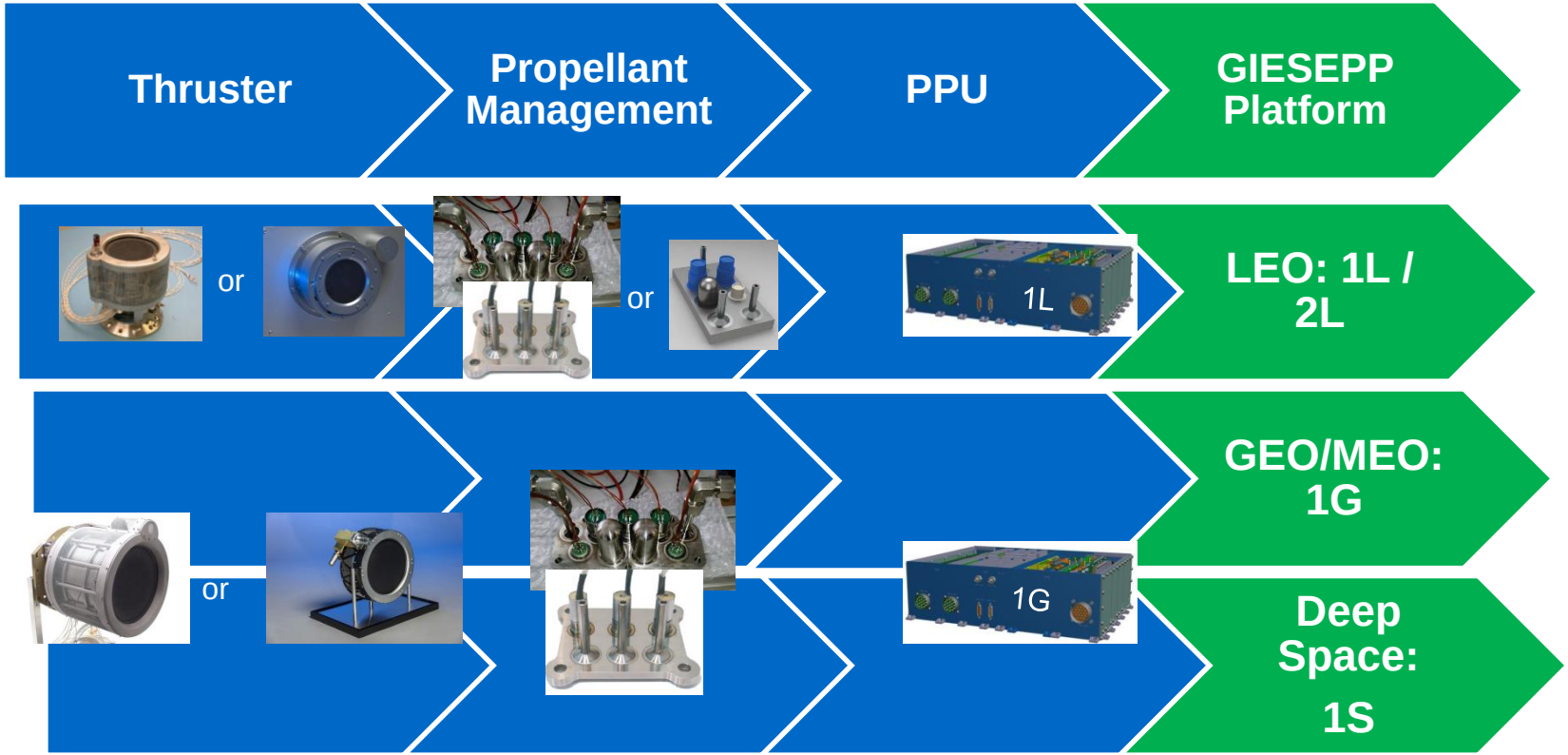
GIESEPP- PLATFORM MODULARITY



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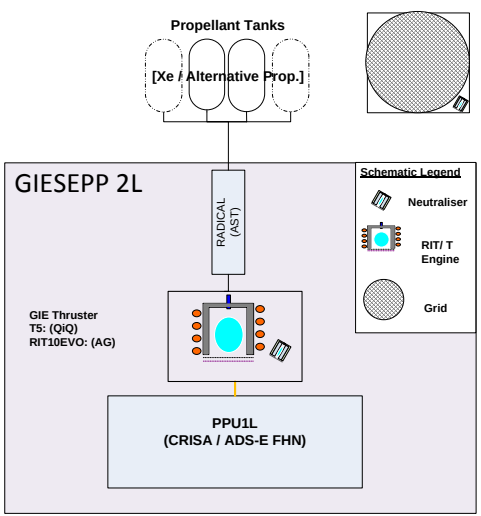
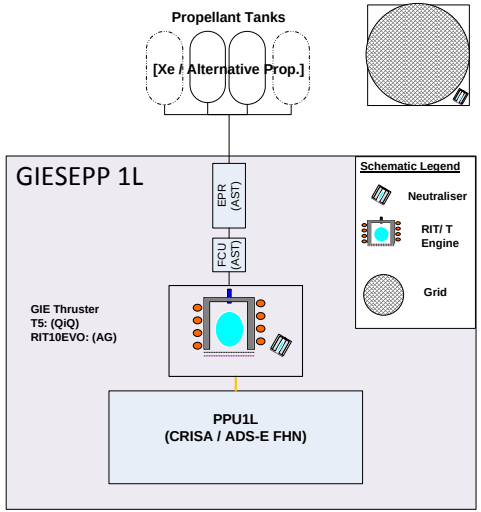
GIESEPP CONCEPT – GIESEPP 1L/2L – 200-700 W - LEO

- ✓ 1 x Thruster
- ✓ 1 x Power Processing Unit PPU 1L
- ✓ For 1L: 1 x Electronic Pressure Regulator EPR
- ✓ For 1L: 1 x Flow Control Unit FCU
- ✓ For 2L: 1x RADICAL instead of FCU and EPR
- ✓ 1 x set of Harness, Filters and Sensors





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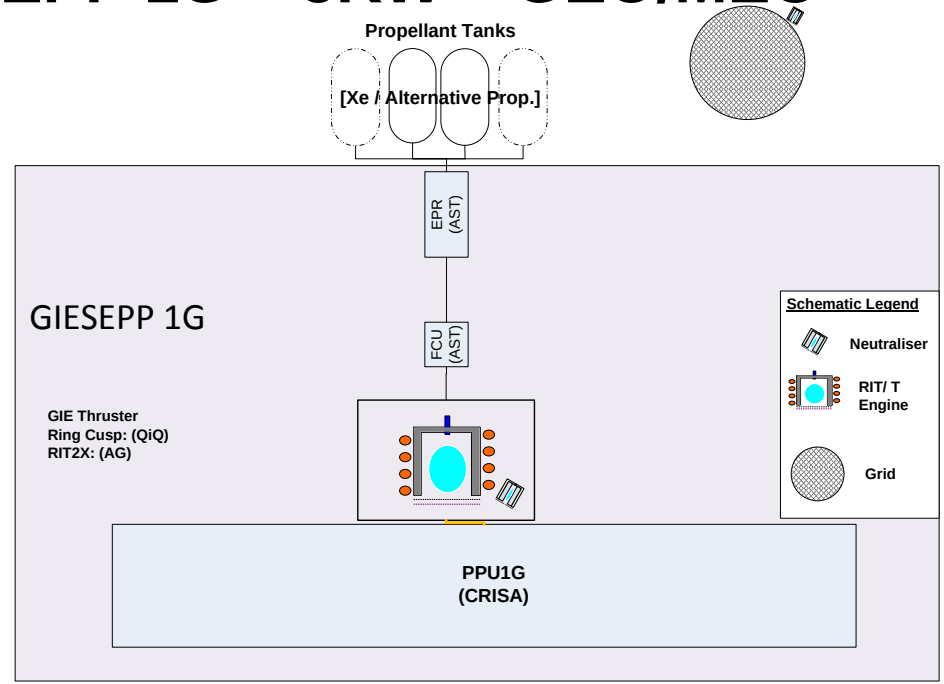
GIESEPP CONCEPT – GIESEPP 1G – 5KW – GEO/MEO

- ✓ 1 x Thrusters
- ✓ 1 x Power Processing Unit PPU 1G
- ✓ 1 x Electronic Pressure Regulator EPR
- ✓ 1 x Flow Control Units FCU
- ✓ 1 x set of Harness, Filters and Sensors



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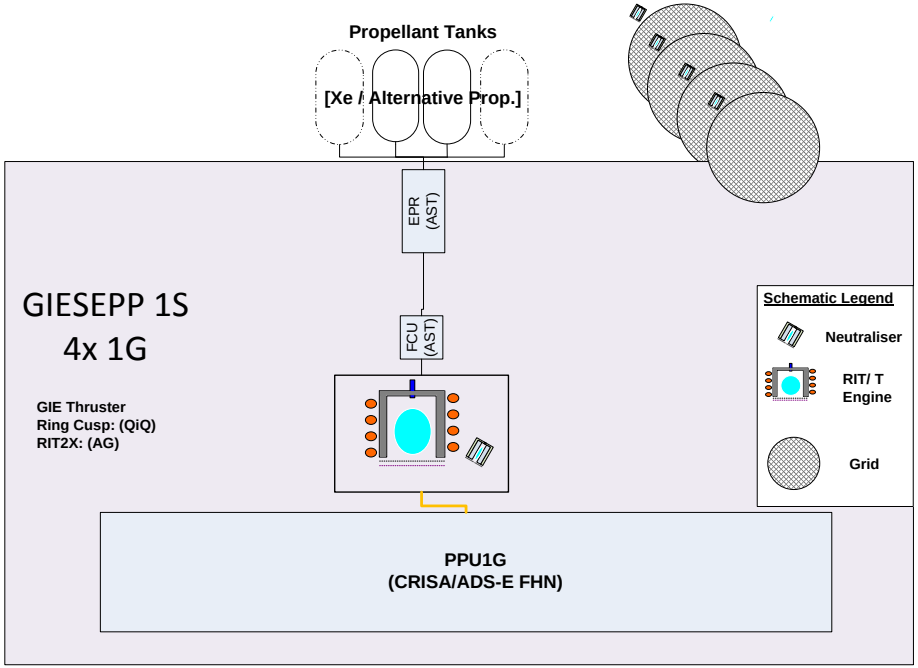
GIESEPP CONCEPT – GIESEPP 1G – 20KW – SPACE TRANSPORTATION, EXPLORATION AND INTERPLANETARY

Clustering of 4x GIESEPP 1G

- ✓ 4 x Thrusters
- ✓ 2-4 x Power Processing Unit PPU 1G
- ✓ 4 x Electronic Pressure Regulator
- ✓ 4 x Flow Control Units FCU
- ✓ 1 x set of Harness, Filters and Sensors



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04
ACTIVITIES AND SCHEDULE

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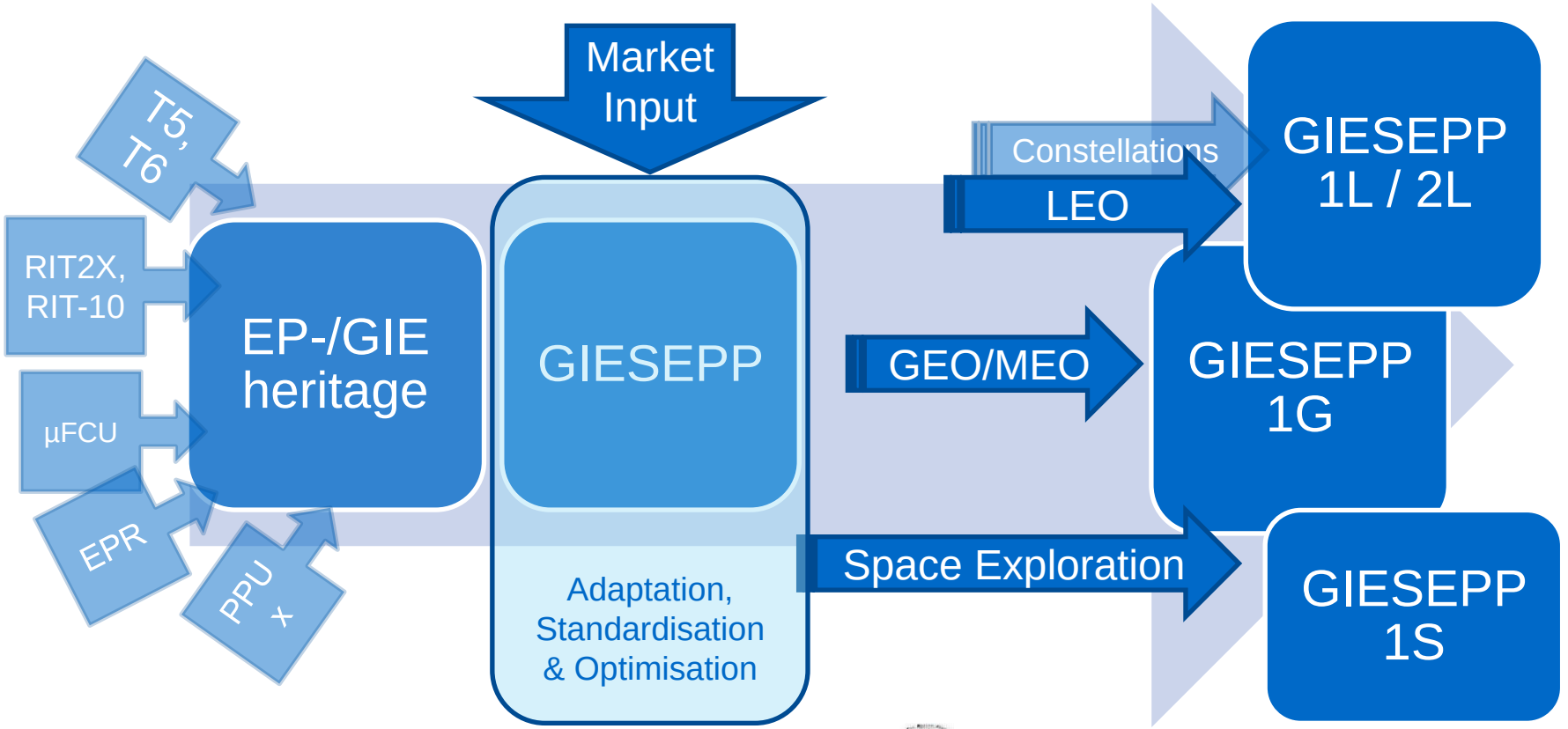
GIESEPP - ACTIVITIES AND SCHEDULE (1/2)



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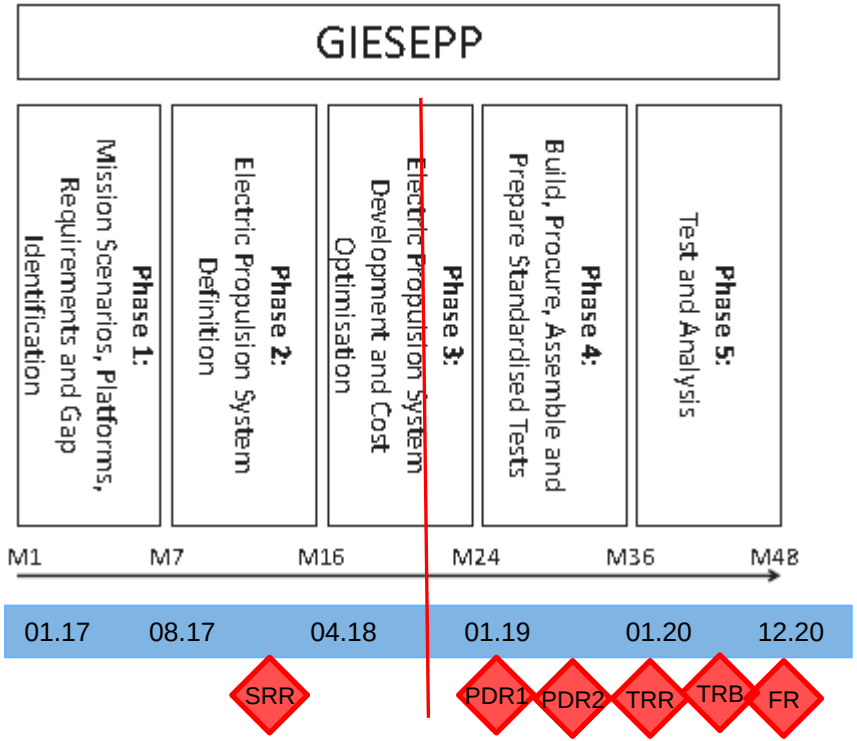
GIESEPP - ACTIVITIES AND SCHEDULE (2/2)



Current Status:

- SRR successful
- PDR1 preparation
- Cost re-iteration
- Final mission parameter definition

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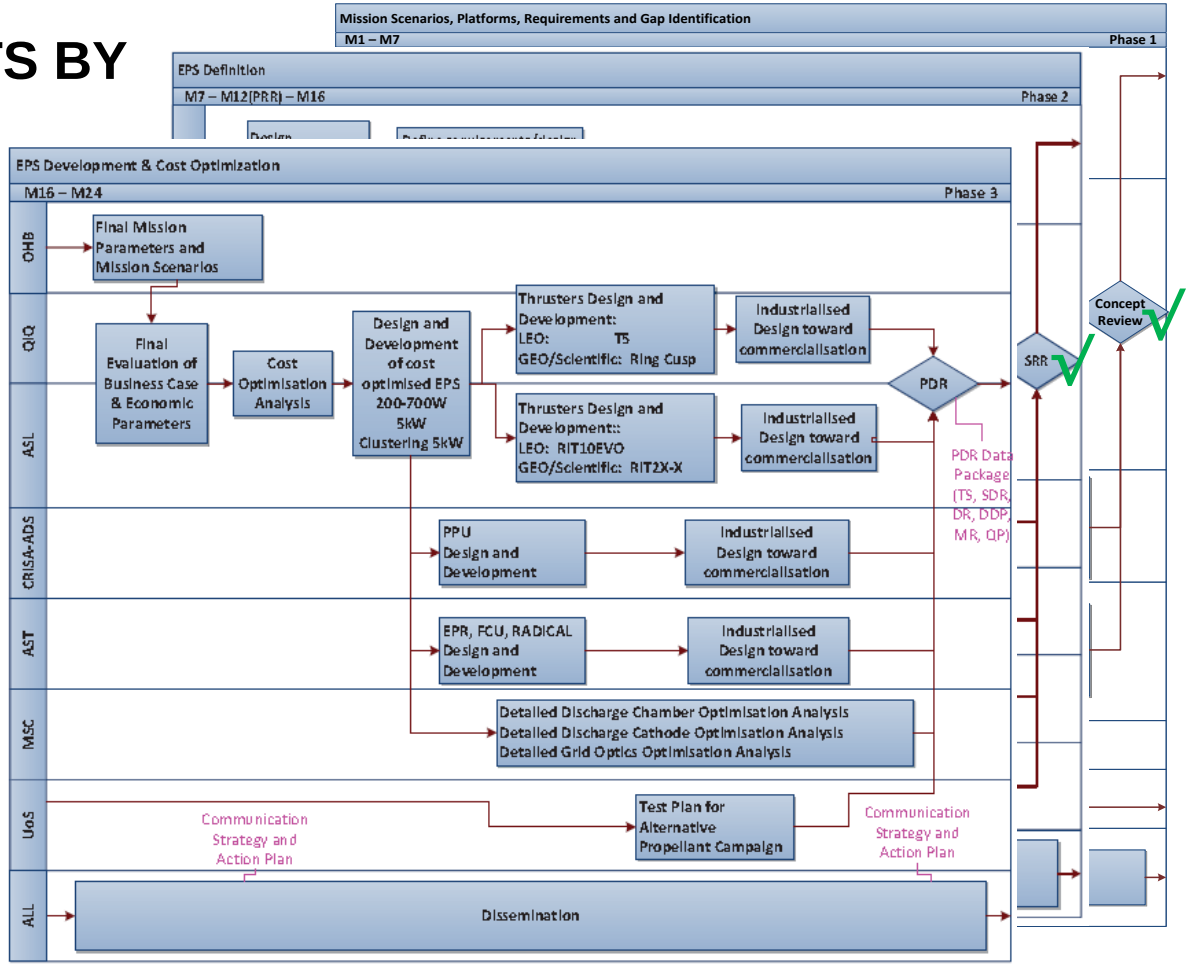
GIESEPP - ACHIEVEMENTS BY TODAY

- ✓ Phase 1 done: Concept review successful
- ✓ Phase 2 done : SRR successful
- ✓ Consolidated requirements on
  - ✓ Mission
  - ✓ system
  - ✓ Equipment
- ✓ Alignment between T- and RIT-thrusters requirements
- ✓ Consolidation on modularity
- ✓ Final trade-offs on LEO ongoing
- ✓ Gap analysis on all levels
- ✓ Enhanced discharge chamber and ion optics modelling
- ✓ Alternative propellants assessment and pre-selection
- ✓ Pre-assessment on industrialization



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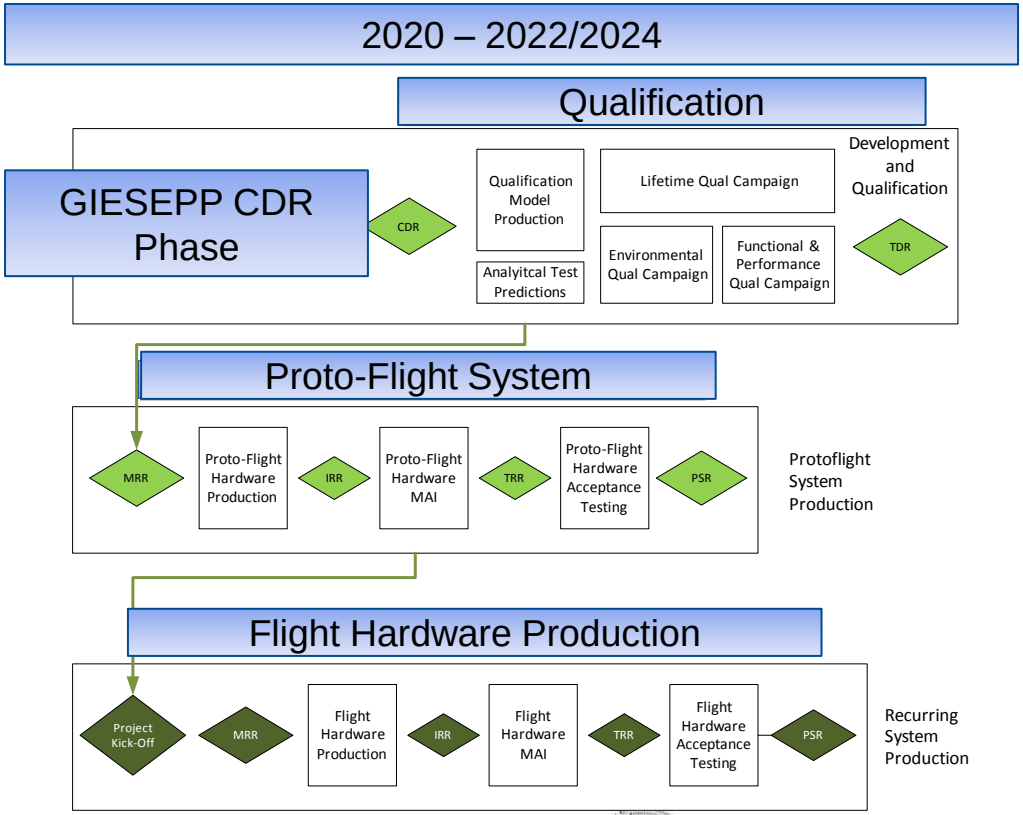
GIESEPP - ACTIVITIES AND SCHEDULE – NEXT PHASE



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05

DESIGN AND DEVELOPMENT CHALLENGES

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MAIN REQUIREMENTS AND MISSION SCENARIOS - DESIGN DRIVERS

High Level Requirements	Flexibility (Input & Output)
	Accuracy
	Efficiency
	Environmental Loads
Materials and Components	High Batch Numbers
	(Industrial/MIL) Parts & Processes
Manufacturing	Tolerances
	Complexity / Flexibility
Testing	ECSS & GERD
	In-house vs. Outsourcing
	Cleanliness
	Margin Philosophy
Verification Documentation	Trust vs. Responsibility
Meetings and Contract Discussion	High cost of TVAC and Structural Test
Non Recurring Qualification	Life Time Qualification

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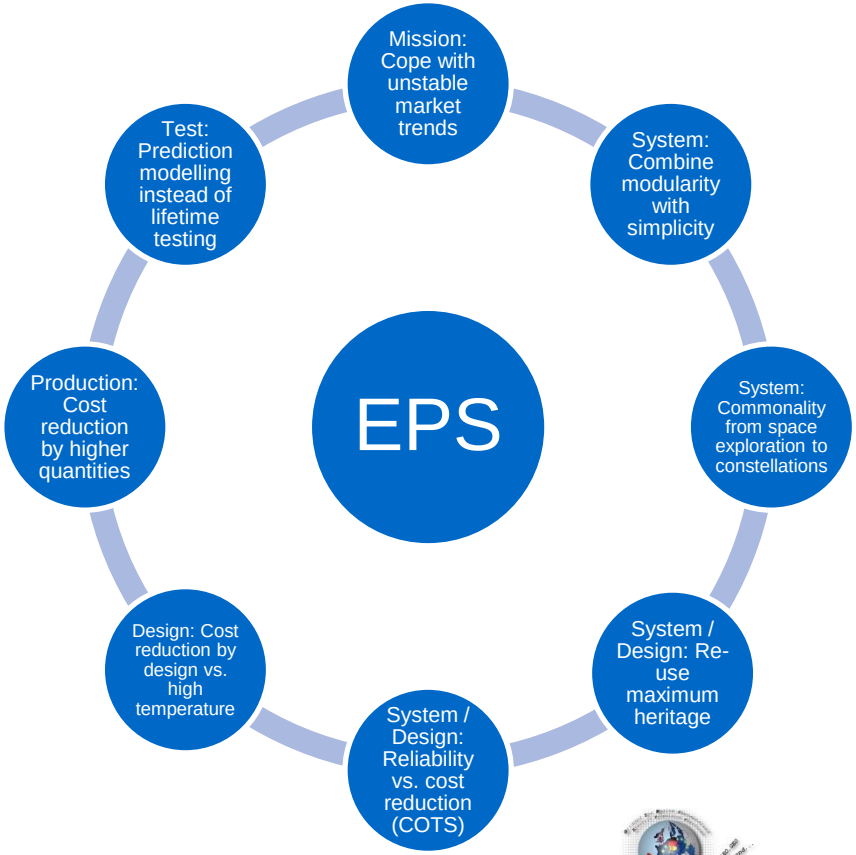
MAIN CHALLENGES DEVELOPMENT PLAN



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