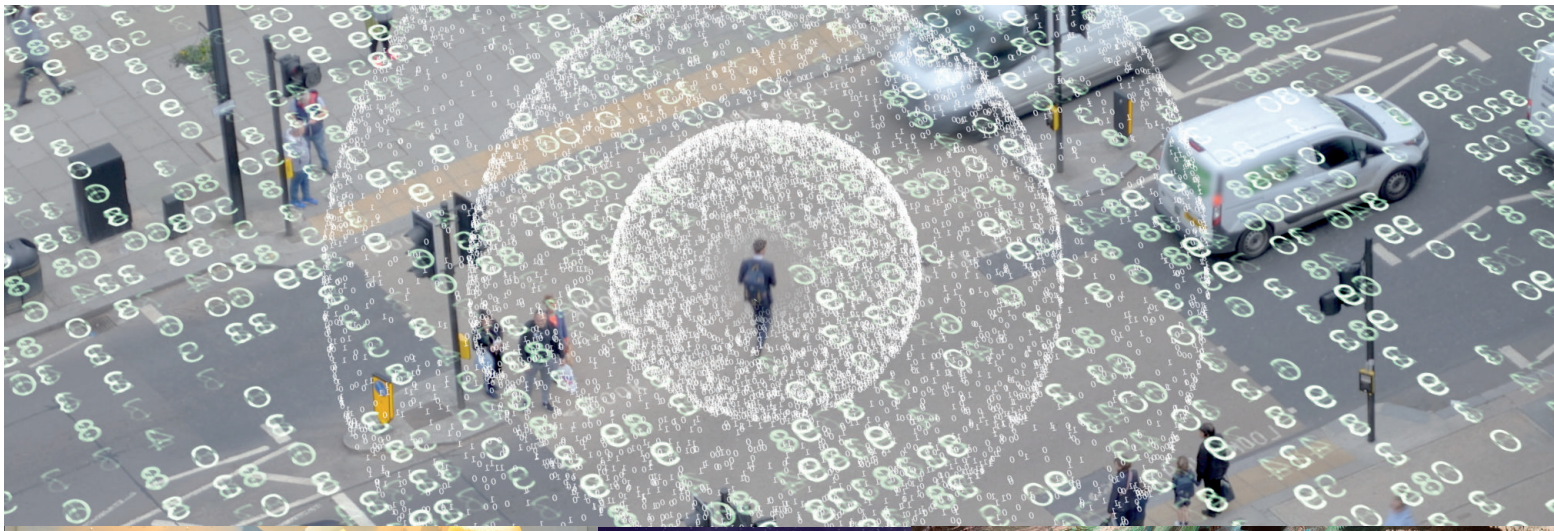
2018 ACTIVITY REPORT

The essentials



NATIONAL ACADEMY OF TECHNOLOGIES OF FRANCE

SHARING REASONED, CHOSEN, PROGRESS

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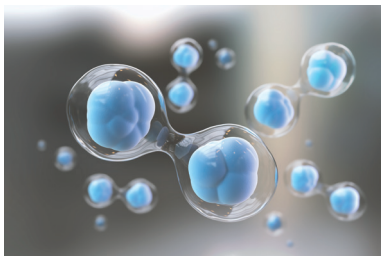
HIGHLIGHTS 2018

JANUARY

- Opinion and report: *The transition to industrial scale of the production of human stem cells for therapeutic use*



FEBRUARY

- *Virtual and augmented, which realities?*
  Public conference in partnership with Universcience, at the Cité des sciences et de l'industrie.
- Report - *Technologies and innovation territories: four relevant and irreverent reflections*

MARCH

- Report - *Renewal of Artificial Intelligence and Automatic Learning*

APRIL

- Contribution to the OPECST scientific note on the energy renovation of buildings
- Session on stem cells organized by Bruno Jarry

MAY

- Joint report with the Academy of Sciences: *Strategy for the use of underground resources for the French energy transition*

- The Academy gives its opinion in the framework of the public consultation on the Multiannual Energy Programming

JUNE

- Contribution to the OPECST scientific note on the Hyperloop project
- Opinion: *Technology and Soft power: the case of the fashion and luxury industry*

JULY

- The flight of French graduates to the GAFAMs and its impact on recruitment by major French industrial groups in the digital arena: evaluation and analysis of the Academy, at the request of the Prime Minister's Office.

SEPTEMBER

- Joint seminar with IHEST on the attractiveness of territories and professions.
- Report: *The rise in technological skills of SMEs. The case of industrial companies*

OCTOBER

- Annual Seminar: *Artificial Intelligence*
- Cornerstones of Machining - organised by the campus of trades and qualifications - propulsions, materials and embedded systems, Normandy.

NOVEMBER

- Sustainable, smart and low-carbon buildings - 2nd edition of the annual convention and awards of the National Academy of Technologies of France

DECEMBER

- Management of major projects: feedback from experience. Colloquium organised in partnership with the French Air and Space Academy.
- Election of 16 new members

EDITORIAL

Bruno Jarry, President of the NATF

In 2017, the Academic Council and the Assembly of Academicians had approved the strategic plan for 2025 prepared by Pascal Viginier, elected Vice-President in 2018 and then, on 14 November 2018, President for the next two years. This plan listed five strategic objectives: develop our relations with Education and the business world; develop our cooperation in Europe and internationally; and double our ecosystem of experts and resources through project funding. The path was therefore mapped out to lead the academy along these clearly identified paths.

Contacts established with the cabinets - ministerial and presidential - have enabled us to make substantial progress in our relations with the national education system.

The development of our relations with the business world has also progressed: the second edition of our Annual Convention, devoted to sustainable, intelligent and low-carbon buildings, was a success. The audience of this convention, organised in partnership with several actors in the construction and related services sector and with the support of the Academy's foundation, confirmed our ability to engage in the dialogue with industry in a spirit of openness towards young people and their teachers.

In addition, the launch of a Senate composed of industrial managers from major groups and Intermediate Sized Enterprises (ISEs) under the chairmanship of former Prime Minister Jean-Pierre Raffarin, will strengthen the link between the industrial world, the academy and political leaders. A core group of more than ten personalities has already agreed to participate and the first meeting is planned for early 2019.

On the international level, the success of the SAPEA project, where the European federation Euro-CASE, is represented by Yves Caristan, its secretary general and member of the academy, is undeniable. Thus, several academics have participated in the work carried out at the request of Commissioners of the European Commission or in the platforms created within Euro-CASE.

As part of bilateral relations between foreign academies, the collaboration initiated in previous years with the Chinese Academy of Engineering on the subject of nuclear energy has been deepened. A second joint report, led by our colleague Alain Bugat, will be presented in Beijing in May 2019.

We also remain very close to acatech, the German sister academy. In addition to frequent meetings, we commissioned, at their suggestion, a national survey on how our fellow citizens view technology. The results, which were widely reported in the press, made it possible to compare them with those obtained on a representative sample of German society and to conclude that the two peoples' views on this subject are very similar.

Finally, the academy has decided to reform itself by discontinuing its organisation into commissions. Ten divisions have been created, which are more closely linked to societal demand and are more open to experts from the private and public sectors to foster contact with innovation stakeholders. This new organisation must also strengthen the involvement of academicians, who are called upon to take on more responsibility for academic work.

IDENTITY & STRATEGY

Created at the dawn of the 21st century, the National Academy of Technologies of France is also the heir to the Enlightenment. Its motto «For reasoned, chosen and shared progress» calls for technological development at the service of mankind, the environment and sustainable growth.

> IDENTITY

Technological innovations is at the heart of most of the major challenges facing society: providing access to training and employment for the greatest number of people, building a healthcare system that can meet the needs of a growing population, making a success out of the energy transition and adapting to climate change… On all these issues, the National Academy of Technologies of France makes proposals and recommendations to public authorities and socio-economic agents.

Thanks to the multi-disciplinary expertise of its members, the academy provides an original insight on technology related issues and their impact on society. It conducts its work independently and places the societal and ethical dimension of technologies at the heart of its thinking in areas such as:

- the improvement of health and nutrition of the French population;
- the fight against unemployment, especially among young people, through change in educational, initial technological education and lifelong technological training for future jobs;
- the fight against climate change through energy transition;
- the digital transformation of all sectors of activity;
- the technological skills development of SMEs and their growth in midcap companies;
- mobility and transport of tomorrow;
- biotechnology and its economic potential;
- development assistance to the least developed countries;
- regional economic development and job creation through technology.

Olivier Appert, Bruno Jarry, Pascal Vignier

> VALUES

PROGRESS

The Academy is committed to promoting technological progress in the public interest. It brings its approach to progress to the attention of the Government and decision-making bodies in France as well as to European and international think tanks: in Europe, notably via Euro-CASE and its new SAPEA scientific advisory programme to the European Commission; internationally, this is achieved within the framework of CAETS, in Asia, the United States and Africa.

IMPARTIALITY

The documents produced by the Academy are validated by the plenary assembly after a process that guarantees their quality and impartiality. The publications mention points that are not sufficiently established from the point of view of the state of knowledge or that are controversial. Members of the National Academy of Technologies of France are elected by their peers on the basis of scientific and technical excellence, according to rigorous recruitment procedures.

OPENING

The Academy contributes to the governance of technological issues, in particular through the involvement of its members in or for the benefit of think tanks and decision-making bodies (National Research Strategy, the Innovation 2030 Commission, OPECST, ANR, etc.). The Academy associates external personalities with its reflections. The relevance of its analyses is also based on a good knowledge of best practices around the world. Its integration into European and international academic networks allows it to benchmark its work.

> STRATEGY

Five strategic objectives determine the Academy's action by 2025:

- Expand its relations with the economic world, in particular by setting up a Senate composed of business leaders, by strengthening its advisory role to the Government and the administration (green papers, prospective studies) and by amplifying its cooperation with bodies with a similar vocation and with other academies or with the university and research system.
- Strengthen its dialogue with education and training stakeholders, in particular by participating in the governance of educational and research institutions and national associations.
- Develop its cooperation in Europe and internationally by seeking project financing.
- Develop its ecosystem of external experts within its divisions and project groups.
- Increase the number of projects funded in order to diversify its resources.

PUBLICATIONS & STATEMENTS

Texts adopted in 2018

- **The transition to industrial scale of the production of human stem cells for therapeutic use.**
  Opinion and report voted on 10 January.

  In a joint report, the National Academy of Medicine and the National Academy of Technologies of France present the state of the art in the use of stem cells in human therapy. They detail the major changes required to move from laboratory work to the industrial stage, while complying with European and French regulatory provisions. Finally, they make recommendations to enable France to participate more effectively in ongoing developments in this field, which is currently booming at the international level.

- **Technologies and innovation territories: four relevant and irreverent reflections.**
  Communication approved on 10 January and report voted on 14 February.

  Where is the economic dynamism, where is wealth created, what are the drivers of innovation? The Academy of Technologies of France devoted its 2017 Annual Seminar to this vital subject for France, focusing on the role of metropolises in the dynamics of innovation and regional decentralisation.

- **Renewal of AI and automatic learning.**
  Report voted on 14 March.

  AI and machine learning use a wide range of methods and the first merit of this report, which is particularly addressed to companies, is to explain how they can complement and enrich each other: what is the range of possible solutions? Which methods to choose according to the problem to be solved? And, most importantly, what should be the essential steps in an AI strategy in terms of skills, data collection and practices?

- **Strategy for the use of underground resources for the French energy transition.**
  Report, May 16.

  The Academy of Sciences and the Academy of Technology have published a joint report aimed, in the context of the energy transition, at advising public authorities on the possible exploitation of rare materials in French, metropolitan or overseas land and sea basements: France's potential in this field may not be negligible.

- **Statement of the National Academy of Technologies of France in the context of the public consultation on the Multi-Year Energy Programming**
  Participant's guide, May 16.

  As part of the public consultation on the multiannual energy programming (MEP), the Academy submitted a participant's guide and an opinion in which it recommends clarifying the French objectives for reducing greenhouse gas emissions, rationalising the decision-making system with reference to the cost of avoided carbon, and developing renewable energies for transport, buildings and heat. Tomorrow's energy system will also require a strengthening of the electricity grid and the massive investments required by the energy transition will have to be accompanied by an appropriate industrial policy.

- Technology and soft power: the case of the fashion and luxury industry.
  Communication approved on 16 May and opinion voted on 13 June.

  Fashion and luxury are affected, like all other industries, by the industry 4.0 or industry of the future. High tech (artificial intelligence, blockchain, immersive technologies, etc.) intersects with low and mid tech and opens new paths to creation, production and distribution. The report aims to establish a common language between fashion players in France, both in the upstream and downstream sectors and in the technological arena. To begin the transition to Fashion Tech, the report offers ten recommendations, focusing on the development of technological skills through training and collaboration.

- The rise in technological skills of SMEs. The case of industrial companies.
  Report voted on 12 September.

  After a wave of more than twenty years of deindustrialisation, companies, especially SMEs, are facing the challenges of a profoundly changing economy. The digital and ecological transitions are reshaping the economic and social landscape, changing the levers of competitiveness and calling for new skills. Some professions are disappearing, others are emerging, a multitude of professions are being transformed. How to increase the skills of industrial SMEs, especially those that are on the way to fall behind? The Academy makes a number of recommendations to the stakeholders concerned - the State, Regions, territories, branches and sectors, training institutions, etc. - to accelerate the transformation of the industrial fabric.

Annual convention
Grand prizes from the National Academy of Technologies of France

November 12

This year's Academy Convention was devoted to «sustainable, intelligent and low-carbon buildings», a major challenge for the ecological transition. This second edition brought together three hundred participants from the fields of construction and public works, education, research, industry and politics at the Maison de la chimie in Paris.

The National Academy of Technologies of France awarded its Grand Prizes to two innovative companies:

Ubiant (SME Category), for its operating system dedicated to the management of buildings that allows connected objects to communicate with each other and to group all the services of a building at a central point to adapt to the expectations of the occupants.

Smart Cast (Startup Category), which aims to revolutionise new multi-family housing projects by providing innovative casing panels for concrete slabs: printed and pre-cut according to the building's digital plans, they integrate network routes as well as the installation of partitions and equipment.

Thematic sessions

10 January - Hyper-industrial society: the new productive capitalism

March 14 - Virtual reality and augmented reality: scientific, societal and technological issues and challenges

April 11 - Stem Cells

16 May - Coastal seas and coastlines

July 11 - Additive manufacturing: towards an expected industrial revolution?

September 12 - Bioresources and biotechnologies: contributions to chemistry, agriculture, health and cosmetics

December 5 - Technologies and music

Meetings and debates 2018

March 14 - Hervé Guillou, Chairman and Chief Executive Officer of Naval Group (formerly DCNS)

April 11 - Raphaël Gorgé, Chairman and CEO of the Gorgé Group

May 16 - Philippe Varin, President of France industrie, Vice-President of the Cercle national de l'industrie,

June 13 - Marguerite Bérard-Andrieu, Head of Retail Banking at BNP Paribas.

November 14 - Daniel Agacinski, Project Manager in the «Society and Social Policies» department of France Stratégie, in charge of education issues.

December 5 - Nadine Leclair, Fellow Expert of the Renault group.

Annual seminar

The Academy's Annual Seminar presented AI from the perspective of automatic learning, using the wealth of data from the digitisation of activities to build the knowledge and models for reasoning, predicting, deciding and optimising in an uncertain context.

Conferences & seminars

February 14 - Virtual and augmented, what realities?

March 14-15 - 2nd edition of the international forum "Energy for Smart Mobility", under the high patronage of the National Academy of Technologies of France

May 16 - A science fiction perspective on business

October 18 - cornerstones of Machining

11-12 December - Management of major projects: feedback

PARTNERSHIPS

FRANCE

The Academy helps informing public choices in innovation policy and R&D, including in the upstream stages of education and training. It participates in the governance of technological issues both through the involvement of its members in (or for the benefit of) think tanks and decision-making bodies and through its work. Let us quote in particular:

- **The National Industry Council:** at its request, the National Academy of Technologies of France identified the disruptions that existing industrial sectors would have to face.
- **The Parliamentary Office for the Evaluation of Scientific and Technical Choices:** OPECST regularly seeks the opinion of the Academy in the form of hearings or written contributions. In 2018, the Academy contributed to several scientific notes for parliamentarians on 3D printing, energy renovation of buildings, Hyperloop, electricity storage solutions, reusable space launchers, etc.)
- **The Prime Minister's Office:** at its request, the Academy assessed the flight of French graduates to the web giants and its impact on recruitment by major French industrial groups in the digital arena

INTERNATIONAL

DELEGATE
Bruno Revellin-Falcoz,

Africa

Two projects are being prepared to support engineering education in Africa, in particular the organisation of an event bringing together a group of young French and African engineers (based on the Frontiers of Engineering model) and the establishment of partnerships with French industrial groups to promote the local creation of start-ups.

Germany

After discussions on «Industry of the Future/Industry 4.0», the joint work in 2018 focused on public perception of technologies, the role of academies in their governments and the suggestion of key themes for Franco-German summits.

CAETS

The Council of Academies of Engineering and Technological Sciences brings together engineering academies from twenty-seven countries around the world. Its annual conference was held in Montevideo (Uruguay) on the theme of sustainable development of agricultural and forestry systems. The next CAETS annual conference will be held in 2022 in Paris.

China

The Academy of Technologies of France and the French Academy of Sciences continued their second phase of work with the Chinese Academy of Engineering (CAE) on the environmental impacts of nuclear energy, following the publication of a first joint report on the future of nuclear energy, presented at the end of 2017 at a meeting of the International Atomic Energy Agency (IAEA). A joint report will be presented to the vote of the members of the two French academies at the beginning of 2019, then solemnly presented to the Chinese authorities in the spring of the same year. This report covers the topics of environmental impacts during normal operation, serious accidents, waste and the consideration of the environment by nuclear safety. It shows the great similarity of approaches between China and France, while indicating some notable specificities.

European commission

In the context of the preparation of the future 2020/2027 «Horizon Europe» plan, the Academy has sent opinions on the European innovation ecosystem to several European Commissioners, including the European Institute of Innovation and Technology (EIT) and the European Innovation Council.

Euro-CASE

Association which brings together the academies of technology and engineering of 23 European countries.

PRESIDENT
Reinhard Hüttl (acatech)

SECRETARY GENERAL
Yves Caristan

Board of directors

Representatives of the National Academy of Technologies of France: Bruno Revellin-Falcoz, Gérard Creuzet (elected in 2018)

Several topics are currently being investigated: "A scientific perspective on microplastics in nature and society"; "The future of ageing"; "Making sense of science". "Novel Carbon Capture and Utilisation Technologies", a report launched under the direction of Euro-CASE in 2017, was released in May 2018.

Thanks to the work of the Energy Platform, Euro-CASE has launched a systemic study on energy cooperation in Europe.

Download
Euro-CASE position papers

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Euro-CASE Working platforms

Several members of the National Academy of Technologies of France contribute to the work of Euro-CASE working platforms:

Energy - with the contribution of Gérard Grunblatt and Bernard Tardieu.

This working group is finalising a report on the energy transition in Europe.

Innovation - Germain Sanz, Dominique Vernay.

The work of this platform led to the publication of the report "Barriers to Innovation and scale-up of innovative SMEs"

Engineering Education - Gérard Creuzet.

Two themes are being studied: identifying gaps in engineering education; Learning Big Data analysis in engineering education.

Annual conference

The 2018 Annual Conference was organised by the Swiss Academy of Engineering Sciences (SATW) in Zurich on the theme: How will artificial intelligence shape our future? Several members of the Academy participated. The Norwegian Academy of Technological Sciences (NTVA) will host the 2019 edition on the future of work on 21 October in Oslo.

SAPEA

Since 2016, Science Advice for Policy by European Academies (SAPEA) has been part of the European scientific advisory mechanism. The project is funded by the European Commission to the tune of €6 million over four years. It is based on the collaboration of five European academic networks: Academia Europaea, the European Federation of Academies of Science and Humanities ALLEA, the European Academies Scientific Advisory Council EASAC, Euro-CASE and the Federation of European Academies of Medicine FEAM.

SAPEA aims to bring together the independent scientific expertise of more than 100 European academies from more than 40 countries. Several reports have been prepared in this context, with the collaboration of the National Academy of Technologies of France: "Cybersecurity in the European digital single market"; "New techniques in agricultural biotechnology"; "Food from the Oceans", and "Authorisation processes for plant protection products in Europe".

Euro-CASE supervised the SAPEA report "Novel Carbon Capture and Utilisation Technologies", published in April 2018, and mentioned in the European Energy Strategy published in October 2018. This report assesses the potential impact of these technologies on the climate.

Frontiers of Engineering

The cycles of exchange organised by Euro-CASE and the US National Academy of Engineering (NAE) aim to bring together young engineers and scientists from Europe and the United States.

The next symposium, organized by the Royal Swedish Academy of Engineering Sciences (IVA) and the NAE, will be held in Stockholm from 18 to 20 November 2019. More than sixty engineers under the age of 45 are expected to discuss cutting-edge developments in the Internet of Things and 5G, systemic approaches for a clean environment, production for smart industry and the evolution of materials engineering through advances in imaging.

India

The National Academy of Technology of France and the Indian National Academy of Engineering (INAE) have decided to launch a joint work on medical tools for Alzheimer's disease, including those using artificial intelligence.

Japan

The fifteenth edition of the STS Forum (Science and Technology in Society Forum) was chaired by the Prime Minister of Japan, Shinzo Abe. The National Academy of Technologies of France was present at this event, which brought together more than 1200 participants. On the agenda for the forty sessions and related events: energy and environment, ICT and smart cities, innovation, health, resource conservation, education.

United Kingdom

The National Academy of Technologies of France continued its reflections with the Royal Academy of Engineering on cybersecurity, technological education, the transition from invention to innovation and the role of academies in the regional and European research and development ecosystem.

Switzerland

The National Academy of Technology of France and the Swiss Academy of Engineering Sciences (SATW) have decided to organize joint meetings on the occasion of visits to industrial R&D centres in both countries, starting with the field of chemistry.

On 14 November 2018, the National Academy of Technologies of France, meeting in plenary session, elected the members of the Bureau, the Academic Council, the Committees and the Chairs of the Commissions for the period 2019-2020. Pascal Viginier, former Vice-President, was elected President; Edwige Bonnevie was elected General Delegate and Dominique Vernay, Vice-President.

Pascal Viginier

A graduate of the École polytechnique (X 76) and the École nationale supérieure des télécommunications, Pascal Viginier is now Inspector General at Orange.

Pascal Viginier joined the France Telecom-Orange Group in 1981, where he held various operational positions in IT and sales. He was appointed Director of the Research and Development Division in 1998 and then Sales Director for France in 2006. From September 2009 to March 2010, he led the preparation of the merger of Orange with T-Mobile in the United Kingdom, which led to the creation of the new company Everything Everywhere (EE), the leading mobile operator in the United Kingdom. He then spent seven years as head of the information systems department of the France Telecom-Orange Group.

Edwige Bonnevie

A graduate of the École polytechnique and the École nationale supérieure de l'aéronautique et de l'espace, Edwige Bonnevie joined the Délégation générale pour l'armement (DGA) in 1978, where she was responsible for preparing the Helios observation satellite programme, and then, in 1992, she became deputy director of the Western European Union team in charge of space observation systems studies. At the same time, from 1989 to 1994, she was advisor for defence affairs in successive ministries in charge of space. In 1994, she turned to the field of deterrence and in May 1999 became Deputy Director of Nuclear, Biological and Chemical Affairs within the DGA.

In 2001, Edwige Bonnevie joined the CEA as Deputy Director of Military Applications. In July 2008 she was appointed Director of the Risk Management Division and Director of Central Security. In 2016 she was nominated Deputy Director of Security and Safety alongside the Deputy Head, while retaining her functions as Central Security Director.

Dominique Vernay

Dominique Vernay is a former Director of Research and Technology of the Thales Group, President of the Development Council of the Paris-Saclay urban community and Honorary President of the competitiveness cluster "Systematic". He is a historical figure in French research and development. He graduated from Supélec [1972].

Very strongly involved in the world of research and innovation, from 2011 to mid-2015, he was the President of the Foundation for Scientific Cooperation "Paris-Saclay Campus", which led the project to create the Paris-Saclay University, which brings together 19 higher education and research institutions according to clear and internationally competitive research university model.

Founding President of the "Systematic" competitiveness cluster (1996-201 l) and founder of the Club of Global Clusters.

Plenary Assembly

As a political and advisory body, it adopts statements and reports, approves general guidelines and the action programme. It is composed of 314 full and emeritus members.

On 5 December 2018, the Plenary Assembly elected 16 new members, bringing the number of academicians to 330.

Bureau

As an Executive Body, the Bureau is composed of the President, the Vice-President, the General Delegate and the Past President. The Chairman of the Programme Committee participates.

Academic Council

The Academic Council is an advisory body for decisions submitted to the vote of the Assembly and is composed of the 4 members of the Bureau, 5 ex officio members and 7 elected members.

Commissions

Eleven commissions have established working groups for analysing the major technological issues of our time. Systemic analysis is the preferred method, as is risk/opportunity analysis and social acceptability. Each report answers an ethical question.

- Biotechnologies
- Education, training, employment and territories
- Energy and climate change
- Environment
- Ethics, society and technologies
- Mobility and transport
- Research, technologies, innovation, employment
- Technology and health
- Technologies and development in the least developed countries
- Information and Communication Technologies
- Urban planning and housing.

Transversal strategic actions

They allow answering questions of national interest, in which technology plays a major role: engineering and major projects; innovation, growth and employment; new urban operators; soft power; technologies and innovation territories.

In 2019, the 11 commissions will be replaced by 10 divisions:

Food and health - Housing, mobility and cities - Education, training, employment and work - Culture, leisure - Energy - Security and Defence - Digital - Industry and services - Environment and the impact of climate change - Technologies, economies and societies.

International organisation

NAFT
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