



EPIC DRAFT ROADMAP OVERVIEW

**ESA Coordinator
EPIC Roadmapping Workshop
Stockholm, 11th February 2015**

EPIC & Electric Propulsion SRC Objectives **EPIC**

(1/2)

- Electric propulsion has been identified by European actors as a **Strategic Technology** for improving the **European competitiveness in different space areas** such as in-space operations and transportation.
- The EPIC roadmap and master plan, when implemented and correctly coordinated by the PSA, will produce major advances in EP for in-space operations and transportation. This major advances need to be materialised by:
 - **Enabling incremental advances in technologies already under development** which require major advances in the development of the thruster itself and its equipment (including power processing unit, PPU, feeding systems, architectures, etc.), in order to increase substantially their TRL to enable them in-orbit in a short-medium timeframe; and
 - Promoting possible (and probable) **disruptive Research, Technology and Developments (RTD)** in the field of EP, including electric power for propulsion; this could correspond to currently very low TRL but very promising technologies.
- The EPIC consortium understands these as two different challenges in response to a **common objective**, that is, **to contribute with the SRC to enhance the European capabilities in EP at world level within the 2020-2030 timeframe and beyond.**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640199
This presentation reflects only the Consortium's view. The EC/REA are not responsible for any use that may be made of the information it contains.

From the *H2020-SPACE COMPET-3–2014: In-Space electrical propulsion and station keeping*:

“**Scope**: In-Space transportation begins where the launch vehicle upper stage separates. It comprises the functions of primary propulsion, reaction control, station keeping, precision pointing, and orbital manoeuvring necessary for all satellites.

Some of these technologies will be used in commercial and governmental communications satellites for orbit positioning and station-keeping. Further development is needed to maintain European leadership in this domain which is threatened by a very strong competition of non-European actors aiming at proposing all-electric platforms. Research and development of promising electric propulsion technologies, far beyond the current state of the art, is encouraged. The Power Processing Units (PPU) for the electrical thrusters will be considered as well.

A first objective for the SRC is **to foster incremental advances in the development of thrusters** by extending their specifications and operative ranges by a factor of at least 3, including advanced studies in the areas of new power concepts, architectures and associated advanced technologies. A second objective is to set up activities for **promoting possible disruptive RTD** in the field of in-space electrical propulsion, including the increase of electric power for propulsion.

In order to assess the commercial viability of the technologies developed, **the proposal should envisage studying the impact of using electrical thrusters in several types of generic platforms. Examples of these are: propulsive modules of interorbital vehicles (as tugs for contribution to in-orbit services), transfer of different payloads towards deep space, GTO transfer for communication satellites, and orbit control.”**

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SRC Roadmap: development lines

EPIC

INCREMENTAL LINE

- To enable incremental advances in already known technologies, currently under development, in order to **increase substantially their TRL** and allow them in-orbit in the **short-to-medium timeframe**
- Addressing the whole Electric Propulsion (EP) system
- Physics of the technology are well understood



Hall Effect Thruster (HET), Gridded Ion Engines (GIE), HEMP thruster-based EP systems

DISRUPTIVE LINE

- To promote the **Research, Technology and Development (RTD)** of very promising and potentially disruptive concepts in the field of EP, in order to allow the increase of the **currently low TRL** of breakthrough concepts which in the **long term** could change the EP landscape.
- Addressing mainly disruptive thruster technologies and EP-system transversal technology concept
- Physics of the technology are not well understood

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From the EPIC mapping to the SRC roadmap

T2.3 Studies and Gap Analysis

of requirements vs.
Application Domains

- T2.3.1 Satcom
- T2.3.2 LEO, MEO
- T2.3.3 Interplanetary
- T2.3.4 Space Transportation



T3.1 Prioritisation Technology
vs. Domains (*Incremental
Advances*)

T3.2 Prioritisation Technology
vs. Domains (*Disruptive RTD*)



T3.4 Roadmaps and Master
Plan preparation

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The draft SRC roadmap - outline

European Commission timeline

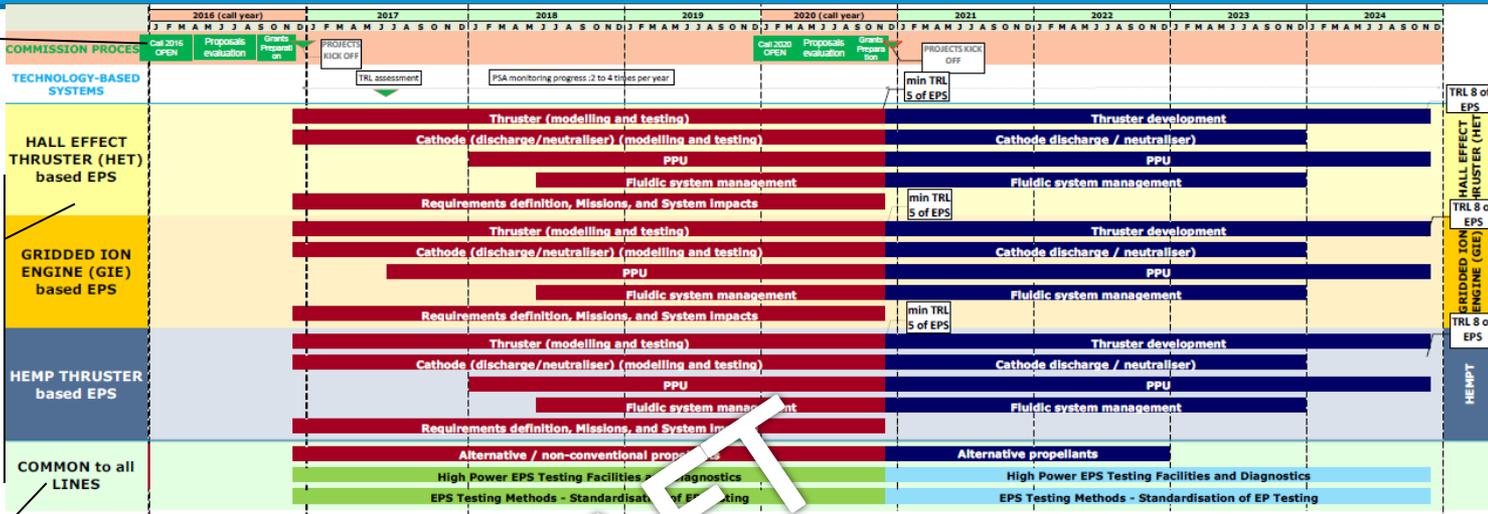
Target TRL at the end of the activity

Colour code
 CALL 2016
 CALL 2020

"TECHNOLOGY-BASED SYSTEMS", defining the Electric Propulsion Systems (EPS) considered in the incremental line and the thrusters considered in the disruptive line

Developments needed for all type of EP systems and all type of applications

APPLICATION DOMAINS with specific needs, for which the technologies should be developed



DRAFT

ENABLED CAPABILITIES: Major operational capabilities achievable, once the technologies developed through the projects will have been qualified.

- In vertical: capabilities common to all applications
- In horizontal: capabilities specific to the application.

This project has...
This presentation...

EPI C Roadmapping Workshop objectives

- To share with interested European stakeholders the draft roadmap for the H2020 SRC, to have constructive discussions in order for the PSA to obtain feedback on:
 - a. All technical aspects considered
 - b. Already identified challenges to reach the goals set
 - c. Timeline of the planned developments
 - d. Industrial interest on each of the roadmap lines and topics
- The PSA will analyse the feedback obtained and update the roadmap as needed.