



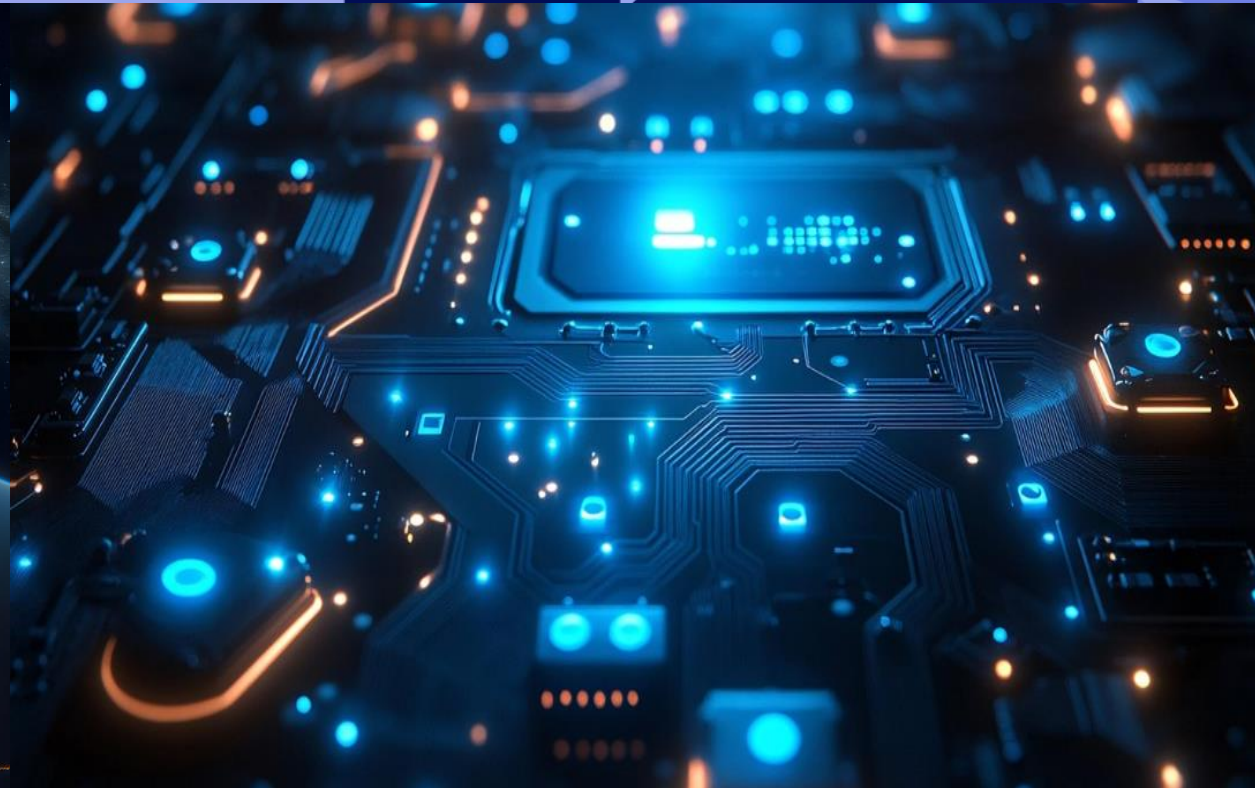
ACCEDE | ESCCON

2025

Seville - Spain
25 to 27th March



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Fundamental Pillars of Component Selection in New Space

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Fundamental Pillars of Component Selection in New Space

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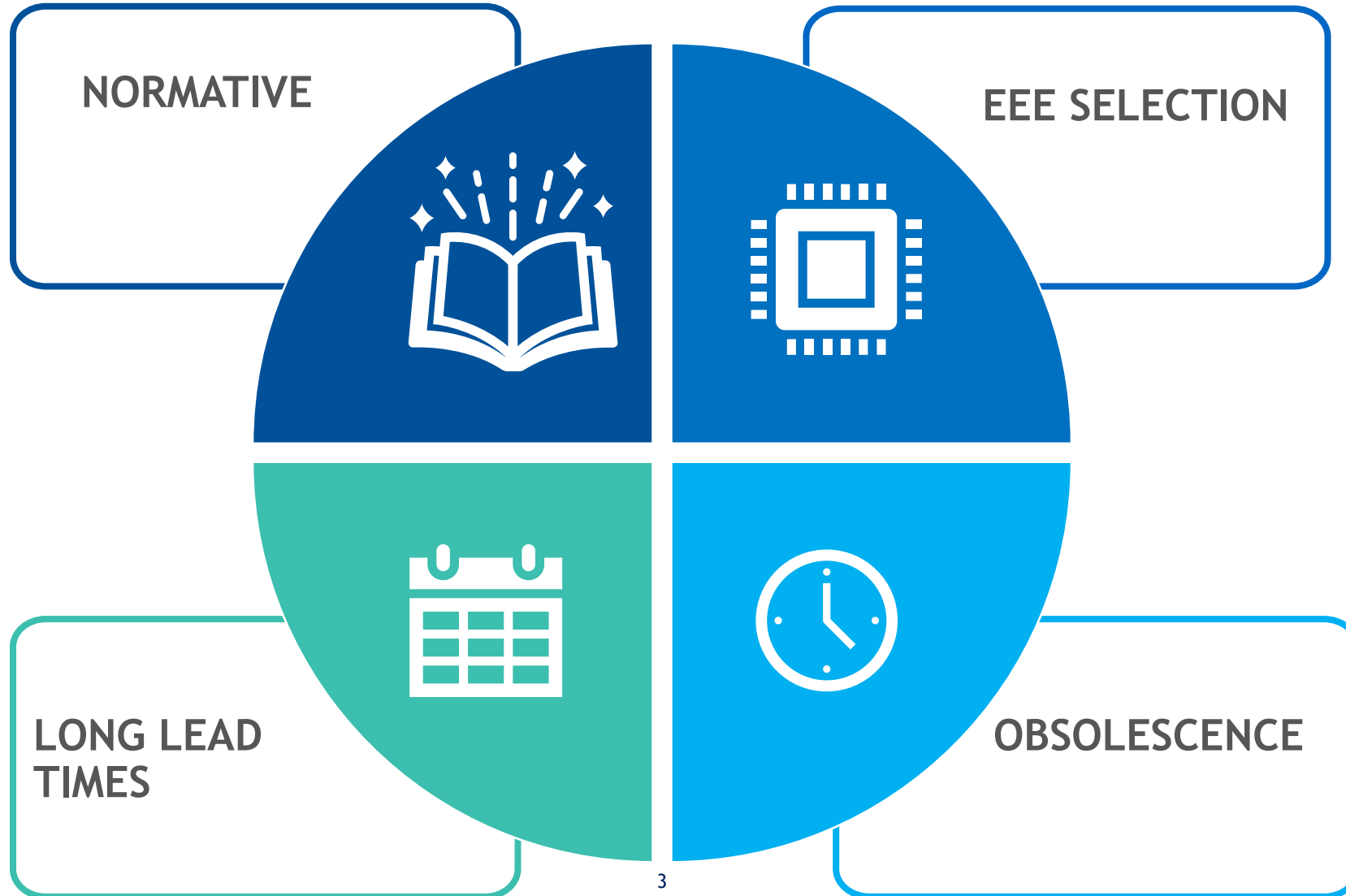
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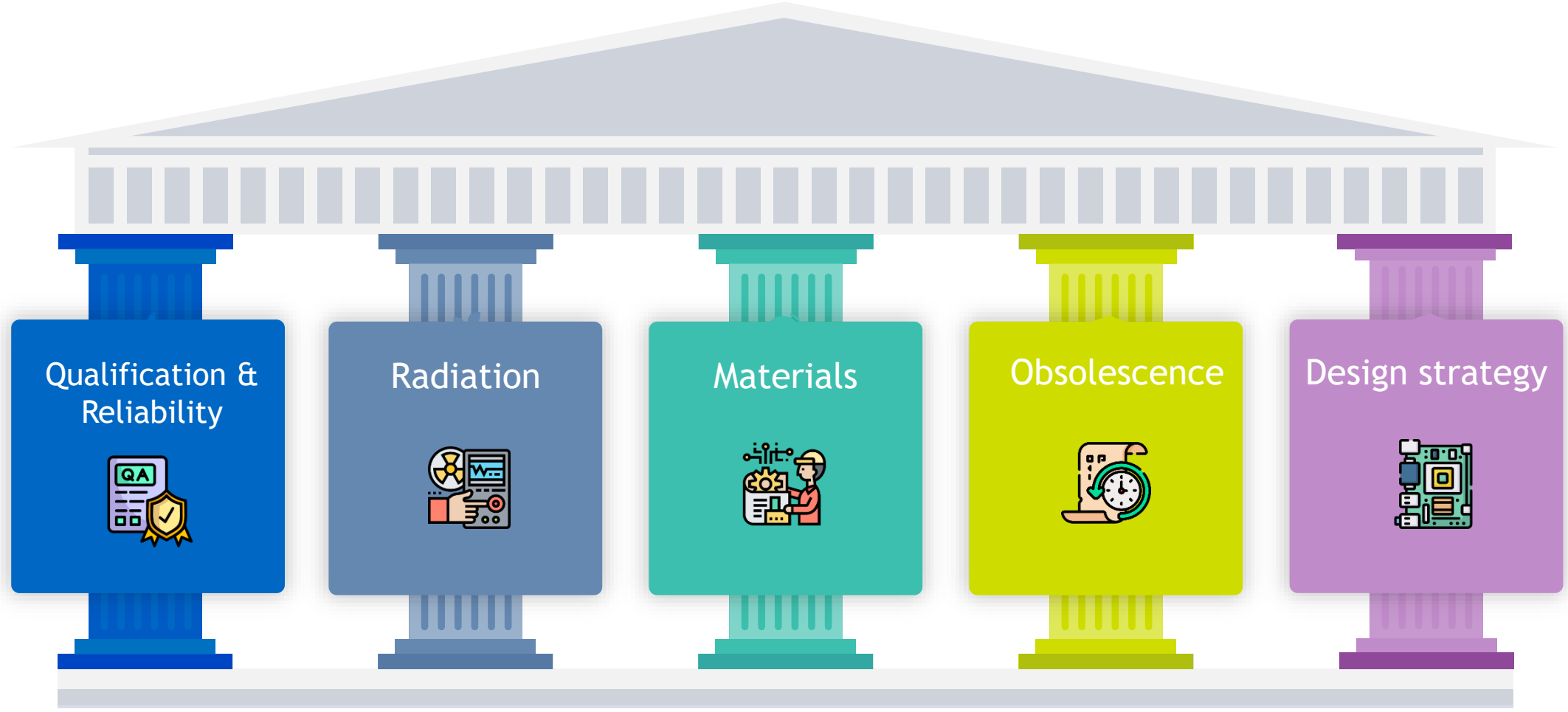
Fundamental Pillars of Component Selection in New Space

SENER's Challenges in 2022



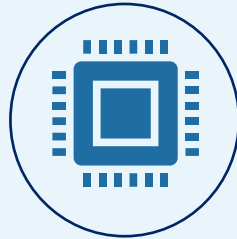
Fundamental Pillars of Component Selection in New Space

The 5 Fundamental Pillars for the selection of Components in New Space



Fundamental Pillars of Component Selection in New Space

Qualification & Reliability



SELECTION

- Part types reduction.
- Manufacturing supporting qualification & reliability data:
 - HTOL, HAST/THB, Thermal Cycling...
- Compile all the information obtained in SENER's CJF.
- Reliability prediction approaches.
- Additional tests such as Construction Analysis, PIND and/or acceptance tests at lot level.

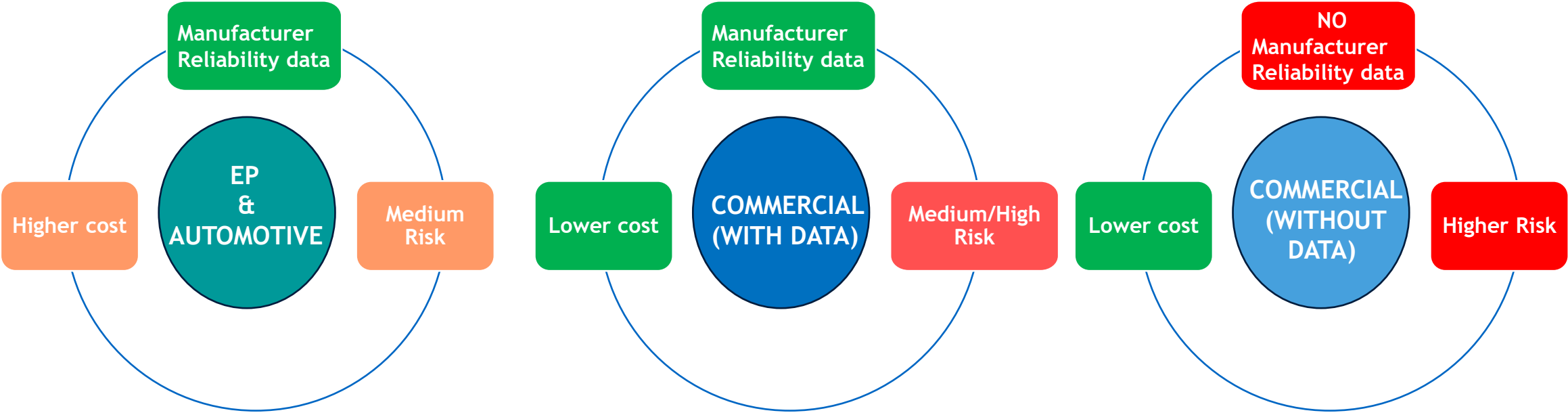


PROCUREMENT

- EEE procured from official distributors or directly or from the manufacturer also to avoid counterfeit issues.
- Look for traceability and production controls.
- Complete reels to achieve the maximum possible level of homogeneity

Fundamental Pillars of Component Selection in New Space

Qualification & Reliability



Fundamental Pillars of Component Selection in New Space

Qualification & Reliability

Provided by manufacturer 

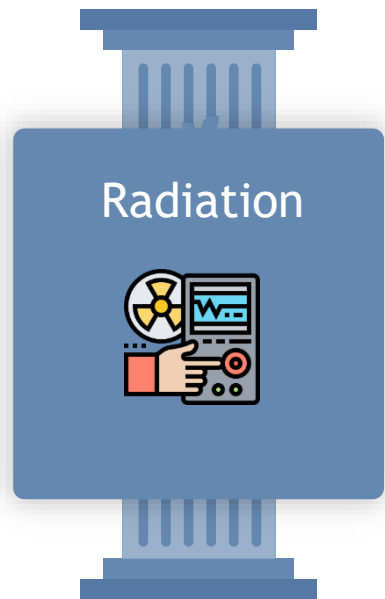
Depends on the manufacturer 

Not provided by manufacturer 

	AUTOMOTIVE & EP					COMMERCIAL WITH RELIABILITY DATA					COMMERCIAL WITHOUT RELIABILITY DATA				
	Ceramic capacitor	Tantalum capacitor	Resistors	Diode Transistor	I.C	Ceramic capacitor	Tantalum capacitor	Resistors	Diode Transistor	I.C	Ceramic capacitor	Tantalum capacitor	Resistors	Diode Transistor	I.C
Surge current		X					X					X			
Construction Analysis	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
HTOL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Humidity test (HAST/THB)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TC	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
PIND (cavity)				X	X				X	X				X	X

Fundamental Pillars of Component Selection in New Space

Radiation



- Radiation analysis is the most important part in the selection of the EEE components and will depend on the specific project Radiation Requirements.
- Radiation Tolerant Components are an option for projects that can assume large expenses associated with high component costs → high MOQs and Price.
- For this purpose, when selecting COTS, SENER has identified the critical points to be covered:
 - Type of mission and Orbit
 - Technology
 - Documentation
 - Investment

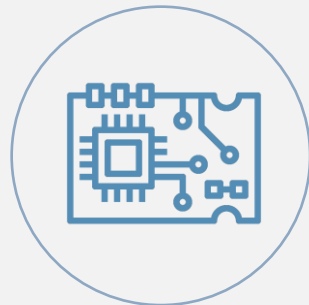
Fundamental Pillars of Component Selection in New Space

Radiation



Type of Mission & Orbit

- ❑ Orbit
- ❑ Mission Duration



Technology

Radiation effects depending on technology



Documentation

- Documentation research:
- ❑ Publications on radiation
 - ❑ Die revision
 - ❑ Wafer fabs

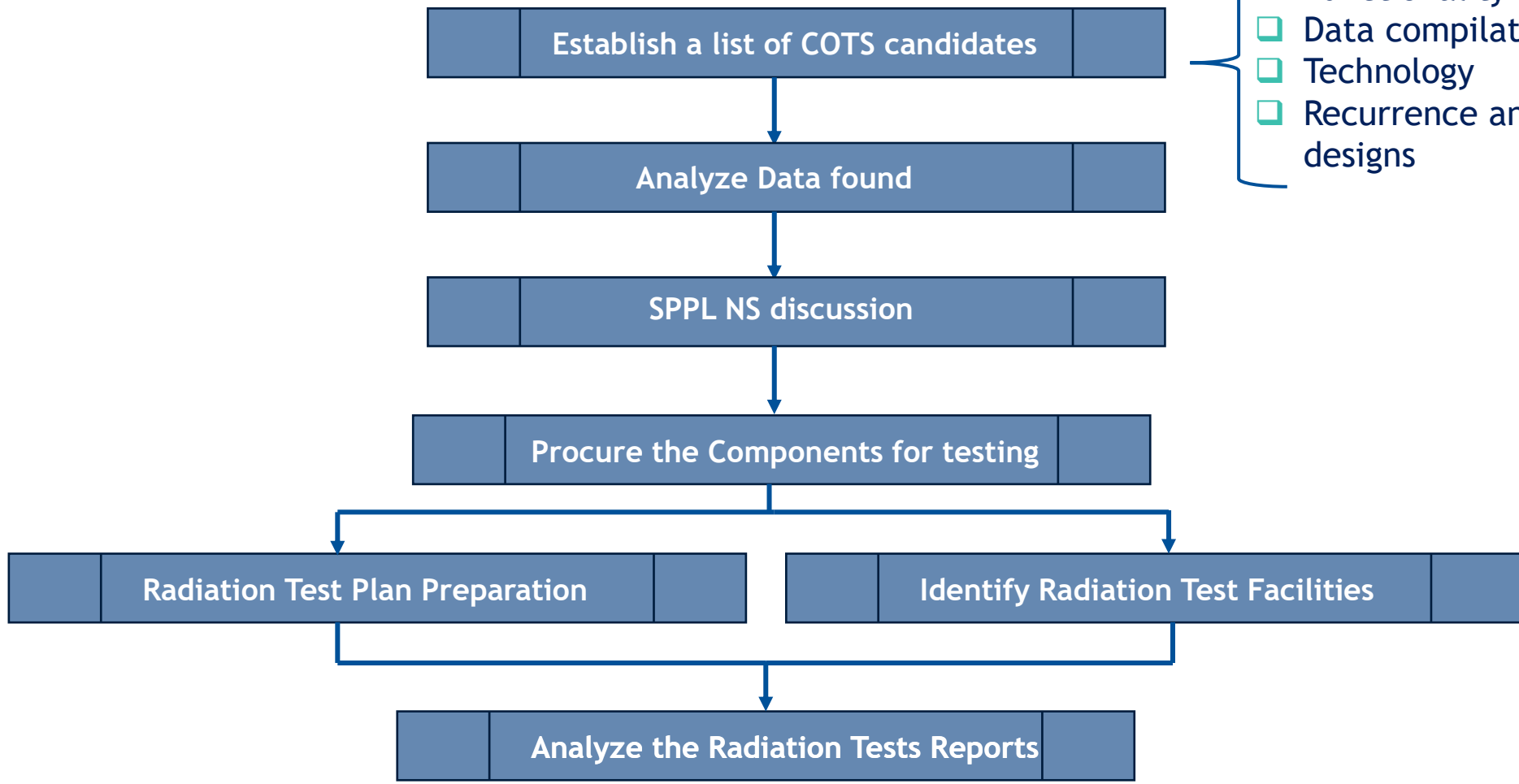


Investment

SENER invests in radiation testing every year and add these tested components into SENER's SPPL.

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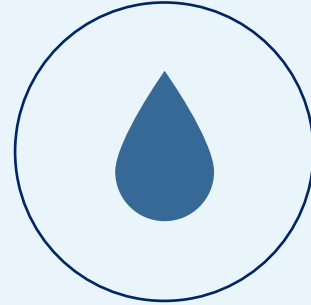
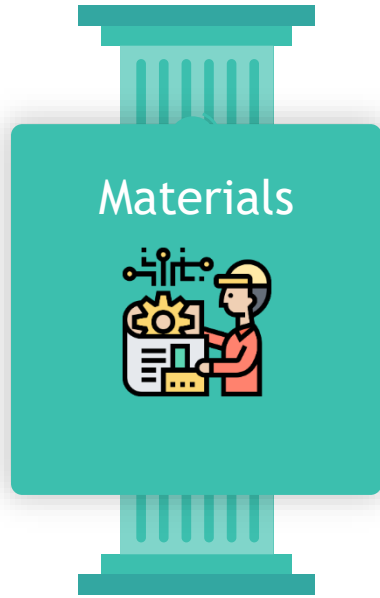
Radiation: Investment Decision



- Functionality
- Data compilation
- Technology
- Recurrence and criticality in our designs

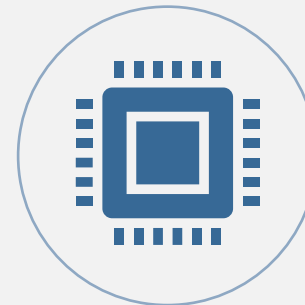
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Materials



MSL

- ❑ Indicates how susceptible the component is to moisture (components are not hermetic)
- ❑ MSL is a key factor during storage, handling and PCB assembly process



LEAD FINISH

- Lead finish can be an issue for COTS EEE components:
- ❑ Choose a non pure Tin lead finish
 - ❑ Mitigation Techniques if pure Tin is the only option
 - ❑ Gold avoided in production

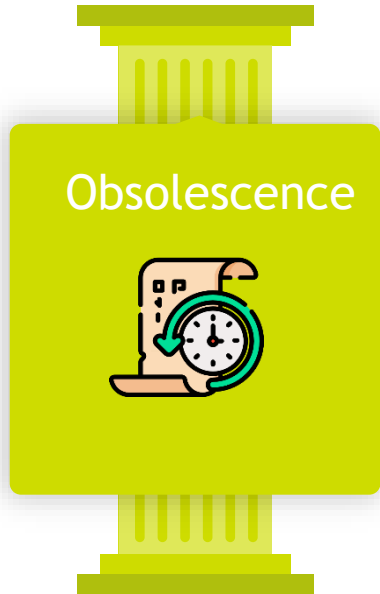


OUTGASSING

- ❑ Outgassing Heritage database
- ❑ Manufacturer outgassing data
- ❑ Declared material list should be provided
- ❑ If not outgassing information available tests should be performed.

Fundamental Pillars of Component Selection in New Space

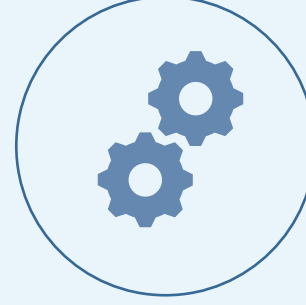
Obsolescence



SHORTER LIFE- CICLE

COTS products life is short:

- Innovation
- Design changes
- Legal requirements (RoHS, REACH)



OBSOLESCENCE TOOLS

Check components availability and status for detecting obsolescence



ACTION WHEN AN EEE BECOMES OBSOLETE

- Option A: procurement in advance and storage
- Option B: Design change that implies requalification, impacts on cost and schedule

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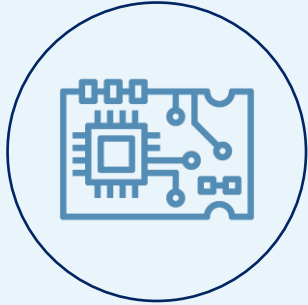
Design Strategy



- ❑ Another key point in using commercial components for New Space is design.
- ❑ Define a clear strategy to follow when designing for New Space. This design strategy can be broken down into four important parts:
 - ❑ Schematic Design
 - ❑ Reliability
 - ❑ Redundancy
 - ❑ Monitoring and Protections

Fundamental Pillars of Component Selection in New Space

Design Strategy



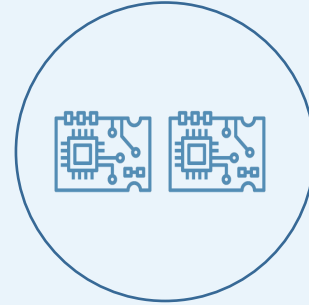
SCHEMATIC DESIGN

- ❑ Increase design margins for additional degradation
- ❑ Filtering of SET (transients).
- ❑ Design to minimise radiation effects.



RELIABILITY

- ❑ Selecting less risky packages.
- ❑ Study the probability of failure
- ❑ Critical components selected radiation Tolerant guaranteed by Manufacturer



REDUNDANCY

- ❑ Design redundant circuits for critical functions.
- ❑ Design with two versions: Rad Tolerant and COTS version

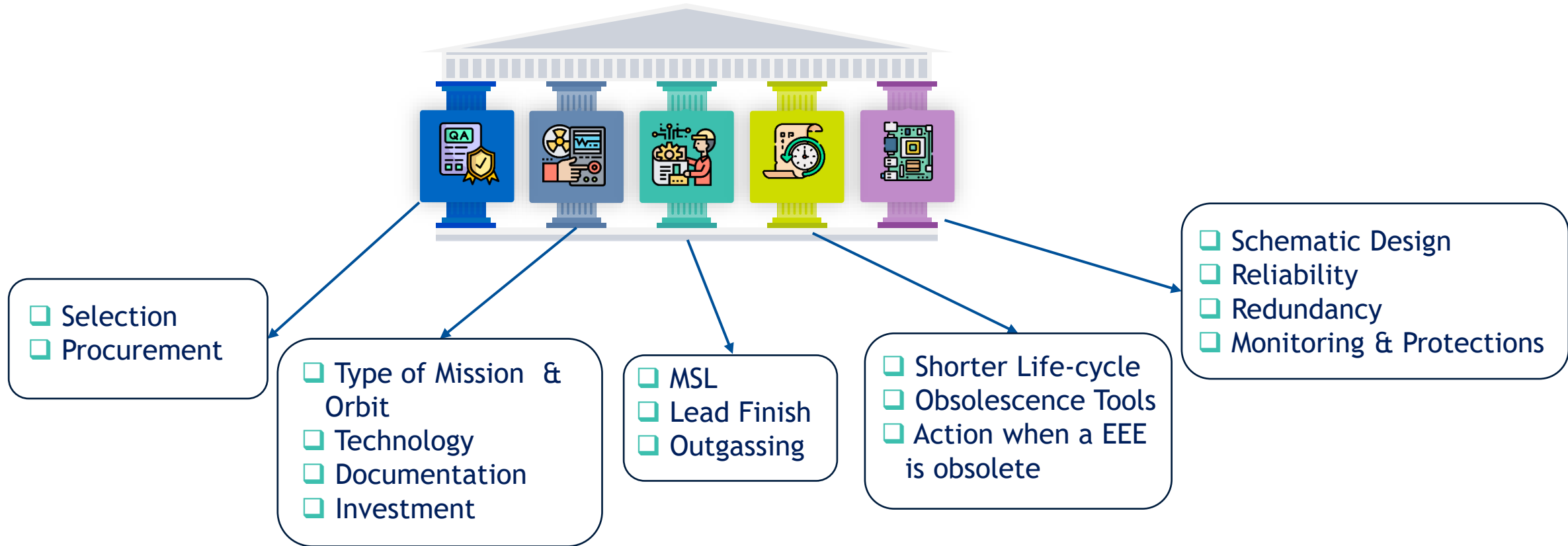


MONITORING AND PROTECTIONS

- ❑ Telemetries should be provided to guarantee the required level of failure observability at unit level.
- ❑ Protection mechanisms as current protections, or for memories robust error detection and correction methods

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Conclusions



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 www.youtube.com/user/senerengineering

