

Establishment of the Centre for Nuclear Safety and Security in South Africa: Project Progress and Lessons Learnt

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Abstract

In order to address existing regulatory challenges and to conform to international best practice the National Nuclear Regulator (NNR) embarked on a multi-phased project to establish a Centre for Nuclear Safety and Security (CNSS) in July 2014. The CNSS was subsequently launched in September 2016 to mark the completion of the first phase of the project. The CNSS project is the first of its kind to be undertaken by the NNR and is also the first application of a process to establish a nuclear safety centre for a nuclear regulatory body in South Africa and in Africa. As such the CNSS project provides an opportunity to learn new lessons regarding the implementation of the process for establishing a nuclear safety centre for a nuclear regulatory organization. The aim of this paper is to disseminate information on the process followed by the NNR to establish the CNSS and the operational model chosen for the CNSS, present a summary of the project close-out report in order to formalize acceptance and closure of the first phase, highlight lessons learnt, outline the vision, mission and values for the operational phase of the project. The organization of the operational phase of the project, key deliverables and major risks for mitigation are also outlined to ensure that subsequent phases of the project remain on track. The successful completion of the establishment phase of the CNSS project, despite some few logistical challenges, serves as an important demonstration that similar projects can be planned and completed with products that have direct use by other regulatory bodies in Africa and internationally.

1. Introduction: Organizational Context and Project Background

The National Nuclear Regulator (NNR) of South Africa is an Agency of government that is empowered through the NNR Act (No 47 of 1999) [1] to protect the public, property and the environment against nuclear damage through the establishment of safety standards and regulatory practices. Like most nuclear regulatory bodies, the NNR proactively undertakes and participates in relevant initiatives to assess the safety performance of the country's nuclear infrastructure and identify challenges and opportunities for improvement. References [2&4] discuss challenges faced by the NNR which led to the initiative to establish the CNSS. The latter will serve as a dedicated nuclear safety centre to support the NNR. The establishment of a dedicated nuclear safety centre as part of nuclear industry infrastructure is a common practice among nuclear countries that is also recognized and recommended by the International Atomic Energy Agency (IAEA) [3]. The proposed Centre will implement the following key programmes:

- Education & training (E&T) programmes in nuclear safety, radiation protection and nuclear security;
- Regulatory Research and development (RR&D) programmes in nuclear safety, radiation protection and nuclear security;
- Technical support service (TSS) programmes in nuclear safety, radiation protection and nuclear security.

The objectives and benefits of implementing these programmes are discussed in detailed in References [2&4]. The CNSS project is the first of its kind to be undertaken by the NNR and is also the first application of a process to establish a nuclear safety centre for a nuclear regulatory body in South Africa and in Africa. As such the CNSS project provides an opportunity to learn new lessons

regarding the implementation of the process for establishing a nuclear safety centre for a regulatory organization. The aim of this paper is to disseminate information on the process followed by the NNR to establish the CNSS and the operational model chosen for the CNSS (Section 2), present a summary the project close-out report in order to formalize acceptance and closure of the first phase of the project (Section 3), highlight lessons learnt from the completion of the first phase of the project (Section 4). Section 5 outlines the vision, mission and values for the next phase of the project, i.e. the operational phase of the CNSS. The organization of the operational phases of the project, key deliverables and major risks for mitigation are also outlined in Sections 6&7 to ensure that subsequent phases of the project remain on track. Section 8 provides a summary of conclusions.

2. Process for establishing a nuclear safety centre and operational model

The sub-sections below present the process followed by the NNR to establish the CNSS and the operational model chosen for the CNSS.

2.1 Process for establishing a nuclear safety centre

The process for establishing the CNSS started with the identification of challenges facing the Regulator as summarized in References [2&4]. Following this, a number of alternatives were explored in order to address the identified challenges taking into account desired outcomes and the approach or process suitable for addressing each challenge. For example, for challenges on nuclear education and training, the Education Capability Assessment and Planning (ECAP) Framework approach was adopted and integrated into the project through participation in the SAN-NEST (South African Network Nuclear Education Science and Technology) project. The ECAP Framework provides a process for developing countries to establish sustainable nuclear education, including a framework for planning and assessing the potential of higher education's contribution to the promotion and development of nuclear science and technology to meet development priorities. Project Cycle Management (PCM) and Logical Framework Approach (LFA) were used as methodologies for designing, monitoring, and evaluating the project. Project management tools utilized to guide the project include PRINCE2® and PMBOK® Guide. A web application platform (SharePoint®) was used to implement project management processes, as recommended in these guidelines, as well as store, track, and manage project documents, including project cost and schedule. The project was overseen by a Steering Committee consisting of representatives from various divisions of the NNR and monitored by the NNR project management office (PMO) for compliance with NNR internal business processes, including quality, cost and schedule requirements. At the end of the establishment phase of the CNSS, a project phase close out report was compiled to record lessons learnt from this first phase of the project, disseminate information necessary to formalize acceptance and closure of the first phase, and to outline the vision and mission for the next phase of the project, i.e. the operational phase of the CNSS. Key deliverables and major risks for mitigation were also outlined to ensure the project remains on track.

2.2 Operational model

In order to leverage on existing resources, South Africa's National Skills Development Strategy [5] calls for the promotion of Partnerships between employers, public education institutions (Further education and training colleges, universities, universities of technology), private training providers and SETAs (Sector Education and Training Authorities) so that the integration of education and training becomes a reality experienced by all South Africans. This requirement formed part of the Strategy for the establishment of the CNSS. Consequently, a call for proposals was issued to academic institutions, including other relevant institutions for partnering with the NNR in addressing the challenges faced by the NNR. A number of institutions submitted proposals for partnering with the NNR on the CNSS project. The proposals were evaluated by the NNR according to the eligibility criteria which were

specified in the call for proposals issued to the institutions. All institutions that met the eligibility criteria were chosen as CNSS partner institutions.

The various institutions are allocated funding and assigned areas of focus and responsibility (i.e. by the program sponsor or sponsors) within the broader defined focus area, preferably within their individual areas of pre-existing competencies, capacities, expertise and specialisation in accordance with the Hub and spokes model (Figure 1). The Hub and Spokes model is recognized by the South African national research system and has been successfully used by the National Research Foundation (NRF) as a model for collaboration among academic institutions in the country. The first hub-and-spokes cluster in the energy sector has been established to contribute to the key strategic area of Energy Security with the Centre for Renewable and Sustainable Energy Studies at the University of Stellenbosch serving as the hub with three spokes focussing on wind, Solar thermal and solar photo-voltaic renewable energy respectively, located at five paired universities which includes Nelson Mandela Metropolitan University, University of Cape Town, Stellenbosch University, Fort Hare and University of Pretoria. According to this model, one institution is selected as the coordinating point (the Hub) and the rest are the Spokes. These hub-and-spokes are mainly expected to focus on applied research with a goal of ensuring that South Africa stays abreast with regard to the latest technologies and research in a specific focus area. A hub-and-spokes cluster may have any number of spokes and these may be added as the need arises, for example if new sub-focus areas not yet catered for are realized. The hub and spokes model selected for the operation of the CNSS was modified accordingly to take into account circumstances that are unique to the NNR and the nuclear industry. For example, in the modified model, the NNR retains responsibility, through a graded approach, for co-ordination of CNSS activities (for nuclear safety and security reasons), instead of delegating the co-ordination of CNSS entirely to the coordinating institution. Furthermore, the primary focus of CNSS activities is the safety and security of nuclear technologies rather than their operational efficiency.

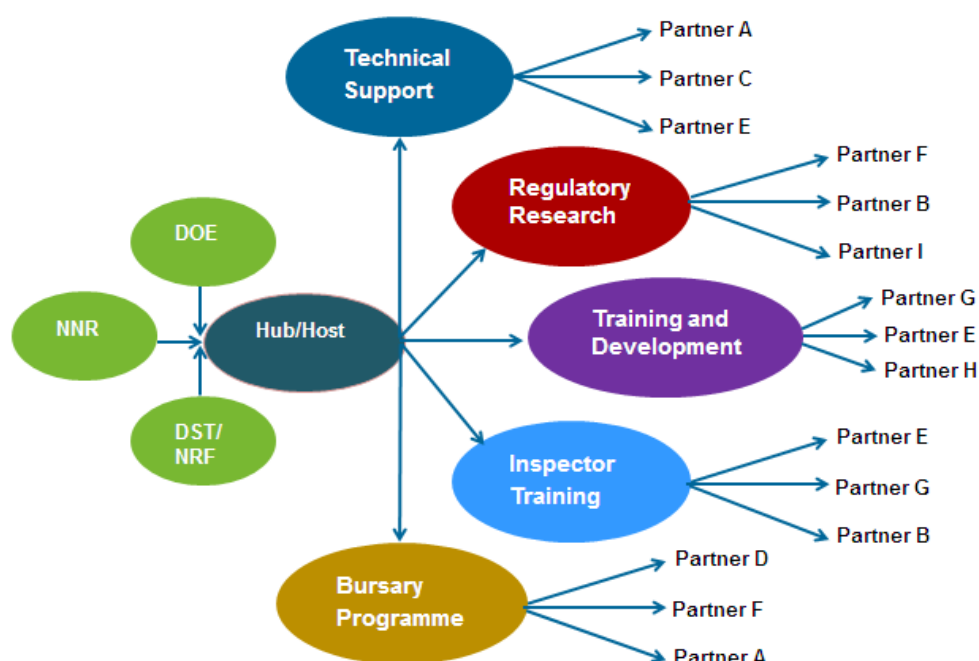


Figure 1: Hub and Spokes Model

3. Summary of project close-out report

Overall the project was executed successfully despite significant challenges which were encountered during the course of implementing the project as highlighted in the subsections below.

3.1 Evaluation of Scope Management

A Scope Management Plan which formed part of the CNSS Project Plan was used to manage the scope of the project and to mitigate against scope creep. Overall management of the scope was successful with only one significant change of scope during the entire project, i.e. the NNR initially held discussions with a single institution interested in partnering with the NNR regarding the possible funding of the construction of facilities for purposes of hosting the CNSS. However, after undertaking a cost benefit analysis, several other institutions were invited to participate through a formal competitive bidding process. This lowered the overall cost of implementing the project.

3.2 Evaluation of Time Management and Project Schedule

A Project Schedule was developed as part of the Project Plan to monitor the project progress. However, the schedule failed to take into account other risks and external factors beyond the control of the project team which would later have a negative impact on the project schedule. For example, during October 2015, the project went behind schedule due to a nationwide strike action which affected universities which were meant to participate in a formal competitive bidding process for the provision of hosting facilities for the CNSS. This had a domino effect on subsequent deliverables and resulted in a net delay in the delivery of the project of about three months.

3.4 Evaluation of Cost Management

Project cost management formed part of the overall Project Plan. Costs for various activities and the overall budget for the project was determined at project planning stage to provide baseline estimates against which to monitor project costs. As the project was executed by mainly utilizing internal human resource capital, and due to the matrix structure of the NNR, it is not possible to accurately determine the total human resource costs that supported the delivery of the project. Nevertheless, the project was completed within budget.

3.5 Evaluation of Quality Management

A Quality Management Plan which formed part of the CNSS Project Plan was used to ensure high quality of project outputs. As part of the plan the project team involved at least one international consultant with extensive experience in the nuclear industry and the application of project management standards in order to execute the project in accordance with international project management practices and to meet global standards. Working with the Project Management Office, the consultant assisted the project management team to adhere to the correct application of standard project management practices in all aspects of the project, including contracting, organization of work and workshops, Quality and Safety Assurance. The Guide called the Project Management Body of Knowledge (PMBOK®Guide) was used as a project management standard to ensure quality management throughout the project.

3.6 Evaluation of Human Resources Management

A Human Resource Plan which formed part of the CNSS Project Plan was used to guide the assignment of personnel to the project. As part of the plan, the NNR appointed an internal team whose membership was drawn from various divisions of the NNR to work with the international consultant. The team possessed the necessary knowledge and provided essential input to the project. However, there were some challenges that needed to be overcome during the course of the project. For example, the international consultant was only available for two weeks a month. This meant that some activities

had to be synchronized with his availability. At some point during the project one member who had sufficient knowledge of the project resigned. The matrix organizational structure of the NNR posed its own challenges as the staff dedicated to the project had other responsibilities. Nevertheless, suitable measures were put in place to mitigate against all these challenges leading to overall success of the project.

3.7 Evaluation of Communication Management

A Communication Plan which formed part of the CNSS Project Plan was used to guide project execution, project control, and to facilitate communication among stakeholders. A Project Dashboard tool (a Microsoft Excel application tool) was designed and made available by PMO to communicate general and specific details related to project progress. Steering committee meetings were also held at least once a month or as necessary in order to communicate project progress and to resolve key issues. Internal tools such as the Intranet, SharePoint and Outlook were also used to facilitate communication. The Chief Executive Officer (CEO) of the NNR also gave regular feedback on project progress as part of the CEO's feedback staff meetings.

3.8 Evaluation of Risk and Issue Management

A risk matrix was developed as part of the CNSS Project Plan to mitigate against foreseeable risks likely to be encountered during project execution. Although this exercise was useful, as already highlighted in sub-section 3.2, the risk matrix developed failed to take into account other external factors beyond the control of the project team which would later have a negative impact on the project schedule.

3.9 Evaluation of Procurement Management

NNR internal policies and processes were adhered during procurement of all services related to the project. Working with Supply Chain Management (SCM), the Project Team prepared bids documents, request for proposals documents, undertook bid evaluations and submitted evaluation reports for approval by various bid adjudication committees, in accordance with SCM processes. All important documents were signed-off and filed according to the NNR's Document Control system requirements.

4. Lessons Learnt

Key lessons learnt from the project are highlighted in the subsections below.

4.1 Project Organization

The project was executed by an internal team whose membership was drawn from various divisions of the NNR. This approach ensured that there was direct ownership of project inputs, processes and outcomes by staff. It also facilitated dialogue between NNR staff and the project team. The project team also consisted of one international consultant with extensive experience in the nuclear industry and the application of project management standards. This ensured that the project was executed in accordance with international project management practices and met global standards.

4.2 Project Schedule

The Project was completed slightly over schedule by approximately three months, with a duration of just over two years from the kick-off meeting of the project to the launch ceremony of the CNSS. As the project was executed by mainly utilizing internal resources it was also completed on budget.

4.3 Collaboration and networking

The NNR did not have the entire infrastructure, including skilled and trained human resources, necessary for the implementation of the project. However, the potential of the project to support the mandates of several government departments, including academic and research institutions, made it possible for the NNR to seek opportunities of cooperation in order to optimise the use of resources. Participation in the ECAP initiative; as well as the SAN-NEST Project provided the NNR with the right platform to identify key institutions to partner with as part of cooperative agreements and the correct tools to use for this project. The use of appropriate project management tools facilitated the development of the Strategy; as well as the management of knowledge generated during the project.

4.4 Funding

The CNSS project, once completed, will lead to diversification of the NNR's organizational structure into further programmes and sub-programmes that are not currently provided for in the NNR budget. The cost of programmes and activities that cannot be accommodated within the current NNR budget will have to be funded/co-funded by alternative mechanisms. Since the NNR had never engaged in a similar project, developing a funding model for implementation of the project proved to be a challenge. As a result the project team conducted research and undertook two study tours to gather lessons learnt from other regulators.

5. Vision, Mission and Values for Operational Phase

The vision of the CNSS is to be a world-class Centre for Nuclear Safety and Security on the African continent. The CNSS mission is to establish capabilities and pursue excellence in offering Education and Training, Research and Development, Technical Support and Expertise related to Nuclear Safety and Security in order to improve regulatory practices in South Africa, including the African region. The CNSS is an NNR owned Centre which is positioned within the Faculty of Engineering & Information Technology and the larger community of the University of Pretoria. Its operational model is based on a collaboration or partnership model (referred as the hub and spokes model) with other local and international academic institutions, as well as other relevant organizations. Due to this the CNSS embraces the values enshrined in the strategic plans of all its partner organizations. Furthermore, being a nuclear technical centre which is founded on the application of engineering and scientific principles from many disciplines, the CNSS values a symbiotic relationship and collaboration across multiple disciplines, as well as between Academic Institutions and Industry.

6. Plan and Strategic Focus Areas for Operational Phase

The focus of CNSS is on sharing and gaining access to global good practice, experience and information about nuclear safety and security by undertaking various activities which has an impact on the following:

6.1 Establish capabilities in Nuclear Regulatory Research and Development

This involves establishing capabilities for CNSS to undertake research in nuclear safety and security by creating collaborations with existing and accredited research institutions involved in similar initiatives, extending the boundaries of knowledge, venturing into new frontiers of knowledge, innovation and scholarship.

6.2 Establish capabilities in Nuclear Education and Training

This deals with establishing capabilities for CNSS to undertake education and training activities in nuclear safety and security by creating collaborations with existing and accredited education and training institutions, maintaining and strengthening existing education and training programs as well as developing new programs. This activity addresses both the production of graduates who are

international scholars and capable of addressing national imperatives of infrastructure development and reduction of social inequalities, as well as continuous professional development of nuclear industry employees through short term courses.

6.3 Establish capabilities in providing Nuclear Technical Support and Expertise

This deals with establishing capabilities for CNSS to provide technical services and expertise in nuclear safety and security by entering into short term and ad-hoc contract agreements with existing and accredited professional service providers, relevant institutions as well as external technical support organizations. The ultimate objective is for the CNSS to contribute to the creation and development of small medium enterprises such that the CNSS has a symbiotic and win-win partnership with the nuclear Industry in South Africa and internationally.

7. Project Organization and Risks

The implementation of the operational phase of the project is led by the CNSS Director who report directly to the CEO. In order to accomplish activities planned for the operational phase, the matrix organisational system at the NNR will be used and resources will be drawn from the various divisions to be complemented by resources from external service providers and short term appointments.

All risks identified for this project are recorded in the risk management register for the CNSS Project. The register is updated as and when new issues emerge. The initiative to establish the CNSS stemmed from the need to address existing capacity issues at the NNR and other national challenges, however there is a risk that the project may be construed as providing an indication of the scale of activities being undertaken to support the country's nuclear expansion plans.

8. Conclusions

This paper has presented valuable lessons learnt from the completion of the establishment phase of the CNSS project, disseminated information regarding the process followed for establishing the Centre, presented a summary the project close-out report in order to formalize acceptance and closure of this phase of the project, and outlined the vision, mission and values for the operational phase of the CNSS. Project organization for the operational phase of the project, key deliverables and major risks for mitigation were also outlined to ensure that subsequent phases of the project remain on track. The collective will, efforts and cooperation of NNR staff (both at operational and management levels) guarantee the realization of the operational phase of the CNSS project.

References

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