NIASA & SOME OF THE ACTIVITIES OF THE INDUSTRY ASSOCIATION

(March 2012)
Content

1. NIASA Mission & Vision
2. Some industry background, highlights & lowlights
3. Public acceptance of nuclear
4. Education & Training
5. Localization Project
6. Conclusion
NIASA Mission and Vision

Mission: To represent the Nuclear Industry in South Africa and to support, promote and champion the collective interests of its members and the country.

Vision: To have a local nuclear industry that has increased local content and that is globally competitive.
Content

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6. Conclusion
## NIASA Membership

<table>
<thead>
<tr>
<th>NIASA - Membership Register</th>
<th>Large Companies</th>
<th>Small Companies</th>
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<td>Schmolz &amp; Bickenbach</td>
<td>Ithemba labs</td>
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Medium Companies
- Steinmuller Engineering Services
- Bateman
- Basil Read

Small Companies
- Bureau Veritas
- Coega Development
- GEA Aircooled Systems
- Mzansi Energy
- NATIXIS
- Nuclear Consultants
- SA Turkey Business & Investment
- TUV Rheinland
- BKS (Pty) Ltd
- NUPIC

Academic Institutions
- Ithemba labs
- University of Johannesburg
- University of Pretoria
- University of North West
### NIASA Membership (cont’d)

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<td>Associate Members (cont’d)</td>
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<td>SA Institute for Steel Construction</td>
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<tr>
<td>Prof Peter Rosewarne</td>
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<td>Dr Pieter Pretorius</td>
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</table>
1. Leaders in infrastructure development
2. The Aveng Group is the largest infrastructure development company in South Africa with a proven track record and presence in key target geographies across the globe. With its broad exposure across the infrastructure value chain, the Aveng Group has the capacity to deliver multidisciplinary projects in construction, engineering, mining, water, transportation, rail, steel and manufacturing.
Profiling some of the NIASA sponsor member companies

1. DCD is an international manufacturing and engineering company providing products and solutions to the rail, defense, mining & energy and marine sectors.
2. A global leader in the manufacture and supply of heavy engineered products and services
3. DCD has participated in the construction of all 23 existing power stations in South Africa and are presently supplying the new coal-fired stations Medupi and Kusile
4. Having participated in all of the country’s former nuclear programmes, the group is well positioned for involvement in all future nuclear power plants
Profiling some of the NIASA sponsor member companies

1. Necsa’s primary function according to the Nuclear Energy Act of 1999 is to serve as the anchor for nuclear energy research, development and innovation in South Africa. Necsa’s strong research focus is directed mainly at nuclear technology applications particularly relating to medical isotopes production; applied chemistry with an emphasis on uranium chemistry etc.

2. One of its subsidiaries NTP is a world leader in the production and supply of radiopharmaceuticals, in particular I-131 and Mo-99, the latter being the most important isotope for devices used in the practice of diagnostic nuclear medicine.
Profiling some of the NIASA sponsor member companies

1. R90bn revenue electricity utility with annual electricity sales in excess of 224,000 GWh.
2. Eskom generates approximately 95% of the electricity used in SA and approximately 45% of the electricity used in Africa.
3. Eskom generates, transmits and distributes electricity to industrial, mining, commercial agricultural, residential customers and redistributors.
1. Stefanutti Stocks, a JSE listed civil engineering and construction group with multi-disciplinary expertise and a wide geographical footprint spread across Africa and the Middle East.

2. Their capabilities span a broad range of industries including: Building Construction, Heavy Industrial, Marine, Mining Infrastructure & Mining Services, Petrochemical, Power, Transport & Infrastructure, Water & Waste Water, Environmental services.
Technological Options

Gas turbines

Efficiency

Renewables

Coal

Nuclear

Transmission
IRP 2010 OUTCOME

Policy-Adjusted IRP

Total additional new capacity until 2030, in GW

- Coal: 6.3 GW
- Nuclear: 9.6 GW
- Hydro: 2.6 GW
- Gas - CCGT Peak: 2.4 GW
- OCGT Renewables: 3.9 GW
- Solar PV: 8.4 GW
- CSP: 1.0 GW
- Wind: 8.4 GW
Net new generation capacity - Revised Balanced Scenario (IRP2010)
Some highlights and lowlights

1. Promulgation of the IRP2010 – a major highlight supplying clarity on the projected electricity generation mix by 2030. Obviously this is still a plan, which now needs to be implemented.

2. The demise of PBMR and the negative impact thereof on the SA nuclear skills base and international image. The poor synchronization between the PBMR and IRP decisions was especially disappointing.

3. The Cabinet decision to establish the National Nuclear Energy Executive Coordination Committee and associated structures – a very important step to get going with the nuclear component of the IRP2010.

4. SA’s continued participation in activities of the Generation IV International Forum, INPRO and Euratom Seventh Framework Programme, through which we maintain very important international networks and remain close to global nuclear developments.
Some highlights and lowlights

5. The events at Fukushima-Daiichi, which obviously impacted heavily on global and local nuclear thinking, planning and perceptions, but which also - rather ironically - presented an opportunity for a more informed nuclear debate than would have been the case in the absence of such dramatic events.

6. Continued interaction by Necsa and various other SA nuclear role players with global reactor vendors and suppliers of fuel cycle services.

7. DST’s commissioning of a study to develop a National Nuclear Energy Research, Development and Innovation Strategy (NERDIS), which is currently being considered by DST executive management.

8. Necsa obtaining ASME III certification, a major milestone for Necsa itself but also to work with local industry to gear up for localization as part of the nuclear new build program.
Some highlights and lowlights

9. Normalization of the international radioisotope market after the supply shortages of a few years ago, but currently experiencing heavy competition.

10. Tender process for Necsa’s Dedicated Isotope Production Reactor

11. Siting for NFC infrastructure under consideration

12. Nuclear industry localization conference

13. Increased interaction between local and international nuclear industry Stakeholders as we prepare for new build program
Other industry developments

1. Bidding process for Isotope Production Reactor for Necsa

2. Plant life extension for Koeberg Power Station (40-60 years)
   - Consideration of Steam Generator replacement
   - Possibility of power up-rate (~ 3-8%)

3. Koeberg operation continues to be solid relative to availability (UCLF), dose reduction and human performance

4. Ten year safety assessment review of Koeberg conducted with possible modifications

5. IAEA Operational Safety Analysis Review (OSART) for Koeberg completed

6. WANO peer review completed in November 2011
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Public acceptance of nuclear

1. Eskom has progressed significantly in qualifying potential nuclear sites

2. The Environmental Impact Assessment process for the three sites is near completion

3. Site Seismic Hazard Assessment studies have progressed on the identified sites

4. Eskom has recently approved additional funds to undertake detail design of supporting infrastructure to the nuclear power plant

5. Radio adverts to promote nuclear awareness and nuclear education amongst communities (on YFM and Motsweding FM, and Daily Sun newspaper)
Some industry developments - Potential Nuclear Sites
Public acceptance of nuclear (cont’d)

6. Necsa Schools outreach program (reached highlights during National Science week – about 2,500 students in one week with last group of 700 students hosted by Minister Dipuo Peters at Necsa’s Visitors Centre)

7. Development of NIASA Fact Sheets to promote more public awareness about nuclear

8. Continued writing of media articles
Certain articles are published in the media

NIASA does not have a policy of responding to everything in the media but we pro-actively promote nuclear based on own agenda
Public acceptance of nuclear (cont’d)

Nuclear debates: e.g. German expert on closure of German nuclear program & testimony of Fukushima victim
Some of the industry developments – public acceptance of nuclear

Main aims of the Necsa Visitors Centre:

1. Engage with South Africa’s nuclear heritage;
2. Inform the public about nuclear science and technology;
3. Inspire learners to take up careers in nuclear science and technology;
4. Supplement the school curriculum by providing laboratory facilities and related tuition.

Opening of the Necsa Visitors Centre, 3rd Feb.’11

Capacity: 10,000 learners per year
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Approach to nuclear industry skills development - NIASA Education & Training Sub-Committee

**Determine Skills Gap for New Build**
- Skills categories & numbers
- When required vs project plan
- Derive gap based on existing skills in industry.
- Benchmark where possible to test results

**Determine Education & Training Gaps**
- Based on skills demand (above)
- Based on existing capacity & resources
- Benchmark where possible to test results

**Skills Gap and E&T Capacity Gaps (per category & timing)**

**Develop Innovative Solutions**
- Increase intakes
- Expand existing E&T capacity
- Build new E&T capacity
- Leverage international opportunities
- Contract solutions with Vendor
- Convert existing/redundant market skills
- Collaborate on “uniform” curricula
- Leverage EWSETA
- Industry & Institution partnering
- …… etc

**NIASA E&T S/Committee**
- Oversee implementation
- Support & guide
- Strategic problem solving
- Address changing requirements and adjust plan
- Perform effectiveness reviews
- Appraise Board and stakeholders
- Scan environment and act accordingly to continuously address new needs and improvement ET&D in nuclear for SA.

**Cost Solutions**

**Develop Project Plan for Delivery**

**Obtain Stakeholders’ input, buy-in & funding**

**Implement**
Current Status

Phase 1: Determine Skills Gap for New Build (Draft completed for Education)
- Skills categories & numbers
- When required vs. project plan*
- Derive gap based on existing skills in industry.
- Benchmark where possible to test results

Phase 2: Determine Education & Training Gaps (In Progress)

Phase 3: Develop & Cost Innovative Solutions for Phases 1 & 2 and develop associated project plan for implementation (not started)

Phase 4: Obtain stakeholder endorsement & funding (not started)

Phase 5: Implement plan, monitor & adjust (not started)
Minister Peters said that it was likely that the nuclear bidding process would start in 2012, and that the first power from new nuclear plants in South Africa would come on line in 2024 or 2025.
# Phase 1 Outcomes Summary

## Skill Categories & Numbers Required Over Time

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# Phase 1 Outcomes Summary

## Skill Categories & Numbers Required Over Time

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<td>27 806</td>
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Phase 1 Outcome Summary

Education Requirements
- Certificates
- Diplomas
- Degrees
- The estimated number of human resources required are approximately 33,000.
- R 6 billion over a period of 20 years (worst case scenario)
- Need to enrol students and do curriculum modification immediately – concern with engineers
- Big concern for experiential training opportunities
Some of the industry developments – skills development

Necsa Decentralized Trade Test Centre:

1. The Centre contributes towards the establishment and maintenance of skills to fully meet the needs of clients in South Africa.

2. The main objective of the Centre is to provide a test facility to do trade testing in the categories of Welding, Fitting and Turning, Electrical Heavy current, instrumentation and Control and Boiler Making.

Opening of the Centre, 4th Feb.’11
Some of the industry developments

Necsa Decentralized Trade Test Centre (cont’d):

3. The Centre has full accreditations from MERSETA, CHIETA and SERSETA.

4. The Centre has the capacity to train 560 apprentices in various trades in skills within one year and to do artisan test for 2,880 artisans per year.
JIPSA Management Training in France - 2011

- 2011 intake of 66 delegates
- 13 delegates from nuclear industry
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Participants included:
IAEA, WNA, AREVA, Westinghouse, EDF, Rosatom, CNPEC, KEPCO, AVENG, DCD Dorbyl, Parsons Brinckerhoff, KEARI, Murray & Roberts, etc

232 delegates in attendance

Succeeded in bringing together international and local industry Stakeholders to share international experience in localization of nuclear industry
Localization Project & Benchmarking Study

1. Development of SA nuclear industry – competitive supply chains
2. Study of industry capabilities (Worley Parsons & NIASA)
3. Identification of NPP components for localization
4. Identification of potential suppliers
5. Matching of local suppliers with NPP components and potential international partners
6. Technology & know-how transfer
7. Govt assistance to address the technology gaps (e.g. Foundry industry)
Localization Study – Worley Parsons

1. Localization of approximately 30% of the nuclear power plant cost will occur naturally for the first two units of the South African new nuclear build programme.

2. This study concludes that South Africa should have the technical capabilities to achieve a local content in the range of 40%.

3. South Africa should focus on establishing the local capabilities to design and project manage the delivery of components and systems, which is of great value than just manufacturing and constructing locally.
Localization Study – Worley Parsons (cont’d)

Equipment and services considered to be natural candidates for localization from highest to lowest estimated value:

a. Civil Concrete
b. Rebar
c. Tanks
d. HVAC Ductwork
e. HVAC Chillers, Heating Coils, etc.
f. Formwork
g. Cranes

Low hanging fruit!
The following equipment and services are considered the best candidates for local delivery when constructing the first two units, presented from highest to lowest estimated value:

a. Services at home office and plant site, incl. design
b. Structural and Reinforcing Steel
c. Heat Exchangers
d. Pipes
e. Valves (~14% of plant maintenance cost)
f. Pumps
g. Motors
h. Electrical Panels
NIASA Localization Study - Approach & Outcomes

1. The major aim of the capability study was to identify localization opportunities through the characterization of the strengths, weaknesses, opportunities and threats within the South African industry sectors namely control and instrumentation, electrical, mechanical and civil works.

2. The basis of the study was the 9600MWe of nuclear installation of the SA nuclear new build as stated in the Integrated Resource Plan.

3. This being the case NIASA commissioned the nuclear industry benchmarking and analysis initiative in order to have an understanding of local capacity and capability in terms of supplying components and services (design engineering, manufacturing, installation and operation and maintenance).
NIASA Localization Study - Approach & Outcomes

4. Local and international constraints and localization opportunities in supply of control and instrumentation, electrical, mechanical and civil works components and services were also examined in the study by taking into consideration global nuclear power plant installations supply chain demands.

5. The review, benchmarking and analysis was conducted using primary data gathered from entities within the aforementioned industry sectors through targeted questionnaires (survey forms) and through interviews with representatives from major companies, academic institutions etc.

6. The primary data was also supplemented with extensive secondary (public domain) data gathering e.g. that pertaining to NPP components, quality and regulatory requirements.
NIASA Localization Study - Approach & Outcomes

7. The report therefore presents possible localization projects emanating from the identified domestic industry strengths, weaknesses, opportunities and threats. The localization projects will be conducted within vendor approved industry sector localization champions.
NIASA Localization Study - Some of the findings

1. Limited local capabilities and capacity to design pressure vessels in accordance ASME VIII.
2. Limited local capability in designing pressure vessel in accordance to nuclear codes and standards.
3. Projects which require ASME VIII manufactured pressure equipment have been insufficient to enable the viability of maintaining the accreditation.
4. Limited nuclear grade manufacturing capability due to non-availability of continuous local demand.
5. Very few local entities are familiar with the installing pressure equipment in compliance with nuclear standards e.g. NQA-1 and nuclear regulator requirements.
6. Design of some petrochemical plants pressure equipment still sourced from abroad
NIASA Localization Study - Some of the findings

7. Shortage of pressure equipment installation personnel such as coded personnel resulting in dependence on foreign expertise.

8. Limited local capabilities and capacity to forge pressure equipment parts in compliance with ASME VIII and ASME III codes and standards.

9. Limited worldwide capacity of producing nuclear grade pressure vessel ultra heavy forgings.

10. Lack of experience in designing pumps in compliance with nuclear codes and standards.

11. Local foundry entities are usually challenged to produce high quality castings.

12. Locally-manufactured castings are very expensive compared to those from other continents.
NIASA Localization Study - Some of the findings

13. Limited foundry casting especially for stainless steel valve components.

14. Currently, local industries source about 60% of valves from abroad, and the remaining 40% locally.

15. Local foundries and valve manufacturers struggle to compete against foreign suppliers.

16. Shortage of valve industry personnel such as pattern makers.

17. There has been a loss of skills through emigration. Large corporations have significantly reduced their apprenticeship training.
1. The foundry industry was specifically targeted in the first round of technology assistance packages as it forms the basis for the development of supply chains for components, linked to the infrastructure build programmes of Eskom and Transnet.

2. During the benchmarking process of the local foundries, the government together with UNIDO and the National Foundry Technology Network developed a technology-benchmarking tool for the foundry industry.

3. R26-million was spent by the government in 2010 financial year in the first phase of the technology assistance packages for 28 selected foundries to become more globally competitive.

4. The foundries receiving the technology upgrade support would be in a better position to leverage government spending from infrastructure investment programs.
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OPPORTUNITIES

1. Huge opportunity to bootstrap South African science and technology on the back of a ~ R 400 billion spend.
2. Opportunity to be part of a global effort to reduce carbon footprint.
3. Opportunity to use the uranium value chain to attract investors.
4. Opportunity to develop local high spec manufacturing.
5. Opportunities for the social sciences in the realm of public opinion and understanding.
PROGRESSIVE DEVELOPMENT OF DESIGN AND MANUFACTURING CAPABILITIES

Globally competitive design and manufacturing capabilities

Primary focus area

Design capability

Manufacturing capabilities
REQUIRED INTERVENTIONS ARE DETERMINED BY DEGREE OF INDUSTRIAL COMPLEXITY

<table>
<thead>
<tr>
<th>Level</th>
<th>Examples</th>
<th>Intervention requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Globally leading</td>
<td>• Ultra heavy forging&lt;br&gt;• Turbine manufacture</td>
<td>• Government driven investments for strategic economic purposes – not commercially viable in short-medium term</td>
</tr>
<tr>
<td>Advanced</td>
<td>• ASME III production facility&lt;br&gt;• Fuel cycle</td>
<td>• Commercially viable but high complexity - government investment required in specialised skills and technologies to enable investment</td>
</tr>
<tr>
<td>Intermediate</td>
<td>• Pipe prefabrication&lt;br&gt;• Pumps, valves…</td>
<td>• Investment requirements within capability of company balance sheets, but clear medium term commitment required</td>
</tr>
<tr>
<td>Shallow</td>
<td>• Construction&lt;br&gt;• Structural steel</td>
<td>• Within current industry capability&lt;br&gt;• Sufficient notice required and information sharing to enable capacity expansion</td>
</tr>
</tbody>
</table>

Globally leading

Advanced

Intermediate

Shallow

niasa nuclear industry association of south africa
LOCALISATION TREND OVER FLEET CONSTRUCTION TIME

Degree of localization

Degree of industrial complexity

2011

2030

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