A selection of challenges and barriers of sustainable power electronics

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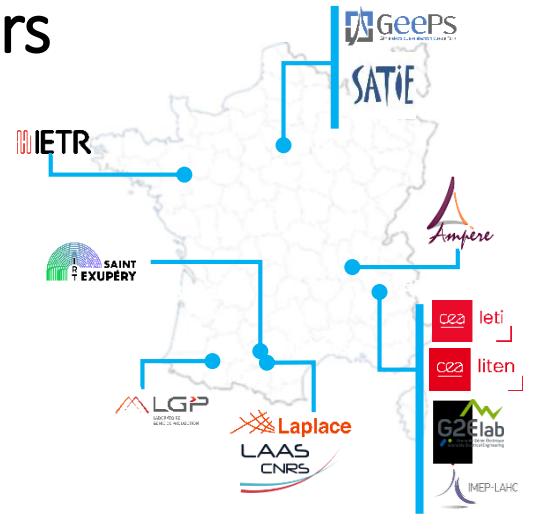
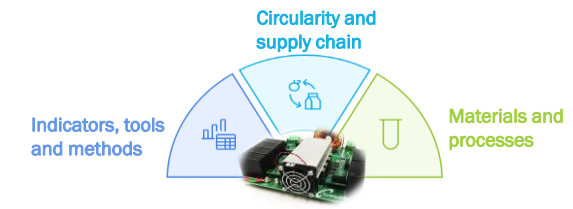
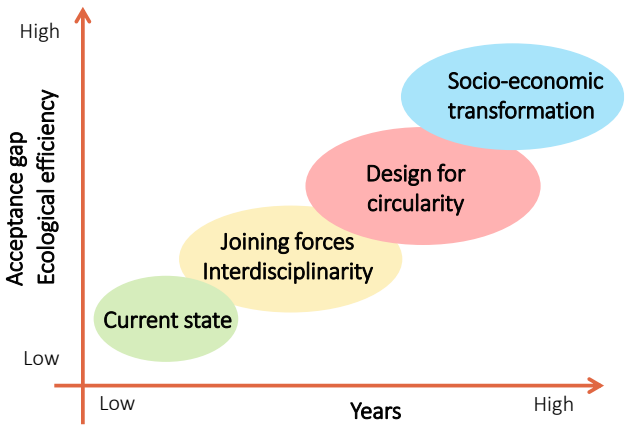
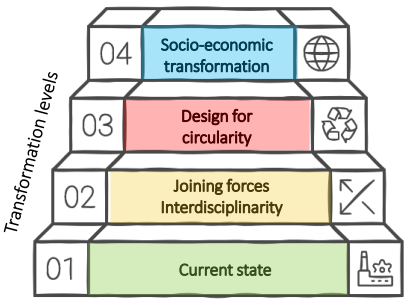






Progression Towards Sustainable Power Electronics



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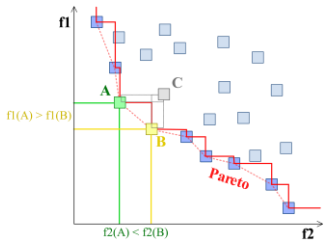
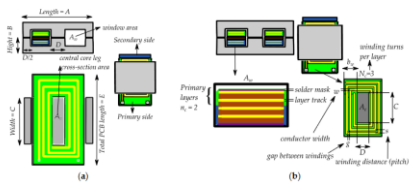
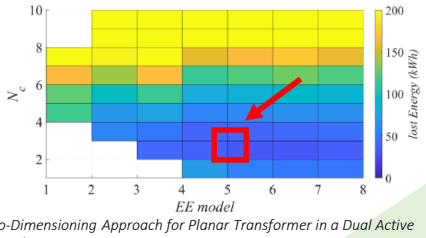
LEVEL 1 : Current state (Incremental improvement)

Criteria	Level
Efforts	Low
Acceptability (within the field)	High
Transformation factor	Low
Temporality	Now

- ❑**Exposing** the gaps in current practices
- ❑**Awareness** of traditional limitations
- ❑**Perceived** contribution of engineers







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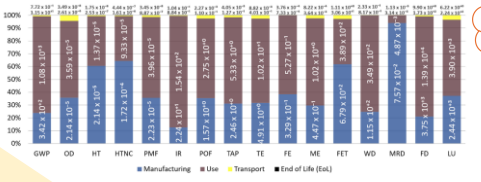
LEVEL 2 : Joining forces (Interdiscplinarity)

Criteria	Level
Efforts	Medium
Acceptability (within the field)	Medium
Transformation factor	Medium
Temporality	ASAP (0-5years)

- ❑**Lack of accurate data** from the value chain
- ❑**Opacity** of the value chain stakeholders
- ❑**Lack of proper tools and universal methodologies** to assess a LCA
- ❑**Lack of a mapping and dynamic classification** of PE fields and stakeholders with respect to eco-design and circularity
- ❑Integrating **End Of Life scenarios** in LCA



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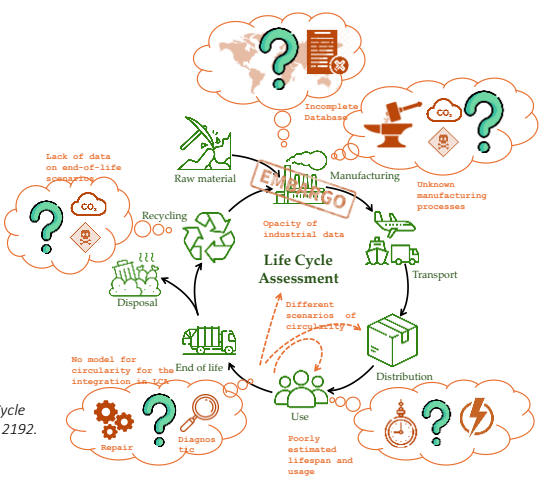

Courtesy : Adrien Voldoire +GT CEPPS

LEVEL 3 : Design for Circularity

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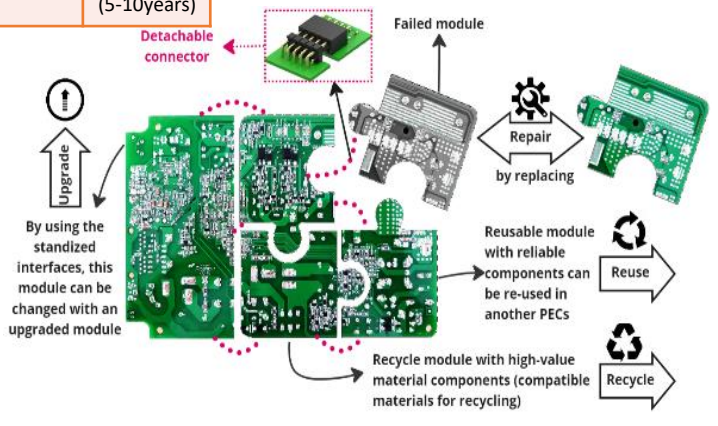
Criteria	Level
Efforts	High
Acceptability (within the field)	Low
Transformation factor	Medium
Temporality	ASAP (5-10years)

- ❑Integrate **new environmental indicators and design rules** into early decision-making in power electronics.
- ❑Switch design practices and **involve new materials, architectures, topologies** and design rules
- ❑Include **Economic and Social Sciences** to act on the value chain and introduce new products, services, and actors.
- ❑**Rise awareness** of the power electronic engineer with respect to the **End Of Life** of the converter



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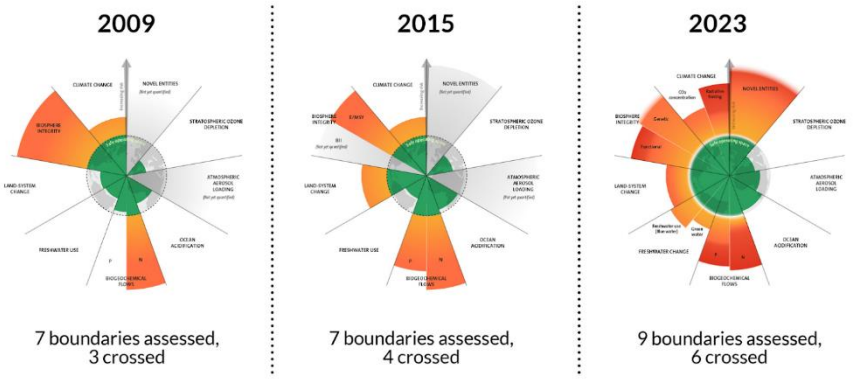
LEVEL 4 : Socio-Economic transformation

Criteria	Level
Efforts	V. High
Acceptability (within the field)	V. Low
Transformation factor	V. High
Temporality	ASAP (>15years)

- ❑**From better to good enough**: Identify the best tradeoff between performance quest and planetary limits
- ❑**From short term competition to long term cooperation**: Identify and implement the technical conditions for industrial cooperation
- ❑**From products for consumers, to services for consumers** Identify the evolution of power electronics to sustain device mutualization, massive usage and long lasting products



The evolution of the planetary boundaries framework. Licenced under CC BY-NC-ND 3.0 (Credit: Azote for Stockholm Resilience Centre, Stockholm University. Based on Richardson et al. 2023, Steffen et al. 2015, and Rockström et al. 2009) Click on the image to download.