



Radio Frequency & Microwave sources



Microwave & Imaging Sub-Systems

Large Instruments



Radiology

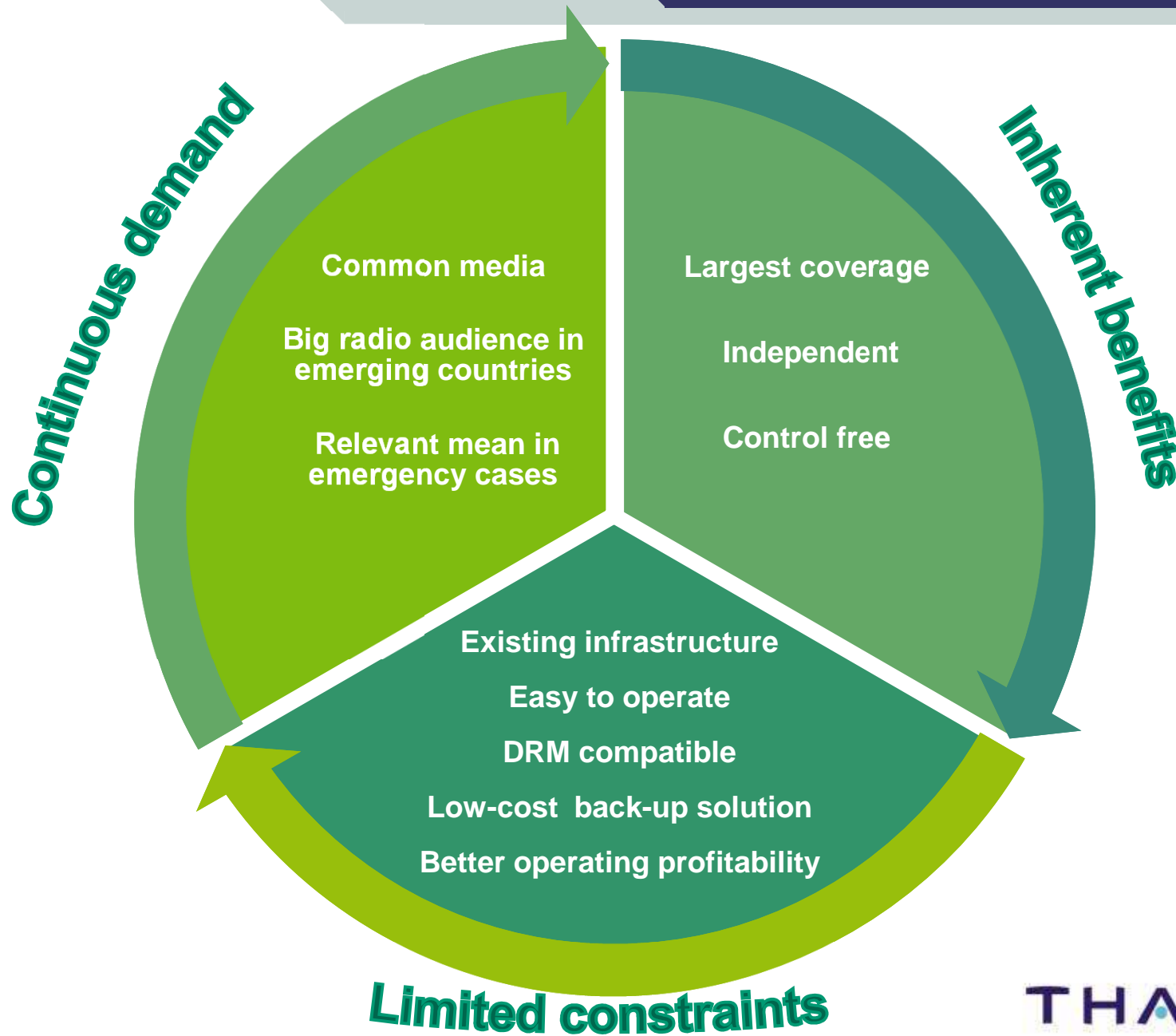
www.thalesgroup.com

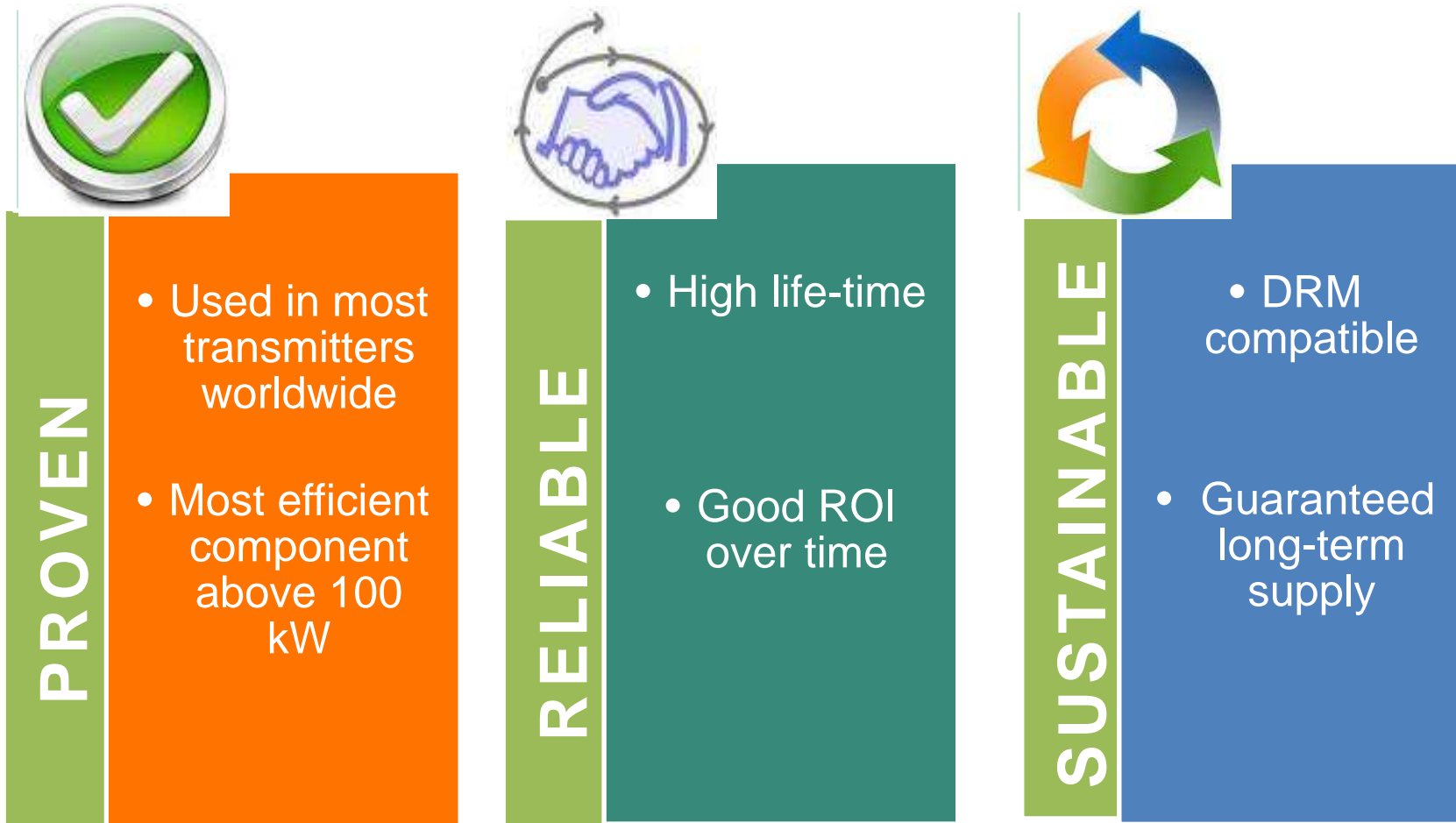
HFCC Conference

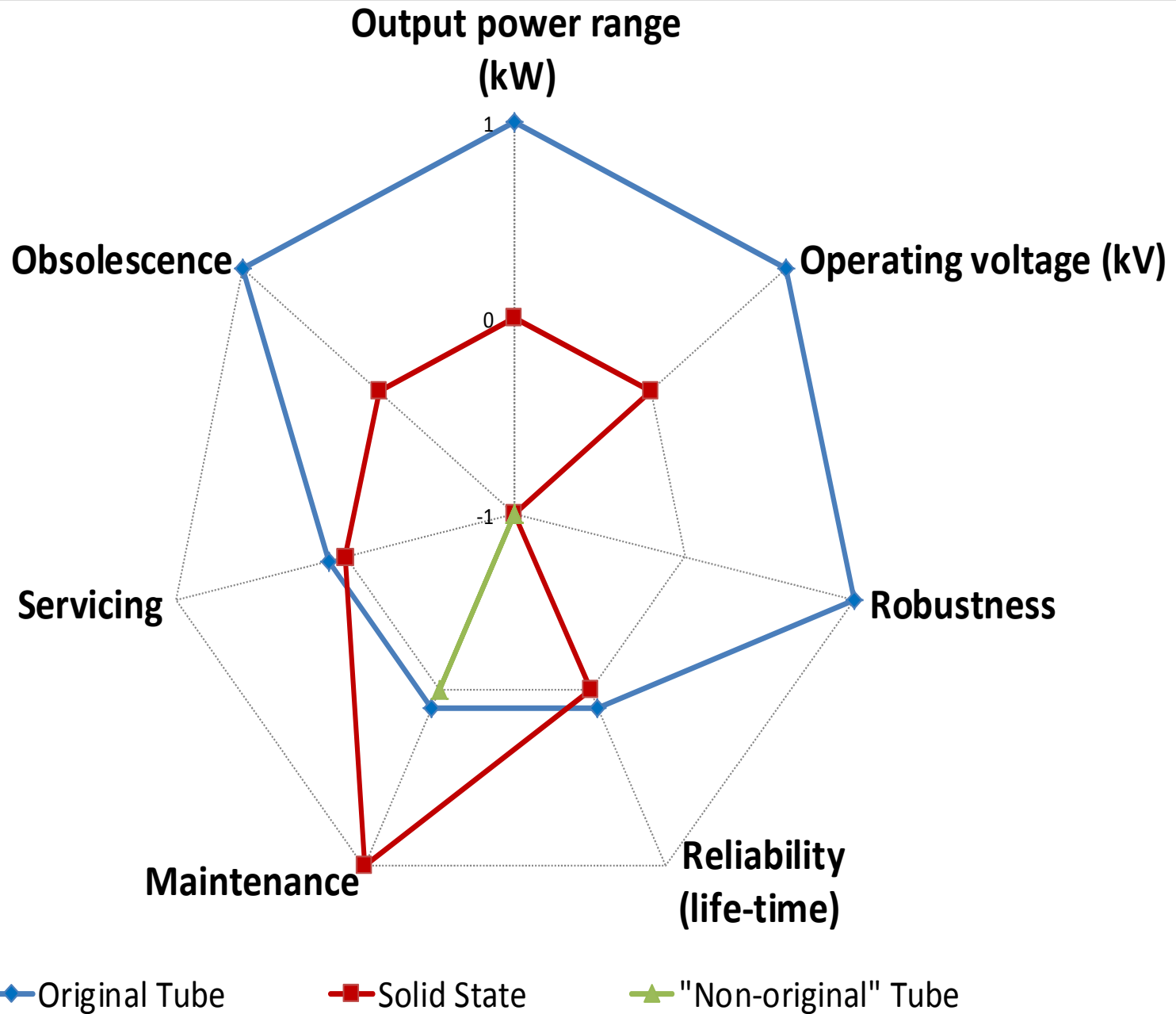
Bratislava, August 26th

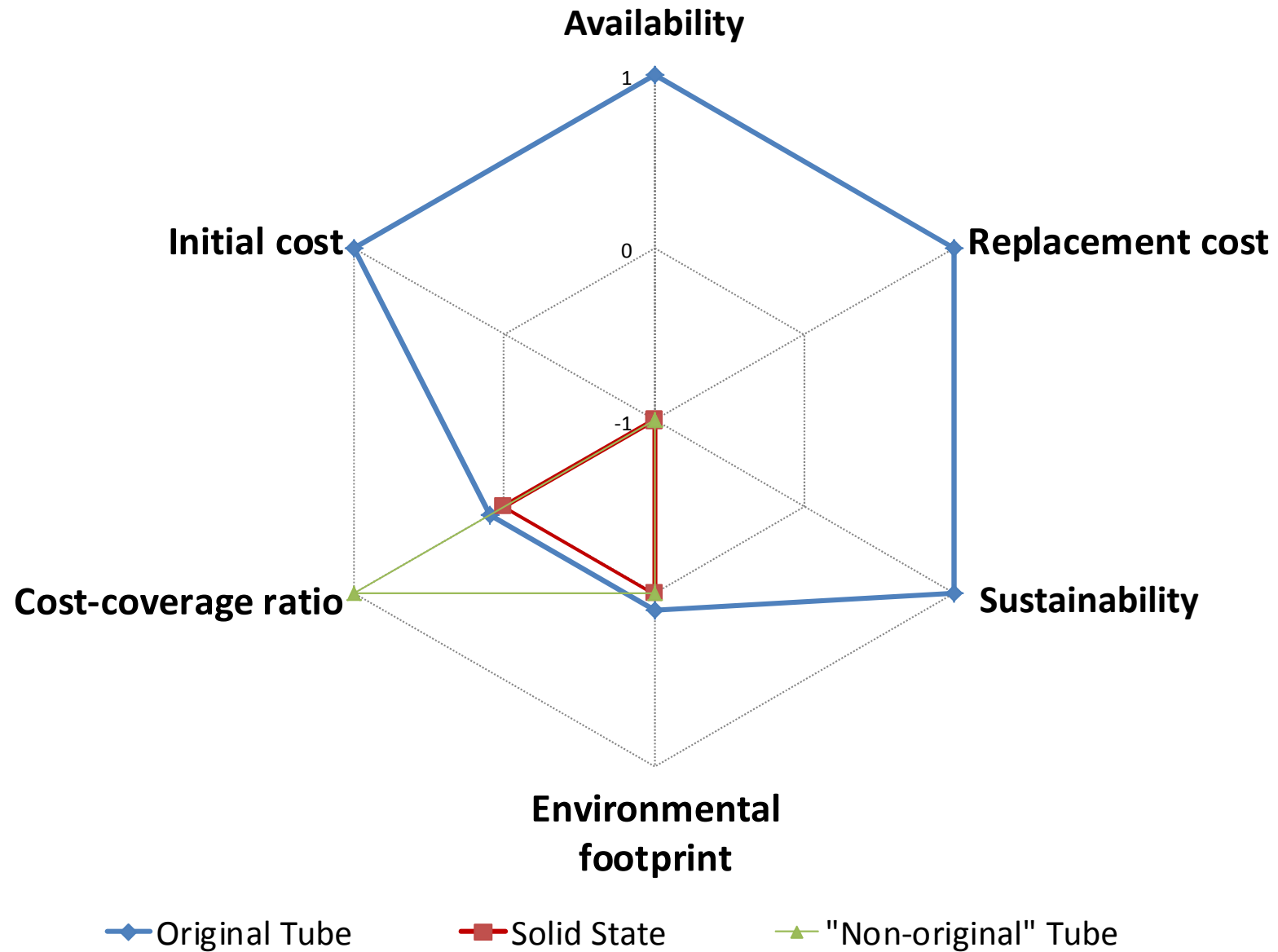
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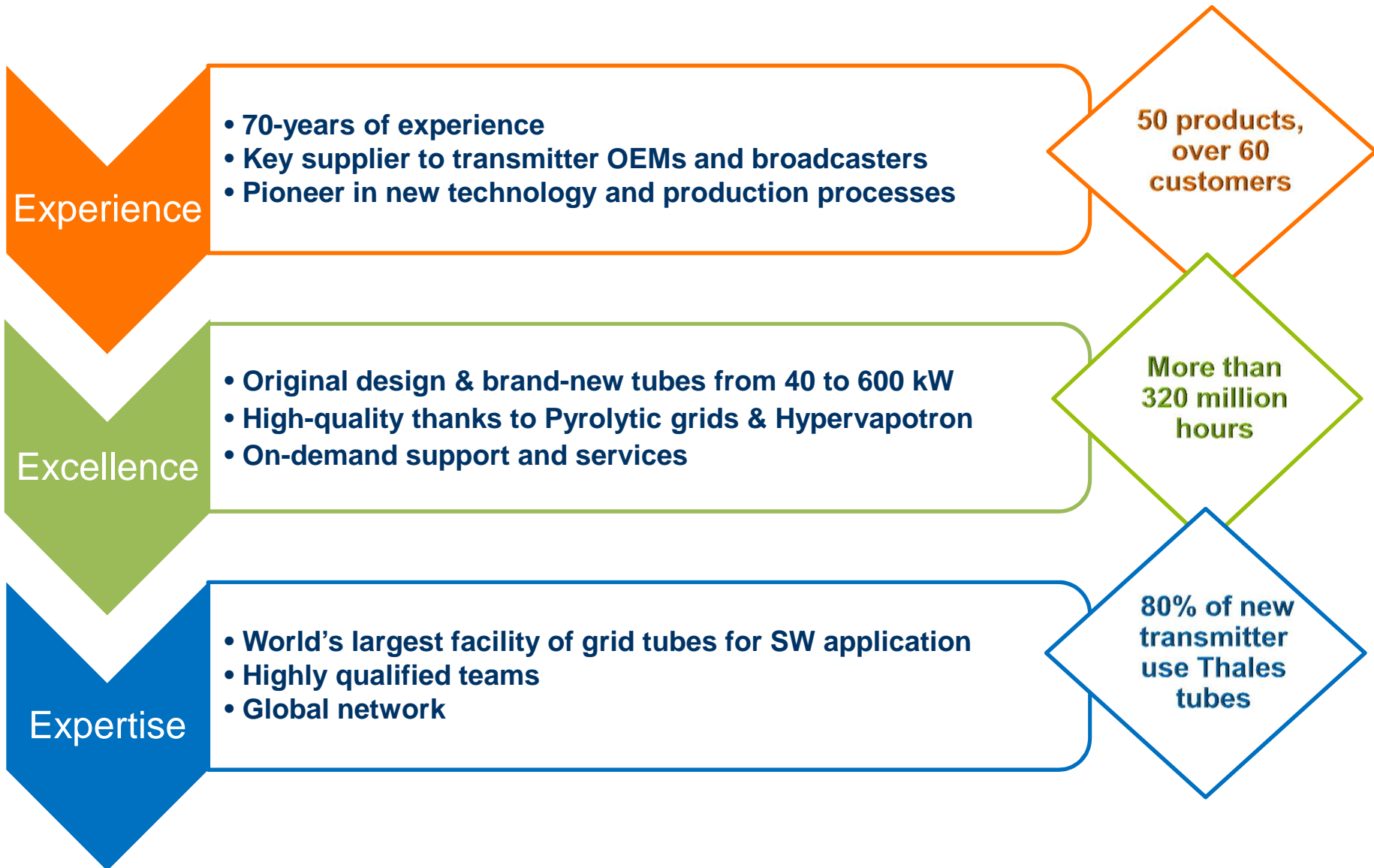
Why keep broadcasting shortwave?



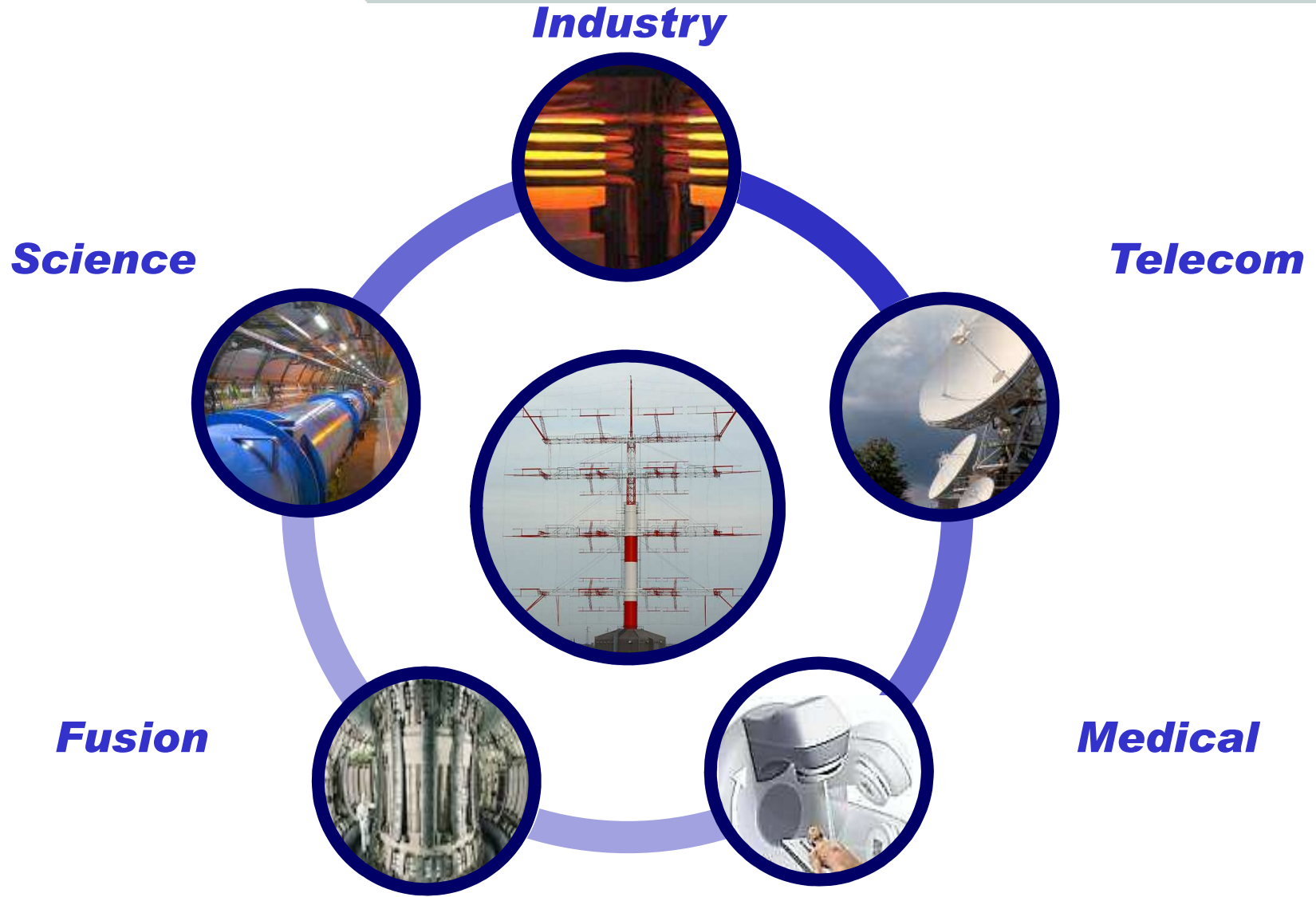








Other main applications for electron tubes



Sustainable supplier to secure continuous SW radio

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- ◆ Production of power grid tubes, x-ray sources, TWTs...
- ◆ 25,000 m² of industrial surface, including 200 m² clean rooms
- ◆ ISO 9001:2008 - ISO 14 001
- ◆ 370 employees
- ◆ 27 industrial patents



X-ray sources



Power triodes and tetrodes



Traveling Wave Tube

World# 1 for broadcast tubes

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A sales network close to you

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74202 Thonon-Les-Bains****FRANCE****To address all your questions****THALES**

Comparing tubes and SSPA in a SW transmitter

Technical attributes	Comments
Output power range (kW)	One single tube can individually deliver the requested output power
Operating voltage (kV)	High-voltage does not mean high energy consumption!
Robustness	Commonly agreed in the RTV broadcasting community that tube transmitters are more robust than solid-state ones
Reliability (life-time)	Rebuilt tubes may last as long as original ones,. However, they may not be operated at rated power
Maintenance	Each solid state module are hot swappable
Servicing	Regular assessment of transmitted signal quality requires dedicated test equipment , whatever the power stage technology.
Obsolescence	Solid-state chip technology being continuously evolving, the original components/modules of SSPA-based transmitter may no longer be available in the mid-term.

Comparing tubes and SSPA in a SW transmitter

Economic attributes	Comments
Availability	One single tube will deliver rated transmitter power, whereas SS technology will require a combination of many individual modules.
Replacement cost	Due to the tube extended life-time, its long-term availability in the market, and the low quantity and complexity of associated circuit components, the replacement cost is most often limited to the tube itself.
Sustainability	Grid tube has been a proven technology since decades, It will be supplied worldwide for many years as well.
Environmental footprint	Life-cycle management offer: Thales provides used tubes disposal on request.
Cost-coverage ratio	The extended coverage of a SW transmitter outside national boundaries, allows for quick return on the total investment costs in a tube-based transmitter (including maintenance).
Initial cost	High powered SSPA-based transmitters are more expensive than tube-based ones