Nuclear Business Opportunities

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Executive: WiN-Global, Africa
Overview

- Necsa Mandate
- SAFARI- I
- Necsa Subsidiaries
- Nuclear Applications
- Opportunities
### Necsa Mandate

<table>
<thead>
<tr>
<th>Function</th>
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<tbody>
<tr>
<td>Promote research and development in nuclear energy and radiation sciences and technology</td>
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<tr>
<td>Process/reprocess/enrich source material, special nuclear material</td>
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<tr>
<td>Execute institutional responsibilities on behalf of government, e.g. utilization of SAFARI-1, decommissioning/waste management</td>
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<td>Co-operate with any person/institution in matters falling within these functions.</td>
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Irradiations for isotope production, neutron activation analysis, neutron beam-line research.
Pelchem SOC Ltd

- Fluorochemical production, sales and distribution company in the Southern hemisphere
- Over 25yrs experience
- Produces 25 fluorochemicals
  - exported to 26 countries in all the continents.
• producing **nuclear fuel** for nuclear power generation (HF & F₂)
• thin **film solar panels** manufacture (NF₃)
• **lithium ion batteries** for computers, cell phones and electric vehicles (LiPF₆)
• processing rare earth elements (HF)
  – e.g. neodymium (used in **super magnets** for **electric vehicles, wind turbines** and computers disk drives) HF
• **power transmission** (SF₆)
• production of **petroleum** (HF)
• **Toothpaste** (fluoride salts)
• **Refrigerants** in fridges, freezers and air-conditioning
• Modern **construction material** (fluoropolymers)
• **Pharmaceuticals** (APIs for ARVs, anaesthetics,...)
• **Medical diagnostics** ($^{18}$F - Positron Emission Tomography (PET) scanner)
• production of **smart chips** for applications such as car air bags ($\text{XeF}_2$), smart phones, new display technologies

![Fluoride Toothpaste Image](image-url)
![Refrigerator Image](image-url)
![Modern Construction Material Image](image-url)
![Pharmaceuticals Image](image-url)
![Medical Diagnostics Image](image-url)
![Smart Chips Image](image-url)
Pelchem’s chemicals in everyday-life products
NTP Radioisotopes SOC Ltd
(Subsidiary of Necsa)
NUCLEAR MEDICINE

South Africa uses a nuclear reactor to produce radioactive medicines needed to diagnose and treat illnesses and manage nuclear medicine across the world. In nuclear medicine, radioisotopes are medical tools for diagnosis and treatment, but they also cause some problems. Many radioactive isotopes may occur naturally, but many are artificially produced. The nuclear reactor at Necsa makes radioactive isotopes. Specific isotopes are used to produce short-lived medicines that are critical to nuclear medicine. Nuclear medicine procedures are extremely common.

MEDICAL ISOTOPES: HOW THEY WORK AND WHO SUPPLIES THEM

MOYDBDENUM-99 DECAYS INTO TECHNETIUM-99m. A SHORT-LIVED MEDICAL RADIOISOTOPES USED IN NUCLEAR MEDICINE PROCEDURES.

THE PROCESS

THE TIME FROM REACTOR TO USE IS VERY SHORT, DUE TO REACTORS OF PRODUCTION PLANTS, EYED TRANSPORTATION DIFFICULTIES CAN BE DETRIMENTAL.

- MOYDBDENUM-99 IS CREATED IN A REACTOR, THEN SHIPPED TO ANOTHER LOCATION FOR PURIFICATION.
- A TECHNETIUM-99m GENERATOR, CONTAINING THE MOYDBDENUM-99, IS TREATED.
- THE GENERATORS ARE SHIPPED THROUGHOUT THE WORLD FOR USE IN HOSPITALS.

SUPPLIERS

- CANADA: 26%
- NO REACTOR: 4%
- WORLD TOTAL: 100%
1. NTP operates as a commercial subsidiary of Necsa.

2. Delivers nuclear medicine to more than 60 countries around the world and enhances over 10 million lives every year.

3. Nuclear medicine revenue reached R1 billion (~US $95m) in 2013 and is expected to grow.

Mo-99 has a half life of 66 hours!
NTP Products & Services

RADIOCHEMICALS
• Mo-99, I-131

RADIOACTIVE SOURCES
• Ir-192, Cs-137, Co-60

IRRADIATION SERVICES
• Neutron Transmutation doping of Silicon,
• Neutron Irradiation Service
• Gamma Irradiation Service

RADIOPHARMACEUTICALS
• NovaTec-P Tc-99 Generator, FDG,
• MIBG, Cold kits, I-131 Capsules
• Ir-192 Brachytherapy
PELINDABA ENTERPRISES
Pelindaba Enterprises (PE) is a division of Necsa specializing in heavy engineering and manufacturing of power generation components; it is the only manufacturing organisation in Africa that has acquired the ASME III Nuclear Certification.
Necsa acquired qualification as a component manufacturer in 2011, certified to manufacture power generation components according to the American Society of Mechanical Engineers (ASME) Code of Standards.

ASME N Stamp was acquired in 2014 and enables Necsa to design nuclear components.

The ability to manufacture power generation components will increase localisation and enhance high level technical skills around the nuclear Newbuild.
Pelindaba Enterprises manufactures power generation components for the two local coal-fired fired power stations (Medupi and Kusile).

The enterprise is ready to support the SA nuclear build programme and plans to supply nuclear components to the international market in the long term.
Nuclear Skills Academy at Necsa
Training Capability

- Since 1983, Necsa has trained thousands of youth in technical trades such as draughting, boiler making, welding, electrical work, turning & fitting, etc. This includes engineering graduates from universities.

- Nuclear Skills Development Centre
  - Boiler making
  - Welding
  - Mechanical Engineering
  - Electrical Engineering
  - Control & Instrumentation
  - SHEQ Training
  - RPO Training

- Capacity to train 150 artisans per semester
Nuclear Applications
Medicine

- Sterilization of Medical Products
- New Drug Testing
- Diagnosis
- Cancer Therapy
Food and Agriculture

- Food irradiation
  - Kill pathogens and extend shelf life
- Speed Breeding of Improved Crops
  - Greater yields
  - Better nutritional value
  - Increased disease resistance for development
- Animal Husbandry
  - Increase body weight
  - Vaccines to eliminate diseases
- Insect Control
Public Safety and Crime Fighting

- Fighting terrorism
- Lighting (airports, exit signs, traffic control)
- Homes (smoke detectors)
- Gun Powder Residue Analysis
- DNA Fingerprinting
- Art Counterfeiting

Californium based explosion detection system
Scientific Research and Industry

- Carbon Dating
- Prospecting
  - Well logging (rock formation characteristics)
  - Water supplies (aquifer interconnections)
- Tracers
  - Movements of materials along riverbeds or seashores
- Environmental Protection
  - Air, water and soil pollution/contamination
  - Global Climate Change
- Space Exploration
What are the opportunities?
# Opportunities

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<tr>
<th>Phase</th>
<th>Services</th>
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<tr>
<td><strong>PRE BUILD</strong></td>
<td>Planning and licensing, Financial and legal, Consultancy, Engineering</td>
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<tr>
<td><strong>CONSTRUCTION</strong></td>
<td>Project management, Plant &amp; equipment, Onsite fabrication, Nuclear fuel supply, Commissioning</td>
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<tr>
<td><strong>OPERATION</strong></td>
<td>Operation &amp; site management, Nuclear fuel supply, Engineering/technical services, Waste management &amp; disposal</td>
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<tr>
<td><strong>DECOMMISSIONING</strong></td>
<td>Planning &amp; Licensing, Decommissioning</td>
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“There is no elevator to success. You have to take the stairs.”

Author Unknown
I WONT DO IT
I CAN'T DO IT
I WANT TO DO IT
HOW DO I DO IT?
I'LL TRY TO DO IT
I CAN DO IT
I WILL DO IT
Yes, I did it!

Which step have you reached today?
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