Contents

Context ................................................................................................................................. 2
1. A 7th framework programme structuring the European Research Area but insufficient to address the challenges ahead .................................................................................. 3
   1.1. The FP structures the European Research Area ....................................................... 3
   1.2. …but has failed to achieve the efficiency expected ................................................. 3
2. A CSF ensuring continuity but with innovative initiatives ........................................ 4
   2.1. Simplify administrative procedures and improve web-based tools ...................... 4
   2.2. Develop researcher mobility, a vehicle for European excellence ......................... 5
   2.3. Consolidate upstream research programmes, a source of innovation ................. 5
   2.4. Pursue the coordinated establishment of world-class scientific and technological infrastructures ................................................................. 6
   2.5. Improve coordination of international cooperation ............................................... 6
   2.6. Build an appropriate intellectual property policy .................................................. 7
   2.7. Innovate in public contracts .................................................................................. 7
   2.8. Support innovation particularly in key technologies, sector-applied or enabling technologies ......................................................................................... 7
   2.9. Encourage greater involvement of industry in the R&T&I process ....................... 9
   2.10. Coordinate national research programmes on grand challenges by joint programming ................................................................................................. 10
   2.11. Migrate from a project approach to a programme approach ............................. 10
   2.12. Support research in energy on a par with the stakes it involves ....................... 10
Conclusion ....................................................................................................................... 10
Context

The French Atomic Energy and Alternative Energies Commission (Commissariat à l'énergie atomique et aux énergies alternatives) has over 15,000 employees and manages a budget of 3.9 billion Euros. It is France’s largest technology research organisation and a leading player in Europe. The CEA has been involved in European research since the beginning of the framework programmes, acting as project coordinator in many cases. It is very often involved, for the relevant research infrastructures, from design through to managing facilities in operation and in governing those structures.

Secondly, for several years now, the CEA has been actively contributing to building the European Research Area alongside its main European partners and as part of strategic community think tanks. It played a key role in creating the SET Plan Energy Alliance, the SNETP platform, in preparing the European Industrial Initiative ESNII and in the start-up of the European Technology Institute on climate and energy, along with chairing the High Level Group on Key Enabling Technologies (HLG KET) which is charged with the elaboration of policy recommendations to accelerate the development and deployment of KETs in Europe. It is an active member of the Board of Directors of the JRC.

Boasting a network of several hundred partners in Europe built through the successive FPs, the CEA strives to be a source of proposals to build a future framework programme, a cornerstone of European cooperation in research and effectively and coherently integrated into the European Research Area.

This document sets out to discuss the limitations of the current framework programme, beyond the contribution it has made to building the European Research Area and to propose solutions for the forthcoming Common Strategic Framework (CSF). It will then describe the leads that our research organisation suggests consolidating or exploring as part of the next programme in order to rise to the challenges currently facing Europe.

The proposals that the CEA wishes to make for CSF are summed up below:

a. Build a European area that stimulates quality research
   - By simplifying administrative procedures and improving web-based tools,
   - By developing researcher mobility,
   - By consolidating scientific upstream research programmes,
   - By pursuing the coordinated establishment of scientific and technological world-class infrastructures,
   - By improving coordination of international cooperation,

b. Build successful framework and structures leading to innovation
   - Through an appropriate intellectual property policy, especially in the KETs area given its potential for innovation driven growth
   - By innovating in public contracts,
   - By supporting innovation particularly in key enabling technologies,
   - By encouraging greater involvement of private industry in the R&T&I process
   - By developing the joint-programming concept
   - By migrating from a project approach to a programme approach

c. And lastly, support research in nuclear and alternative energies on a par with the stakes it involves
1. A 7th framework programme structuring the European Research Area but insufficient to address the challenges ahead

1.1. The FP structures the European Research Area...

As the world’s largest research programme in terms of funding, the FP has a decisive influence on the European research landscape. As the fourth largest beneficiary research structure in Europe, the CEA is greatly attached to this programme and convinced that it has considerable potential impact. It indeed extends well beyond providing research organisations with financial support. It contributes to structuring the European Research Area at every level:

- For researchers, it encourages idea-sharing and mobility;

- For research operators, the FP establishes ongoing dialogue throughout Europe on research issues between organisations, universities and businesses; it fosters and instigates numerous cross-border initiatives for cooperation and contact through research projects;

- On a political level, the discussions held during the FP7 preparatory talks put research and innovation questions back at the top of the European political agenda, in coherence with the Europe 2020 Strategy for a smart, sustainable and inclusive growth. They also marked a significant budget breakthrough compared to FP6 with the FP becoming the EU’s third largest budget as a result!

1.2. …but has failed to achieve the efficiency expected

However, despite all the positive achievements delivered by the series of framework programmes, a number of observations can be made:

- The FP still accounts for less than 5% of total European investment in research, which is insufficient to have a significant and/or lasting impact on the ERA as a whole. Despite the Eranet tool, designed to coordinate national programmes on certain topics, the European Research Area is still very fragmented (gaps, overlaps, sub-criticality).

- Compared to the USA in particular, Europe suffers from a lack of private investment in research. The FP does not, unfortunately, help to change that situation: inappropriate intellectual property rules that do not protect results sufficiently, and that do not prioritise exploitation of results on European soil, in addition to the time consuming contracting processes and uncertainty in particular, all turn industry, and especially SMEs, away from the programme. The Joint Technology Initiatives (JTI), launched at the start of FP7, aim to reduce this tendency in strategic sectors but experienced a difficult start.

- The FP still has overly systematic scattering of resources resulting in a lack of cohesion between projects and preventing any critical mass from being formed on a coherent programme. Owing to excessively large consortia and inappropriate intellectual property rules, certain projects remain focussed on marginal subjects with very little knowledge transferred to industry.
- This spreading of resources namely led to a multiplication of initiatives launched at the start and in the course of the programme, rendering the community research scene somewhat complex.

- One of the effects of this scattering mentioned above is a large amount of project management work, confining the Commission’s services to a purely administrative role. It is appropriate to suggest other models, more in line with the amount of funding involved, relying on the players and national R&D&I programming, control and assessment structures.

- Lastly, numerous initiatives have been launched at community level in recent years, on the sidelines of the FP: EIT, Joint programming, Competitiveness and Innovation Framework Programme, etc. Their goals sometimes appear to overlap and do not help to clarify the Commission’s actions or the research scene in Europe. Similarly, the complementarity between the FP and Structural Funds to stimulate innovation is still to be proved: this is particularly the case in France where decentralisation complicates reporting on project funding by the structural funds.

2. A CSF ensuring continuity but with innovative initiatives

The structure of CSF is being discussed exactly at a time when:
- The Commission has published its communication ‘A union for innovation’ with the focus on 2020.
- Significant thought is being given to the identification of major challenges.
- A High level group on key enabling technologies is developing a new strategy for the development, deployment and protection of such KETs in Europe.

CEA relies on the analysis of all these initiatives to develop its own thinking and to suggest several leads for consideration in the future FP, as set out below:

a. Build a European area that stimulates quality scientific and technological research
   - By simplifying administrative procedures and improving web-based tools,
   - By developing researcher mobility,
   - By consolidating upstream research programmes,
   - By pursuing the coordinated establishment of scientific and technological world-class infrastructures,
   - By improving coordination of international cooperation,

b. Build a framework and structures conducive to innovation
   - Through an appropriate intellectual property policy, especially in the KETs area given its potential for innovation driven growth
   - By innovating in public contracts,
   - By supporting innovation particularly in key enabling technologies,
   - By encouraging greater involvement of private industry in the R&T&I process
   - By developing the joint-programming concept
   - By migrating from a project approach to a programme approach

c. And lastly, support research in nuclear and alternative energies on a par with the stakes it involves.

2.1. Simplify administrative procedures and improve web-based tools

Like each transition between two framework programmes, there will be a period of 3 to 4 years in which the operational teams must work on projects under both the 7th and the 8th programme. To lighten the workload of the teams involved in these programmes, we need to propose an administrative organisation that ensures continuity while correcting existing problems.
Like many parties involved in the FP, the CEA calls for:
- reducing researchers’ administrative workload, while giving each structure as much flexibility as possible to use their customary accounting rules, and particularly to use average personnel costs and fixed or real rates, at the participant’s discretion,
- defining clear, transparent and unambiguous rules,
- providing comprehensive documentation in a timely manner comprising all legal documents and guides required for the FP8,
- abolishing any measure that would burden the administrative workload, like the obligation to open interest accounts under FP7,
- only deploying the Commission’s IT tools to participants once we can guarantee that they work correctly.

2.2. Develop researcher mobility, a vehicle for European excellence

Mobility is an effective means of building networks between organisations. It is an opportunity for researchers to discover new horizons and to develop their careers. And it is an asset in terms of strengthening the excellence of our laboratories and developing innovation. All the tools that foster such mobility must be maintained and optimised to remove the obstacles that still hinder free movement of research staff.

The issues of health insurance and pension contributions in connection with mobility must particularly be solved by the relevant European authorities, with a view to simplifying and achieving greater consistency.

As regards mobility tools, the Marie Curie ITNs are extremely beneficial for research teams and for young researchers who are able to develop a network of European relations. The benefits are reflected in the low success rates recorded and justify significantly increasing the sums allocated.

Alongside the individual Marie Curie fellowships that must be maintained, the Co-fund programme for mobility of experienced researchers should be scaled up. The programme’s beneficiary structures, who themselves manage a global programme of numerous mobility grants, are very satisfied with the way it works. An extension of this type of programme to PhD students would be greatly appreciated.

An initiative in favour of the mobility of researchers employed in the EU and related states could be put in place for short stays along the same lines as the IRSES (International Research Staff Exchange Scheme) which already exists for exchanges with third-party nations. Even if it only funds small, lump-sum amounts, this instrument would be flexible and would facilitate outward researcher mobility.

2.3. Consolidate upstream research programmes, a source of innovation

The new ‘European Research Council’ programme which began with FP7 has swiftly gained considerable visibility among pure research scientists. This specific programme should deliver major results whose effects will be visible and quantifiable in a few years’ time thanks to the support it offers individual, top-level researchers, often at the interface between different disciplines. The CEA maintains its support for this programme, provided that it keeps the same single goal of excellence. However, it strongly recommends that excellence in both scientific and technological research is promoted and supported. We also hope that the gaps between the flexibility and streamlined management promised to researchers and the reality on the ground will quickly be closed. Removing the obligation to have interest-bearing accounts should contribute to that.

The programme currently offers two types of grant, the starting and advanced grants, with one criterion concerning the time elapsed since the viva. We do not consider it appropriate to introduce a third intermediate category between the two current ones (which is sometimes mentioned): it would weigh down the system and remove the instrument’s current incentive to progress towards excellence. So that certain countries can benefit under the ERC programme, one solution could consist in offering grants with two host entities, one of which would “sponsor” the fellow by allowing him to take
advantage of its facilities and skills, which would then enable him to develop his project in his home country.
We must also raise a point about the portability of intellectual property (IP) in the event that the grant-holder researcher leaves his employer: in this situation, negotiations must have regard for the specific rules of employer structures. This is a condition to authorise the researchers in our centres to apply for the programme.

The ERC initiative alone cannot solve all fundamental research issues. It must also be possible to conduct upstream research in partnership, to respond to societal issues or technological obstacles, even though that aim is relatively distant and uncertain. It is therefore vital to maintain and expand the 'Future and Emerging Technologies' (FET) scheme from ICT to the other key enabling technologies along with other areas of the Cooperation programme (particularly health, nanoscience and nanotechnology, energy, the environment, etc.).

2.4. Pursue the coordinated establishment of world-class scientific and technological infrastructures

The positive contribution FP7 made to the question of European research infrastructures was undeniably the effective implementation of the ESFRI process. As a result, the question of new infrastructures has been formally taken to the political level. This process of selecting priorities has given rise to a regularly updated, common roadmap. The infrastructures and particularly those that will enjoy ERIC status, will be eligible in the ERA for co-funding at EU level. They will offer equitable access to research facilities and to modern technological demonstrators of international dimension, or even to new distributed infrastructures. However, the ESFRI process should endeavour to clearly redefine the term 'research infrastructure': they must be separated from technical platforms –whether physical or virtual- by underlining the compulsory criterion of centralised governance. Furthermore, the European Commission should focus its financial contribution on real world-class research infrastructures, to achieve greater international visibility and to truly help the research community. The ESFRI demands greater involvement of the management of major research organisations very early on in the process to avoid making decisions that are not based on realities on the ground. Moreover, Member States and organisations’ financial commitments should be identified as far upstream as possible of future RI projects, to avoid wasting time on hypothetical projects that will never materialise.

As regards major international infrastructures, the CEA recommends reserving specific budgets outside the FP and creating the capacity to meet European commitments through managerial margin control.

Support for integration is one of the major contributions of the FP. Its role in structuring the ERA is unquestionable. This support also helps to rationalize the way infrastructures are used while offering the possibility of expanding access, if necessary, to European users. While the CEA supports the continuation and even an increase in these activities for FP8, we also believe that the question of sustaining these structures beyond the calls must be addressed.

The pre-procurement system combined with design and pre-construction studies of infrastructures to compare and qualify alternative technologies deserves to be developed. It could particularly be developed for research into generic technologies like instrumentation in support of design and maintenance of European, world-class infrastructures.

2.5. Improve coordination of international cooperation

The existence of the recently created ‘Strategy Forum for International Cooperation’ (SFIC) confirms the Commission’s intention to better coordinate international cooperation initiatives in its programmes. We believe it would be appropriate to include its recommendations in the CSF.
All the new instruments (EIT, Alliances, JTI, etc.) also develop an international component to convey their image abroad and to take advantage of input from competent players outside Europe. The international policy developed under FP8 must take the international strategy of existing structures into account.

2.6. Build an appropriate intellectual property policy
It is unrealistic to think that intellectual property issues need only be considered in a partnership to develop products close to the market. Every player in the innovation chain, from basic research to demonstration studies, is faced with the need to protect the results they obtain: in basic research by pioneer patents, in upstream research by generic patents, in applied research by application patents and in proof of concept by improvement patents. We must also emphasize the fact that “open innovation” must not be confused with “free access”. Intellectual property is recognized as a tool to structure and regulate Open Innovation. Conversely, “free access” results is low incentive to trace and protect intellectual property, in turn reducing impact in terms of cooperation and transfer of technology. The models chosen for intellectual property should often be the starting point to look for the keys to increasing efficient cooperation between partners and to ensure more regular transfer of technology to industry. In particular, the principle of intellectual property exclusivity by geographic area, business sector, market or technology is applied too little, which is detrimental to SMEs who need it to gain a firm foothold in the market they have their sights on. Furthermore, creating consortia overcrowded with partners is also an obstacle to satisfactory intellectual property management.

In particular, it is proposed that for the distinct case of KETs, which will underpin future economic competitiveness in Europe, that the European Commission put in place appropriate regulations and rules to ensure that public funded technological research in the domain of KETs is firstly exploited in European territory.

2.7. Innovate in public contracts
The pre-procurement process, frequently applied in the United States to support businesses and namely SMEs, is referred to in the communication ‘A Union for Innovation’. This extremely interesting system, as we have already seen in the PRACE project on high-performance computing, could encourage innovation and support the competitiveness of European companies. It does however, if it is included in the FP, come with the risk of consuming a large part of the resources. Firstly, the closer we get to the market, the more costly products or demonstrators are to develop. Secondly, at this stage in the process, the users of solutions (regions, companies, etc.) are the only ones who really know their needs. The European Commission has no particular legitimacy to lay down the specifications and make the technical choices. We therefore believe that this system should be supported but we recommend examining its funding in detail by coordinating the FP, structural or CIP funds, depending on the type of product to be developed.

In particular it is proposed that for the distinct case of KETs that all appropriate public procurement measures and lead market stimulation initiatives be explored to facilitate the deployment of KETs in Europe.

2.8. Support innovation particularly in key technologies, sector-applied or enabling technologies
The major challenges facing Europe are new opportunities for our continent’s economic development and employment. So far, our industrial base to rise to these major
challenges is sometimes lacking in structure. In the years to come, new markets will emerge and others will change and adapt.

They will all need a real **European industrial policy**. Even though the technological platforms lead to structuring R&T roadmaps, their application through to the production of technological goods will demand supporting political measures, in intellectual property or regulation for example. The recommendations of the communication on innovation are along the same lines, as is the activity developed within the EIT KICs.

In research, **a policy to focus programmes and the regulatory framework on these innovative technologies** would be worthwhile, as was the SET-Plan in energy. However, studies must also encompass the **entire innovation chain**, and particularly instruments and the research players in charge of running them. We will not, in these recommendations, compare the various steps, players and instruments present in the innovation chain, especially as the innovation process is iterative rather than linear and requires ongoing dialogue between all the parties involved. We must therefore ensure that the next framework programme avoids all excessive partitioning between upstream research, technological research and support for technology transfer. The entire chain must be able to benefit from support, and the instruments must foster dialogue between players. In particular, upstream research must supply technological research with innovative ideas.

In this respect, the Commission’s proposal in its communication on innovation to create **’European innovation partnerships’** is interesting, as it considers bringing all the players together around an identified challenge and implementing clearly result-orientated work modules. The Communication was not silent on the question of funding these partnerships since it even states that they will be included in the next financial perspectives. Research organisations expect these EIPs to appropriately coordinate the various initiatives on a given topic and to provide Alliances, such as EERA for example, with political backing, by a programme labelling process. The role of the EIT and the KICs should also be clarified within this framework and fully integrated into the future FP.

In 2009, European Member States and the European Commission identified Key Enabling Technologies (KETs) - nanotechnology, micro and nanoelectronics, advanced materials, photonics, industrial biotechnology and advanced manufacturing systems- for their potential impact in strengthening Europe's industrial and innovation capacity

In particular, KETs were recognized as playing an increasingly vital role in developing the required industrial and technological base indispensable for the delivery of smart, sustainable and inclusive European growth.

The mastering and deployment of KETs in the EU represent a genuine opportunity; failure to maintain and develop KET-related activities in the EU would result in subsequent difficulties for Europe to keep up with international competition and master its own future.

The European Union should therefore in priority support the six KETs identified in the Communication from the Commission from 2009 on KETs.

In order to better support the development and deployment of KETs, the European Union should implement the recommendations from the HLG KET.

The High Level Expert Group (HLG) on KETs launched in 2010 was tasked with the elaboration of a coherent European strategy to develop these KETs and bring them most effectively to industrial deployment.

The HLG KET diagnostic clearly showed that Europe has fundamental research in the different KET domains at world-class level. However, beyond this foundational innovation

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creation stage, Europe encounters major difficulties to commercially exploit its ideas, transform them into technologies, subsequently into products and finally produce them competitively at world level. Europe finds itself incapable of crossing in a systematic and efficient manner the “valley of death” which separates the creative idea from the global market. Therefore, the successful deployment of KETs in Europe necessarily implies focusing future actions on this “valley of death” challenge and putting in place the means necessary to cross it as well as US and Asian competitor nations. The crossing of “valley of death” in the KETs could therefore be imagined in the following manner in constructing a European bridge comprising three pillars:

- The pillar of technological research focused on the technology
- The pillar of product demonstration arising from the technologies focused on the products
- The pillar of production, competitive at world level, focused on advanced manufacturing.

This crossing of the “valley of death” presupposes finally that a complete political and regulatory environment is put in place in order that the efforts made across the three pillars would be crowned by success.

In conclusion, the following specific recommendations are made:
1. Extend the scope of R&D definition in order to include RDI activities in Industry environment targeting product development such as pilot lines.
2. Create a KETs' distinct box with specific budgetary line in the forthcoming CSF
3. Implement KETs IP policy measures as outlined above.

2.9. Encourage greater involvement of industry in the R&T&I process

FP7 created the JTI, a new instrument of public-private partnership. Owing to our positive experience, the CEA recommends that this tool should be maintained, but has potential to be optimised for particular domains. The JTIs have succeeded in conducting programmes by means of calls for projects; they have managed to integrate unusual players (society) and thus go well beyond the research agendas of the platforms they stem from.

With FP8, the Commission must strive to encourage high-tech industry to reinvest massively in research in Europe. To do so, the FP should support projects closer to the market, more in line with industrial ambitions, larger in volume but also smaller in numbers of partners and with intellectual property rules more suited to market realities. Given the resources allocated, the European Union could give the FP a more important role and make it the research limb of a real European industrial policy. But to do that, the Commission will have to revise its procedures to make the system more flexible and responsive for all programmes involving manufacturers and SMEs.

In particular, it is suggested for the domain of KETs which includes nanoelectronics, that the JTI tool be optimized. In this regard, we support the proposal of Commissioner Kroes as outlines in her response to the interim review of JTIs, proposing "to extend the operational activities of potential PPPs to encompass accompanying measures such as infrastructure and large demonstration actions" and including the concept of "combined funding"\(^4\) from different sources.

In particular we suggest the possibility of accelerating the implementation of mid-term HLG KET recommendations by elaborating a proposal for KET pilot line utilizing the tri-partite ability of JTI tools and based on the following principles:

a) Call for proposals with detailed specification focused on pilot lines;

b) Mutual commitments between Industry, region (where appropriate), member state(s) & European Union;
c) Utilization of objective based indicators (commitments of industry);
d) Simultaneous signatures and disbursement of payments of EU and member state(s), region(s), (when appropriate);

In addition, the activities addressed by the Competitiveness and Innovation Programme (CIP) dedicated to demonstration and non technological innovation should be maintained in future CSF.

2.10. Coordinate national research programmes on grand challenges by joint programming

Financial pressure in years to come will mean that the 27 Member States are unable to conduct their national programmes without organised consultation. Through the technological platforms, this consultation is already effective between industrialists and leads to well-applied strategic research agendas. On the grand challenges, joint programming between States must do the same to define these strategic agendas. However, implementation of those strategic agendas will subsequently come under an instrument that does not yet exist and whose main players may not necessarily be the States themselves, as we suggest in the paragraph below.

2.11. Migrate from a project approach to a programme approach

The change of scale of FP7 compared to FP6 revealed the limits of directly managing individual projects, dissociated by the Commission’s services. A further increase in the research budget under FP8 would appear difficult unless it is accompanied by a reform of the management method. We therefore feel that the Commission should gradually move away from its “project”-based model towards a ‘top-down’ model or, that it at least begins to introduce this new way of working. The Commission must regard the innovation chain as an ongoing process. Although it must allow innovative, revolutionary projects to emerge, the Commission must (either directly or by granting power to an appropriate body) make strategic choices in certain areas of research, while making players more responsible and adopting efficient financial and administrative rules that give them greater autonomy. A first step has been achieved with the joint financing of programmes such as CO-FUND under Marie-Curie.

One possible change that is already fiercely debated no doubt lies in joint programming relying on public research organisations in charge of a national mission. These structures already exist and have proved their programming capabilities. As the EERA initiative shows, they have significant means and are keen to cooperate more closely on ambitious programmes. The swift creation of EERA also demonstrates how responsive these organisations are and their ability to respond to Europe’s ambitious policies defined through the SET-Plan to achieve the 20-20-20 goal.

2.12. Support research in energy on a par with the stakes it involves

The CEA is extremely active in the topic of energy, be it nuclear, alternative or renewable, and supports the idea that the EU should step up community support for research in energy and particularly for Euratom Fission & radioprotection. Nuclear fission is indeed the major source of electricity in Europe and the one with the greatest potential to achieve the 20-20-20 goal. Paradoxically though, it is still the poor relation of community research.

Conclusion

The structure that the CEA proposes for the future CSF could rely on three pillars: ‘science base’, ‘from emerging technologies to applied joint programmes’, both designed
to prepare the scientific and technological answers to grand challenges, and ‘demonstrating and deploying’. It positions FP8 in relation to the demonstration and deployment steps and their specific instruments. Two points are particularly emphasized in the technological research step:

- The need to rely on key enabling technologies (KET),
- And the point we consider the most important, real pooling of resources across Europe by joint technological programming entrusted to public research organisations in charge of a national mission.

In conclusion CEA wishes to make the following proposals:

a. Build a European area that stimulates quality research

- By simplifying administrative procedures and improving web-based tools,
- By developing researcher mobility,
- By consolidating scientific upstream research programmes,
- By pursuing the coordinated establishment of scientific and technological world-class infrastructures,
- By improving coordination of international cooperation,

b. Build successful framework and structures leading to innovation

- Through an appropriate intellectual property policy, especially in the KETs area given its potential for innovation driven growth
- By innovating in public contracts,
- By supporting innovation particularly in key enabling technologies,
- By encouraging greater involvement of private industry in the R&T&I process
- By developing the joint-programming concept
- By migrating from a project approach to a programme approach

c. And lastly, support research in nuclear and alternative energies on a par with the stakes it involves

Tackling Grand Challenges through innovation

Preparing for Grand Challenges

From emerging technologies to applied Joint programmes

FP8