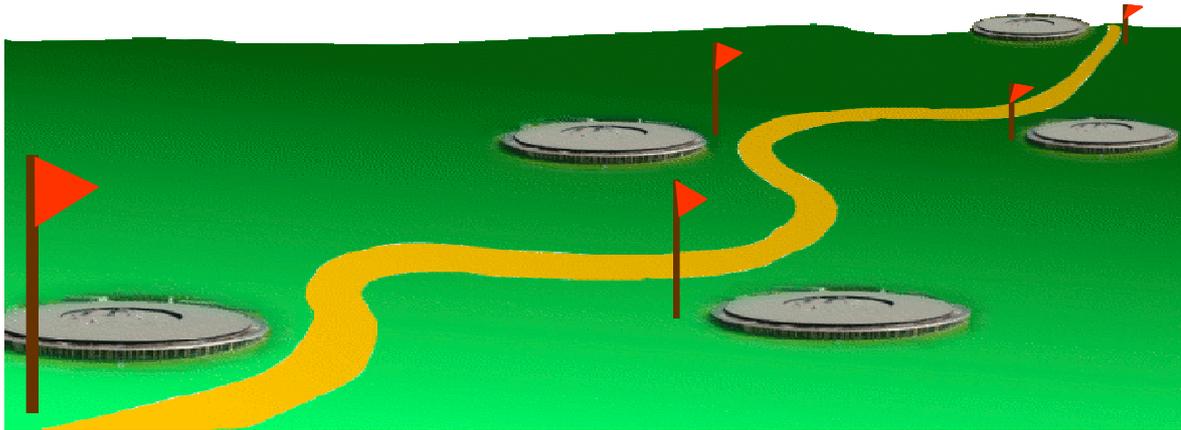


The Science at Synchrotrons Roadmap



Rationale – A synchrotron is a large multi- and inter-disciplinary facility known to deliver massively in certain areas.

1. Enhanced research opportunities in many disciplines.
2. Stimulating Competitive Industry : Industry potential, both research into industry relevant problems and materials processing in the micro and nano domain .
3. Dramatic contributions in Health Sector
 - a. New characterisation modalities for bio-systems ;
 - b. Understanding health on the molecular level ;
 - c. Drug design and optimisation .
4. Dramatic Impact in Materials Science and Nano-Materials .
Internationalisation, though collaboration, networks, linkages, global participation and competitiveness.
5. Build capacity, particularly amongst the younger scientists in synchrotron science and technology .

Scope

1. The project has an African scope in the context of NEPAD
2. An outer layer, embracing Industry, Government, the Public, the Education and Research Sectors will be part of the Business Plan.
3. The synchrotron is not a science in itself, but a tool. It massively enhances the research in several disciplines.
4. Funding opportunities would be also be found in the thematic areas, but also to have a special Synchrotron stream itself.
 - a. An opportunity is recognised within the European FP7 projects.
 - b. There is a special NRF Mobility grant for the access to Synchrotrons
 - c. Bilateral programs such as the Protea program with France.
5. The future is in the hands of the students. The program aims at training the students ... should therefore be a strong program in the training of students.

Roadmap

Current location - 2007

There are currently 26 researcher-visits per year (scientists and students) in accessing synchrotrons on South African research projects. Compare this with the figure of 300 researcher visits for Australia at the time of the decision to build a national facility. The awareness of the massively enhanced research potential of the synchrotron tool is in its early stages in South Africa. The Series of Four Meetings on Science at Synchrotrons in February 2007 had 85 SA researcher delegates, where about 50% were students. This event marks the first major milestone in the South African participation in Science at Synchrotrons.

Stage 1 – Improved, Access, Capacity and Growth [3 year program]

The focus at this stage is

- Develop the user base of researchers deploying the synchrotron as a tool in their research program, both in numbers and in the diversity of the theme areas (Biosciences, Materials Science and Chemistry, Heritage Sciences, Environmental Sciences, Geology, Industrial Competitiveness, Accelerator Physics).
- Develop the human capacity in synchrotron based research (students and scientists)
- Raise the awareness of the Synchrotron as an important tool for research and development amongst academics, students, captains of industry and science administrators.

This can be done in a cost effective manner considering the current scale of synchrotron usage. For a reasonably low level of demand, meritorious projects can be granted beam time at international facilities at no charge when the project includes collaborators from the country which hosts the facility. The costs of international facility access are therefore mobility related costs only. Internationally competitive research proposals to the Scientific Advisory Committees of synchrotrons (or specific beam lines) and effective use of these facilities is to some extent dependent on local excellence in preliminary or associated research on the same project, as well as effective sample preparation. The mobility and human capacity building funding must therefore be allied with development of local research capacity (in so-called “interface” laboratories) at South African institutions. Examples are rotating anode X-ray diffractometers for bio-science structure determination, industrial scanners for paleo-tomography, various conventional characterisation equipment for materials scientists and so on.

In this stage the funding is deployed as follows

1. **Mobility funding** for SA researchers to facilitate short term (about 1 week at a time) access to international facilities on a collaborative basis based on meritorious applications submitted through the Science Advisory Committee of a particular Synchrotron.
2. **Capacity Building** funding for an annual School on Synchrotron Science (duration is one week with parallel sessions according to research theme areas)

3. **Capacity Building** funding for an annual SA Synchrotron Users Meeting (duration is one week with parallel sessions according to research theme areas)
4. **Mobility funding** for SA researchers (students and scientists) to attend Conferences and Schools abroad
5. **Capacity Building** funding for medium term (6 months) student working visits to international synchrotron facilities under a program of identified co-supervision on formal collaborative programs.
6. **Equipment Program** funding for development of local excellence and research capacity to enable effective meritorious international applications to top synchrotrons and to promote local training and effective use of allocated beam time at synchrotrons.

The business plan for this section will allow for a ramping of the funding as the community grows. It is estimated that this stage will be in place for 10 years and that the community will grow at a rate of about 31% to attain about 300 scientist visits in this time.

Special access by SA scientists can be arranged with a particular synchrotron or set of synchrotron facilities. This allows the arrangement of additional relationships.

- Establishment of special bi-lateral funding instruments to facilitate access .
- Extended scientific relations targeted to specific programs, such as fields where there are extensive collaborations, joint organisation of Schools and workshops, provision of lecturers from outside SA, extended scientific visits. A local school coupled to an international school, (Hercules School, ICTP School) .
- Co-supervision of students.

**Stage 2 – SA stake in beam-lines at International Facilities [3 year program]
(Access, Capacity and Growth continue)**

The focus remains the same as in Stage 1. There is however increased demand by the science community. Owning a stake in a beam line can facilitate faster access times to the facility, as an SA structure could allocate a portion of the time available on that beam-line internally. With higher levels of access, there is also an imperative for SA to increase its own contribution to the provision of infrastructure. In addition, it opens up the further possibilities of developing capacity as instrument scientists, accelerator physicists and beam-line technologists. There is the possibility of bartering beam time on different facilities (this is very dependent on the demand for the beamline and the alternate capacity of the other party).

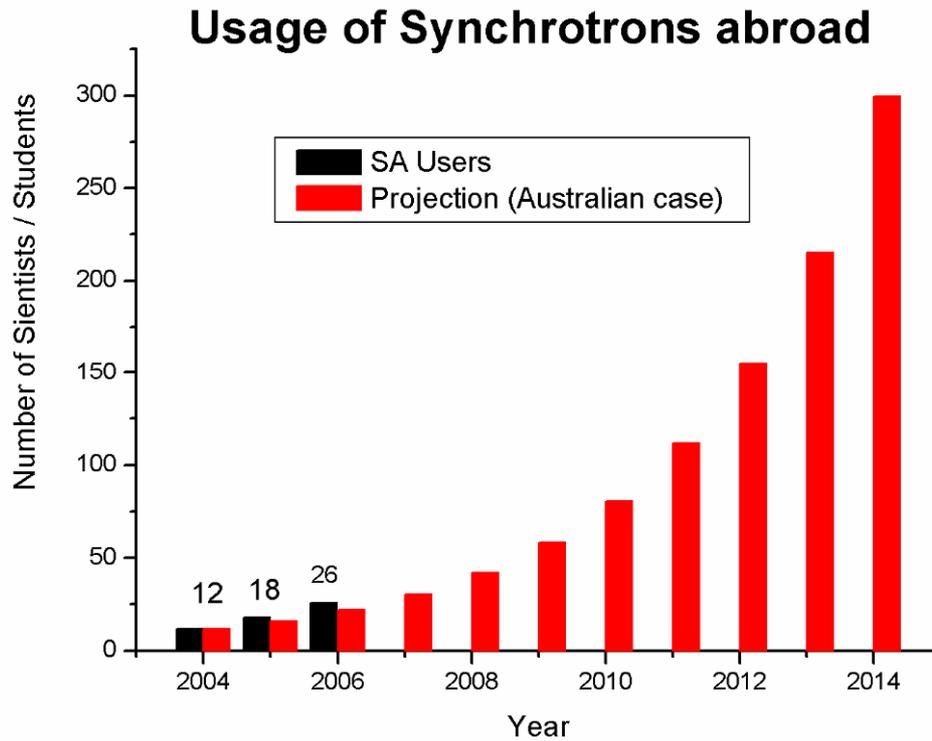
**Stage 3 – SA builds a beam-line at an International Facility [3 year program]
(Access, Capacity and Growth continue)**

The intentions of Stage 1 and Stage 2 continue, however, there is increasing demand by the research community and by industry for beam time. Further

stakes in existing beam-lines may be acquired. However, there is also an imperative to develop the capacity in beam-line design and construction, and to have a beam-line tailored to a specific South African research program

Stage 4 – Complete the feasibility study for an African Synchrotron

This stage is expected to be reached in about a decade from the beginning of the project.



Graph shows synchrotron usage by South Africans over the last few years, as compared with developments in Australia.