



Strategic review of Particle Physics in the UK – Terms of Reference

1) Background

The existing approach for the particle physics programme was informed by the 2012 Programmatic review, which prioritised investment in the LHC experiment upgrades and broadening the programme, but did not provide a wider long-term strategic framework for STFC investment in particle physics. It could be argued that the absence of strategic guidance to Science Board and the Particle Physics Grants Panel has resulted in structural issues, for example an imbalance between capital investment and science exploitation in some areas. For this reason, STFC is seeking guidance on a refreshed strategic framework for particle physics and related areas. This is not a programmatic review and it will **not consider or prioritise individual projects**.

Why now?

The funding for the UK national particle physics programme has remained largely flat since the 2012 Programmatic Review. During this time research costs have increased significantly, for example the average cost to STFC of a PDRA has increased by 40%. Furthermore, since 2012 the global strategy for particle physics has progressed through the publication of European Strategy for Particle Physics Update (ESPPU) in 2020 and the DOE Particle Physics Project Prioritization Panel (P5) review in 2015, which is due to be updated in 2022. In addition, the emerging European detector and accelerator R&D roadmaps highlight opportunities for the development of new technologies. There has been a lot of progress, but there are also significant uncertainties, such as the timescale and/or the feasibility of the Future Circular Collider (FCC) at CERN.

Given the global direction of the field, managing the programme within tight financial constraints requires updated strategic guide rails to ensure the maximum scientific impact for the UK.

For the purpose of the **scope of this review**, the UK particle physics programme refers to STFC's support for particle physics through its core scientific programme, including the accelerator programme, computational support for particle physics, direct dark matter searches and neutrino-less double-beta decay.

2) Desired Outcome of the Review

STFC is seeking guidance *on a refreshed strategic framework that will ensure the long-term health of UK particle physics and related areas* and maximise the scientific benefits to the UK within likely financial scenarios.

The aim is to provide guidance to the STFC Executive on the elements of high-level long-term framework that will be developed to:

- inform possible *structural* changes to the way of funding the particle physics programme within the STFC Programmes Directorate;

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- provide strategic guidance for the overall programme, including skills and training, to deliver the best long-term outcomes for the health of the field in the UK to those managing the programme within STFC's Programmes Directorate and National Laboratories;
- provide guidance to Science Board on the wider strategic considerations when considering new proposals and/or statements of interest;
- provide additional guidance to the Particle Physics Grants Panel in the consideration of consolidated grants applications.

The review will not prioritise individual projects or wider areas, but will consider the balance between research and development, capital construction, maintenance and operations, and scientific exploitation.

3) Terms of Reference

The review panel is asked to provide guidance in the form a series of recommendations, *on a refreshed strategic framework that will ensure the long-term health of UK particle physics* and maximise the scientific benefits to the UK within a range of realistic financial scenarios.

Scope of the Review

The review will cover **particle physics**, including direct Dark Matter searches, and the accelerator and computing disciplines that support the field. It will take account of how wider international developments affect the UK.

In the context of developing an overall *strategic framework that will ensure the long-term health of UK particle physics*, the considerations of the review committee should include the following questions:

1. Are there any lessons to be learnt from the last ten years regarding the scientific and/or investment decision-making processes within STFC? The committee should consider the balance between broad areas, capital investment, exploitation, R&D, etc., not individual scientific areas.
2. What are the considerations that determine the appropriate balance between R&D, capital construction, M&O and scientific exploitation and how should these considerations be included in the decision-making process?
3. How should the UK programme ensure that it effectively leverages the investment in the membership of CERN?
4. To ensure the health of the UK particle physics programme, what is an appropriate level of early-stage technology R&D funding.
5. Given the financial constraints and uncertain timescales, how and *when* should the UK engage in the R&D phase for the next generation of colliders/experiments?
6. In the context of three/four financial scenarios, what are the essential elements and what areas could potentially be traded-off against each other within the strategic framework?
7. What are the key international decision points in the coming decade that will affect forward planning and influence the shape of the future UK particle physics programme?

Outputs from the Review

Having considered the above questions, the review panel will present its recommendations for *a refreshed strategic framework that will ensure the long-term health of the UK particle physics programme* and *any changes needed to deliver the best outcomes within the recommended framework*.

The output of the review will be a report to the STFC Executive, presented in three main sections:

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- **Findings:** summarising the main findings of the review, representing a factual playback of the information that was presented to the committee that supports the committee's assessment.
- **Comments:** representing the committee's assessment of what was learnt during the review, providing narrative background to the committee's recommendations.
- **Recommendations:** presenting the main recommendations from the committee that will be used to inform the development of the strategic framework for UK particle physics and its delivery.

The findings and recommendations will be presented in separate sections addressing the seven questions for consideration and any broader issues discussed by the review committee.

The report will be used by STFC, in consultation with STFC Council, to develop a new strategic framework for UK particle physics.

Inputs to the Review

The review committee will be provided with:

- historical information on the evolution of the existing particle physics programme;
- financial modelling for the potential future programme in a few scenarios ranging from:
 - pessimistic: flat cash (not adjusted for inflation) for the next ten years; to
 - optimistic: 5% year-on-year above inflation increase for the PPAN budget for five years and the inflationary increases.