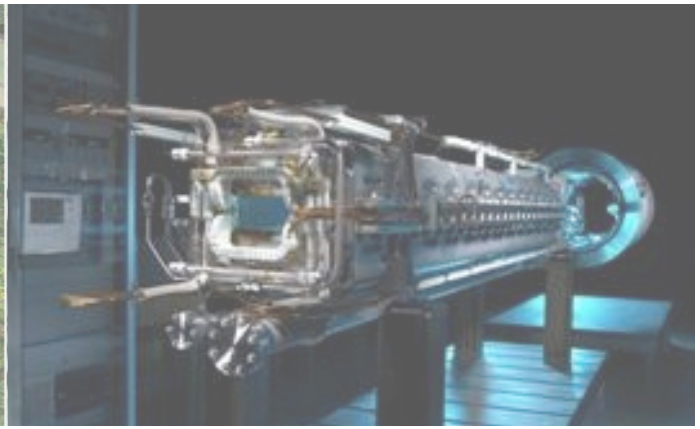
Status and News from FAIR

Inti Lehmann
Facility for Antiproton and Ion Research
Darmstadt, Germany
NUSTAR Collaboration, Warsaw – 28 Sept 2015





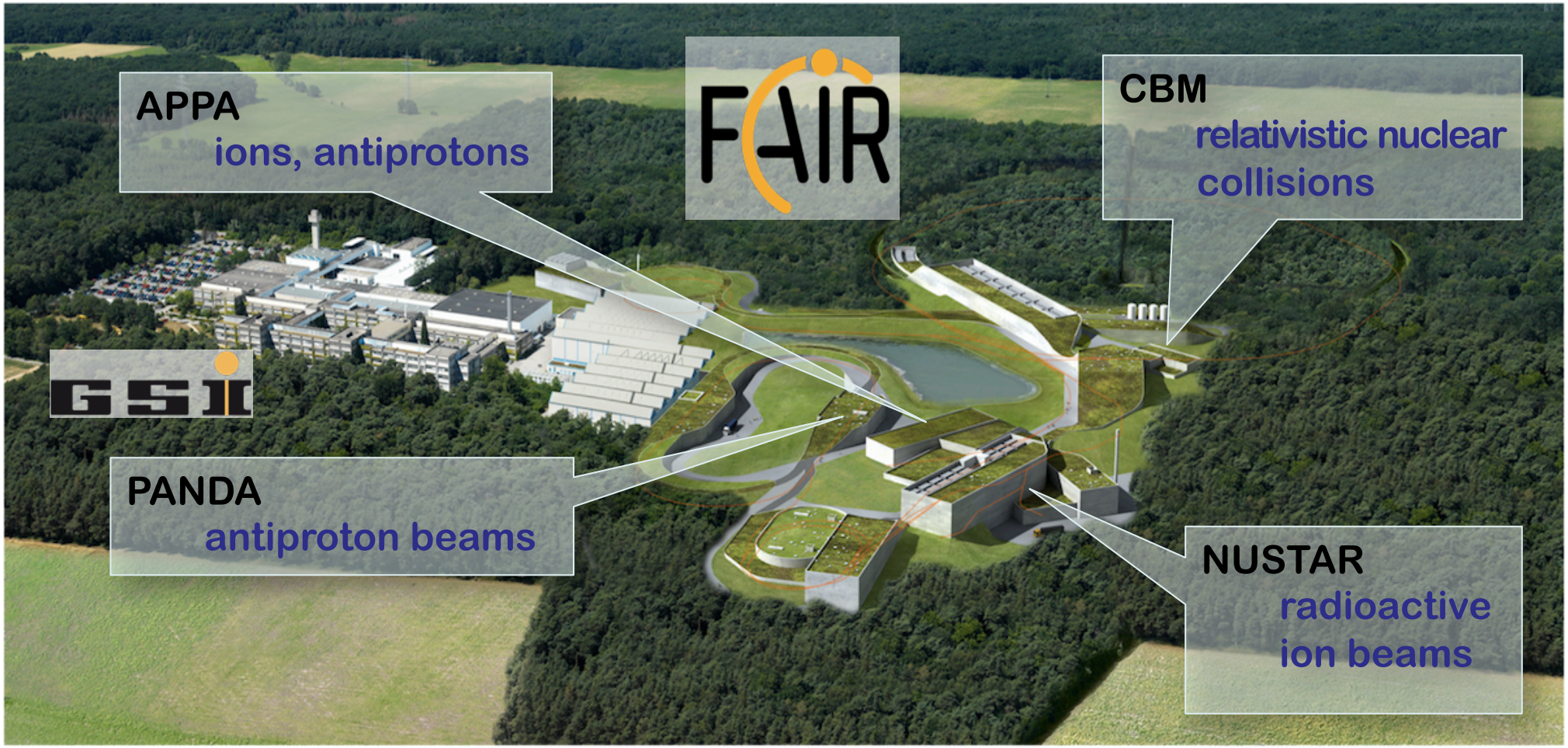
Overview

1. Status of the Project (as a whole)

2. Status of the Experiments

1. Status of the Project

The FAIR Project



The FAIR Project

Nuclear Structure & Astrophysics
(Rare-isotope beams)

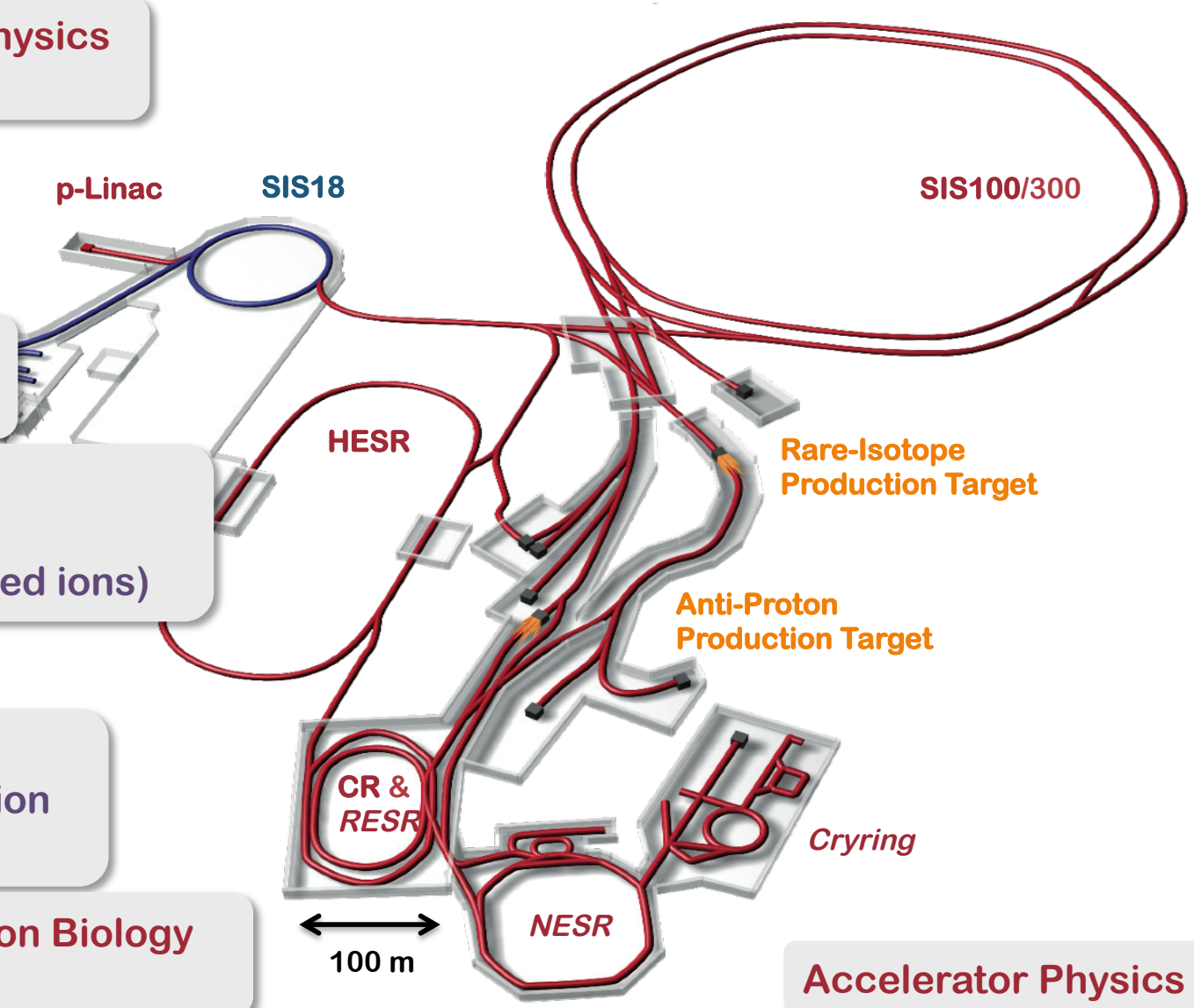
Hadron Physics
(Stored and cooled
14 GeV/c anti-protons)

QCD-Phase Diagram
(HI beams 2 to 45 GeV/u)

Fundamental Symmetries
& Ultra-High EM Fields
(Antiprotons & highly stripped ions)

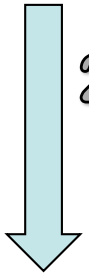
Dense Bulk Plasmas
(Ion-beam bunch compression
& petawatt-laser)

Materials Science & Radiation Biology
(Ion & antiproton beams)



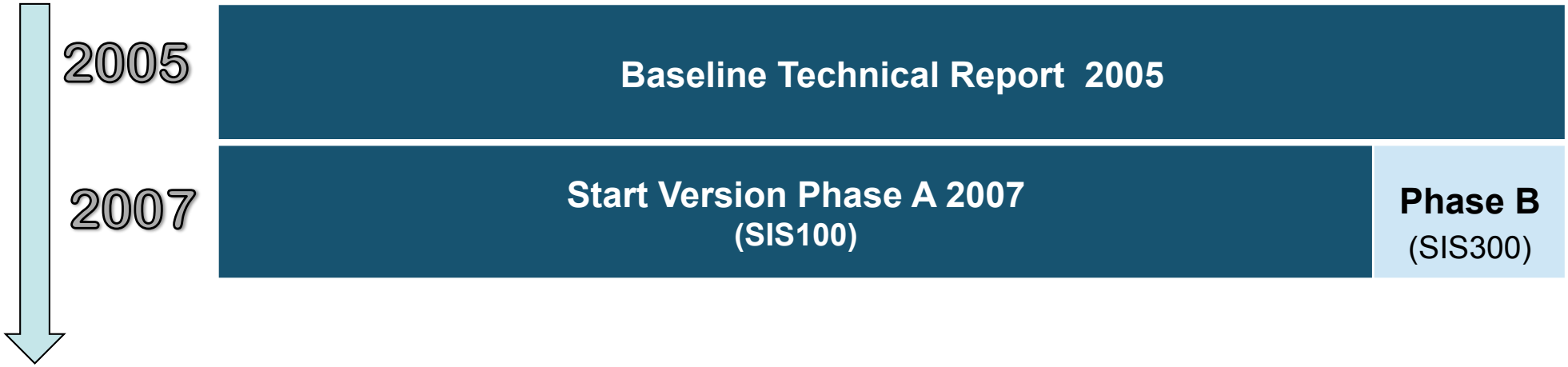
Accelerator Physics

Staging of the Project

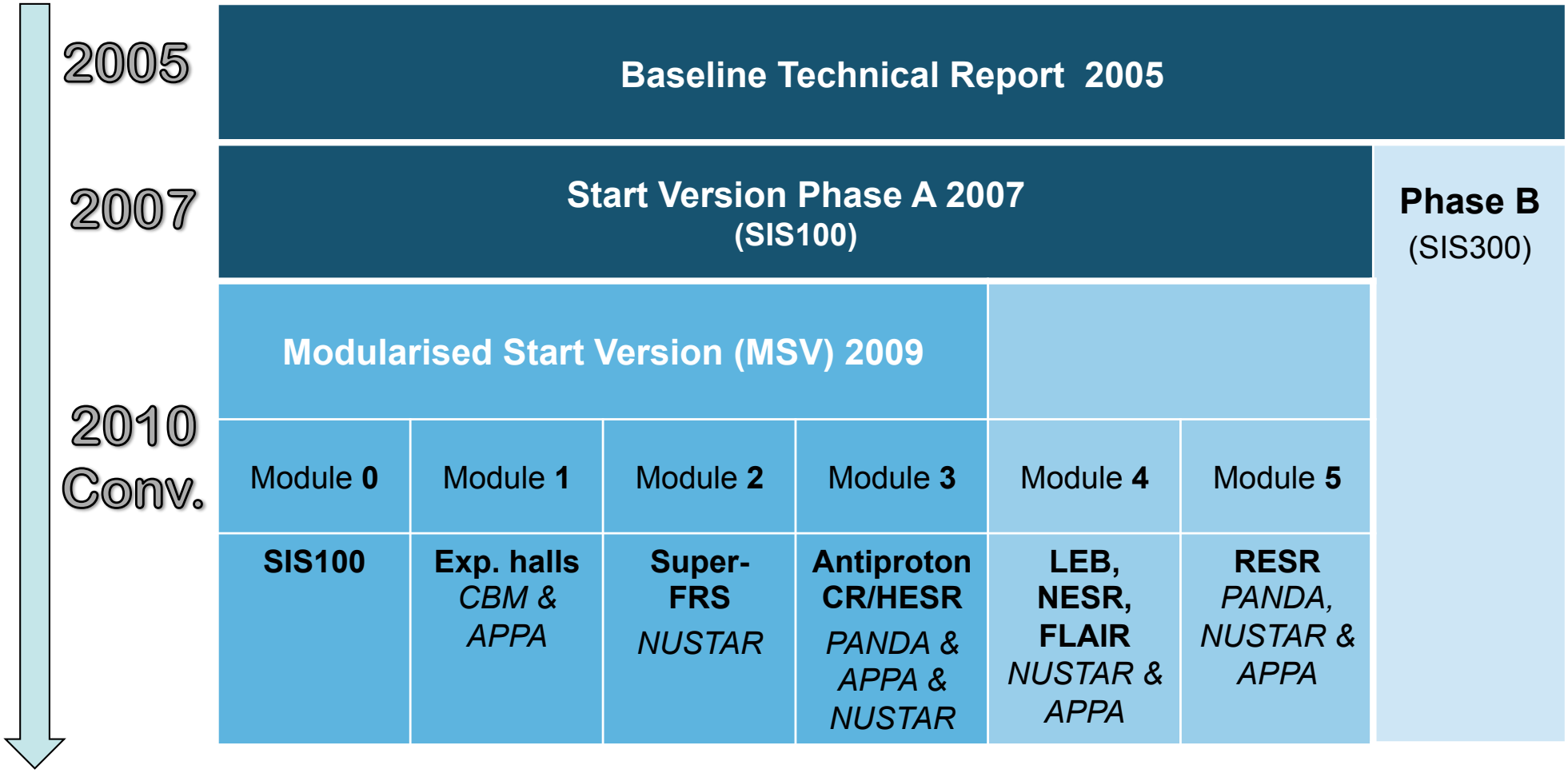


Baseline Technical Report 2005

Staging of the Project



Staging of the Project



"The construction of the FAIR facility shall start… …in accordance with the document 'The Modularized Start Version…"

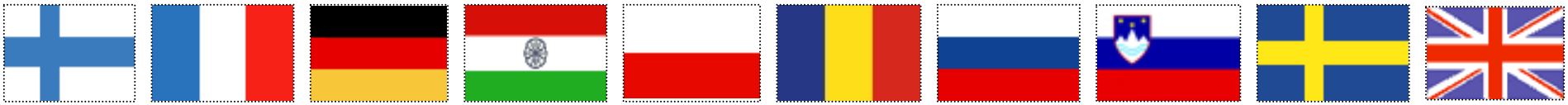
"Based on recent cost estimates and the firm funding commitments of the FAIR Member States the Modularized Start Version (see Fig. 1) comprises of Modules 0 – 1 – 2 – 3."

FAIR GmbH

- Steering company
- International Convention
  - In force since March 2014


Wiesbaden, 2010

- Partners

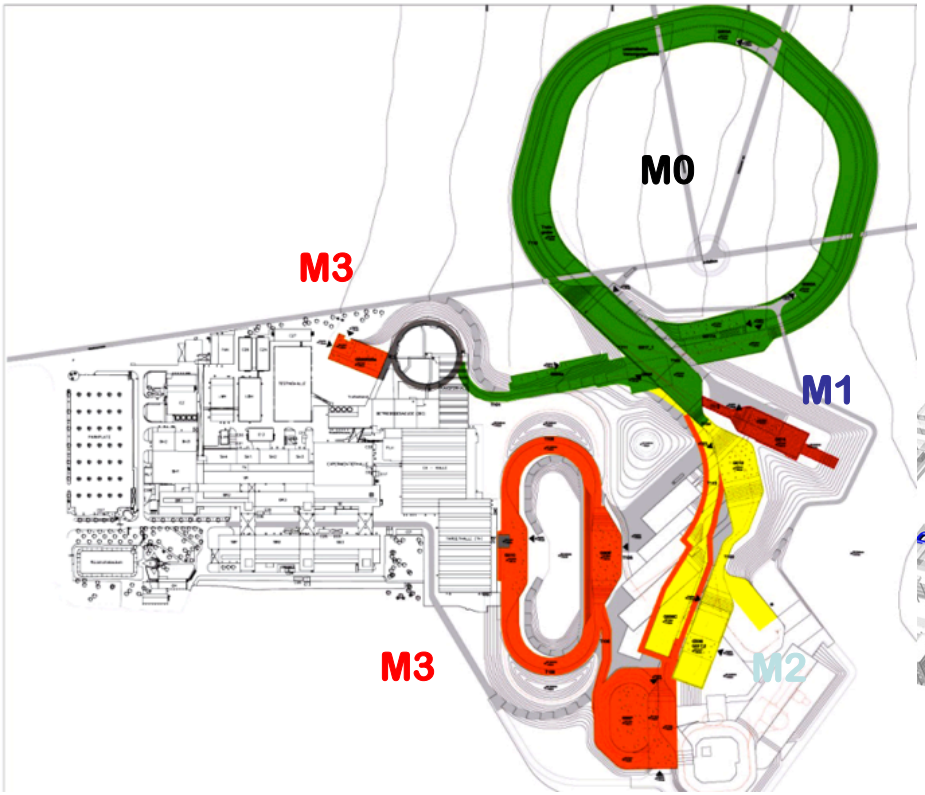

Finland France Germany India Poland Romania Russia Slovenia Sweden UK

Baseline 2010

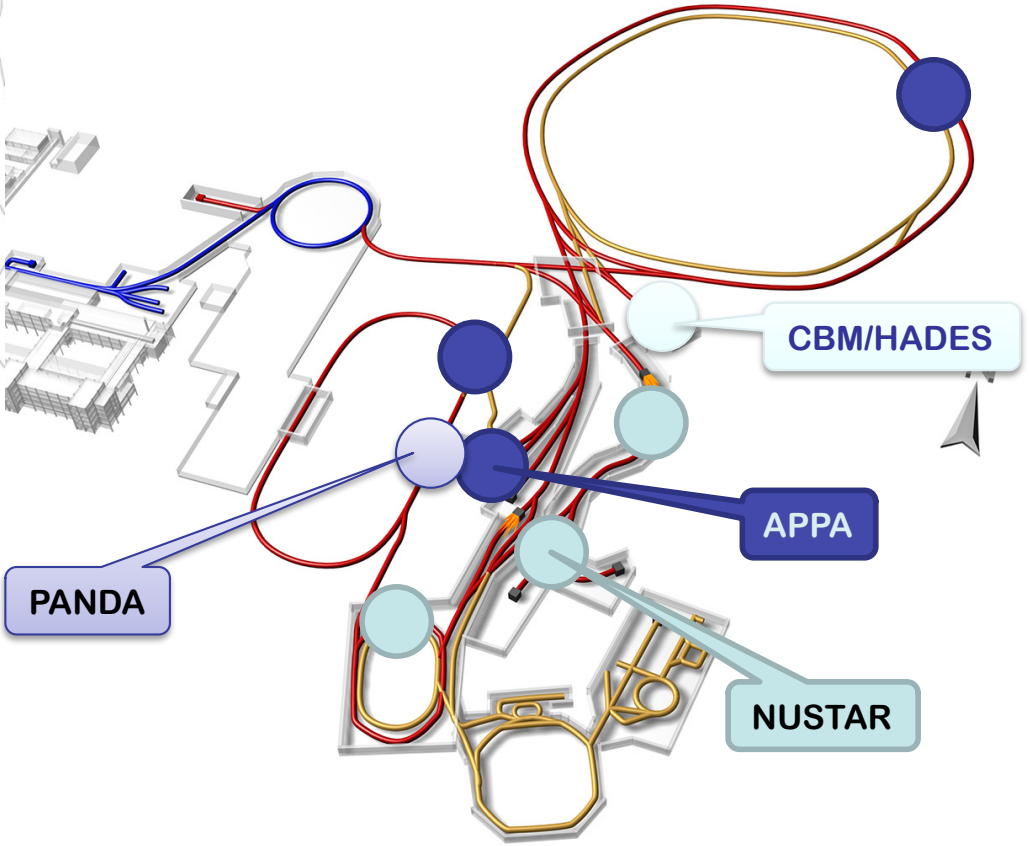
- Charge for the White Book: „The Modularized Startversion“ (MSV)
  - Financial ceiling of 1027 M€
  - State of planning as of October 2009
  - None of the four scientific pillars to be omitted completely
  - The full version must be still possible
  - Scientific programme must be competitive and world class
- After several evaluations by external reviewers and the FAIR Scientific Council (SC)
  - MSV: Significant reduction of the initial performance of all experiments (can be recovered later)
  - Modules 0 – 3 confirmed
  - Report to the FAIR Council by SC (20 January 2013)

The MSV should enable the realisation of an outstanding and forefront research programme to all 4 scientific pillars of FAIR

Modularised Start Version (MSV)



Cost about 1 billion 2005 Euros



Modules

M0: SIS100

M1: APPA

M1: CBM/HADES

M2: NUSTAR

M3: PANDA

Funding Modules 0-3

Partners	Contribution (in 2005 M€)
Finland	5.0
France	27.0
Germany*	800.0
India	36.0
Poland	23.7
Romania	11.9
Russia	178.1
Slovenia	12.0
Sweden	10.0
UK**	5.0
Total*	**1,108.7**

- International endeavour
- All numbers in 2005 €
- Most contributions in-kind

* incl. site-related costs

** UK is Associate Partner

Boundary Conditions for the Future Strategy

Council Decision from the 13th Council session on 7 November 2014
Decision XIII.7.1:
The Council takes note of the Report by the FAIR Management on a delay of the schedule and an increase of costs of civil construction and possible de-scoping measures.

The Council acknowledges and confirms its responsibility to finish the project according to the Modularized Start Version as described in the Convention.

1. MSV is the minimal configuration that allows all scientific pillars to operate

2. the shareholders did not commit to cover additional civil construction cost of 320 M€ so far.

Both conditions can only be changed by explicit FAIR Council or shareholder decision

Costs of the MSV

Total costs (M€)	2005 prices	Escalated prices*
Experiments	78,0	83,6
Accelerators	385,0	412,5
Acc. coordination personnel	110,9	113,1
Personnel FAIR GmbH	38,0	43,1
Running costs	15,4	19,8
Civil Construction original estimate	495,0	676,3
Subtotal	1.122,3	1.348,4
less site costs	1.027,3	1.220,9
Civil Construction cost increase	227,9	**320,1**
LEB building	6,5	9,6
Total incl. site costs	1.356,8	1.678,1

Civil construction cost overrun of 320 million € not covered.

Task assigned by the FAIR Council

(March 2015)

Decision XV.0.1

The Council recalls the cost estimate as laid out in the Convention based on 2005 prices.

Taking into account the indication of the Review Committee that the completion of the FAIR project will take longer than expected, the **Council asks the Management** to execute an up-to-date and critical analysis of the cost, the schedule, and the scope and **to prepare different scenarios based on (1) a set cost cap** or (2) the completion of the full scientific scope of the Modularised Start Version.

Scenarios based on set cost cap

- Criteria for the selection of scenarios to be examined:
  - technical feasibility
  - reasonable re-planning efforts
  - significant saving potential

- Criteria for strategy proposal in case of cost cap:
  - preservation of scientific uniqueness of the facility for a broad, cutting-edge research program
  - realization as fast as possible
  - significant saving potential

Scenarios (Part 1)

Scenario 1: Without CBM (Module 1)

- Scientific consequence: Omission of experiments HADES and CBM
- Re-planning effort: small
- Saving potential: ca. 50 M€

Scenario 2: Without Module 2 (Super-FRS, R3B, ILIMA, HISPEC/DESPEC, MATS, LASPEC, EXL)

- Scientific consequence: Omission of the full NUSTAR program
- Re-planning effort: Replanning required
- Saving potential: ca. 312 M€

Scenario 3: Without Module 3 (p-linac, pbar-Target, CR, HESR, PANDA, ILIMA, SPARC)

- Scientific consequence: Omission of PANDA, massive impairment of SPARC/APPA, NUSTAR (ILIMA and EXL) through omission of the CR und HESR rings
- Re-planning effort: significant
- Saving potential: ca. 324 M€

Scenarios (Part 2)

Scenario 4: Like Scenario 3 but keeping the CR

- Scientific consequence:
  Omission of PANDA, massive impairment of SPARC/APPA through omission of HESR, impairments for NUSTAR (part of EXL)
- Re-planning effort: moderate
- Saving potential: ca. 220 M€

Scenario 5: Like Scenario 3 but keeping both CR and HESR (--> 11 @ 22)

- Scientific consequence:
  Preservation of scientific instrumentation for APPA (SPARC) and NUSTAR (ILIMA, EXL),
  Staging of physics programs with antiprotons including PANDA is possible since the HESR is included in this scenario
- Re-planning effort: moderate
- Saving potential: ca. 103 Mio. €.

Scientific Council Recommendations - I

The Scientific Councils of FAIR and GSI met jointly on 29-30 June 2015 and conveyed the following 9 observations and recommendations as outcome

1. The Scientific Councils (SCs) reconfirm their earlier assessment that all four FAIR pillars - despite the delay of the project - carry compelling scientific cases with unique discovery potential.
2. Therefore, the SCs consider the FAIR MSV to offer the best science to cost ratio for the FAIR project.
3. The SCs carefully took into account the recommendations by the International Review Committee chaired by Rolf Heuer.
   The SCs consider the ordering of the experiments as the result of a resource- loaded rather than a purely scientific evaluation.

Scientific Council Recommendations - II

The Scientific Councils of FAIR and GSI met jointly on 29-30 June 2015 and conveyed the following 9 observations and recommendations as outcome

4. In case it is needed to consider scenarios with a - so far unknown - cost cap, the SCs consider the 11 @ 22 scenario as a viable option, provided that a strategy is developed to realize an antiproton program by 2025.

5. The 11 @ 22 proposal requires an immediate start of the project. Nevertheless, on a six months time-scale, corresponding resource loaded plans should be presented for the 11 @ 22 scenario with a staged antiproton program.

6. The SCs urge the management to investigate all potentials for cost savings. These discussions should involve representatives from civil construction, accelerators and experiments.

Scientific Council Recommendations - III

The Scientific Councils of FAIR and GSI met jointly on 29-30 June 2015 and conveyed the following 9 observations and recommendations as outcome

7. The SCs congratulate the FAIR collaborations for the continuous progress achieved towards the realization of the experiments.

8. The SCs consider the planned intermediate research program of high importance and quality which also keeps the scientific communities alive.

9. The SCs welcome the steps taken by the Management towards setting up an adequate project organization.

Council Decision, 1st July 2015

The Council takes note of the scenarios and recognises that a funding gap of 350 M€ exists (in 2022 prices) for the realisation of the MSV.

The Council will do its utmost to find a solution to close the funding gap.

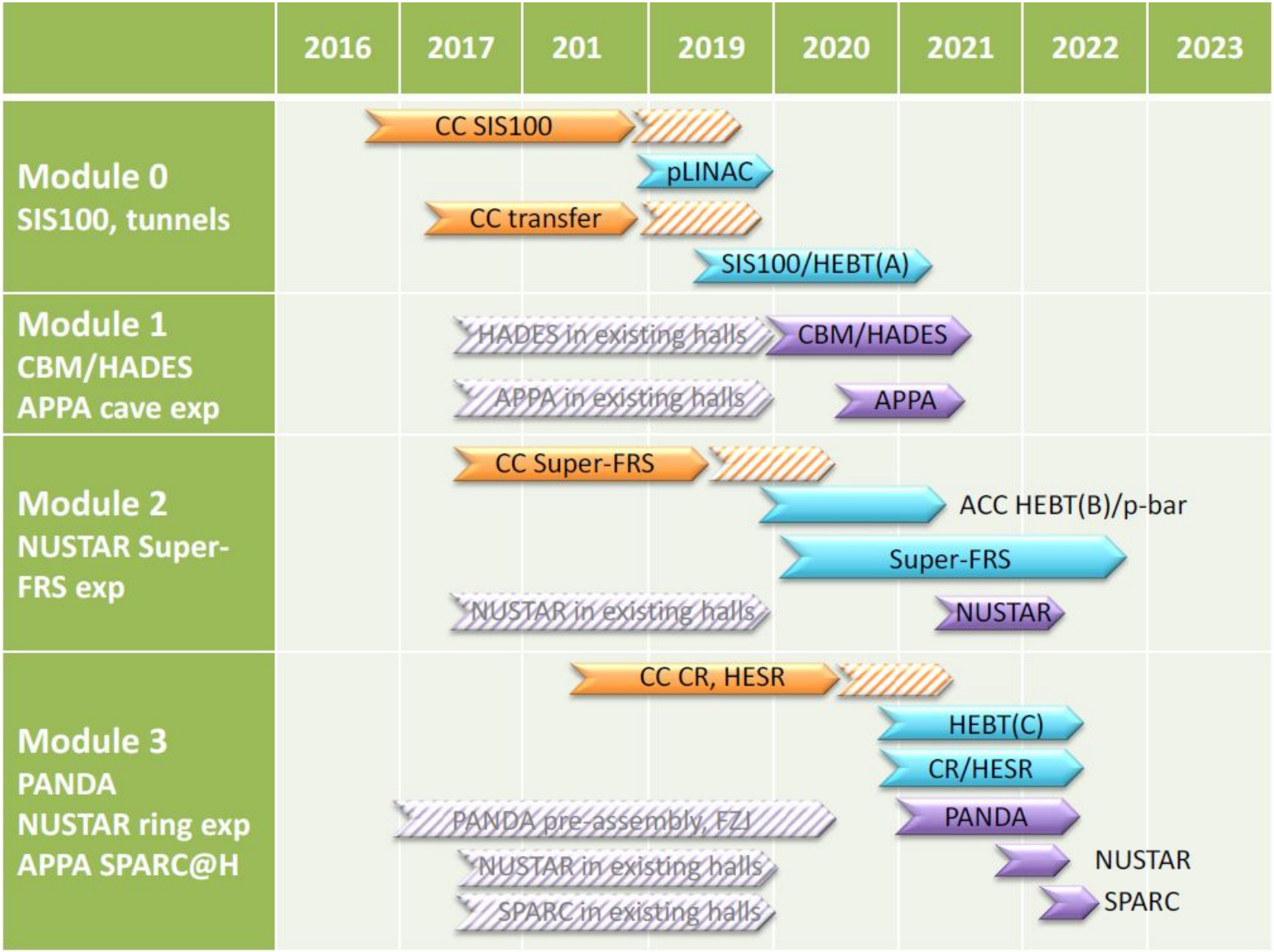
With the aim not to lose more time the Council asks the management to start immediately with the planning of the construction of the facility in a staged approach.

The Council will try to find measures to close the funding gap for the realisation of the MSV.

A decision on the funding baseline and the respective scope will be taken at the extraordinary meeting on the 29th September 2015.

(XVI.4.1)

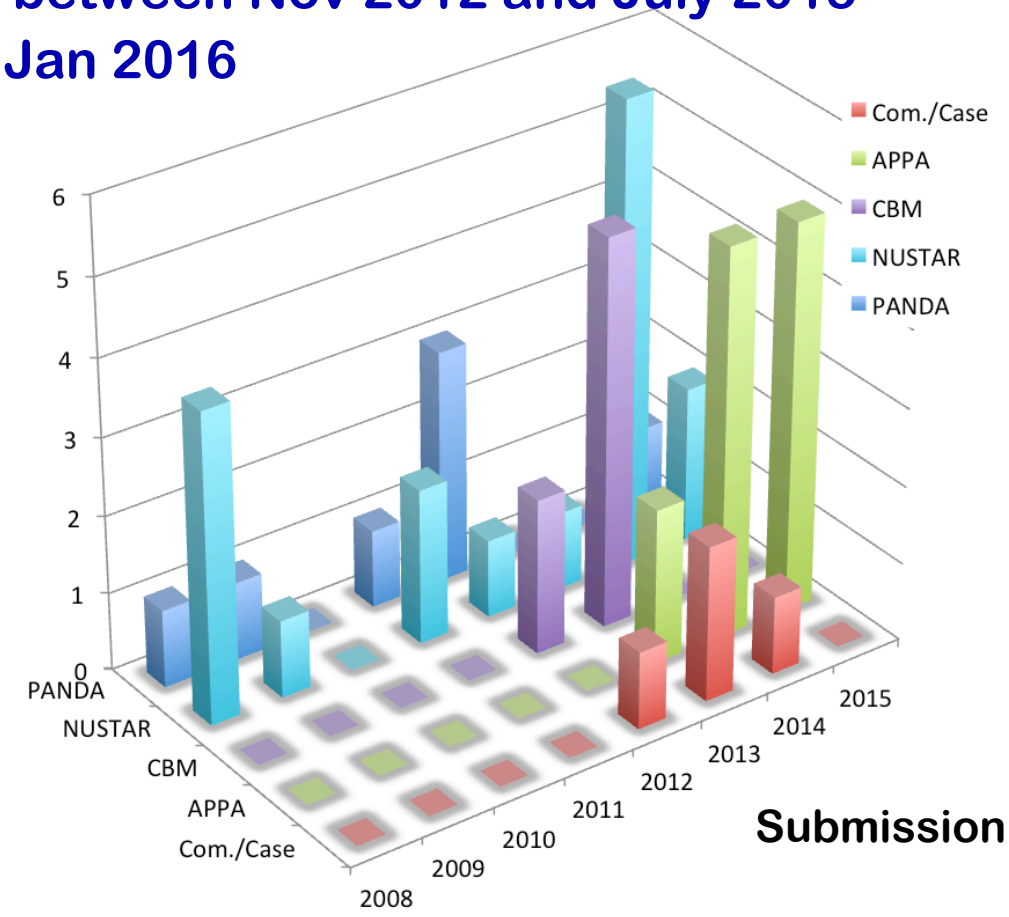
High Level Schedule of the MSV



2. Status of the Experiments

TDR Submission

- **Prerequisite for financing of experimental equipment:**
  - **Technical Design Report (TDR) approved by Expert Committee Experiments (ECE)**
  - **6 ECE mtgs. between Nov 2012 and July 2015**
  - **7th meeting, Jan 2016**



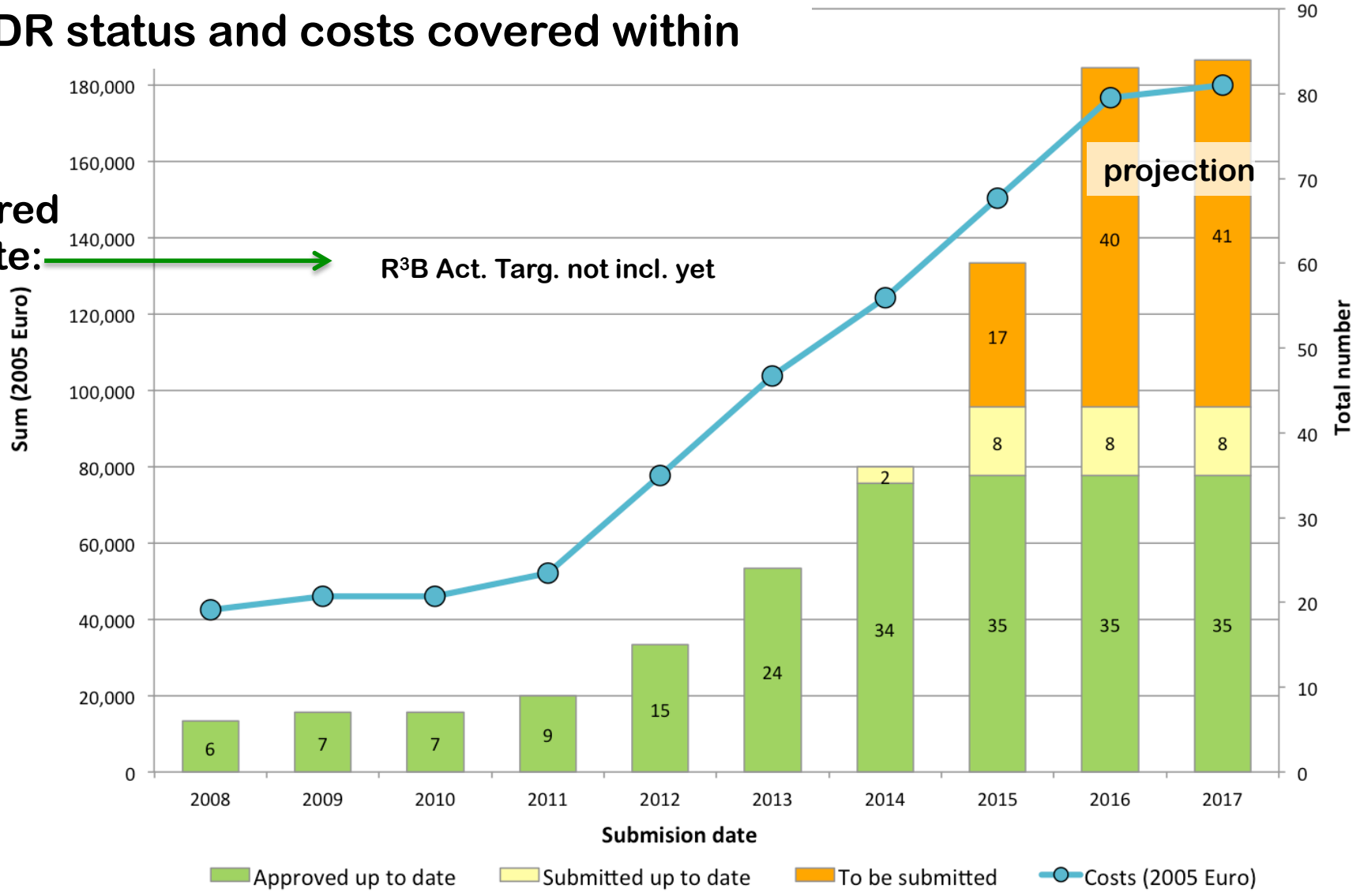
TDR Status

Collaboration	Approved	Submitted	Still outstanding	Announced for the next couple of months	Total expected
Common TDR/ Scientific Case	**3**	**0**	**2**	**1**	**5**
APPA	**7**	**6**	**8**	**0**	**21**
Atomic Phy	2	5	3	0	10
Biophy & Mat Sc	0	0	1	0	1
Plasma Physics	5	1	4	0	10
CBM	**7**	**0**	**4**	**1**	**11**
NUSTAR	**15**	**2**	**19**	**4**	**36**
LEB Super-FRS	0	0	2	1	2
HISPEC/DESPEC	8	1	5	2	14
MATS/LASPEC	1	0	0	0	1
R3B	6	1	6	1	13
ILIMA	0	0	3	0	3
Super-FRS	0	0	3	0	3
PANDA	**6**	**1**	**12**	**1**	**19**
Total	**38**	**9**	**45**	**7**	**92**

TDR Status and Costs

- TDR status and costs covered within

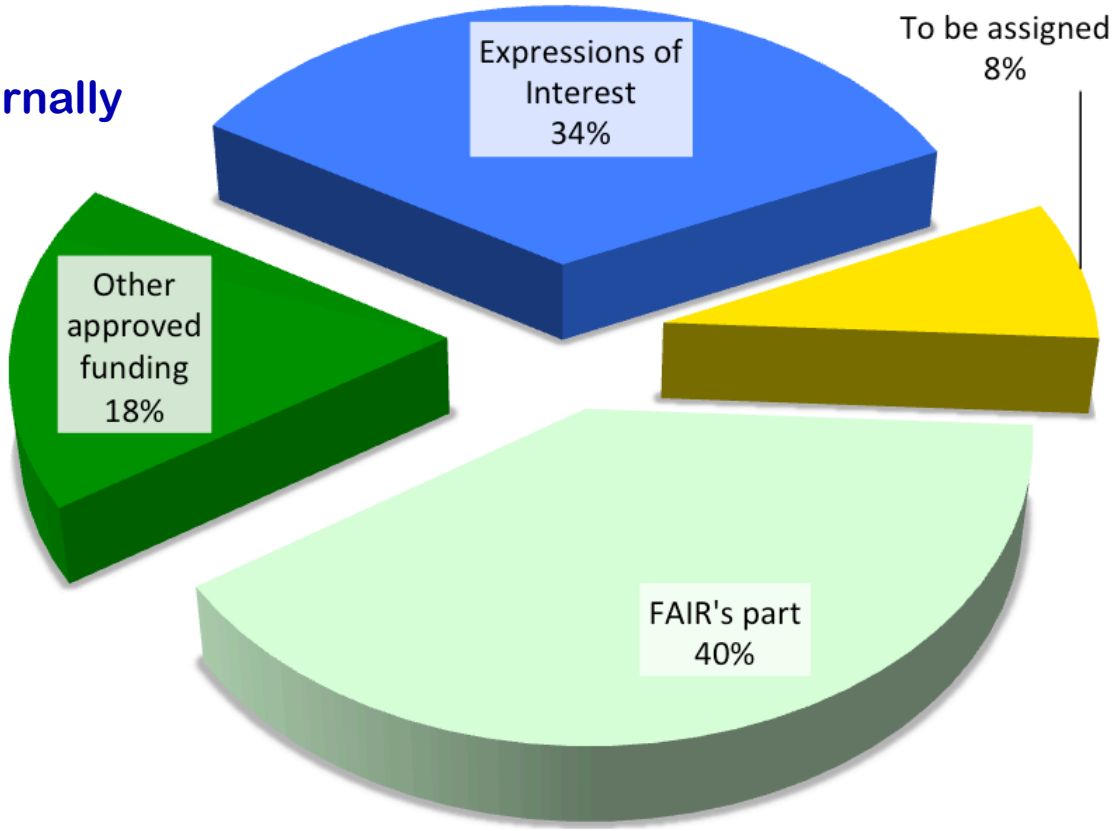
Covered to date: 73%



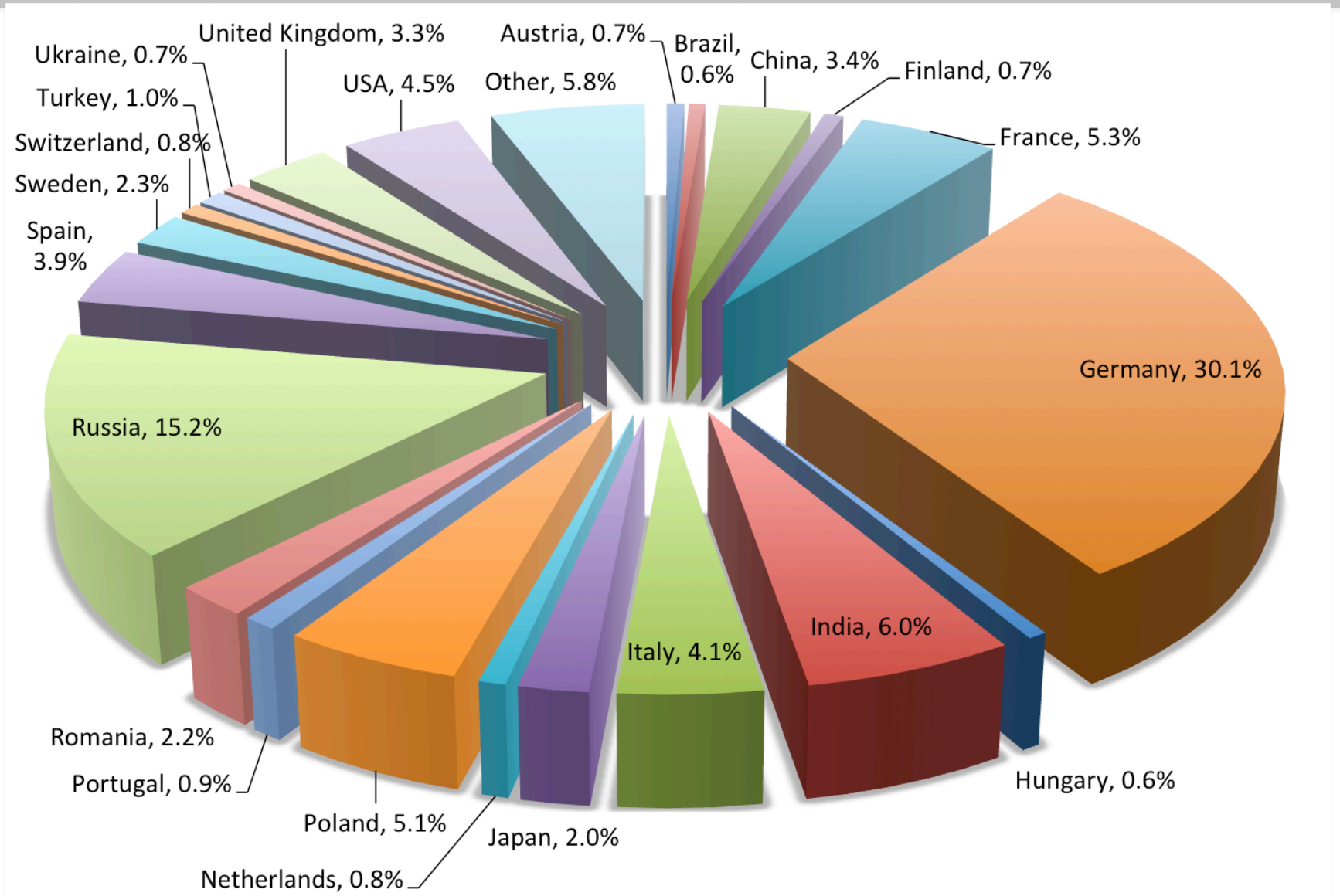
Not counted: items without cost assignment, i.e. Common TDRs, Science Cases, Super-FRS TDRs

Experiments' Costs (4th RRBs, 16th Council)

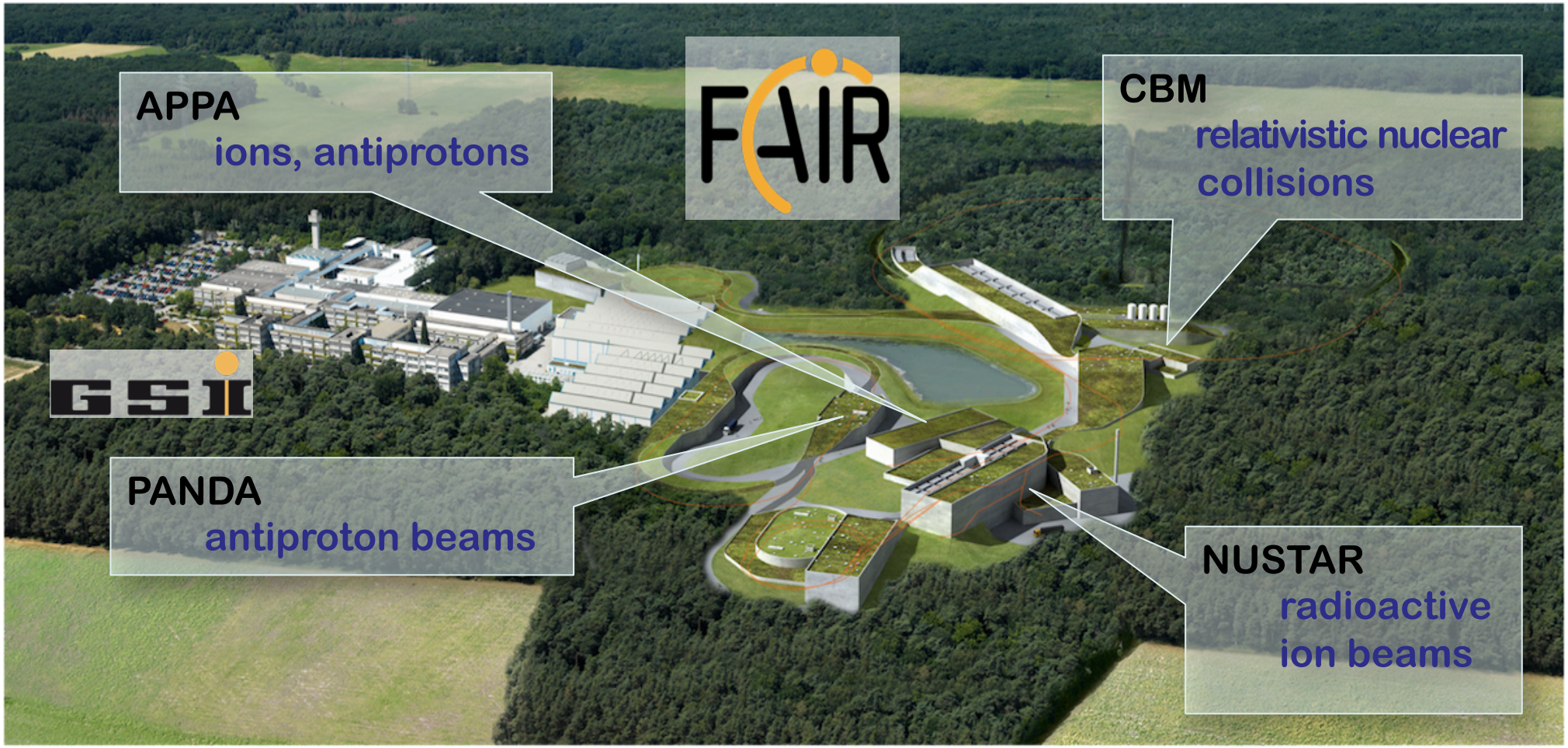
- Cost estimate Jan 2015, Collaborations' input to 4th meetings of the Resources Review Boards (RRBs)
  - 245 M€ (2015 prices) = 196 M€ (2005 prices)
- Funds foreseen (2005 prices)
  - 78 M€ in FAIR budget
  - Remainder to be sought externally
- Breakdown (2005 prices)
  - FAIR's part: 78 M€
  - Other approved funding: 35 M€
  - Expressions of Interest: 68 M€
  - To be assigned: 15 M€



Collaboration Members by Country



The Future


APPA
ions, antiprotons
FAIR
CBM
relativistic nuclear collisions
GSI
PANDA
antiproton beams
NUSTAR
radioactive ion beams

Thanks for your attention