LEAPS League of European Accelerator-based Photon Sources

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Chair of LEAPS Coordination Board

EU-Project Office @DESY

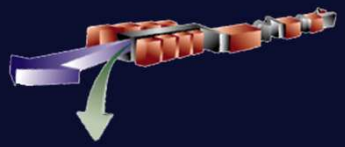
A new consortium of excellence in Europe devising a transformative level of coordination and integration

LEAPS Consortium Declaration
13 Nov 2017, Brussels

13 Synchrotron Radiation &

6 FEL Facilities

16 organisations are joining forces to master the challenges of the next decades



Ambition

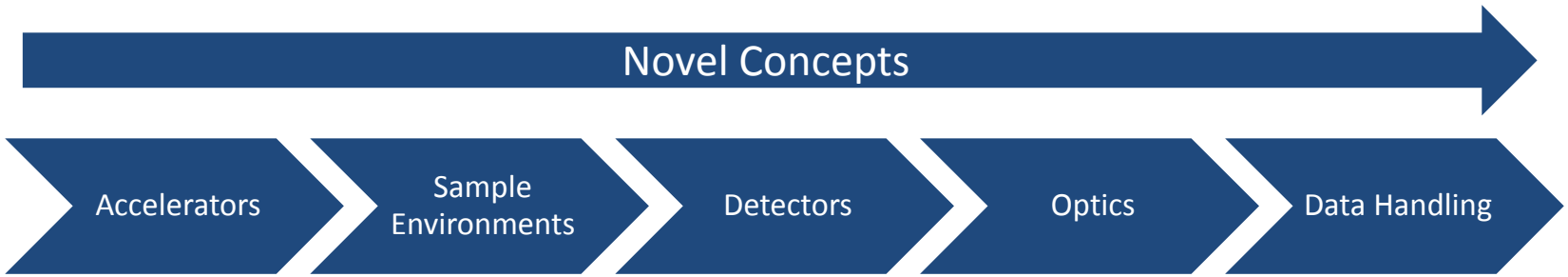
Preparing the next era of science and innovation in Europe with European Synchrotron radiation and FEL facilities:

- **Upgrading existing synchrotron facilities** with the next generation storage ring technologies: **MBA** and **HMBA-technologies**
- **Expending FEL infrastructure** with new facilities with different concepts and energy range

A common Science Vision

- Ultimate in-situ X-ray microscopes for materials and drug design
- Accessing all length and time scales of nano-bio-science and technology

A common Technology Vision



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Challenges (1/2)

21st Century, Era of Complexity

Together we can provide answers to the grand societal challenges with research in Health, Food, Environment, Energy, Engineering, Heritage & Fundamental Science

Together providing dedicated high-resolution technologies for researcher and industry to enable the design of tailored (bio-)materials

LEAPS facilities must develop a sustainable RI ecosystem

- provide the most advanced technologies and a state-of-the-art user infrastructure
- enable mobility among researchers
- train future managers
- master the data challenge
- develop new partnerships with industry

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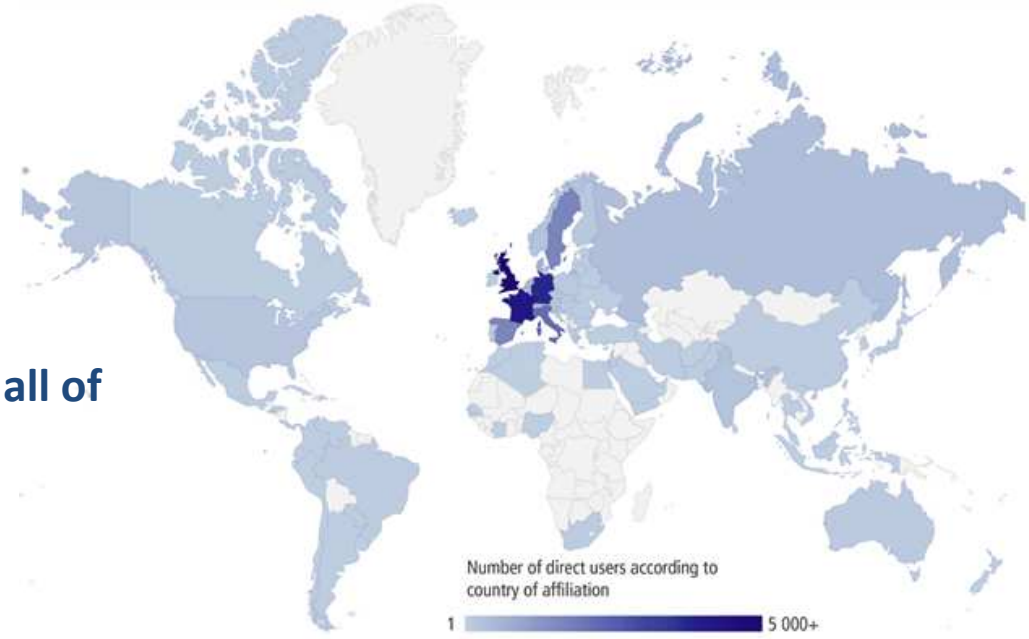
Challenges (2/2)

21st Century, Era of Complexity

The smart transformation of existing storage rings into nextGen facilities requires from LEAPS facilities a new level of coordination, specialisation and cooperation.

Integrate emerging communities and benefit all of Europe and beyond



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Action Plan

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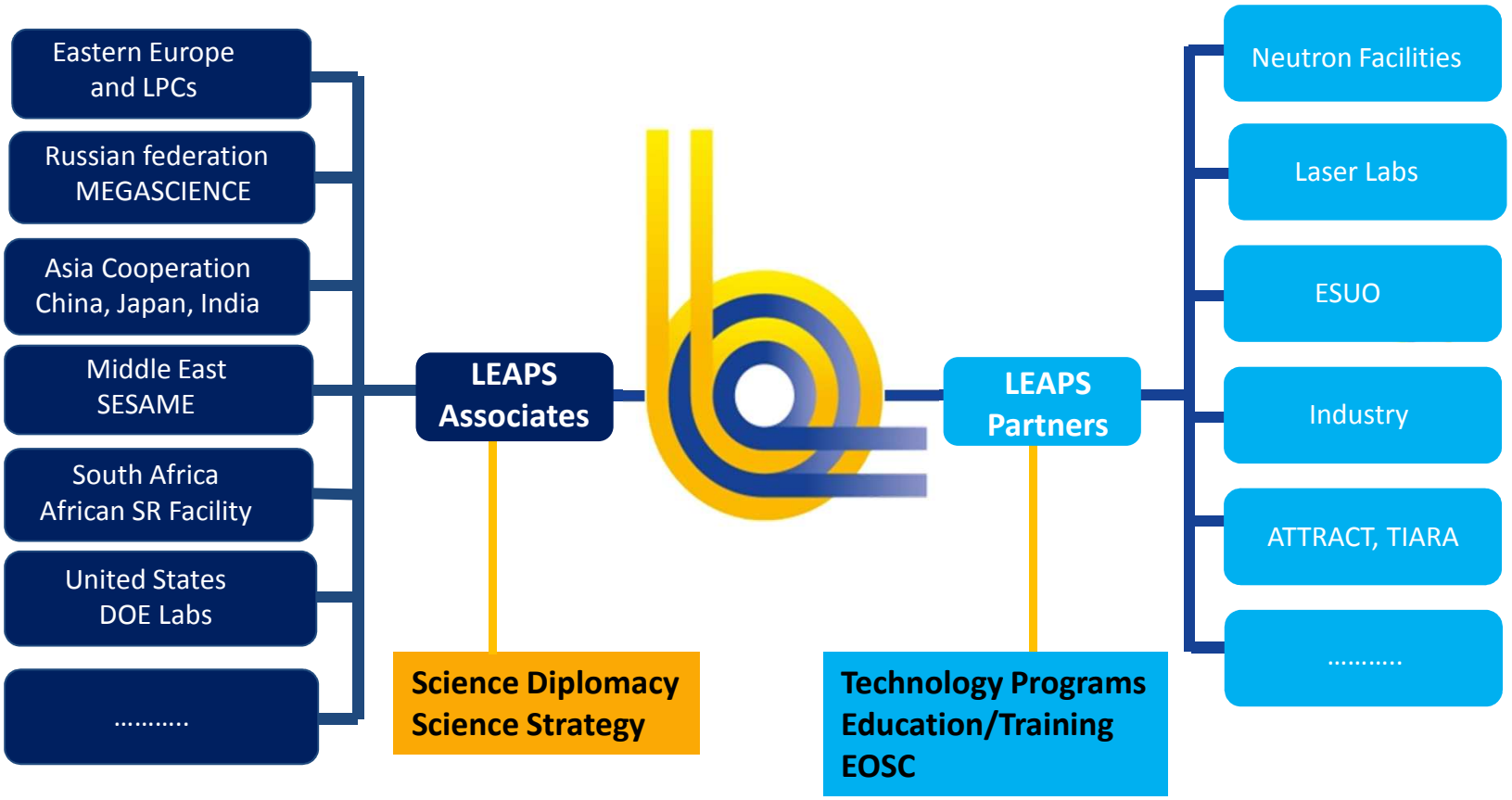
Integration

“New strategic partnerships in Europe and beyond”



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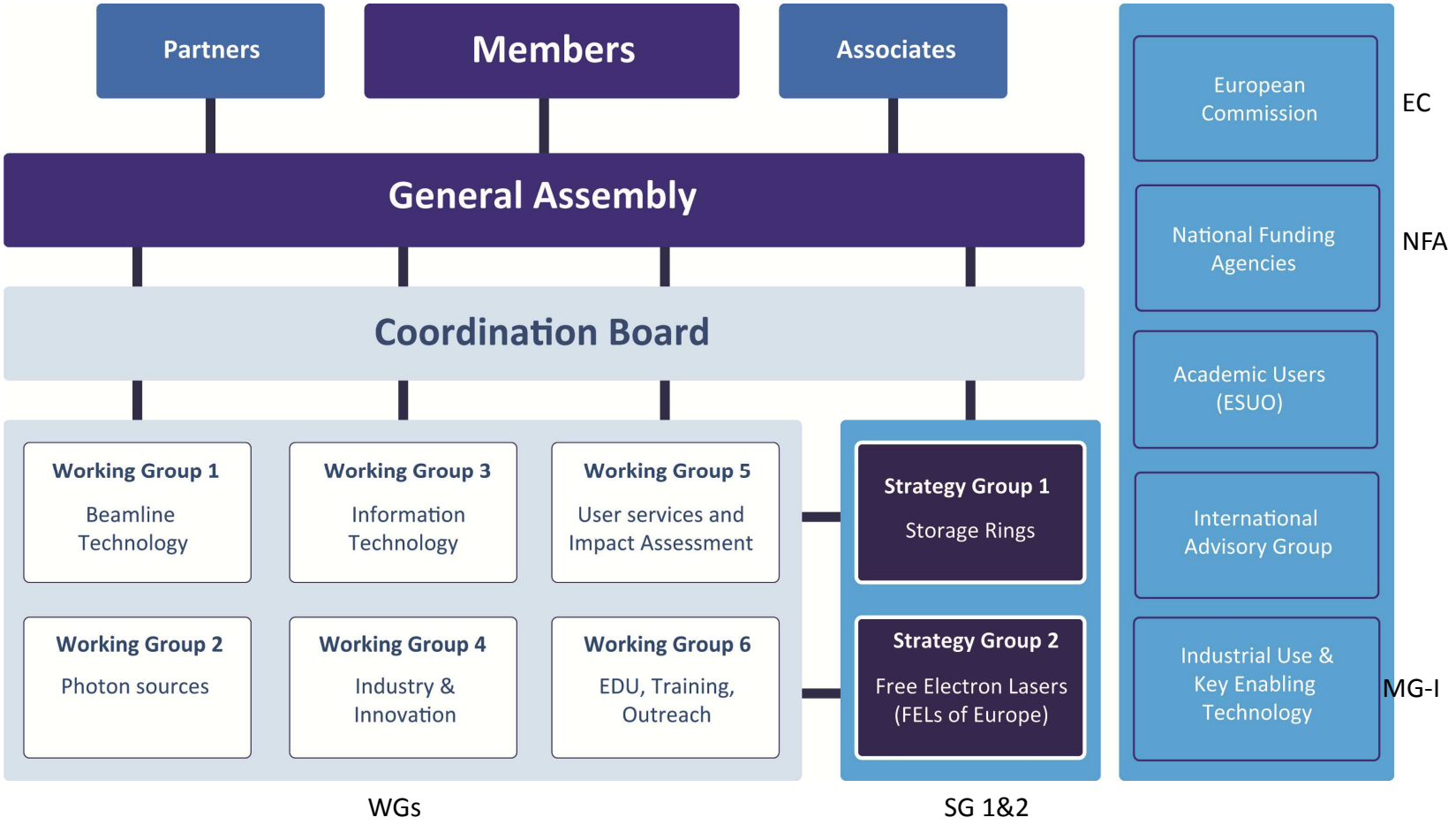
Organisation



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LEAPS Strategy 2030

- to the European Commission on 22 March 2018 in Sofia
  LEAPS as a new role model for advanced RI communities in Europe
- Adressing Grand challenges of Society by searching for new materials and new ways of cooperation across disciplines and national borders
- Adressing the European Long-term Sustainability Action Plan
- Developing a Research Infrastructure & Technology Roadmap process
  Implementation next European Framework Program beyond 2020

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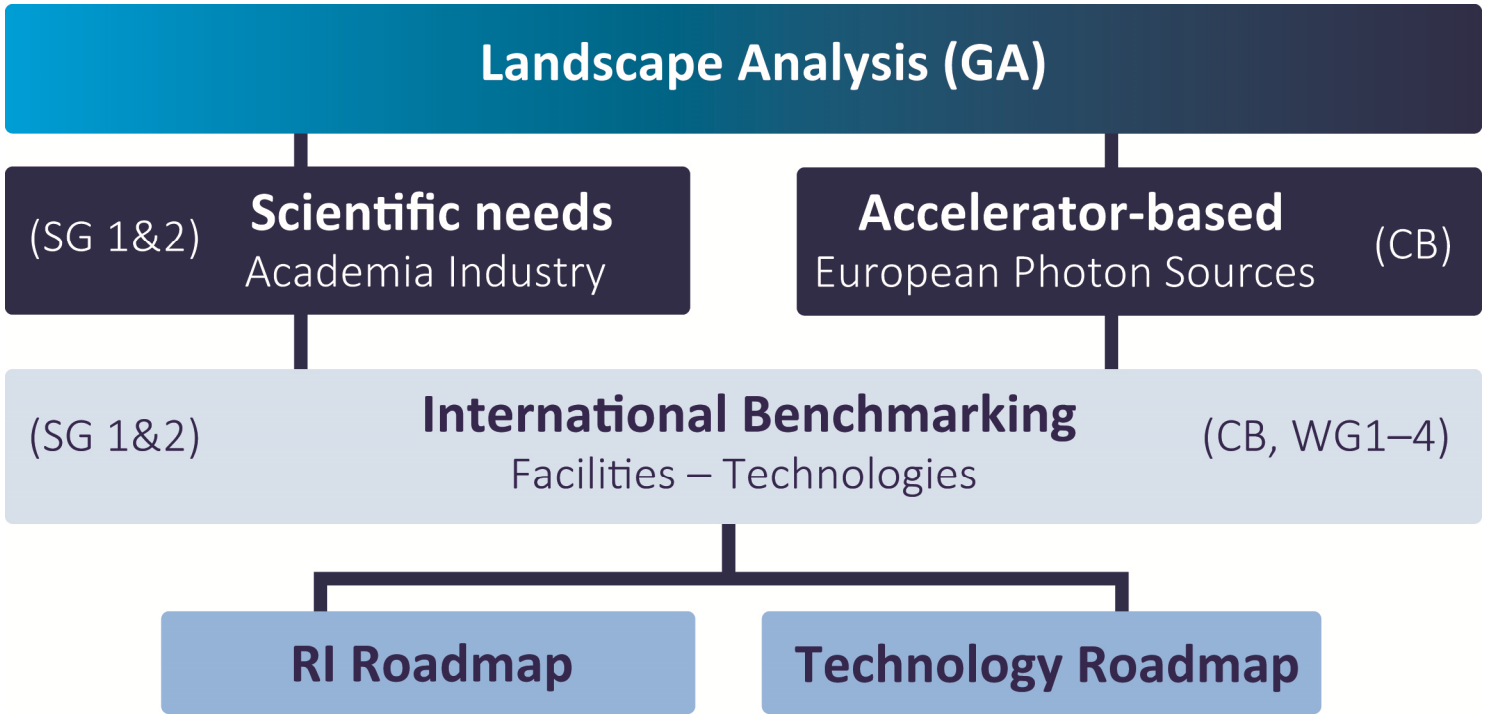
LEAPS Roadmap Process



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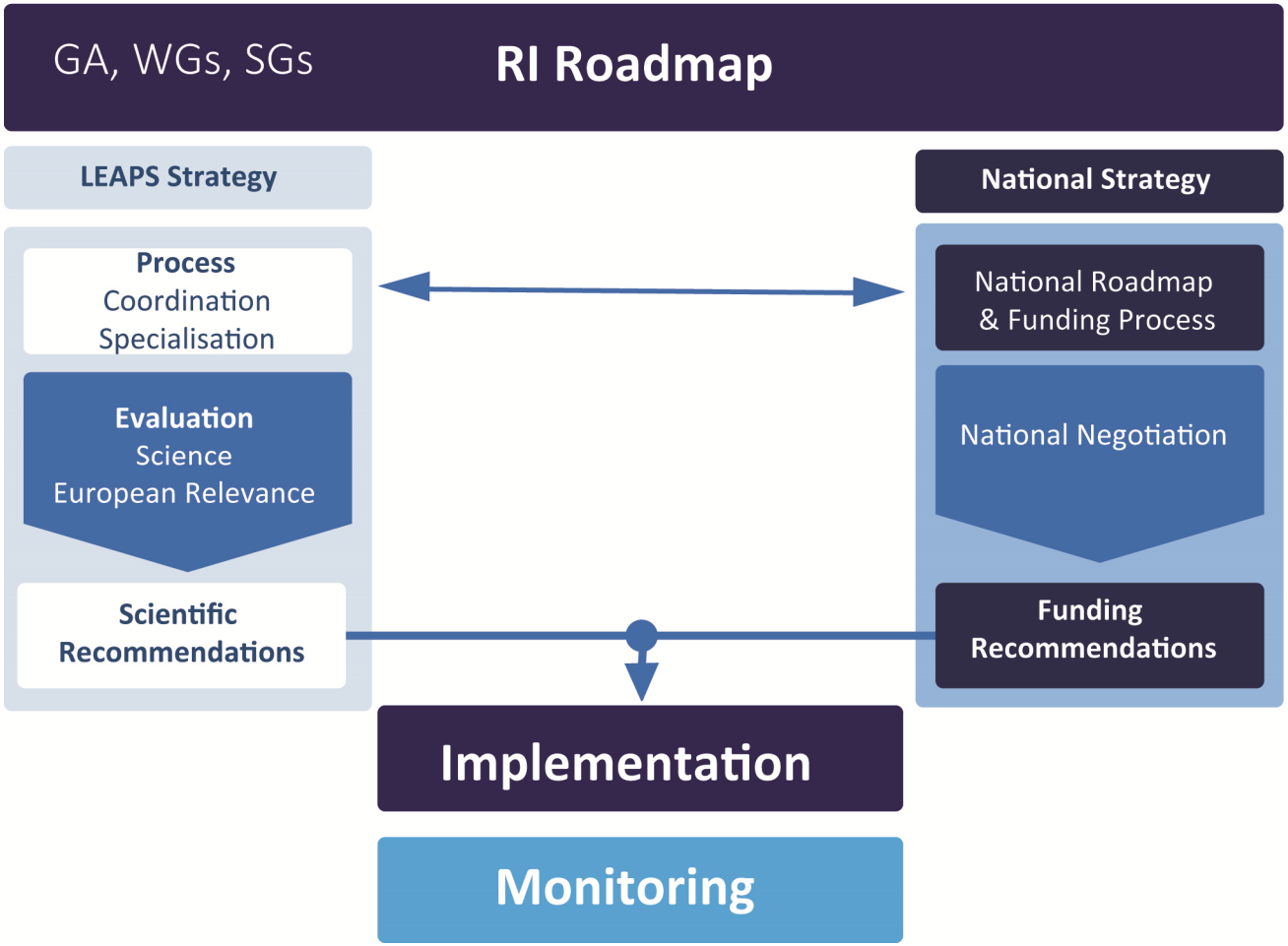
LEAPS Research Infrastructure (RI) Roadmap



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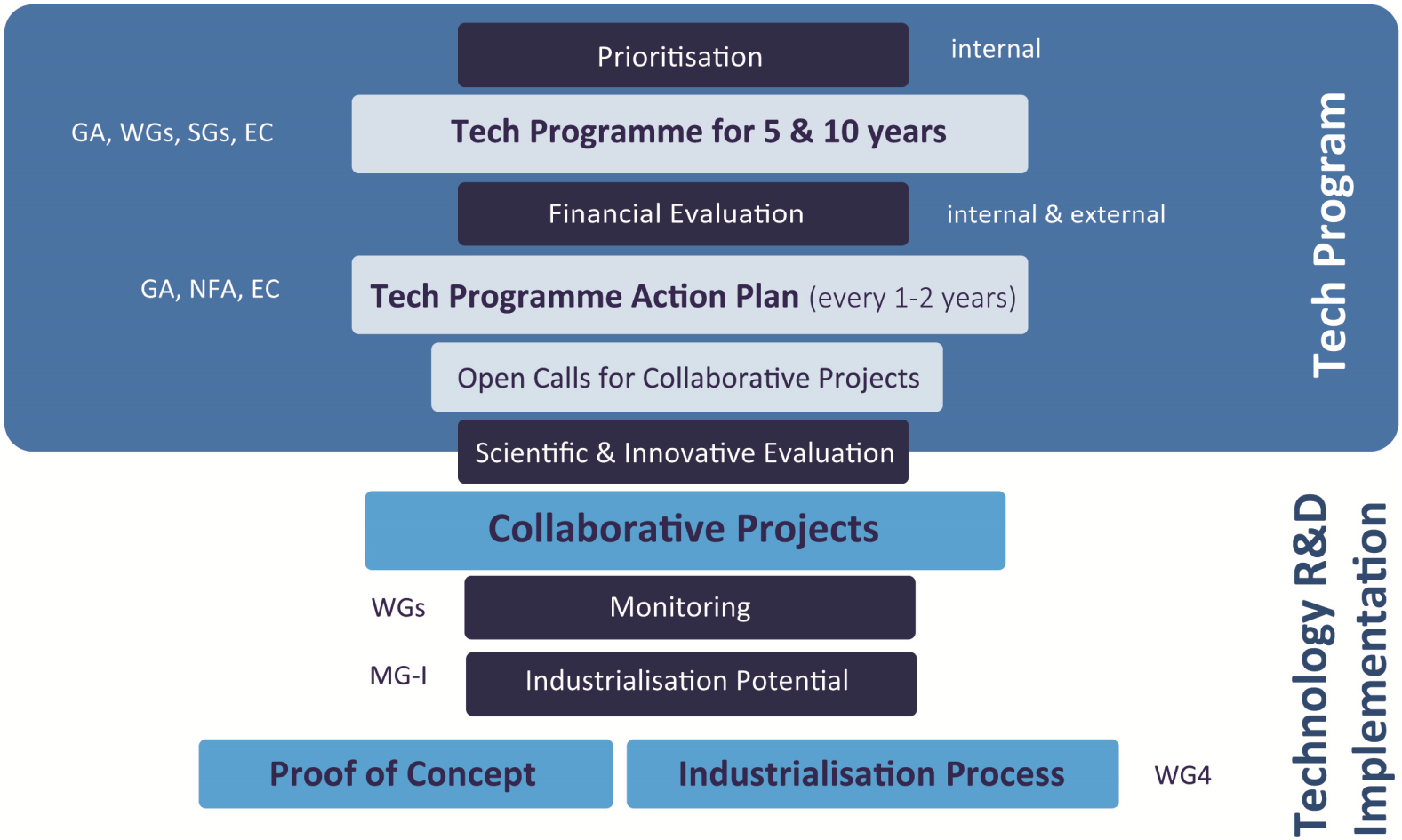
LEAPS Technology Roadmap Process



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Technology Roadmaps

Technology 2018-2028		requires / Mio €
Beamline technology	Detectors, optics, sample environment	200
Photon Sources	(novel accelerators)	198
Information technology / Data		137

Integration 2018-2028	requires / Mio €
Innovation & industry	85
User Services and Impact Assessment	5
Education, training & outreach	25
Governance	0

~ 650 Mio €

LEAPS is aiming for support by the E.C. in FP 9 and beyond

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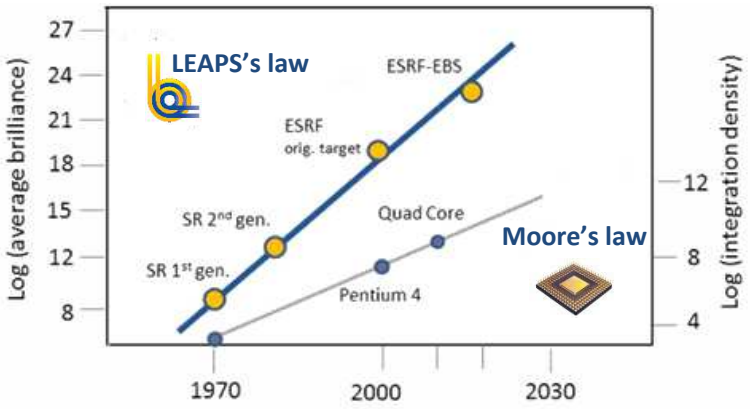
Synchrotron Radiation Facilities

ALBA, BESSY II, DIAMOND LIGHT SOURCE, ELETTRA, ISA, MAX IV, MLS, PETRA III, SWISS LIGHT SOURCE, SOLARIS, SOLEIL

European flagship: **ESRF** - *Advancing science since 1992*

- **Pushing scientific excellence:**
  - In 2016 more than **500 000** hours of beamtime
  - More than **200** operational Beamlines
  - Over **23 000** unique articles published in peer reviewed journals in the last 5 Years
  - **5** Nobel Prizes linked to LEAPS facilities

- **Pushing technology limits:**



- **Serving users of all scientific disciplines**
- **Partnering with industry**

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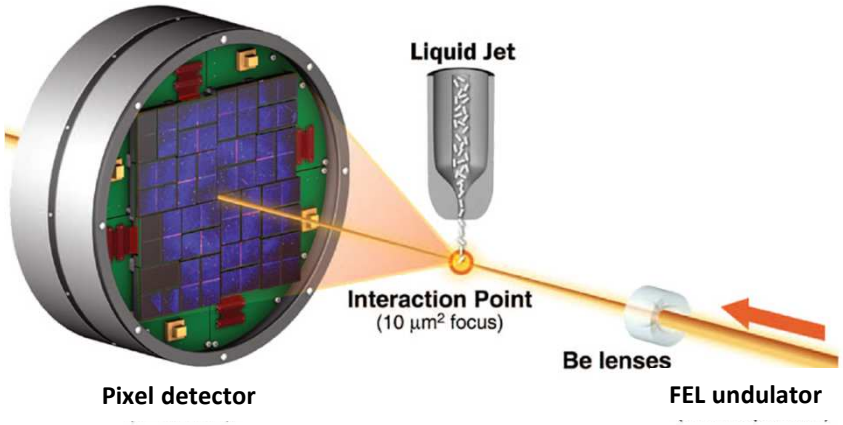
Free Electron Laser Facilities

FLASH, FELBE, FELIX, FERMI, SWISS FEL

European flagship: **European XFEL** – *most powerful XFEL worldwide*

- **New science – "Discovery Channel"**
  - New avenues in macromolecular crystallography
  - New disruptive schemes for X-ray sciences



- **Pushing technology limits:**
  - Advanced linear accelerators
    Superconducting technology
  - Laser femto technology
  - Novel pixel detectors
  - Novel sample delivery systems
  - Information technology
    Advanced computational methods

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Facility Roadmaps – 2020-2035

LEAPS roadmap process has been started

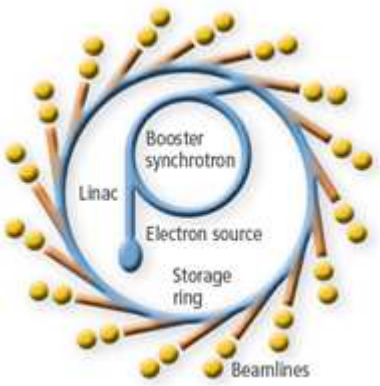
- **Consultation of national authorities**
- **Integration of user needs** ➔ ESUO questionnaire 2016/17

ESUO
EUROPEAN SYNCHROTRON AND FEL USER ORGANISATION

2018 LEAPS focus activities

Upgrade of European Synchrotron Radiation Facilities with 4th generation technology

- Novel high brilliance storage rings
- Strong international competition
- MAX IV and ESRF: international trend-setters and technology drivers



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Impact and Science and Innovation

Discovery Science

- Transients in chemical reactions
- Crystallography of local order
- Photosynthesis
- Evolution of electronic correlations
- Nonequilibrium matter
- Water – bio interface
- X-ray quantum optics

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Bio-Medical Science

- Biochemical reactions
- Nature of signal transmission
- Smart materials in med-tech applications
- In-vivo medical imaging

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Applied Sciences

- Materials under extreme conditions
- Engineering and functional materials
- Catalytic reactions
- Rational materials design
- Ultrafast switching of materials properties

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Opportunities for Industry

- Catalysis
- Batteries, energy conversion systems
- New and better drugs
- Engineering materials
- Future medical imaging systems

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Summary

Pushing X-Ray Science in Europe to the next level building a new RI consortium for FP 9 and beyond

New Cooperation between European Facilities in close interaction with national authorities and the European Commission

- **Coordinated transformation** of Europe´s facilities towards the nextGen facilities
- **Smart specialisation** strategy among LEAPS facilities
- **LEAPS roadmaps** for facility developments and new technologies
- Most **advanced technologies** to academia and industry
- New European **training platform** for nextGen scientists, industry and future managers
- Development of LEAPS as a contact point of the future **EOSC**
- **Integration** of emerging communities and strategic partners of Europe

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