

South African Network

Nuclear Education, Science and Technology

Nuclear Human Resource Capacity Building in South Africa
AtomExpo 2018 – Sochi, Russian Federation

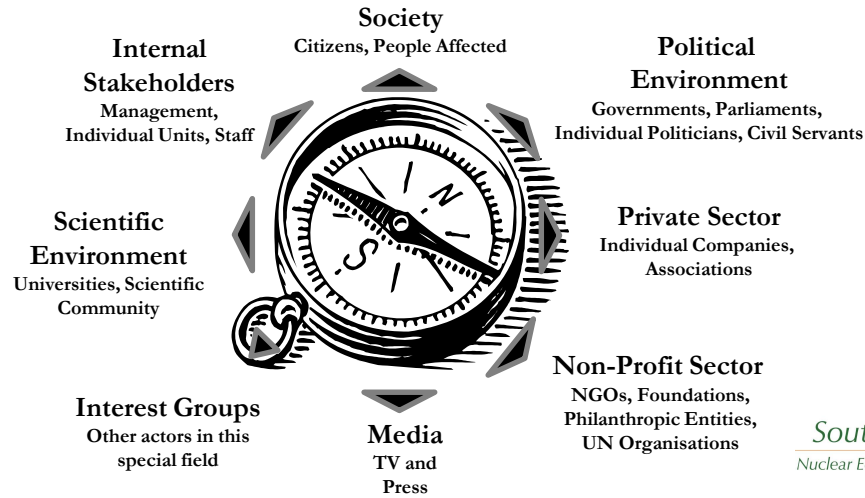
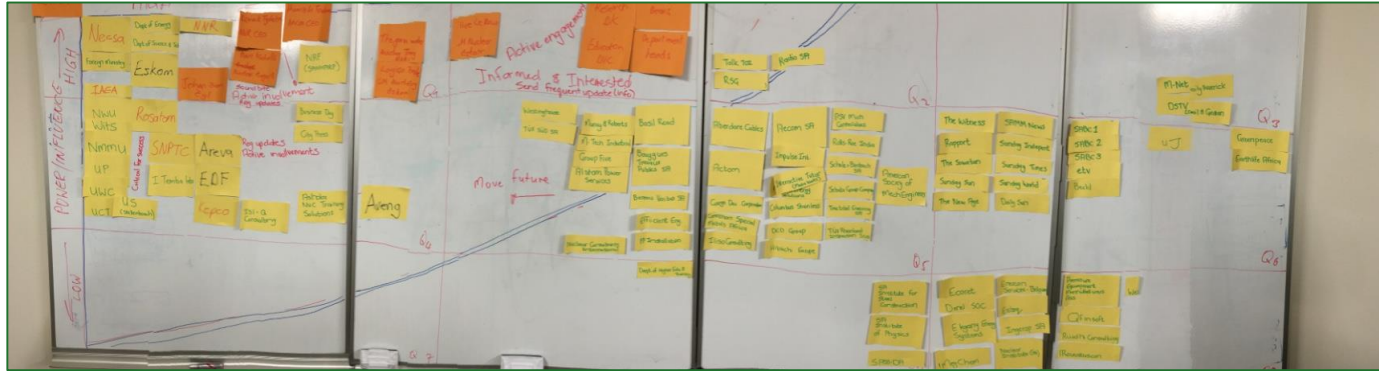
Dr Antonie Cilliers, Programme Manager: Advanced High Temperature Reactor R&D, University of the Witwatersrand

The Knowledge Value Chain



- *Stakeholder Analysis.*
- *Education Capability Assessment and Planning (ECAP).*

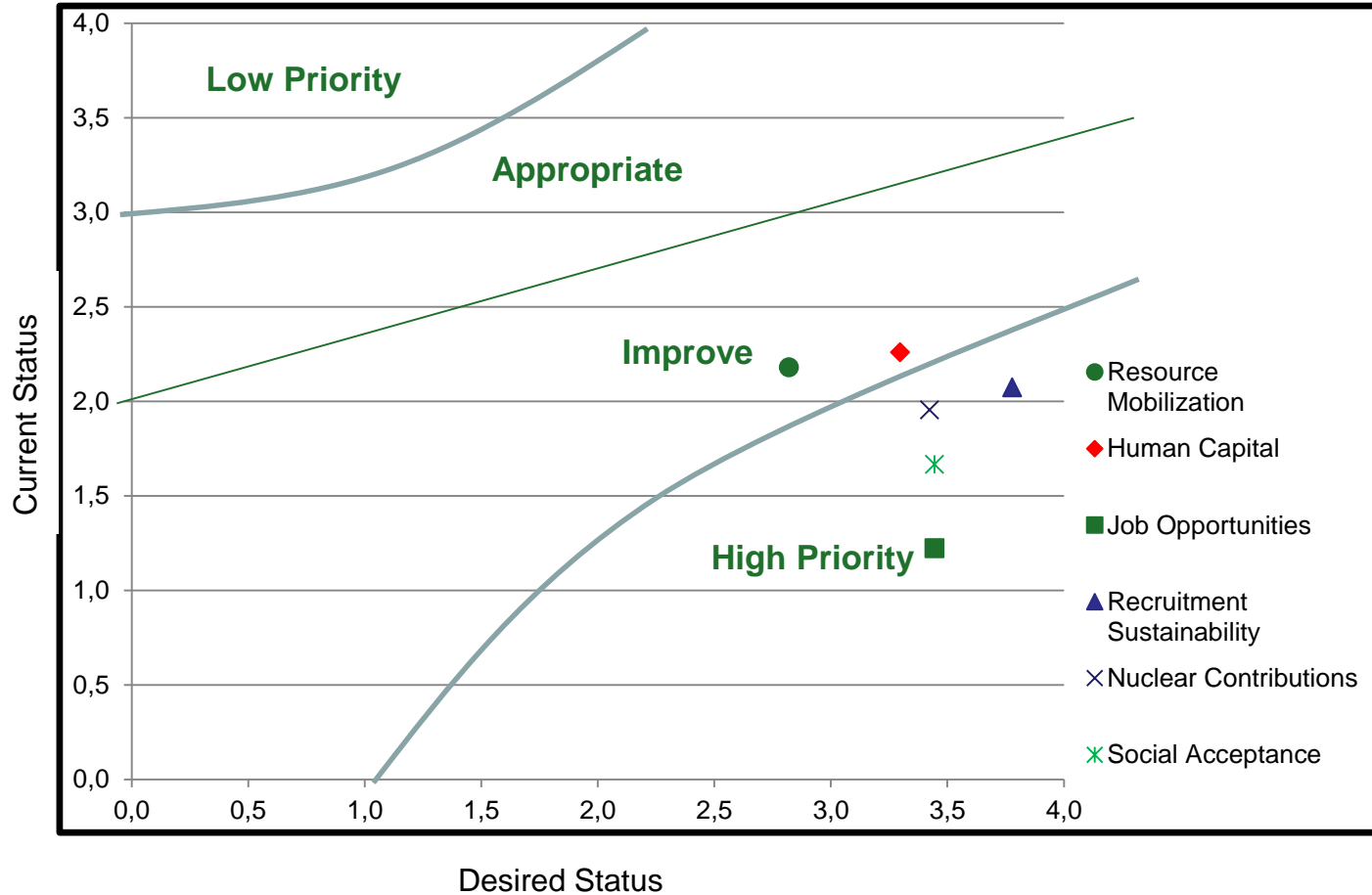
Stakeholder Analysis



ECAP Self Assessment

No.	Capability	Sustainability Considerations	Current status					Scoring	Desired status					Scoring
			0	1	2	3	4		0	1	2	3	4	
1a	Social Acceptance	To what extent are universities providing a balanced representation of nuclear science and technology to the society?		4	5			1,6				9		3,0
1b		Is the Government providing support for the teaching of nuclear science and technology?		5	4			1,4				3	6	3,7
1c		Does society accept the use of nuclear science and technology?		2	5	2		2,0				3	6	3,7
2a	Resource Mobilization	Are nuclear educational programmes being developed to address national priorities in your country?			6	3		2,3				3	6	3,7
2b		Do nuclear education programmes receive funding from Government to be sustainable?		3	3	2		1,9		2	3	3		2,1
2c		Do nuclear education programmes receive support (funding, internships etc) from industry to be sustainable?			6	3		2,3			3	6		2,7
3a	Human Capital	Do students have a high completion rate in nuclear related subjects?				9		3,0				9		3,0
3b		Is there leadership with understanding of nuclear science and technology in policy making positions?		7	2			1,2				7	2	3,2
3c		Are there opportunities for graduates to receive on the job training from professionals (i.e. as mentors)		1	2	6		2,6				3	6	3,7
4a	Job Opportunities	Are there entry level nuclear related vacancies and internships in the industry, including in academia, research positions and industrial sectors?		3		6		1,7				2	7	3,8
4b		Is government providing incentive schemes for incubating nuclear business models based on research?		6	3			0,3			2	3	4	3,2
4c		Are there professional level nuclear related vacancies in the industry, including academia and research positions and industrial sectors?		5	2	2		1,7				6	3	3,3
5a	Recruitment Sustainability	Do universities and other educational organisations have outreach programmes that promote universal appeal for potential students and the general public?		2	6	1		1,9				2	7	3,8
5b		Does the Government support outreach programmes that promote universal appeal for potential students and the general public?		2	7			1,8				2	7	3,8
5c		Does industry have, or support, outreach programmes, that promote universal appeal for potential students, employees and the general public?		1	2	6		2,6				2	7	3,8
6a	Nuclear Contributions	Are there adequate and balanced numbers of qualified nuclear professionals being produced nationally?		9				1,0					9	4,0
6b		Are there agreements in place to provide nuclear services and technologies to national and international industrial community?		2	7			1,8				9		3,0
6c		Does nuclear science and technology currently play a role in solving societal challenges. (energy, health, agriculture etc.)			2	7		2,8				2	7	3,8
6ac		Are research publications being produced in the area of nuclear science and technology.			7	2		2,2				6	3	3,3
6abc		Have any nationally developed nuclear science technologies, including patents, been adopted by other countries?			9			2,0				9		3,0
		Average						1,9						3,4

ECAP Self Assessment Results



The Knowledge Value Chain



- South African Network for Nuclear Education Science and Technology (*SAN-NEST*).
 - Objective - Suitably qualified and experienced nuclear personnel employed by nuclear science and technology programmes in South Africa are predominantly produced by the South African education system.
 - Outcome - Strengthening the nuclear science and technology education programs to better meet future demands in terms of quality, capacity and relevancy.



SAN NEST Members

SAN-NEST was approved by the IAEA Board of Governors in December 2015.

- University of the Witwatersrand (Wits) – Nuclear Technology Leadership
- North West University (NWU) – Nuclear Engineering, Centre of Applied Radiation Science and Technology.
- Nelson Mandela University (NMU) – Physics.
- University of Johannesburg (UJ) – Reactor Physics.
- University of Cape Town – Nuclear Physics.
- University of Pretoria (UP) – Nuclear Engineering.
- Stellenbosch University (SU) – Nuclear Physics.
- Other Universities presented – Universities of Venda, KZN, Western Cape.
- Nuclear Energy Corporation of South Africa (NECSA) – custodian of nuclear research in South Africa.
- National Nuclear Regulator (NNR).
- Industry – through NIASA.
- Government – DoE, DST



Benchmarks and Indicators

- Human Capability

Benchmark	Indicators	Results
% of the required suitably qualified and experienced professionals in Nuclear Education Science and Technology (NEST) is produced by national nuclear education and training institutions by 2030	3. Number of nuclear graduates receiving on job training	24 Graduate in Training 102 Professionals
	4. The number of South Africa-trained nuclear experts employed in the country	- number of faculty at nuclear education departments - 35 - Industry and government– 311
	2. Ratio of entry vs completion for nuclear students	Average time to complete: 4 year B.Eng – 4.22 years 2 year M.Eng – 2.96 years 3 year PhD – 4.25 years
	1. Number of nuclear educational programmes available in country	11

The Knowledge Value Chain



SAN-NEST Outputs:

1. Joint university degrees with suitable nuclear content in line with national and industry needs.
2. Zero power teaching reactor in operation.
3. Continuous professional development (CPD) accredited courses delivered in specific topic areas drawing on expertise from member universities and advertised/ administered centrally by *SAN-NEST*.
4. Training programme (certificate programme) for specialised nuclear organisations delivered (e.g. certified nuclear reactor operator).
5. Produce material and host outreach events.
6. Mechanism to advice on research priorities through research focus groups at member institutions. (e.g. link with Eskom, Necsa, NNR, DoE, DST).



The Knowledge Value Chain



- *Knowledge Incubation Centres for Science, Technology Adoption, Resourcing and Transfer (KIC-START).*
 - *Commercialise knowledge and expertise with the aim to create SME's and contribute to the nuclear industry.*
- *Research Enabling Nuclear through University Collaboration (RENUC)*
 - *Collaborate international KIC-START project with the aim to develop future nuclear technologies that will address the UN sustainability goals.*

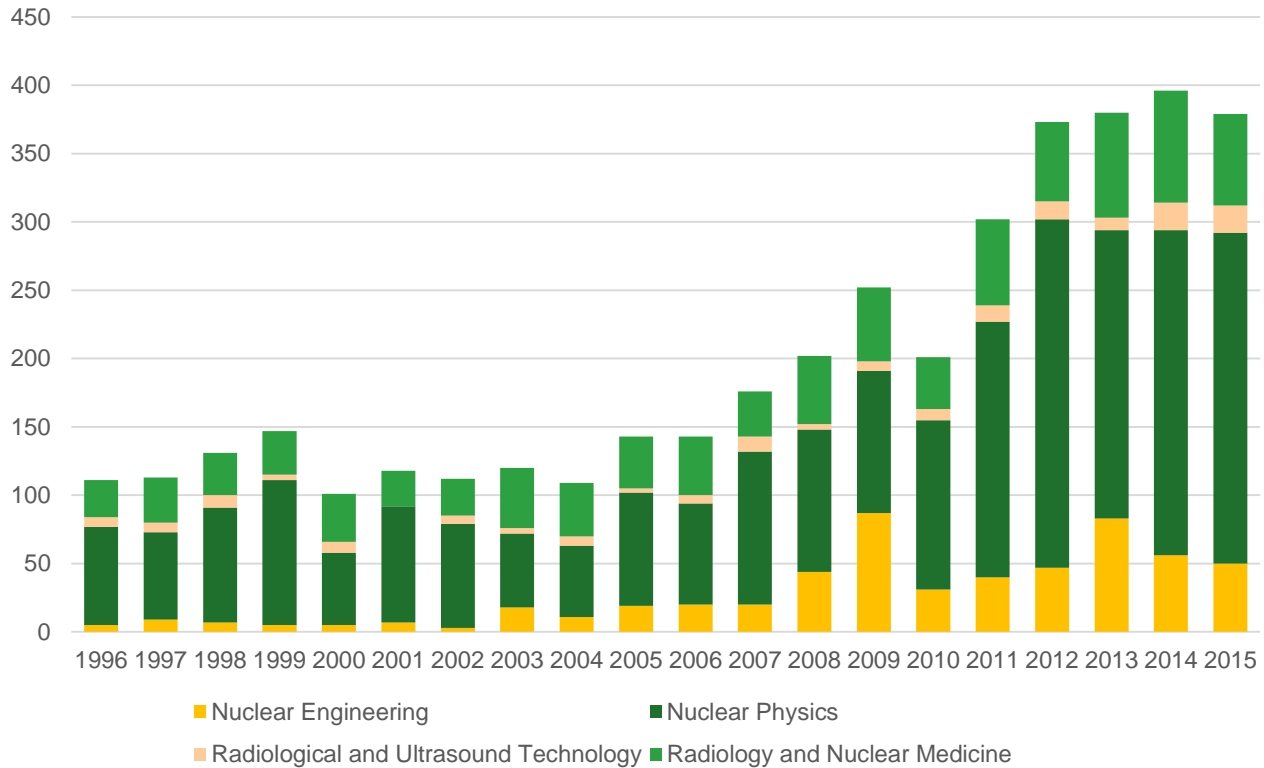


Defining Benchmarks and Indicators

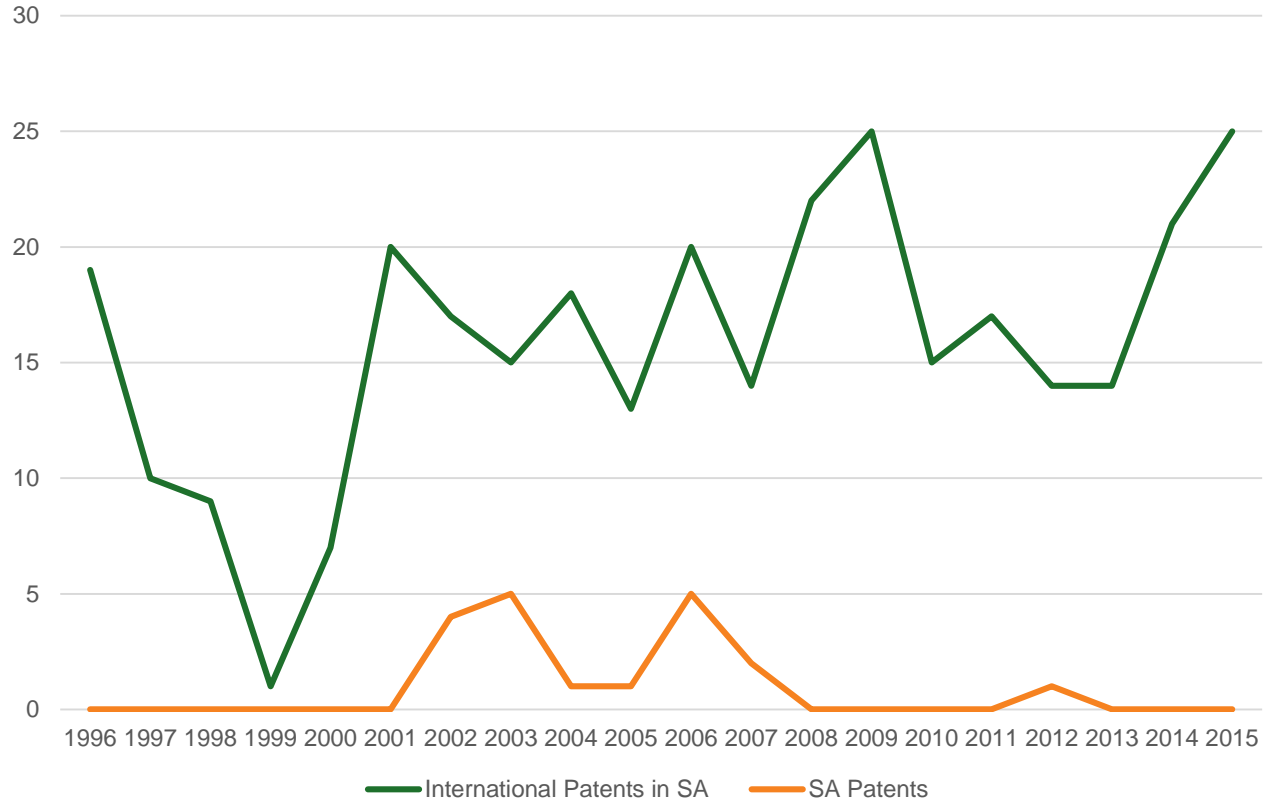
- Organizational Capability

Benchmark	Indicators	Results
To enable [%] growth of nuclear science and technology in Member States through positive policy and provision that foster a positive environment for Nuclear Education, Science and Technology (NEST) development and innovation by 2030	Is a national policy in place for Nuclear Education, Science, Technology and Innovation?	One point each for policy on Education, Science, Technology, Energy – 2/3
	Number of projects (planned, under construction and completed) implementing nuclear technologies	19
	Number of research publications being produced in the area of nuclear science and technology	379 (2015)
	Number of nuclear local technological developments (research and patents) being implemented nationally and abroad in the nuclear industry	0 (2015)

Research Publications in the Field of Nuclear Technology



Patents registered in South Africa in Nuclear Technology



Planned SAN-NEST Projects 2018

- *First intake of students into Masters in Nuclear Technology Leadership (part of IAEA INMA initiative).*
 - *Utilizing a blended learning approach of 1 contact week with e-learning for a duration of 3 months per module.*
- *SAN-NEST requested by IAEA to support E-CAP missions to:*
 - *Nigeria*
 - *Ghana*
 - *Tunisia*
 - *Egypt*
 - *Funded by IAEA - Technical Cooperation - Africa*
- *2nd Nuclear Energy Management School in Africa (Hosted by Wits) November 2018.*
- *SAN-NEST is taking part in:*
 - *Assisting in developing a Clean Energy Ministerial project with Department of Energy.*
 - *Assisting in developing a BRICS nuclear research and education position.*
- *SAN-NEST Coordinator – Dr. Anthonie Cilliers, elected as AFRA-NEST regional coordinator.*
- *Monthly Webinar on Nuclear Technology and the state of the industry.*

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- *Nuclear Knowledge Management School in Africa (Hosted by Wits).*
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- *SAN-NEST is taking part in:*
 - *Gen IV forum to be held in Cape Town from October 2017.*
 - *Assisting in developing a Clean Energy Ministerial project with Department of Energy.*
 - *Assisting in developing a BRICS nuclear research and education position.*

Thank you



ÖKTG
ÖSTERREICHISCHE KERntechnISCHE
GESELLSCHAFT



Webinar: Antonie Cilliers - Small Modular Reactors (SMRs)

With world changing energy demands and the threat of climate change, nuclear power has the potential to overcome these increasing challenges. However, to be successful, nuclear power generation needs to better adapt to the future end-use demands of the electrical grid. This webinar examines the benefits, design requirements, and current developments in SMRs, and discusses how SMRs are able to meet future energy and environmental demands.

Small, safe, affordable and flexible SMR power plants are paving the way to an energy abundant future.

Registration is required to watch this webinar
May 23, 2018 12:00 PM

https://zoom.us/webinar/register/WN_5ZRdGCbfTiKmRUIm_Aa5Rg