

'Accelerator and Magnet Infrastructure for Cooperation and Innovation'



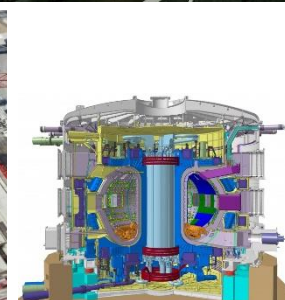
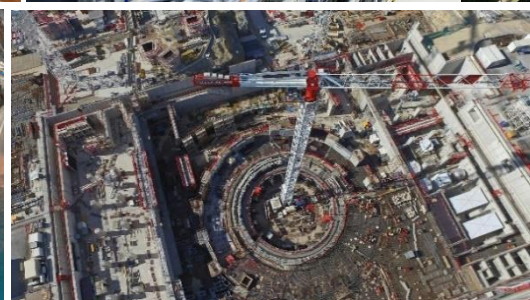
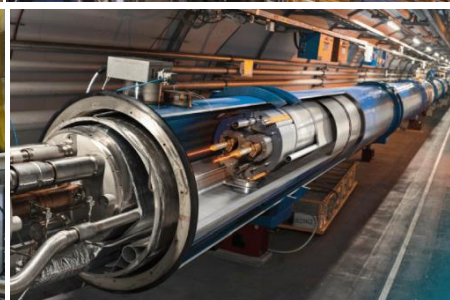
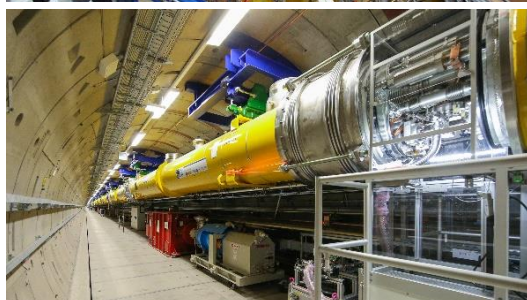
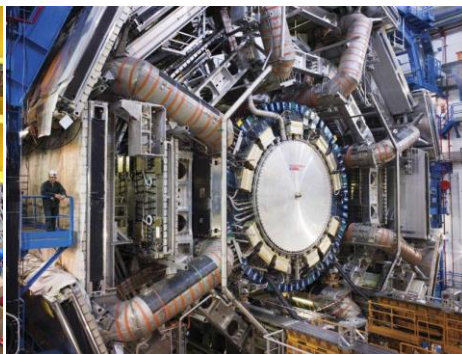
Olivier Napoly, coordinator
CEA/Irfu



EUROPEAN COMMISSION
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Research infrastructure



The collaboration between European Technological Facilities and Industry has been seminal for the realization of unprecedented scientific endeavors, like LHC, W7X, EU-XFEL, SwissFEL, ESS and ITER, that have recently projected Europe to an undisputed position of worldwide leadership.



The construction of such projects is only possible through the realization of a large and distributed accelerator and SC magnet **Technology Infrastructure (TI)** including high technology systems built to unparalleled quality standards. **This TI represents a major investment and asset for Europe.**



It includes several technological facilities, located at research laboratories and industrial sites, and entails:

- sophisticated R&D platforms for key technologies,
- large-scale facilities for assembly, integration and verification,
- large concentrations of dedicated, highly-skilled personnel and,
- **long-standing relationships between laboratories and industry.**

“Large-scale science projects address fundamental questions at the forefront of science and technology.

These projects require large and sustained infrastructures and a good collaboration on long time scales.

In turn, such projects provide unique equipment, challenging request for high technology and innovation, stimulating ideas that attract good people, and offer the occasion to bring people closer together.”

Rolf Heuer, *The Role of Big Laboratories*,
Phys. Scr. T158 (2013)



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AMICI, for ‘**Accelerator and Magnet Infrastructure for Cooperation and Innovation**’, is an H2020 ‘**Coordination and Support Action**’ project.

Its general goal is to **propose a model** for the **profitability** and **sustainability** of the **Technological Facilities** dedicated to **Accelerators and Superconducting Magnets** in Europe, based on the engagement of the European Commission, the National Agencies and the Industry, and serving **innovation** and **scientific research**.

AMICI is charged by the EC with the challenging task of building the conditions for consolidating and exploiting these **Technological Facilities** :

- **to strengthen the capabilities of European companies to compete on the global market**, as qualified suppliers of components for accelerators and big superconductor magnets,
- and also **in the development of innovative applications in advanced sectors such as healthcare and space**.



**Science & Technology
Facilities Council**

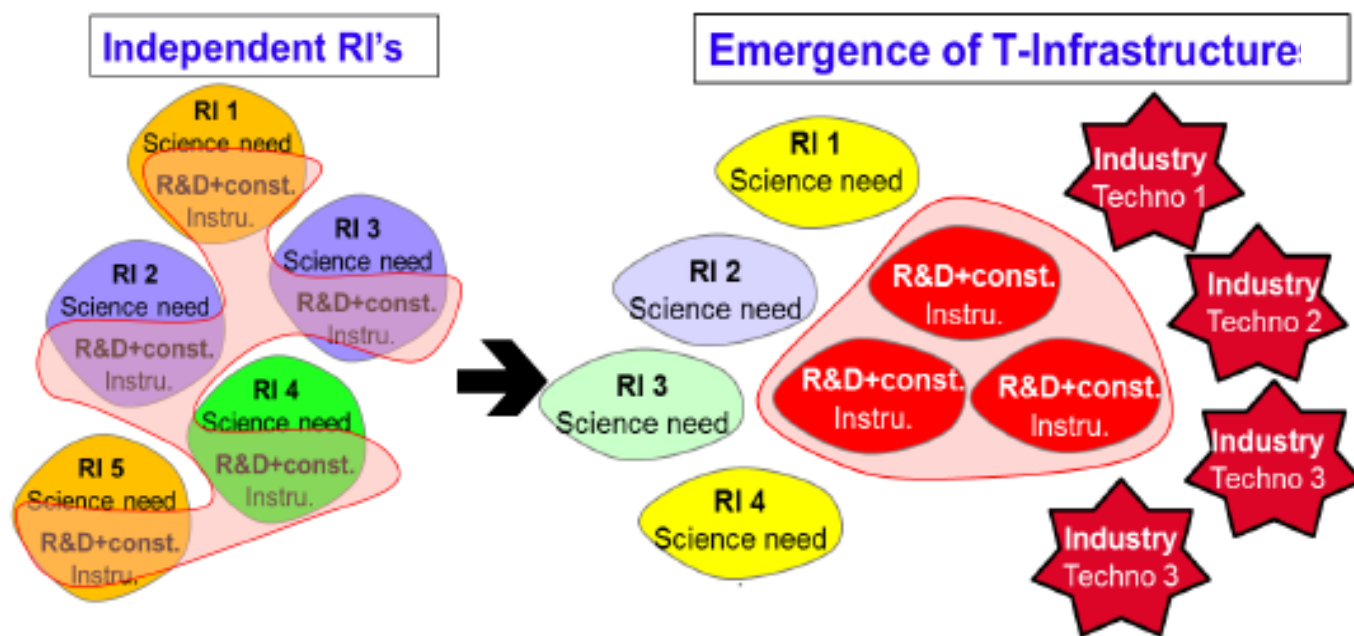


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Our vision is that a **Technology Infrastructure** will emerge from the few large facilities creating an efficient integrated ecosystem comprising:

- **Laboratories** focussed on R&D, with a long term vision for the technological needs of future Research Infrastructure RI's (e.g. ILC, FCC, DONES, DEMO),
- **Industries**, including SME's, motivated by the innovative environment and the market created by the realisation of the technological needs of RI's,
- **Technology Infrastructure**, with an 'equidistant' position between RI's and Industries, to create new applications of direct benefit to science and society.

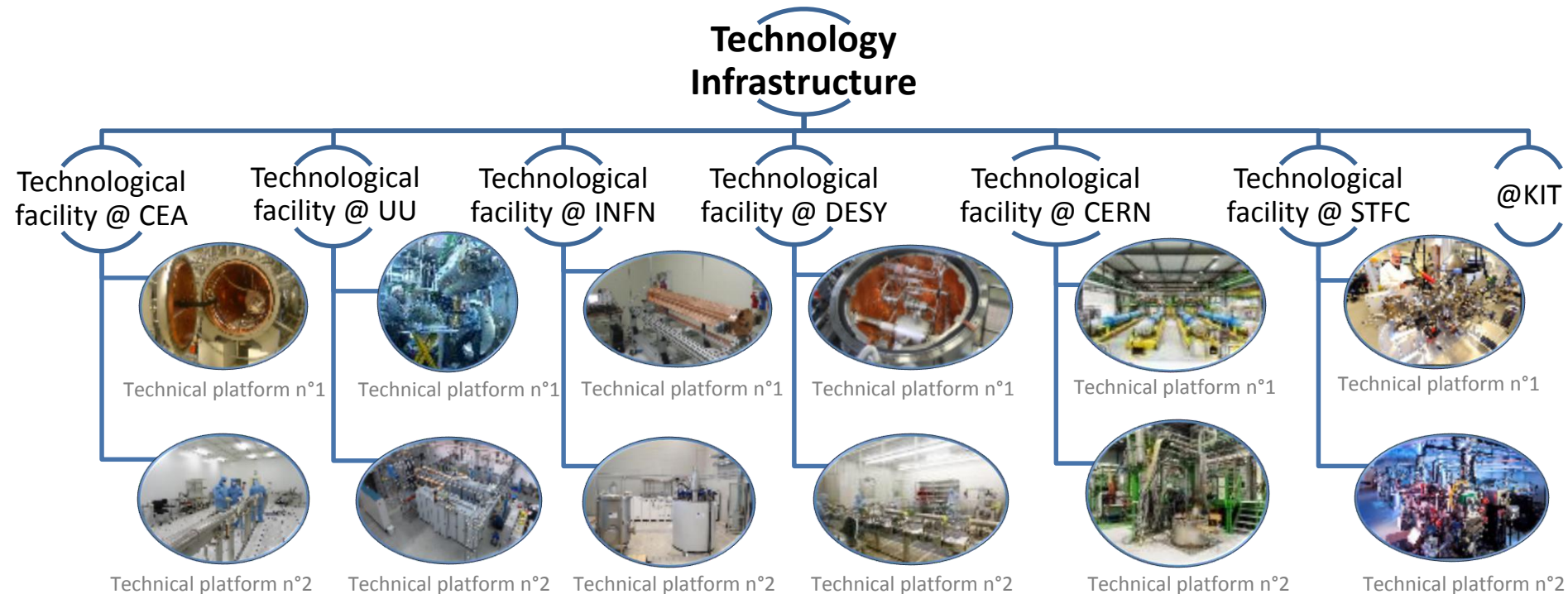


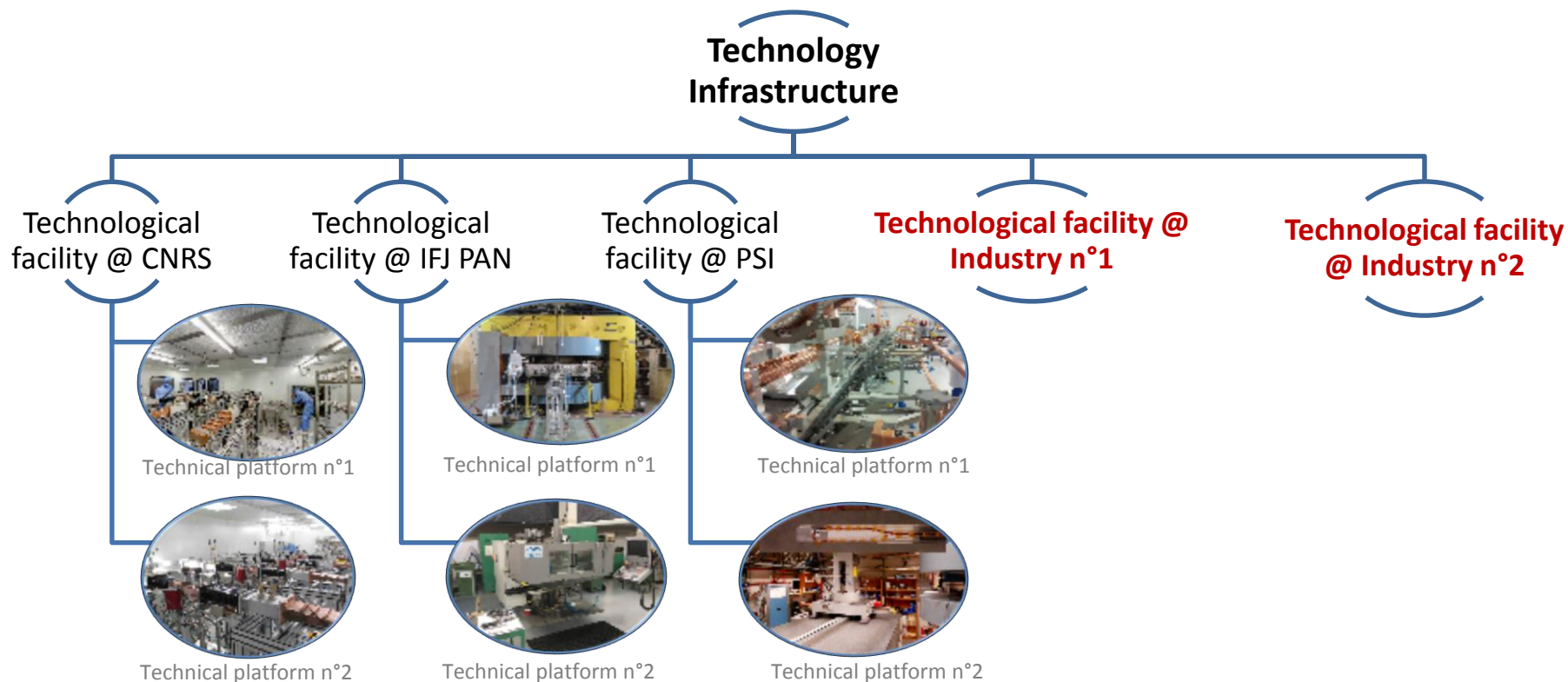
Technology Infrastructure (1/2)

(Courtesy M-A. Maynard)

Some 'definitions':

- Technology Infrastructure = a network of 'Technological facilities'
- Technological facilities = a cluster of 'Technical platforms'



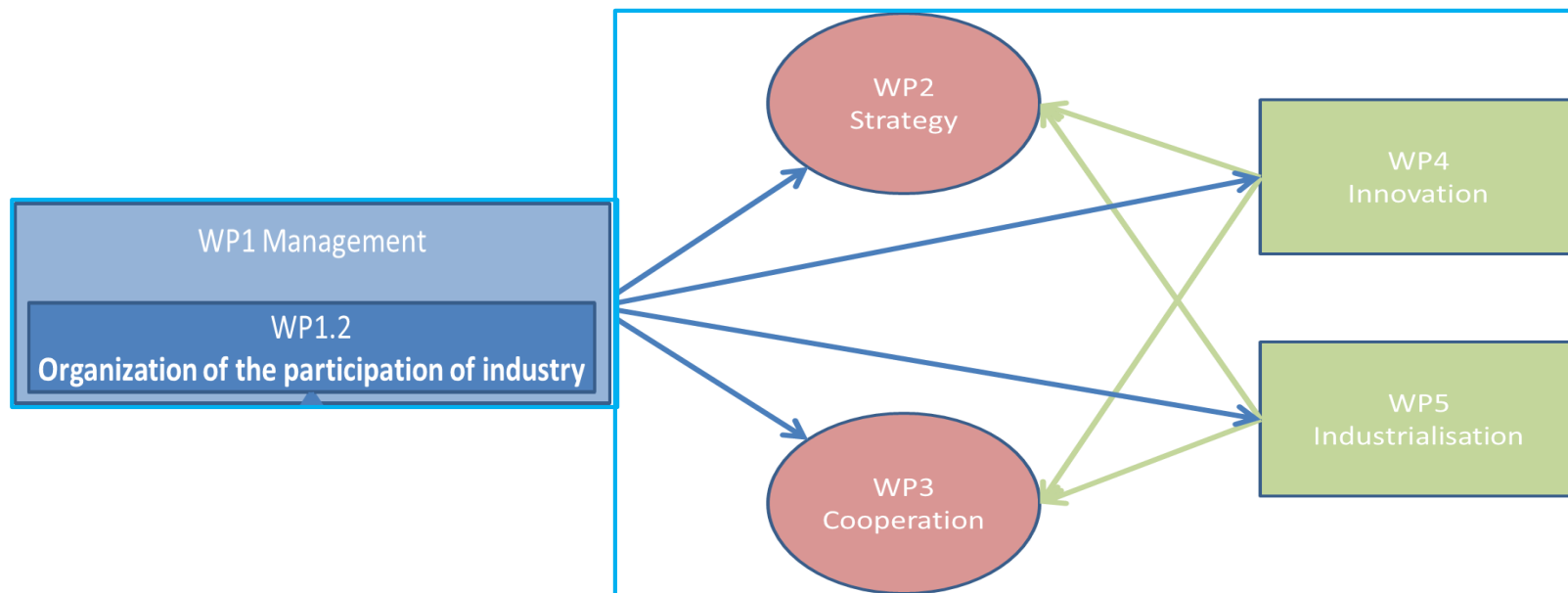


The question of the participation of Industry to the AMICI Work is the paramount and central question.

It precedes that of the association of Industry to the 'future' TI.

To optimize the future impact of the Technology Infrastructure, i.e. its adequation to the **needs** of Society (**WP4 'Innovation'**) and Science (**WP5 'Industrialisation'**) applications, AMICI will:

- assess the prevailing **strategic** elements (**WP2 'Strategy'**)
- explore new modes of **cooperation** (**WP3 'Cooperation'**)



WP1 'Management' will ensure the overall coordination of the project, including the capital question the **Industry participation**.

“Cutting-edge science relies on cutting-edge instrumentation.

...

There is a need to strengthen the relations between academia and industry in the field of scientific instrumentation.

This could be accomplished through the promotion of knowledge and technology transfer between the two entities.”

*Rolf Heuer, The Role of Big Laboratories,
Phys. Scr. T158 (2013)*

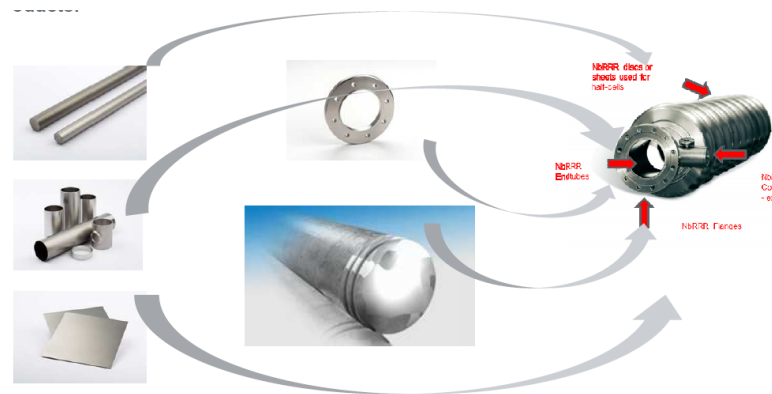
The *Innovation*-related activities aim at transferring the knowledge and know-how of research laboratories to industry and creating new products and new applications of direct benefit to society.



For that purpose, Industry will access a pool of technical platforms made available by European Research Institutes such as test beam facilities, cryogenics, magnet and RF facilities and test benches, laboratories for material analysis and vacuum technology, for chemistry and surface characterization, for beam electronics and instrumentation, clean rooms and assembly halls including the equipment and the associated human expertise.

The *Industrialization*-related activities aim at keeping industry at the forefront of the international competition, in terms of technology, quality and costs, in view of the construction of future scientific research instruments in Europe and elsewhere.

(Courtesy A. Spaniol)



This will be achieved by fostering collaboration initiatives and opportunities between Industry and the TI that include: research and development of key technology prototypes, test and verification of industrial products, professional training and apprenticeship, certification studies and training (e.g. vacuum, cleanliness, welding, etc.), harmonization and standardization studies (e.g. cryogenics, material, etc.).

“Facilities for high-energy physics (but also for other branches of science) are becoming larger and more expensive.

Funding for the field is not increasing and the timescale for projects is becoming longer; both factors resulting in fewer facilities being realized.

...

All this leads to the need for more co-ordination and more collaboration on a global scale..”

*Rolf Heuer, *The Role of Big Laboratories*,
Phys. Scr. T158 (2013)*

The *Strategy*-related activities aim at providing strategic insights into opportunities and needs of future basic research and applications, thus steering and sustaining the activity of the Technology Infrastructure

Accelerators for America's Future, DoE Report, 2010

R&D Need	Energy & Environment	Medicine	Industry	Security & Defense	Discovery Science
Reliability	Red	Red	Red	Blue	Red
Beam Power/RF	Red	White	Orange	Red	Red
Beam Transport and Control	Yellow	Red	Blue	Orange	Yellow
Efficiency	Orange	Blue	Orange	Blue	Yellow
Gradient (SRF and other)	Blue	Blue	Yellow	Red	Blue
Reduced Production Costs	Blue	Orange	Red	White	Blue
Simulation	Yellow	Blue	Blue	Orange	Blue
Lasers	Blue	White	White	Orange	Orange
Size	White	Orange	Blue	White	Orange
Superconducting Magnets	White	Yellow	Yellow	Yellow	White
Targetry	Orange	Yellow	White	Blue	White
Particle Sources	Blue	Blue	Blue	Blue	Blue

Color code: increased priority

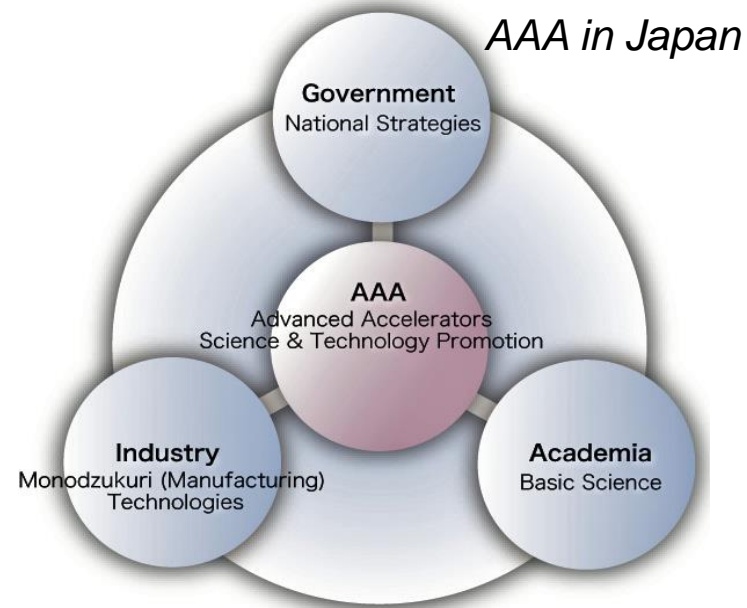
This will be achieved by:

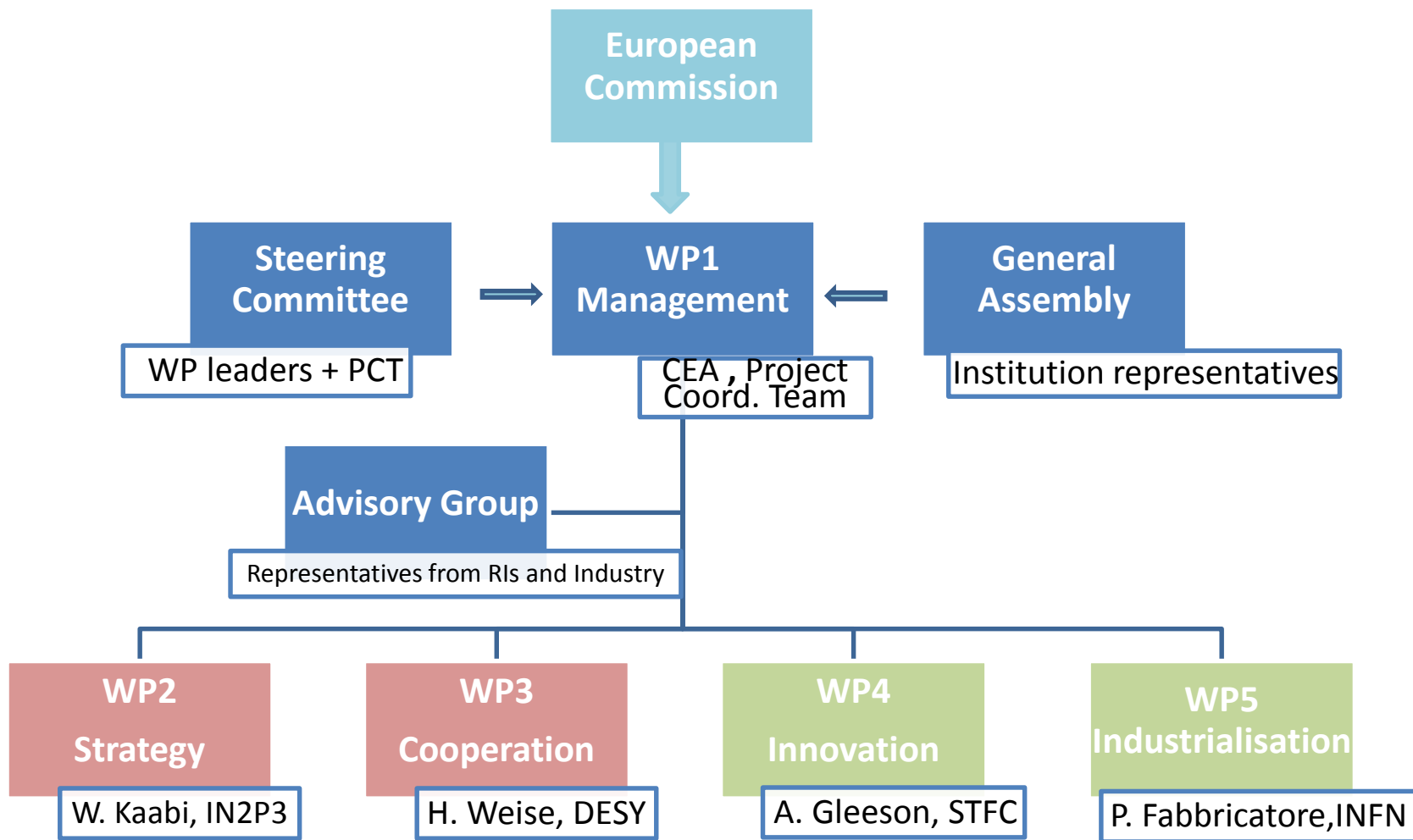
- updating the Key Technological Areas (KTA) of accelerator and superconducting magnet science and technology,
- collecting the scientific roadmaps Research Infrastructures in Europe (ESFRI) and in the global landscape,
- assessing the workload, the capabilities and, when possible, the priorities of the Technology Infrastructure in the different KTAs.

The *Cooperation*-related activities will study the conditions of the coordination of the Technology Infrastructure in order to harmonise its operation and increase its efficiency, and to establish a co-innovation platform with industry.

These investigations will be performed by:

- defining the eligibility criteria for the participation/association to the Technology Infrastructure,
- developing a coordination model for the use of eligible TFs and industries
- supporting the integration into local, regional and global innovation systems,
- identifying synergies, complementarities and duplication.





Mid-2019 the AMICI project will have explored and assessed all the means to ensure that European industry:

- will have a clear view of the strategic science and technology roadmaps for the future accelerator and SC magnet-based Research Infrastructures worldwide and therefore they will be in a strong position to compete on the global market, *(WP2 Strategy)*
- will have a simplified and supported access to the most adequate technical platforms thanks to the stronger and optimized integration model established among the large existing technological facilities, *(WP3 Cooperation)*
- will benefit from the integrated ecosystem that will foster innovation based on cutting-edge tools and developments and will enhance their visibility and competitiveness in new markets, *(WP4 Innovation)*
- will overcome their technology development barriers and further develop commercial opportunities within the Research Infrastructures and wider societal markets, *(WP4 Innovation, WP5 Industrialization)*
- will profit from the information exchange, definition of harmonized and standardized procedures and access to databases, which should allow cost reduction in the long term. *(WP5 Industrialization)*

First step : <http://eu-amici.eu>

– Developing list and description of AMICI TIs

The screenshot shows the AMICI website homepage. The header features the AMICI logo on the left and navigation links: HOME, ABOUT, EVENTS, TECHNOLOGY INFRASTRUCTURE (highlighted in red), and INDUSTRY INVOLVEMENT. Below the header is a large banner image of an accelerator tunnel with the text: "ACCELERATOR AND MAG INFRASTRUCTURE FOR COOPERATION AND INNOVATION EUROPEAN TECHNOLOGICAL INFRASTRUCTURES". A red navigation menu is overlaid on the right side of the banner, listing: TECHNOLOGICAL FACILITY @ CEA, TECHNOLOGICAL FACILITY @ DESY, TECHNOLOGICAL FACILITY @ IFJ PAN, TECHNOLOGICAL FACILITY @ INFN, TECHNOLOGICAL FACILITY @ STFC, TECHNOLOGICAL FACILITY @ UU, ENGINEERING, MATERIALS, DETECTORS, and DOSIMETRY & RADIOLOGY. Below the banner, the "ABOUT" section is visible, containing text about the collaboration between European Technology Facilities and Industry. The "EVENTS" section is also visible, featuring a date box for "18 APR" and the title "INDUSTRY DAYS".

Objective:

- convince EU Commission of the importance of the **Technology Infrastructure**, along with with Research Infrastructures, for RI sustainability, in a new scheme associating more closely industry and innovation, e.g. *'European Technology Platform'* (ETP)
- follow-up of AMICI ideally in the next Work H2020 Programme (2018-20) or in FP9 with a (substantial €-budget) call integrating the structure and ideas proposed by AMICI.

Lobbying the EU Commission is needed, and actually is already going on. Your feedback and your activity is desirable.

On our horizon we have ambitious projects like the DONES accelerator and the DEMO tokamak for nuclear fusion, the ILC in Japan, and the FCC at CERN and CEPC in China for particle physics, and others. But we also have to preserve and consolidate our capacity to maintain and upgrade the facilities built in this decade like the LHC, the European XFEL, the FAIR nuclear physics facility, the European Spallation Source, the ITER tokamak, the Extreme Light Infrastructures in central Europe.

The goal of the AMICI project is to consolidate our existing European Technology Infrastructure to be in position to contribute to future facilities with the same success as for the past ones, in terms of schedule, budget, performance and discovery.

AMICI first overarching objective is to rally European Industry and get it on board of our project during the ['Partner and Industry Days for Scientific Technology Infrastructure'](#) in Padova in April 2017.

AMICI first overarching objective is to rally European Industry and get it on board of the AMICI project.

This is the absolute priority of the next month with,

- 1) first, the occurrence of the 'Partner and Industry Days for Scientific Technology Infrastructure' in Padova in April 2017,
- 2) then, in May 2017, the delivery of the report '*Definition of the participation of industry*', under the coordination of INFN.

Concrete actions will only start after this.