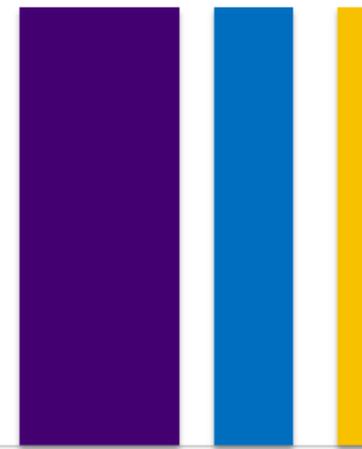




UK High-Field NMR Funding and the UKRI Infrastructure Roadmap

Tony Chapman, EPSRC

UK NMR Manager's Meeting – University of Warwick 20th June 2018



Topics to be covered today

Part 1- An overview of UK investment in Very-High Field NMR

- Background to recent UKRI investments in Very-High Field NMR.
- Outcome of the recent NMR investment.
- Future directions for Very-High Field NMR in the UK.

Part 2 – NMR and the UKRI Infrastructure Roadmap

- Background to the UKRI Infrastructure Roadmap.
- NMR and the UKRI Infrastructure Roadmap.

An Overview of UK investment in Very-High Field NMR

In the beginning...

- Recent high-profile investments in NMR have their origins back in 2012.
 - Publication of the first EPSRC survey of NMR infrastructure in the UK
 - Highlighted the importance of NMR as an underpinning analytical technique.
 - Described the scale (field strength), scope (solid/solution state), distribution, condition (e.g. age) and sustainability of NMR facilities across the UK for the first time.
 - An important benchmark.
- This roadmap was updated in 2017
 - Key changes between 2012 and 2017...
 - Included more information on the provision of NMR in the life-sciences sector.
 - Average age of instruments reduced (but more improvement was still required).
 - Upgrading of (fit for purpose) existing equipment was important.
 - More high-field systems, but few Very-High Field (800 MHz plus) systems available in the UK compared with other nations.
 - Progress in comparison to 2012, but more progress required to retain international competitiveness.

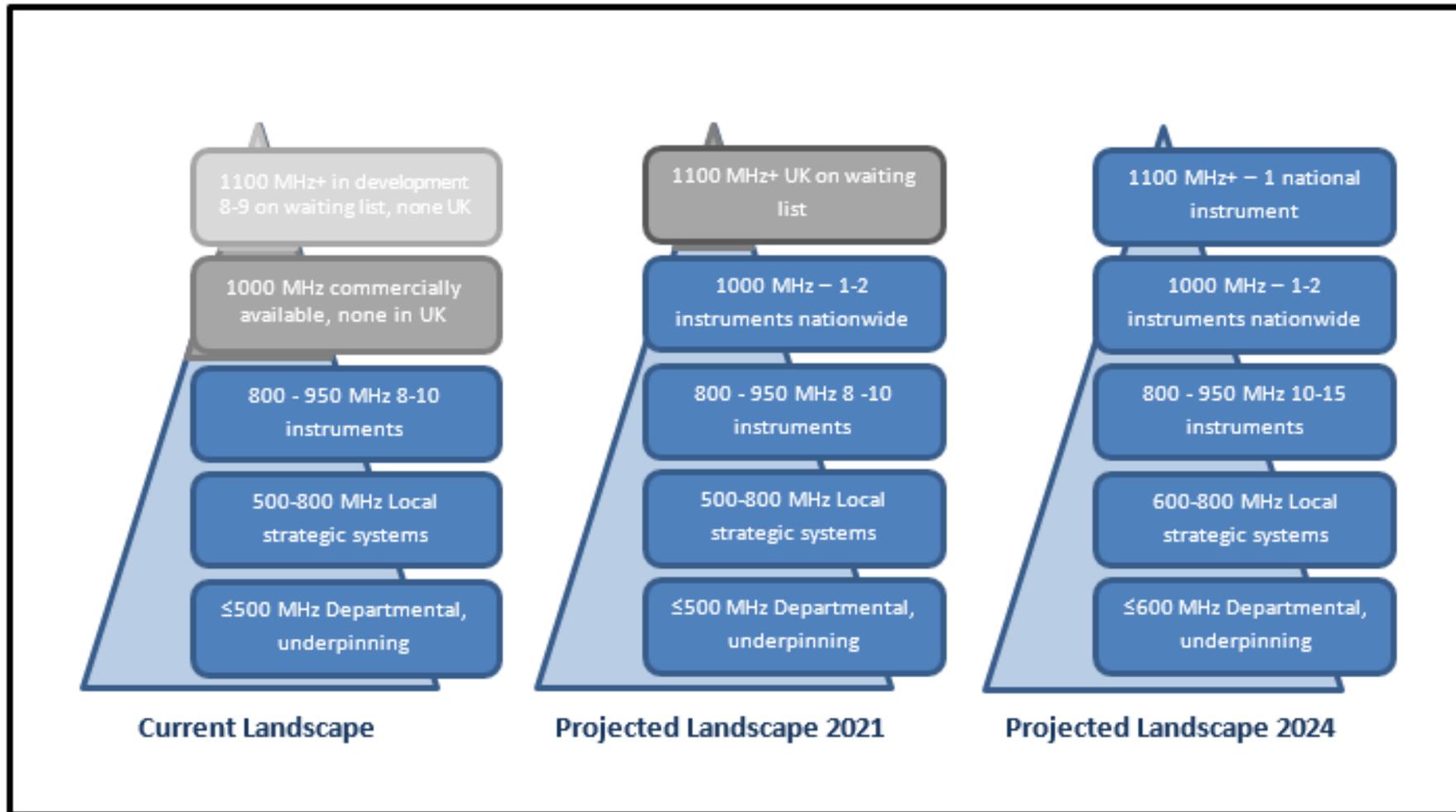
The value of the roadmap...

- The original roadmap quantified and classified NMR provision in the UK.
 - Helpful to identify and quantify gaps.
 - An important tool to make a case for funding at a national/political level.
 - Helps to demonstrate the value of NMR to the UK scientific community
- The updated roadmap added value to the original.
 - It was possible to show how the landscape evolved in the timescale.
 - New and existing needs were either identified or reinforced
 - Expansion to include the life sciences sector was important – broadened the relevance and strengthened the case for investment.
- NMR featured Prominently in the Government Capital Roadmap in 2014.
 - Strategic investment in world-class scientific infrastructure to 2020-21
 - Investment in Flagship NMR facilities for the biosciences and physical sciences communities

Recent investment in Very-High Field NMR

- The investment need highlighted in the Government Capital Roadmap in 2014 translated directly into the call for High-Field NMR in the Physical and Life Sciences in 2017.
 - £20m investment in new Ultra-High facilities (1.0 GHz) and upgrades of Very-High facilities (800 MHz plus).
 - Originally targeted procurement of a 1.2 GHz system – not available in the timescale of the investment. £2m of original £22m budget retained by BEIS.
 - An additional business case was subsequently submitted to BEIS to support future investment in NMR systems in excess of 1.0 GHz field strength.
 - This is ongoing
 - Plan to establish an interconnected national-scale NMR infrastructure for the benefit of the whole UK research community in two broad research areas.

Current and Projected UK NMR infrastructure

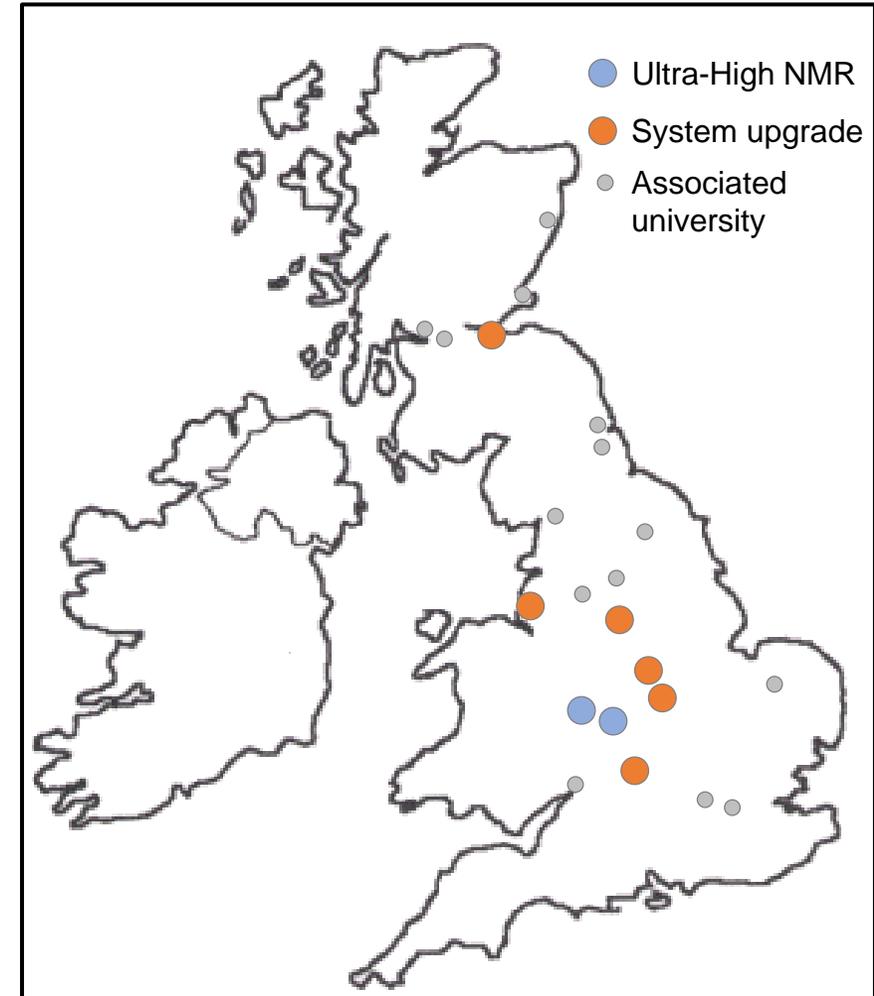


Outcome of the call (1)

- Eight proposals were funded.
- A total investment of approximately £21.4m
 - £20m Government investment
 - £1.13m leverage from universities
 - £0.3m from EPSRC
- Two 1.0 GHz systems have been supported
 - One Solid State/materials focus (here), one solution state/medical focus (Birmingham)
- Six upgrades of existing systems
 - New consoles and probes
 - Solid and solution state capability
 - Increased capacity and capability for local, regional and national users

Outcome of the call (2)

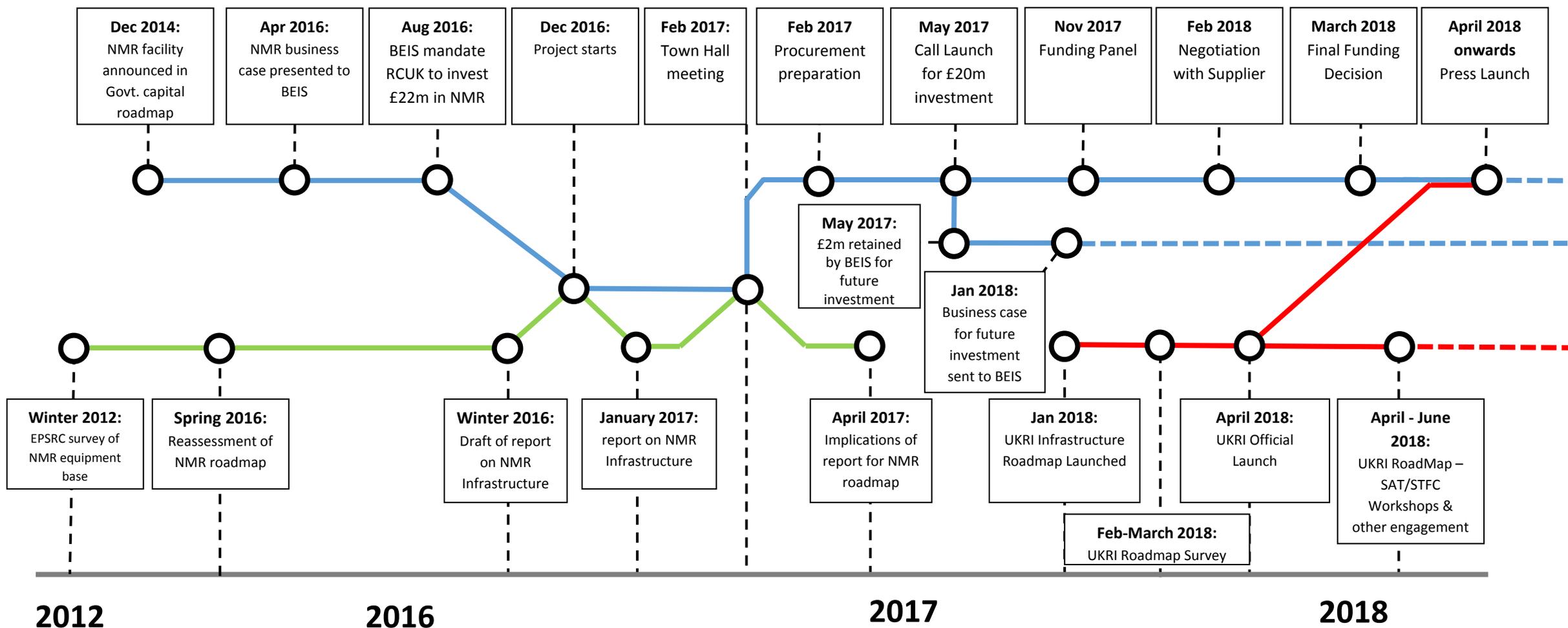
- Good geographical spread.
- Directly serving associated universities.
- Good access to the a wider community.
- Most UK researchers with an interest in NMR will see some benefit from the investment.



Outcome of the call (3)

Ultra-High Field Proposals						
			State			
Lead Institution	Partners	Field Strength	Solid	Liquid	Physical Sciences	Life Sciences
Warwick		1.0 GHz				
Birmingham	Leicester	1.0 GHz				
Very-High Field proposals						
			State			
Lead Institution	Partners	Field Strength	Solid	Liquid	Physical Sciences	Life Sciences
Oxford	Bristol, Cambridge, Imperial, Kings	950 MHz				
Leicester		800 MHz				
Nottingham		800 MHz				
Edinburgh	Glasgow, St Andrews, Aberdeen, Strathclyde	800 MHz				
Liverpool	N8, Knowledge Centre for Materials Chemistry	800 MHz				
Sheffield	N8, Knowledge Centre for Materials Chemistry	800 MHz				

NMR Investment Timeline 2012 - 2016



Key Messages

- Large-scale investment in NMR infrastructure has been made possible by creating a strong business case backed up with evidence...
 - Roadmap – quantification and identification of gaps
 - Demonstration of scientific demand
 - Strategic importance on an international and national scale
 - Clear need and a target infrastructure identified
- Different academic communities working together to demonstrate strategic importance.
- Long timescales (2012 – 2021)
- Thank you

NMR and the UKRI infrastructure Roadmap

UKRI Infrastructure Roadmap Objectives

The principal objective for the programme is to create a long-term (to approximately 2030) research and innovation infrastructure roadmap based on a picture of existing UK infrastructure and future requirements.

Additional sub-objectives are to:

- Identify new research and innovation capability needs, existing gaps and areas of duplication or reduced priority
- Identify opportunities for increasing inter-connectivity between infrastructures
- Use the roadmap to promote the UK as a global leader in research and innovation

Sector approach

Following the approach taken by ESFRI the roadmap will be structured in the following sectors:

- Biological sciences, health and food
- Environment
- Energy (led by EPSRC)
- **Physical sciences & engineering** (led by STFC)
- Social sciences, arts and humanities
- Computational & e-infrastructures (led by EPSRC)

(It is recognised that there will also be cross cutting themes and that many infrastructures will contribute to more than one sector.)

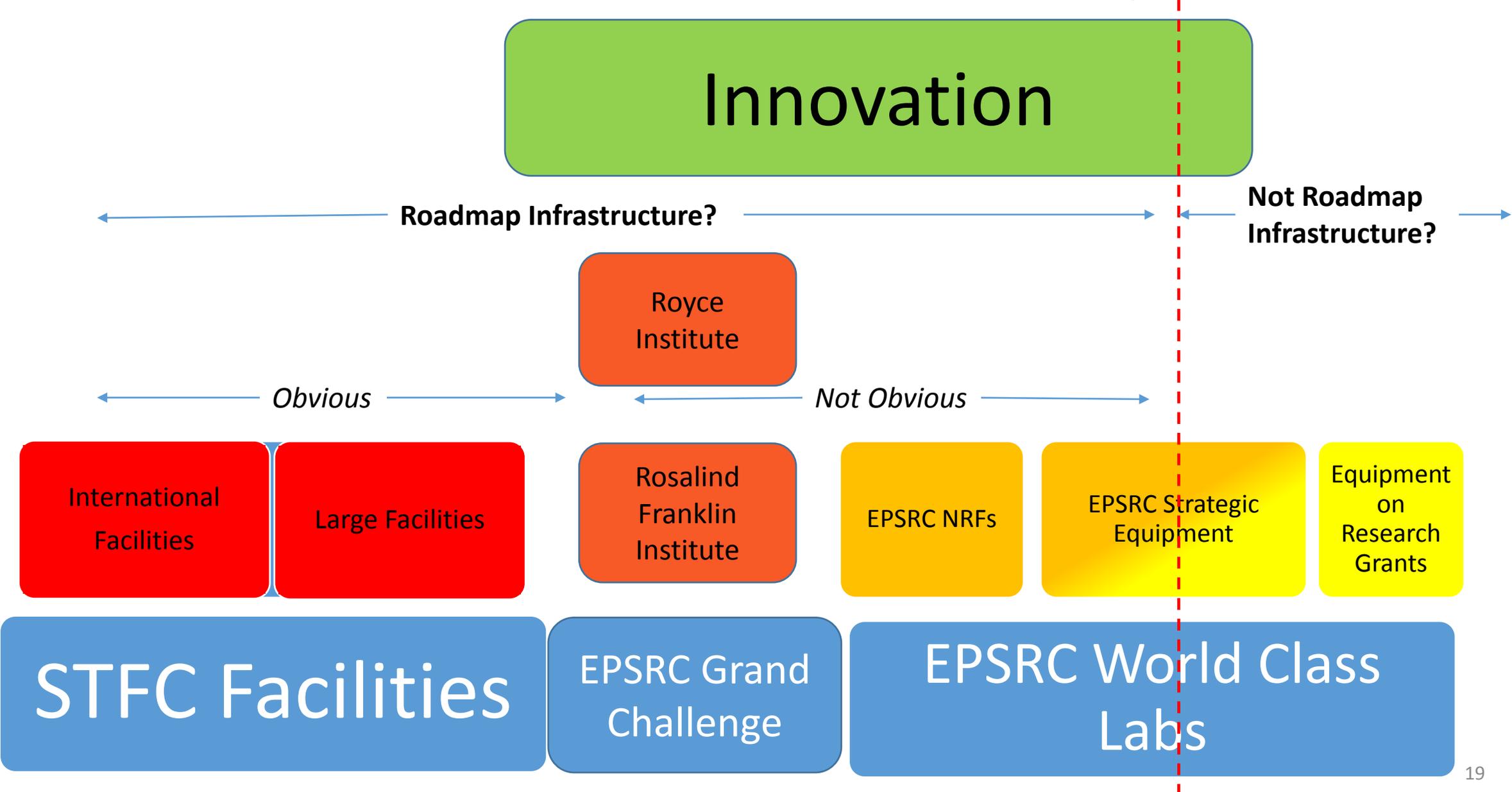
The broad phases of work are:

- ***Landscape analysis***: Creating a snapshot (the map of now) of the existing landscape (UK and international involvement), collecting data to inform what is on the final map and supporting analysis of existing capability.
- ***Identification of future needs & opportunities***: Initial identification of strategic and emerging areas of opportunity, gaps to fill, future needs and opportunities for new collaborations.
- ***Synthesis of emerging findings***: Key conclusions from landscape analysis and future needs and opportunities analysis used to prepare initial draft themes or options to test with key R&I community groups and stakeholders (summer and through autumn 2018).
- ***Preparation of interim report for consultation***: Publish interim findings in autumn 2018 and use this to support further targeted consultation with research and innovation community from late autumn 2018 to spring 2019.
- ***Final publication***: Refine the analysis based on feedback received, for publication in April 2019. The report will present options within each theme, but will not attempt to prioritise.

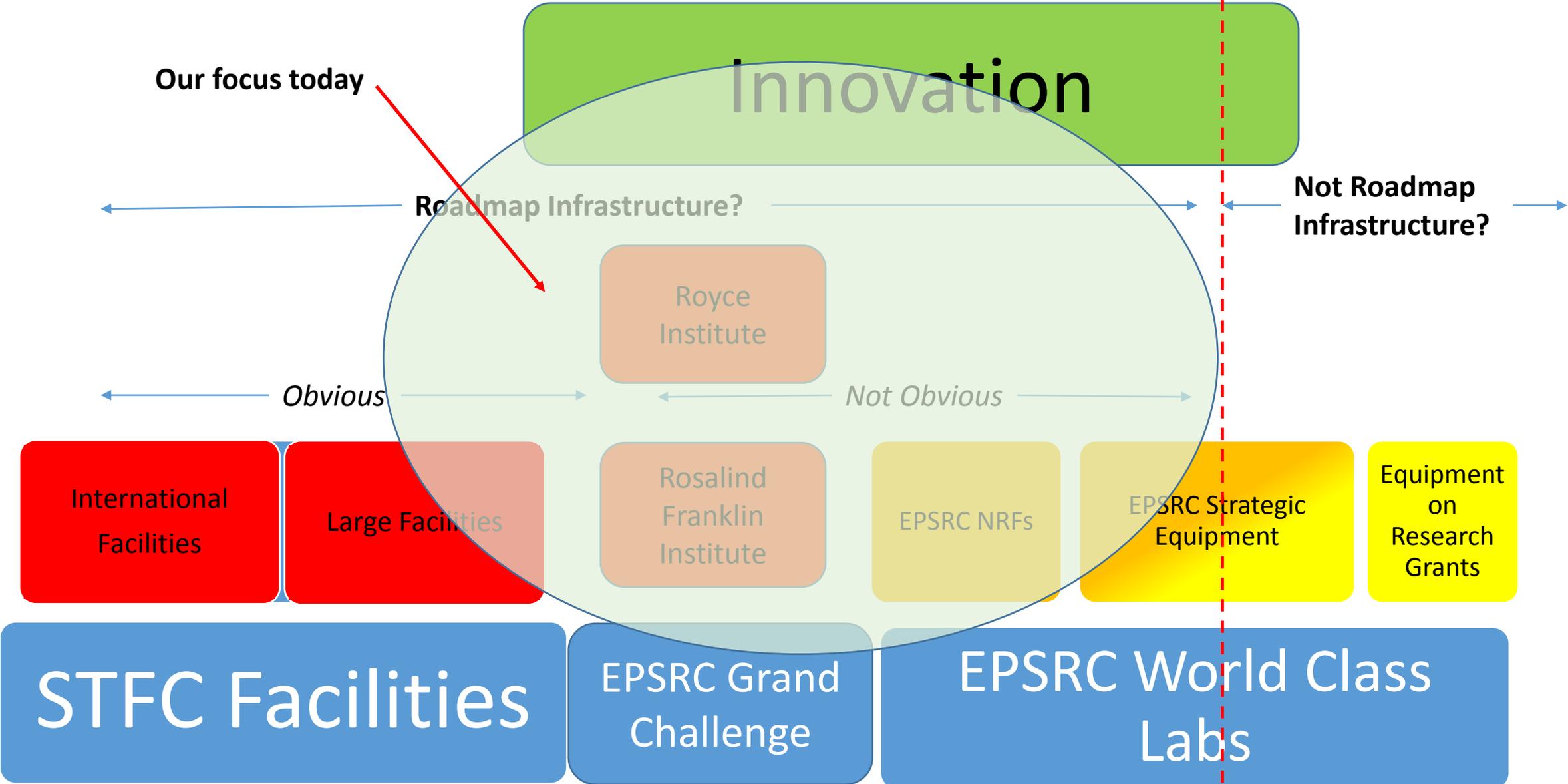
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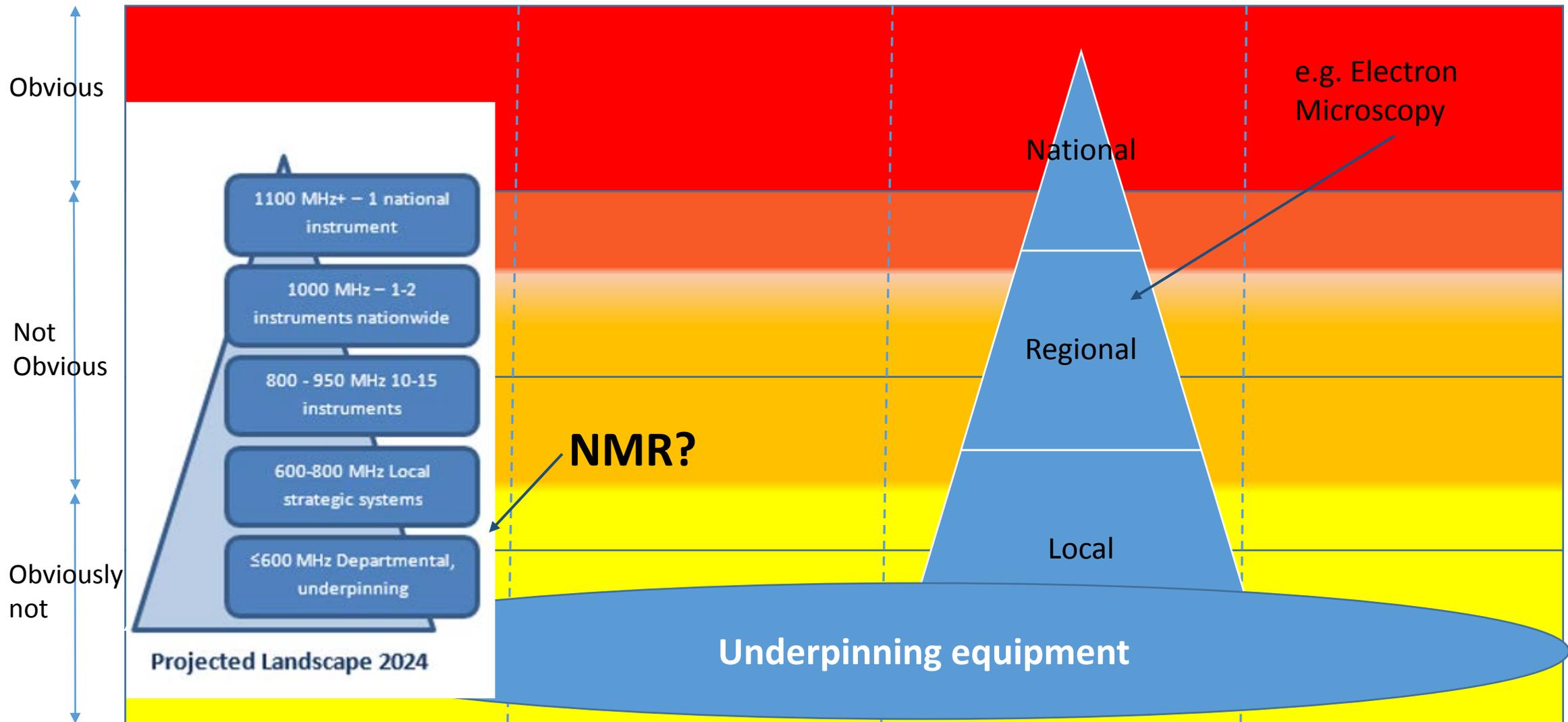
EPSRC Infrastructure within the Roadmap



EPSRC Infrastructure within the Roadmap



NMR in the context of the UKRI Infrastructure Roadmap?



Some definitions



Definitions:

- **“Map of now”** – this is the current landscape of existing infrastructures.
- **“Future of now”** – this is the future for existing infrastructure in terms of upgrades, replacements etc...
- **“Future possible”** – this is infrastructure that does not currently exist but would provide a step change in capability if it did.

Questions for the discussion today:

1. What opportunities are there in the future to enhance the productivity, efficiency and effectiveness of research infrastructures?
2. Potential areas for new, or greater, collaboration and connectivity across infrastructures.

Discussion session
