Fuel cycle stewardship in a nuclear renaissance

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Project background

- Many countries worldwide are considering to expand their civilian nuclear power programmes or even embark on civil nuclear power for the first time to help meet their climate change and energy security needs.

- This so-called 'nuclear renaissance' has renewed debate about the relationship between civil nuclear power and the proliferation of nuclear weapons, as well as other security risks.

- This project explored the potential of new technologies and new governance practices to make the nuclear fuel cycle more proliferation resistant and secure.

Best practice for non-proliferation

1) Civil nuclear power has its history in nuclear weapons; its future is not.

All NWS to separate NWs from civil nuclear power programmes, placing latter under international safeguards to verify this separation

2) There is no proliferation proof fuel cycle- IAEA central to manage dual use risks

Diversion from declared facilities unlikely- Additional Protocol important to detect undeclared facilities

All NNWS with nuclear power to implement IAEA comprehensive safeguards and Additional Protocol

3) Unclear if personnel/knowledge from civil nuclear assisted NW programmes

Universities and industry to develop education and awareness raising courses

4) Plutonium in spent fuel unattractive for NW use

Develop nuclear fuel and configure nuclear reactors to enable maximum burn up, consistent with efficient and economic operation

A Nuclear 'Davos'

We now have an International nuclear power market, supply chain and services

National facilities moved and are moving from purely state-run to multinational companies

Major benefits:

- Increase transparency and spread best practice
- Industry has supranational interest in non-proliferation and nuclear security- single incident from civil facility will affect credibility of industry worldwide.

Global governance does not yet reflect this reality of a fully internationalised fuel cycle
This multinational industry must be part of the solution, not the problem

UK government should help to establish a CEO led, World Nuclear Forum

- interface with political leaders to explore development of/responsibilities for nuclear power
- could be proposed at 2012 in South Korea to ensure momentum generated by Nuclear Security Summit process is sustained

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Integrated risk management

- Post Fukushima: complacency must be avoided
- But not just for safety; but security and non-proliferation, too
- Safety, security and proliferation risks no longer considered in isolation
- Integrated approach reflects 'all hazards approach' to national security: range of threats from natural disasters to manmade accidents or malicious attacks by states and non-state groups.

- **Safety by design** now standard practice
- **Security by design** becoming best practice (WINS)
- **Safeguards by design** should become best practice

Integration by design: identify synergies/resolve conflicts in advance

- Develop security and non-proliferation assessment methodologies just like there are for safety: participation of experts from all three areas

National regulation

Safety and security regulated at national level.

- Integrate safety and security into single national regulatory body (NRB)

Non-proliferation regulated at international level

- In interests of national governments to ensure legislation in place so that industry supports safeguards activities and avoid false accusations of proliferation
- safeguards office in NRB as focal point for industry and IAEA
- NRB could act on IAEA's behalf during licensing process:

  1) licensee understands, and facility design meets, safeguards requirements

  2) avoids delays and conflicts with other regulatory requirements.

  3) supports more efficient fuel cycle designs.

- IAEA prescribes high level requirements; NRB flexibility in their implementation.
- IAEA approves final arrangements- does not replace safeguards inspections
- Provides NRB with powers to promote *and* enforce safeguards by design.

International regulation

- No equivalent intergovernmental regulator for safety and security
- IAEA only as source of best practice and advice
- **Peer review** key: well developed for safety; not yet for security

1) Integrated governmental peer review

- include appropriate security information, on a voluntary basis, in national reports submitted as part of the peer review process for safety
- integrate safety and security into IAEA advisory services for member states.

2) Integrated industry peer review

- WANO and WINS to collaborate on joint safety and security reviews
- Post-Fukushima: not just reactor operation but also spent fuel storage

3) Integrated corporate governance

- Non-proliferation and nuclear security to feature with similar status to safety.
- security as site licence condition: operators liable for security just as for safety

Cradle to grave planning

The management of spent fuel must no longer be an afterthought

- Entire fuel cycle needs to be considered from cradle to grave at the outset.
- The multi-decade to century timescales require long term, strategic planning.

1) A National Policy that contains a long term role for nuclear power in the country's energy strategy, including:

- requirements for sufficient interim storage of spent fuel
- Creating a Waste Management Organisation to deliver disposal in a timely way

2) Long term R&D roadmap to support spent fuel management strategies.

- R&D provides contingency to address unforeseen changes in policy by keeping future management options open.

3) International fuel cycle arrangements should be sought, especially when national capacity is lacking.

- In everyone's interests that all countries with nuclear power have access to capacity to manage nuclear materials safely and securely

International spent fuel management

Renewed interest in non-proliferation and security benefits of cradle to grave fuel cycle services

- Concept not new: USSR and customer states, Areva's 'integrated offer'
- Not just thermal reactors but also research reactors
- International arrangements will be relevant in managing spent fuel from Small and Medium reactors.

International services for reuse have been available for decades- not so for storage and disposal

- Could the large volumes of spent fuel arising from a nuclear renaissance create a commercial market for disposal services?
- Will every country have suitable geology and resources to dispose of nuclear materials safely and securely?

International disposal

1) Longer term prospect given political sensitivities involved.

2) 'Partnering': may be more attractive for countries with smaller nuclear power programmes.

- Group of countries could collaborate on a joint waste disposal programme with a view of one of them eventually hosting an international GDF
- The sensitivities should not be underestimated but this does not mean that governments should reject them.
- Governments need not commit to the implementation of international options at this stage.
- Collaborative R&D still important to keep these international options open
- In longer term, R&D partnerships could build trust to foster more integrated policies and collaborative infrastructure.
- Should international route fail, could fall back on the national route since national and international options draw on overlapping R&D.

European approach

EURATOM: best exemplar of regional approach to fuel cycle management

- Lack of cradle to grave thinking 50 years ago: regional approach to front end, not back end
- But European governments starting taking this seriously:
- ‘sharing of facilities for spent fuel and radioactive waste management, including disposal facilities, is a potentially beneficial option when based on an agreement between the Member States concerned’ (EC Directive 2011)

EURATOM

- regional mechanism for highest standards of safety, security and non-proliferation in member states
- regional oversight, including safeguards inspections. Similar arrangements could compliment the IAEA and help address political problems in other regions by involving inspectors from neighbouring states rather than from outside of the region
- Supports regional R&D: EC Technology Platform Implementing Geological Disposal (brings together national Waste Management Organisations from across the EU to develop collaborative R&D on geological disposal)

Summary

- Best Practice
- International Realities
- Integrated Risk Management
- Regulation
- Cradle to Grave Management
- International Management

How can these be applied in Africa ?