

HIGH RELIABILITY ENERGY Center of Competence



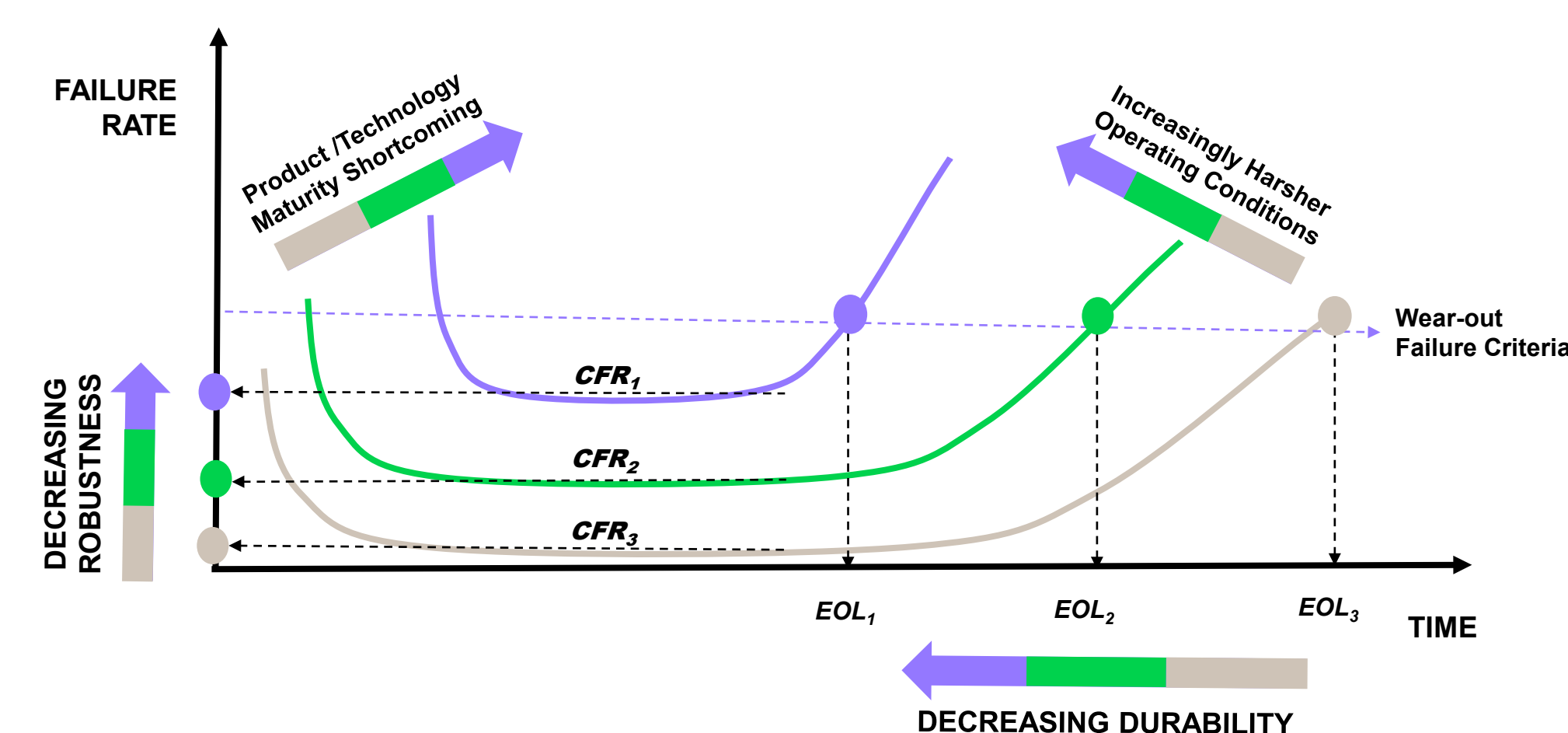
Bridging Emerging Technologies to Harsh Environment Operation !



Reliability of Embedded Electronics: Tackling the underlying Physics of Failure in COTS emerging Technologies

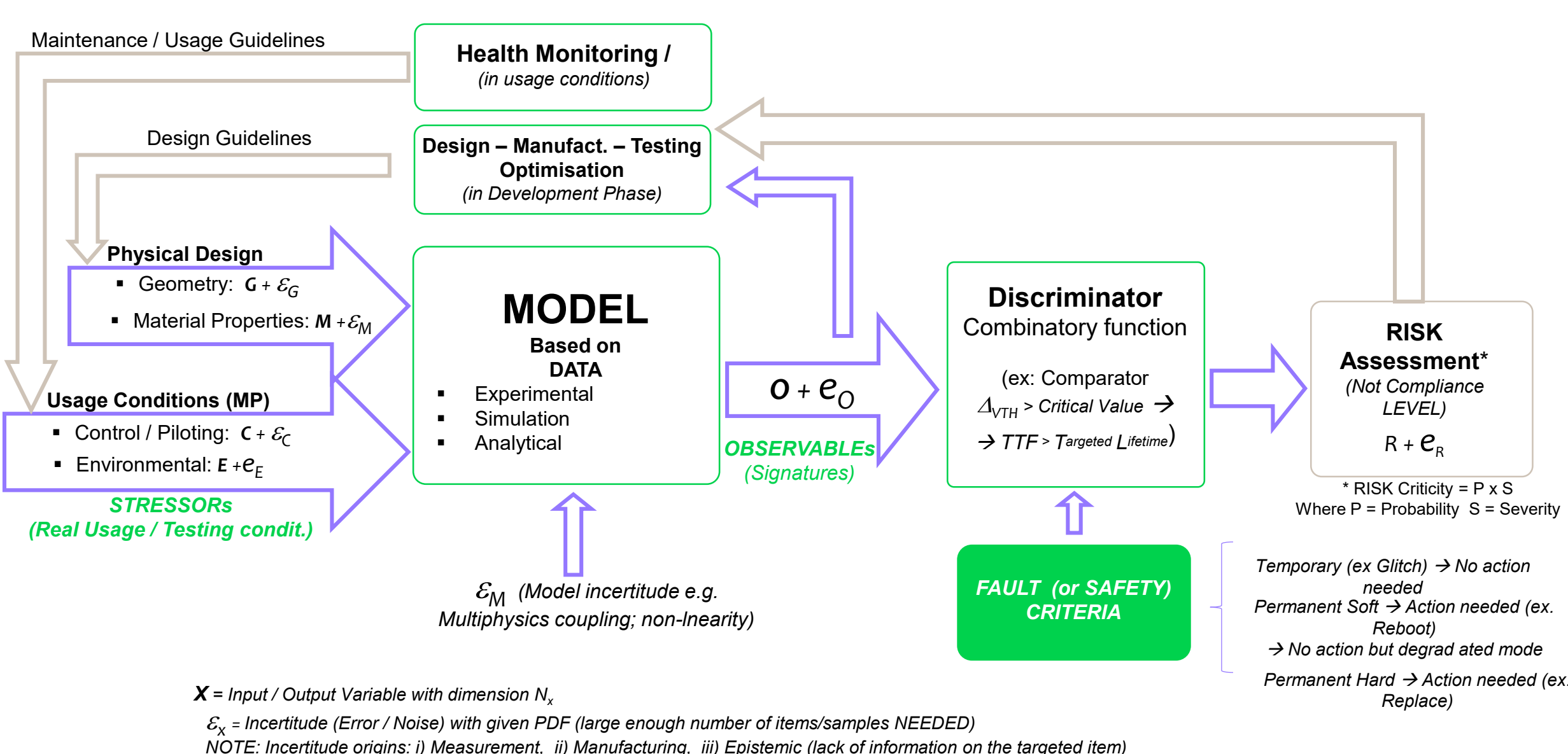
GENERAL CONTEXT

- ❖ **Emerging technologies** evolve with **very fast pace** ("Moore's law" – "Edholm's Law" - ...) $2x / 18MM$
 - ❖ Shortcoming in technology maturity hinder manufacturing yield and qualification (extrinsic failure)
 - ❖ Lacks of Design rules - testing methodologies & standards (often outdated and/or not adapted) !
- ❖ Manufacturers (ODM) have deepest knowledge about their product but are not willing to share (x niche market)
- ❖ In **harsh environment operation** (such as automotive to aeronautic and space) **ROBUSTNESS** and **DURABILITY** may be **significantly impacted** (difficult to untangle increase CFR and decrease EOL)
- ❖ **Mastering Reliability** is essential to **Safety, Availability** and **Greener** adoption of **COTS based equipment/systems** (strong impact on Product Lifecycle at R&D phase so as into the useful lifetime).



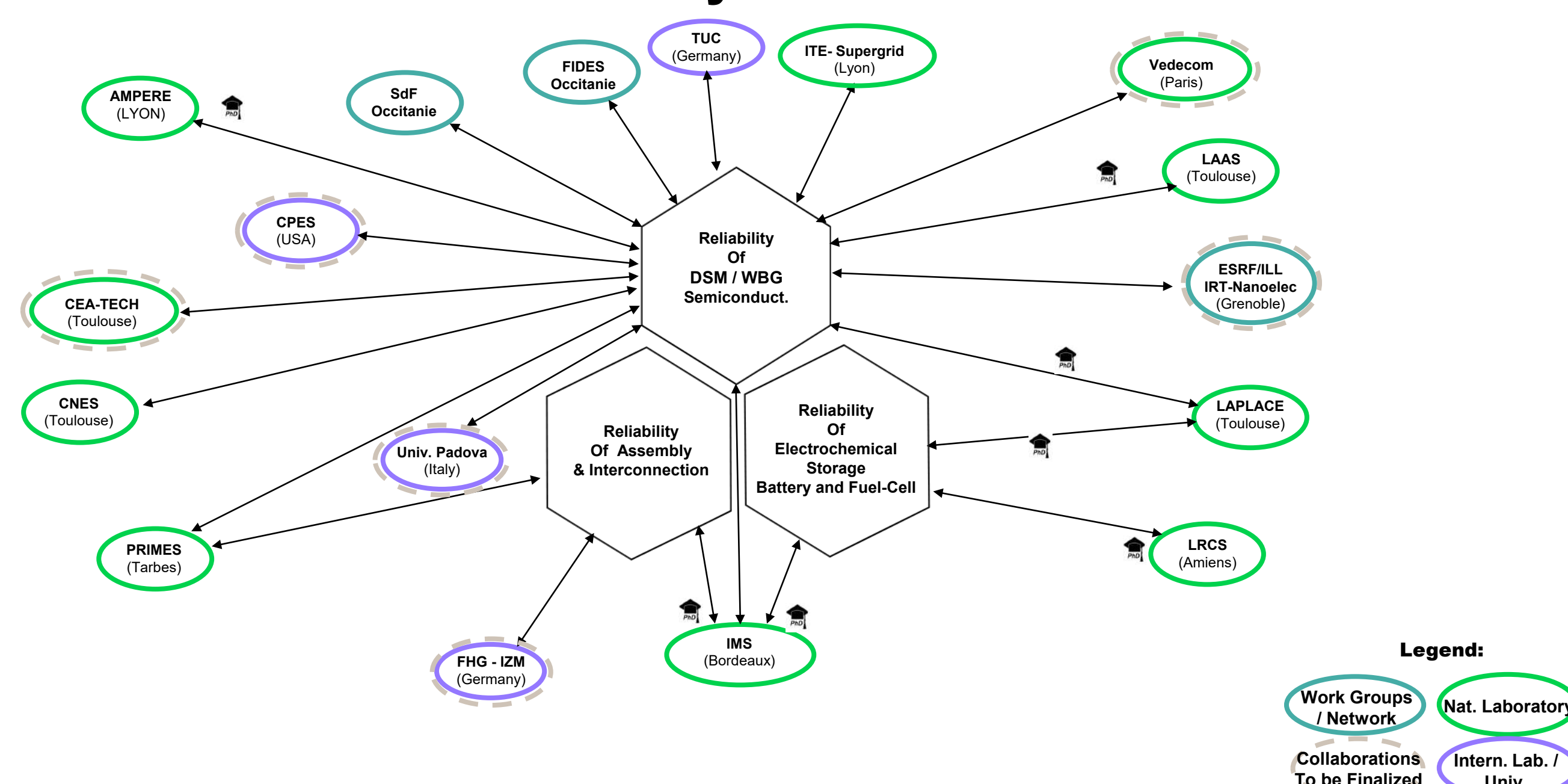
RATIONAL

Reliability Model based Risk Assessment



R&T ECOSYSTEM

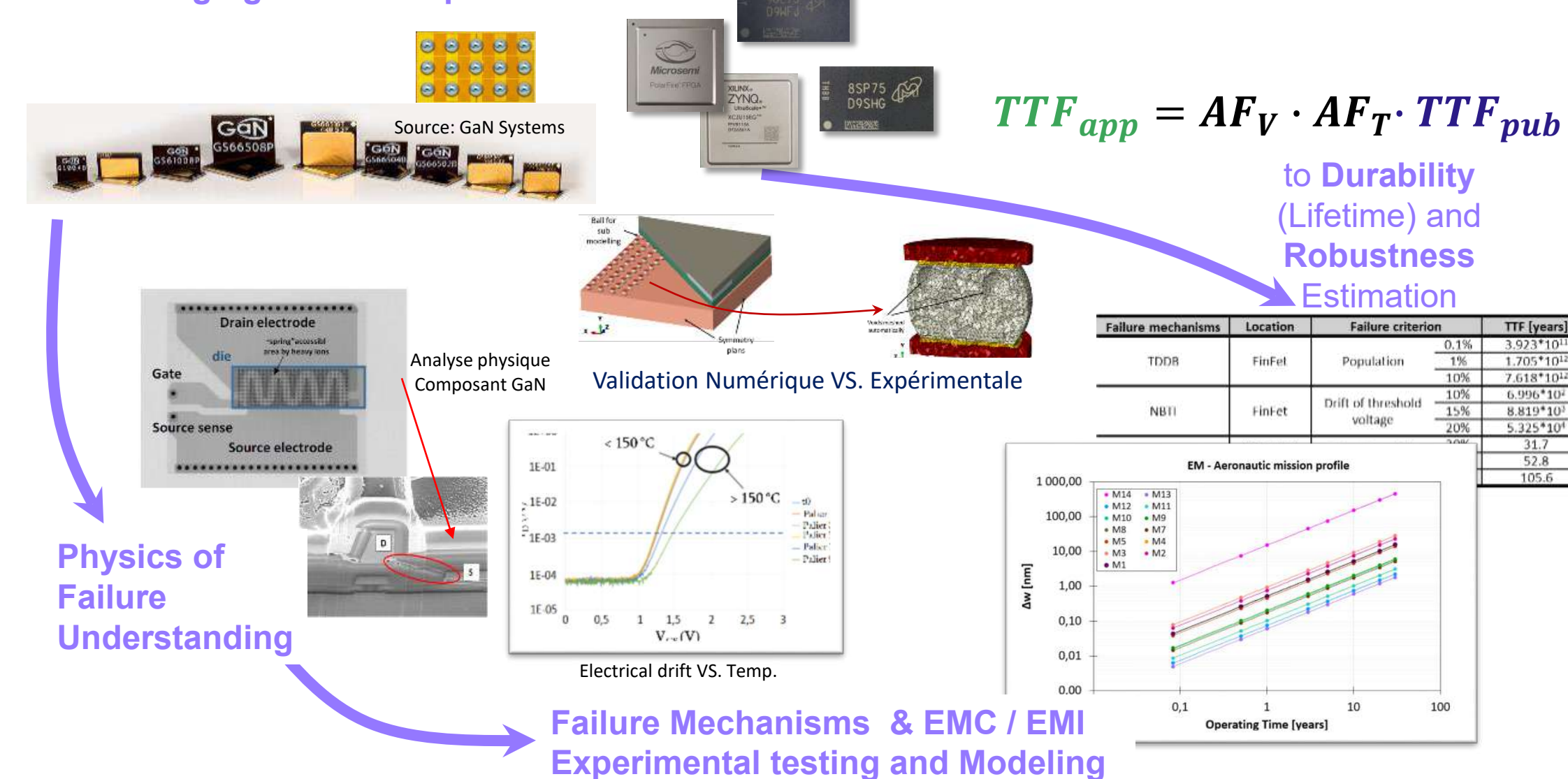
Three reliability focuses:



EXAMPLE OF MAIN ACHIEVEMENTS

FRAME (Failure Risk Assessment Methodology)

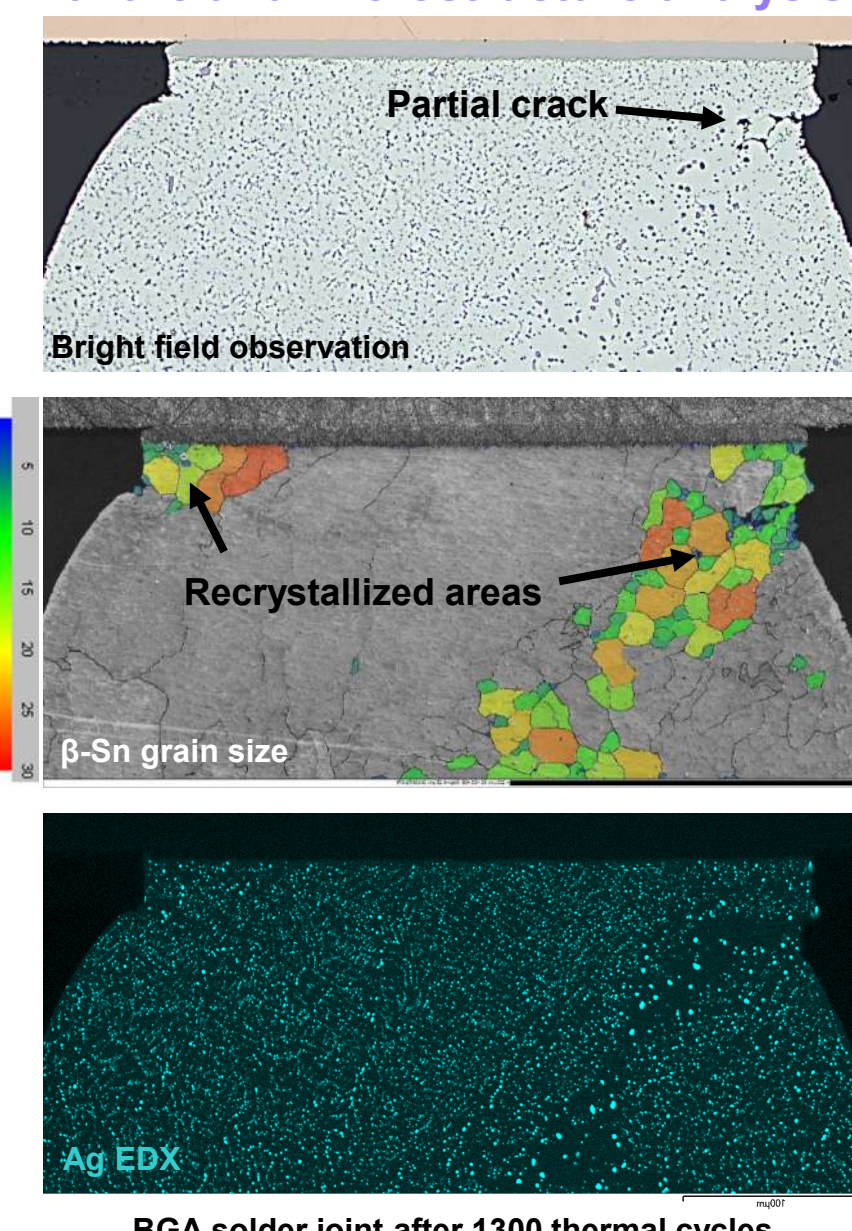
From emerging COTS components



Source: Projects ROBUSTESSE (2014-2016), FELINE (2017-2021), SICRET(2020-2023)

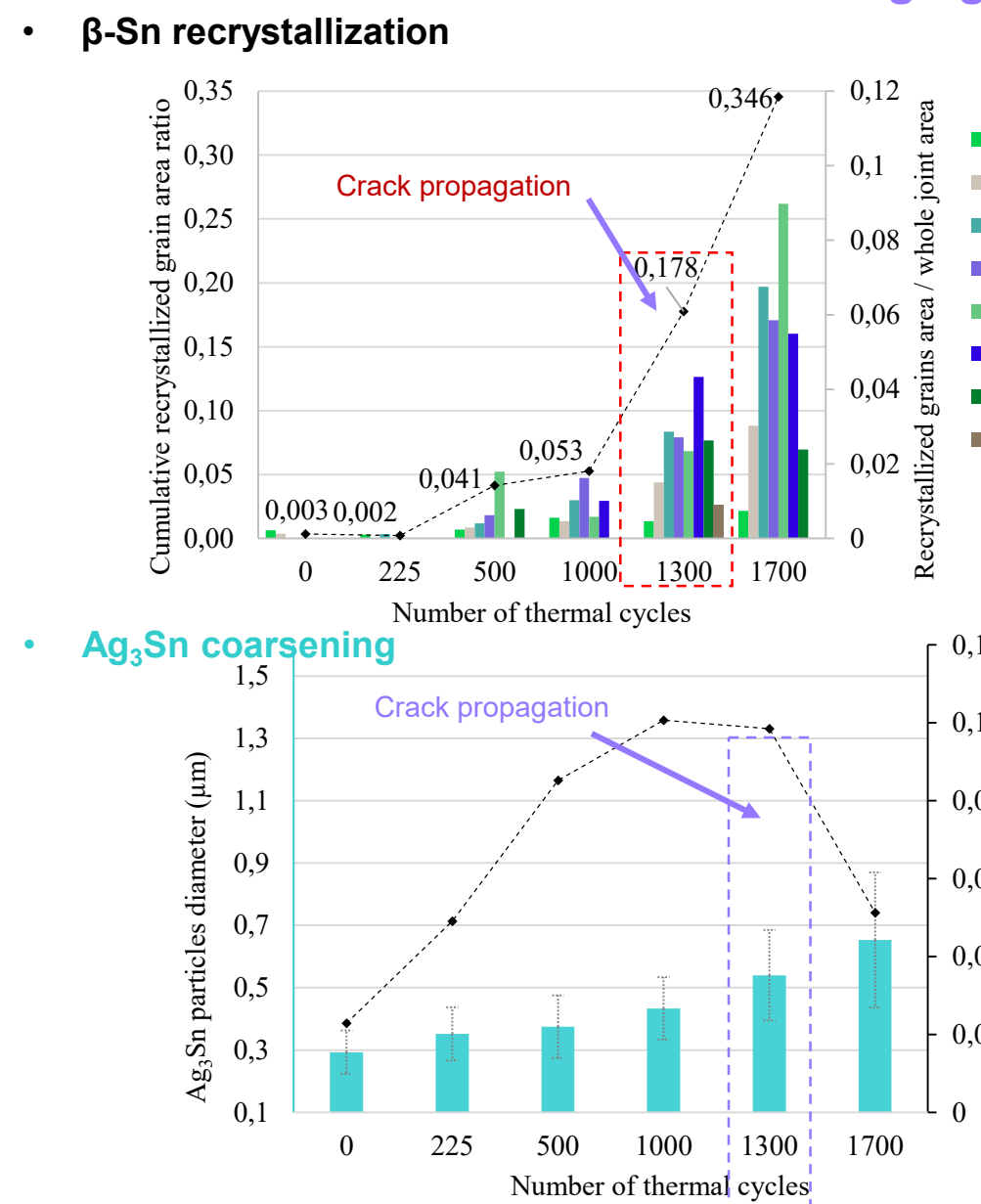
Thermo-mechanical reliability of BGA solder joints

Failure and microstructure analysis

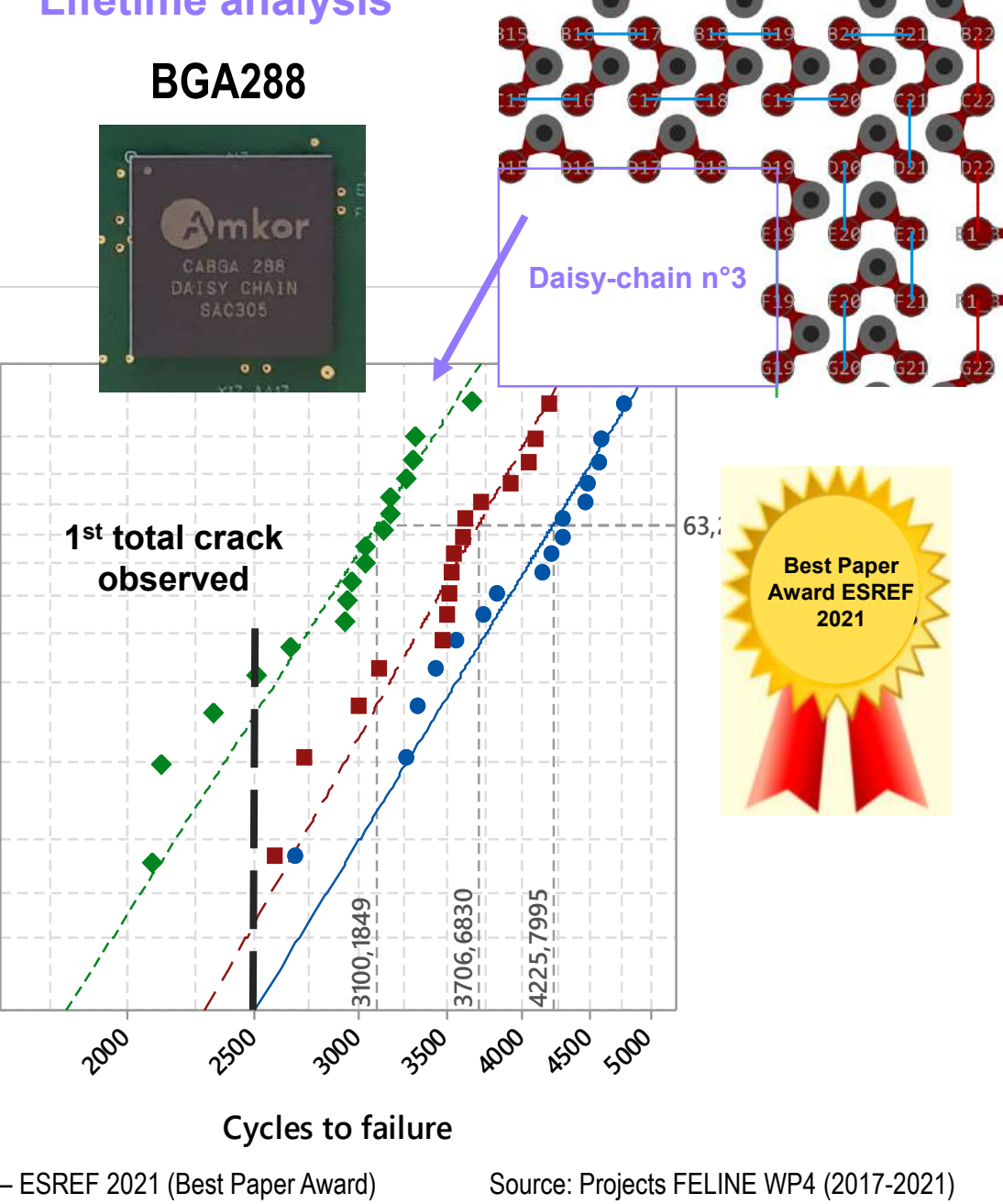


BGA solder joint after 1300 thermal cycles

Solder microstructural aging

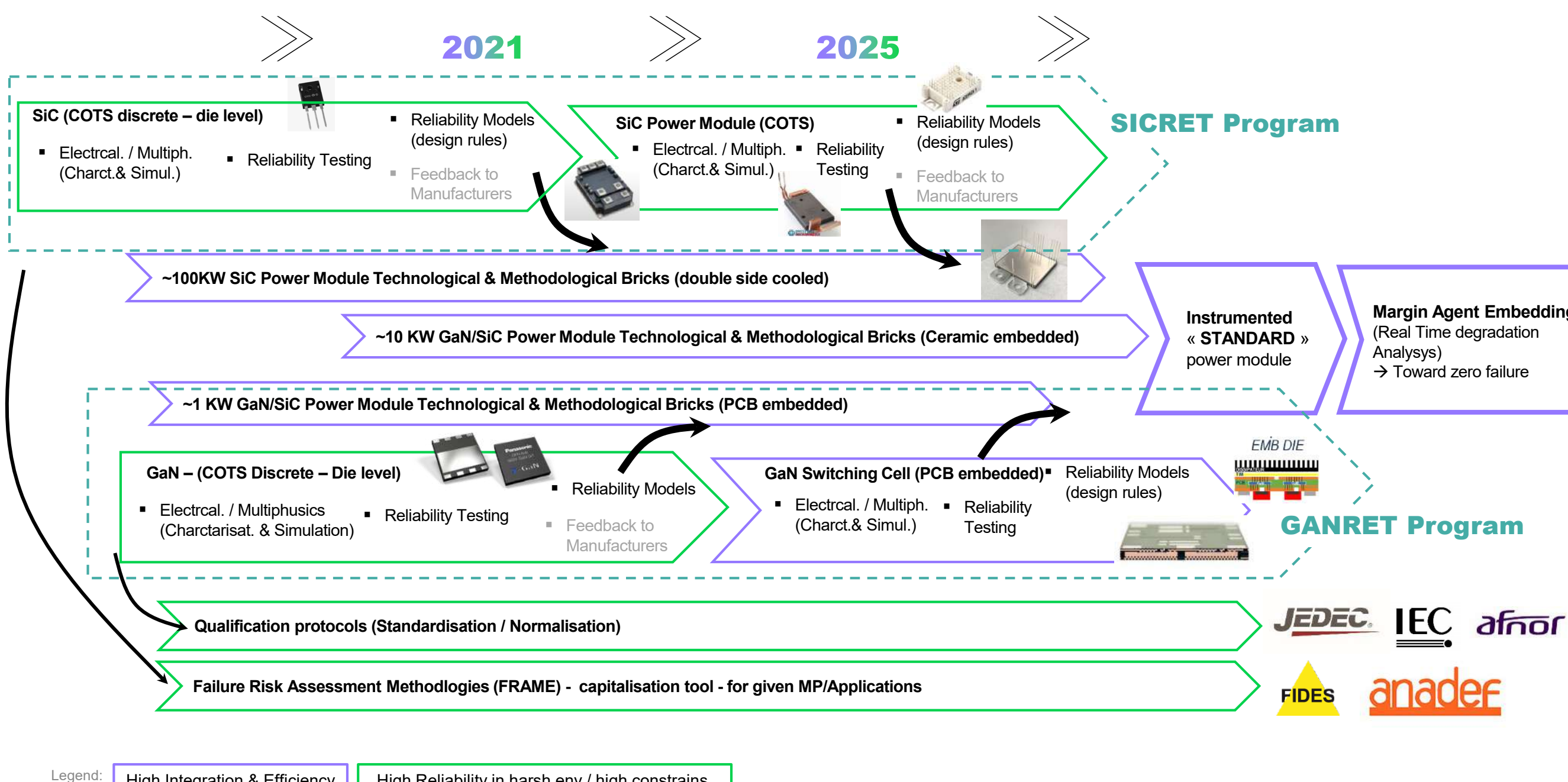


Lifetime analysis

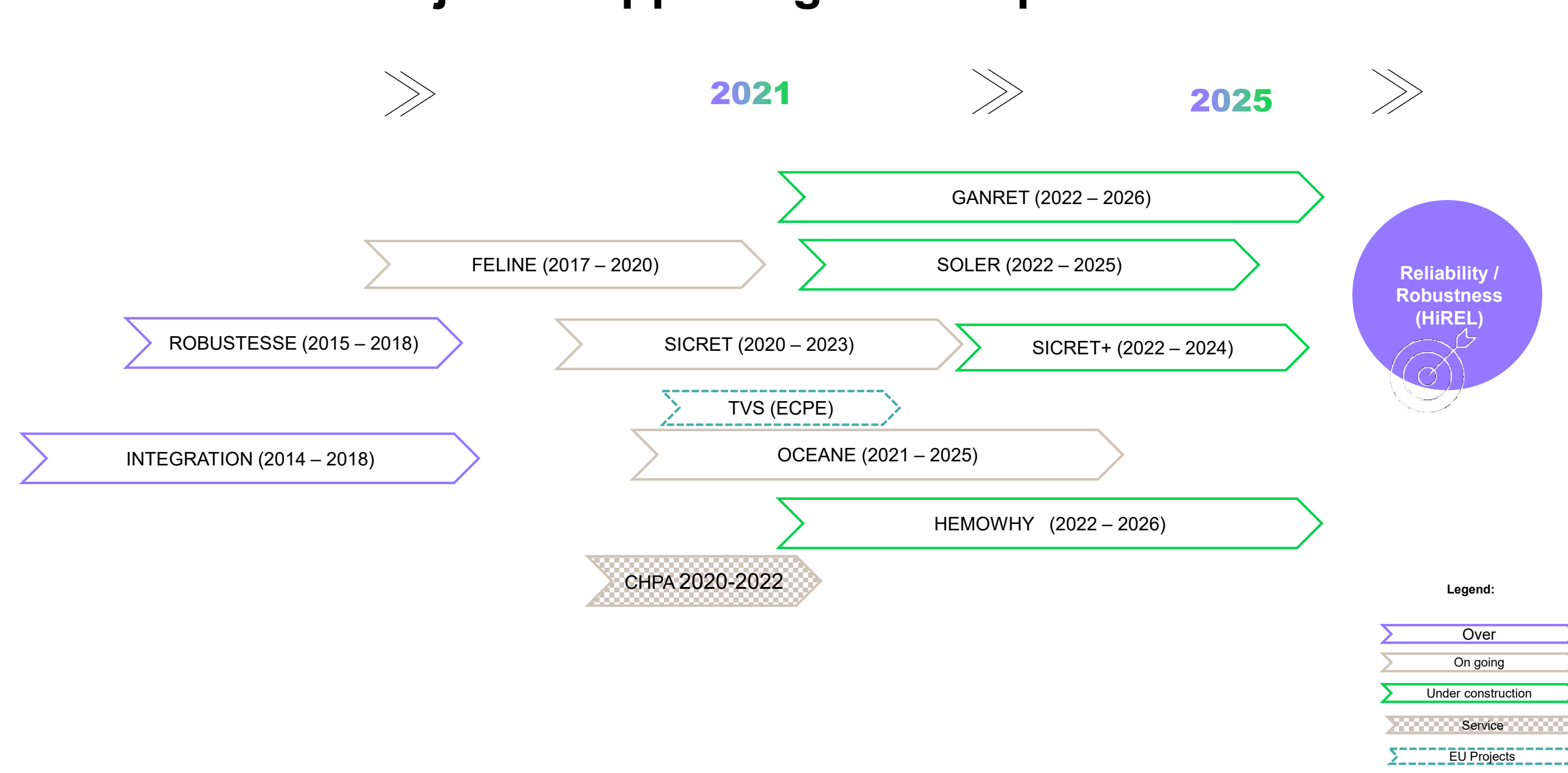


ROADMAP

5 years horizon with focus on WBG



Projects supporting roadmap



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