



MISSION REPORT
ON
THE PHASE 1 FOLLOW-UP INTEGRATED NUCLEAR INFRASTRUCTURE
REVIEW (INIR) MISSION

Counterpart:

Ghana Nuclear Power Programme Organization (GNPPO)

21–24 October 2019

Accra, Ghana

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EXECUTIVE SUMMARY

The International Atomic Energy Agency (IAEA) conducted a Phase 1 Integrated Nuclear Infrastructure Review (INIR) mission in Ghana in January 2017. In December 2018, Ghana requested the IAEA to conduct a follow-up mission to review the status of implementation of the recommendations and suggestions.

The Phase 1 follow-up INIR mission was conducted from 21–24 October 2019. Interviews were conducted over three days. During the interviews, the Ghanaian counterparts provided further explanations and responded to the follow-up INIR team’s questions on the content of the action plan progress report and supporting documentation that Ghana sent to the IAEA in advance of the follow-up mission.

Of the twelve recommendations and eight suggestions made during the 2017 Phase 1 INIR mission, the follow-up INIR team concluded that Ghana has completed eight of the recommendations and six of the suggestions. The remaining four recommendations and two suggestions require further attention and action.

The follow-up INIR team concluded that Ghana has completed the studies needed for the government to be able to make a knowledgeable commitment to a nuclear power programme. Ghana has also completed its assessment of the adequacy of its national legal framework and has made plans to proceed with the necessary amendments.

The follow-up INIR team concluded that Ghana has begun preparing itself for Phase 2 activities including discussions with vendors and other potential partners. Further work is needed in areas such as government funding, stakeholder involvement planning, fuel cycle options for the first nuclear power plant (NPP) and goals for local participation.

1. INTRODUCTION

The International Atomic Energy Agency (IAEA) conducted a Phase 1 Integrated Nuclear Infrastructure Review (INIR) mission in Ghana from 16–23 January 2017. That mission concluded that Ghana had made considerable progress in the development of its nuclear power infrastructure. It had established effective mechanisms to involve a wide and comprehensive range of national stakeholders in the relevant activities. Ghana had already completed or initiated a significant number of studies, but some studies on key issues remained to be completed in order for the government to be able to make a knowledgeable commitment to a nuclear power programme.

In order to assist Ghana in making further progress in its infrastructure development, the INIR team made 12 recommendations and 8 suggestions, several related to the planning for Phase 2 activities.

In a letter dated 5 December 2018, the Ghana Atomic Energy Commission (GAEC) writing on behalf of the Government of Ghana and the Ghana Nuclear Power Programme Organization (GNPPO) requested the IAEA to conduct a Phase 1 follow-up INIR Mission in Ghana. The GNPPO coordinated the preparation of an action plan progress report. The action plan progress report and supporting documents were sent to the IAEA in October 2019. The Phase 1 follow-up INIR mission was conducted from 21–24 October 2019.

The Honourable Deputy Minister of Energy and Chairman of the GNPPO Mr William Owuraku Aidoo provided opening remarks for the follow-up INIR mission. On the Ghanaian side, the mission was coordinated by Mr Seth Kofi Debrah, Acting Director of the Nuclear Power Institute. The follow-up INIR team was led by Mr Anthony Stott of the IAEA Nuclear Infrastructure Development Section. The full list of participants is included in Appendix 2 to this report.

The follow-up INIR mission and associated activities were funded through a combination of a cost-sharing contribution from the Government of Ghana and funds from the IAEA Technical Cooperation project GHA2004 *Establishing Nuclear Power Infrastructure for Electricity Generation – Phase IV*.

2. OBJECTIVES OF THE FOLLOW-UP MISSION

The main objectives of the follow-up INIR mission were to:

- Assess the status of implementation of the recommendations and suggestions provided by the Phase 1 INIR mission in 2017; and
- Identify areas needing further work to fully implement the recommendations and suggestions.

3. SCOPE OF THE FOLLOW-UP MISSION

The follow-up INIR mission did not provide new recommendations or suggestions but only reviewed the status of implementation of the recommendations and suggestions from the Phase 1 INIR mission conducted in 2017. Those recommendations and suggestions related to the following infrastructure issues:

- National position;
- Nuclear safety;
- Funding and financing;
- Legal framework;
- Electrical grid;
- Human resource development;
- Stakeholder involvement;
- Site and supporting facilities;

- Environmental protection;
- Emergency planning;
- Nuclear fuel cycle;
- Industrial involvement.

4. WORK DONE

Prior to the follow-up INIR mission, the INIR team reviewed the action plan progress report prepared by Ghana as well as the supporting documentation. The INIR team also received input from staff of other IAEA departments.

The follow-up INIR mission was conducted from 21–24 October 2019. The meetings were held at the premises of the Bui Power Authority/Nuclear Power Ghana (NPG) in Accra in a cooperative and open atmosphere. The mission was coordinated on the Ghanaian side by the GNPPO with the participation of several organizations involved in the nuclear power programme and corresponding infrastructure development activities. The full list of participants is included in Appendix 2 to this report.

The main interviews were conducted over three days. During the interviews, the Ghanaian counterparts provided further explanations and responded to the follow-up INIR team's questions on the content of the action plan progress report and supporting documentation.

A preliminary draft report was prepared by the follow-up INIR team and discussed with the counterparts. The follow-up mission conclusions were presented to representatives of the Government of Ghana and the GNPPO in an exit meeting on 24 October 2019, and the preliminary draft report was delivered to the counterparts.

The main conclusions of the follow-up INIR mission are summarized in Section 5 and the evaluation results are presented in tabular form in Section 6. Appendix 1 includes the review observations and evaluation results.

5. MAIN CONCLUSIONS

The follow-up INIR team concluded that Ghana has completed eight of the twelve recommendations and six of the eight suggestions made during the 2017 Phase 1 INIR mission. The remaining four recommendations and two suggestions require further attention and action.

The follow-up INIR team concluded that Ghana has completed the studies needed for the government to be able to make a knowledgeable commitment to a nuclear power programme. Ghana has also completed its assessment of the adequacy of its national legal framework and has made plans to proceed with the necessary amendments.

The follow-up INIR team concluded that Ghana has begun preparing itself for Phase 2 activities including discussions with vendors and other potential partners. Further work is needed in areas

such as government funding, stakeholder involvement planning, fuel cycle options for the first NPP and goals for local participation.

The evaluation results for the Phase 1 follow-up INIR mission, including a description of actions taken by Ghana since the 2017 INIR mission for each recommendation and suggestion, are included in Appendix 1 to this report.

6. EVALUATION RESULTS FOR PHASE 1 FOLLOW-UP

For the purposes of the follow-up INIR mission, the following definitions are used:

No action taken:

The recommendation or suggestion has not been taken into account or work on this issue has not started yet.

Work in progress:

Actions have been taken following the recommendation/suggestion in the INIR report but further work is required.

Completed:

The actions taken have fully addressed the recommendation/suggestion.

1. National position	Phase 1		
Recommendations/Suggestion	Status		
	No action taken	Work in progress	Completed
R-1.3.1 Ghana should complete the update of its energy planning studies and ensure they encompass the projected timeframe in the Roadmap for Ghana Nuclear Power Programme.			X
R-1.3.2 Ghana should complete the outstanding Phase 1 studies and compile the comprehensive report required for the government to make a knowledgeable commitment to a nuclear power programme.			X
S-1.2.1 Ghana is encouraged to ensure that the GNPPO has appropriate financial resources to complete all remaining Phase 1 activities.			X

2. Nuclear safety	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
S-2.1.1 The GNPPPO is encouraged to consider mechanisms to ensure that all GNPPPO Board members understand nuclear safety and its implications.			X
3. Management	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			
4. Funding and financing	Phase 1		
Recommendations/Suggestions	Status		
	No action taken	Work in progress	Completed
R-4.1.1 The GNPPPO should complete the work to estimate the funding required for Ghana's ministries and organizations to develop the national nuclear power infrastructure in Phase 2 and Phase 3.		X	
S-4.1.1 The GNPPPO is encouraged to identify how adequate funds for radioactive waste and spent fuel management and decommissioning will be assured.			X
R-4.2.1 The GNPPPO should analyse and develop proposals for NPP financing options, assessing their viability and their implications for Ghana.			X
S-4.2.1 The GNPPPO is encouraged to continue its work to identify potential investment by industrial consumers in its nuclear power programme.			X

5. Legal framework	Phase 1		
Suggestions	Status		
	No action taken	Work in progress	Completed
S-5.2.1 Ghana is encouraged to further assess Act 895 and plan for its amendment as necessary to provide for specific matters that may still need to be addressed.			X
S-5.3.1 Ghana is encouraged to complete its assessment of the adequacy of other national laws that may affect the nuclear power programme and to prepare a plan for submitting required amendments to the national approval process.			X
6. Safeguards	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			
7. Regulatory framework	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			
8. Radiation protection	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			
9. Electrical grid	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-9.1.1 Ghana should complete its study of the national and West African grid systems, covering all relevant requirements for nuclear power.			X
10. Human resource development	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-10.2.1 The GNPPPO should complete its Phase 1 work on national human resource development planning and submit a summary document to the GNPPPO Board.			X

11. Stakeholder involvement	Phase 1		
Recommendations	Status		
	No action taken	Work in progress	Completed
R-11.1.1 The GNPPPO should develop a plan to implement its Stakeholder Engagement Strategy with a schedule of identified activities, responsibilities and required resources.		X	
R-11.1.2 Ghana should conduct a survey to determine the public's knowledge of and receptiveness to nuclear power.			X
12. Site and supporting facilities	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-12.1.1 The GNPPPO should complete its study to identify NPP candidate sites.			X
13. Environmental protection	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-13.2.1 The GNPPPO should complete the review of Ghana's existing environmental protection framework.			X
14. Emergency planning	Phase 1		
Suggestion	Status		
	No action taken	Work in progress	Completed
S-14.1.1 Ghana is encouraged to review and clarify as necessary the interfaces between the National Disaster Management Plan (NDMP), the National Nuclear and Radiological Emergency Response Plan (NNRERP) and the National Chemical, Biological, Radiological and Nuclear Emergencies Response Plan (NCBRN-ERP).		X	
15. Nuclear security	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			

16. Nuclear fuel cycle	Phase 1		
Recommendation	Status		
	No action taken	Work in progress	Completed
R-16.1.1 The GNPPPO should consider a broader range of nuclear fuel cycle options for the first NPP as an input to the development of a national nuclear fuel cycle policy.		X	
17. Radioactive waste management	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			
18. Industrial involvement	Phase 1		
Recommendation/Suggestion	Status		
	No action taken	Work in progress	Completed
R-18.1.1 The GNPPPO should develop a policy for national industrial involvement in the nuclear power programme.		X	
S-18.1.1 The GNPPPO is encouraged to engage potential NPP suppliers to better understand where Ghanaian industry could participate and to develop awareness of the required quality standards and procedures for qualification of contractors.		X	
19. Procurement	Phase 1		
There were no recommendations or suggestions in this area in the 2017 INIR Mission.			

APPENDIX 1: REVIEW OBSERVATIONS AND EVALUATION RESULTS OF THE PHASE 1 FOLLOW-UP

1. National position

2017 Mission Recommendation	
R-1.3.1	Ghana should complete the update of its energy planning studies and ensure they encompass the projected timeframe in the Roadmap for Ghana Nuclear Power Programme.

Action taken since the 2017 INIR mission

An electricity assessment for Ghana's nuclear power programme spanning the period 2018 to 2048 was conducted by a team made up of the Ghana Atomic Energy Commission, the Energy Commission and the Volta River Authority. The draft report was finalized in October 2019.

Representatives of the Energy Commission informed the follow-up INIR team that the assumptions, for example regarding the growth in electricity demand and the incorporation of nuclear power under certain policy scenarios, used in this assessment are consistent with those used by the Energy Commission in the development of the Integrated Power System Master Plan for Ghana and the Strategic National Energy Plan (SNEP).

Recommendation status: Completed

2017 Mission Recommendation	
R-1.3.2	Ghana should complete the outstanding Phase 1 studies and compile the comprehensive report required for the government to make a knowledgeable commitment to a nuclear power programme.

Action taken since the 2017 INIR mission

The GNPPPO has worked with relevant stakeholders to undertake or update a number of studies since January 2017. These included an energy planning assessment, a nuclear power specific grid assessment, an assessment of resource requirements/cost estimates for the nuclear power programme, a study of NPP financing options and their viability, funding options for back end liabilities, a pilot public perception survey, siting criteria and identification of candidate sites, a review of Ghana's environmental protection framework, a review of the Energy Commission regulations on local content and local participation in the electricity supply industry, a survey related to potential industrial participation in NPP projects, a review of national laws potentially impacting the nuclear power programme, a human resource plan for the nuclear power programme and nuclear fuel cycle policy guidance.

The Programme Comprehensive Report (PCR) has been drafted and contains eight sections: Introduction to the Ghana Nuclear Power Programme; Power Sector Assessment; Legal and

Regulatory Framework; Nuclear Safety, Security and Safeguards; Technical Considerations; National Participation; Cost and Economic Rationale of Nuclear Power Development; Conclusions and Recommendations. The follow-up INIR team was informed that the GNPPO plans to present the PCR to its Board for endorsement prior to submission to the Government by the end of 2019.

Recommendation status: Completed

2017 Mission Suggestion	
S-1.2.1	Ghana is encouraged to ensure that the GNPPO has appropriate financial resources to complete all remaining Phase 1 activities.

Action taken since the 2017 INIR mission

The GNPPO has received support from the government and various government organizations to complete remaining Phase 1 activities. For example, in February 2019 the Ministry of Finance allocated funding to the Ministry of Environment, Science, Technology and Innovation to support the development of Ghana’s nuclear power programme.

Ghana Atomic Energy Commission (GAEC), Volta River Authority (VRA), Bui Power Authority (BPA), Ghana Grid Company Limited (GRIDCo) and other stakeholders have also provided human and/or financial resources for the completion of various studies.

Suggestion status: Completed

2. Nuclear safety

2017 Mission Suggestion	
S-2.1.1	The GNPPO is encouraged to consider mechanisms to ensure that all GNPPO Board members understand nuclear safety and its implications.

Action taken since the 2017 INIR mission

The GNPPO has been using various mechanisms to enhance the understanding of GNPPO Board members on nuclear safety and its implications. These include participation in meetings, workshops, conferences, expert missions and visits related to nuclear power in other countries. The follow-up INIR team was informed that each GNPPO Board member, including those appointed since the 2017 INIR mission, has participated in one or more of these events. The GNPPO also shares information — including on nuclear safety — with its Board members through monthly newsletters and a WhatsApp group.

The follow-up INIR team was informed that GNPPO Board members have demonstrated their understanding of nuclear safety during meetings and discussions on issues with safety implications (e.g. on NPP siting, on the importance of hiring competent staff to ensure nuclear

safety etc.) and by making presentations with nuclear safety-related content to various stakeholders.

Suggestion status: Completed

3. Management

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

4. Funding and financing

2017 Mission Recommendation	
R-4.1.1	The GNPPPO should complete the work to estimate the funding required for Ghana's ministries and organizations to develop the national nuclear power infrastructure in Phase 2 and Phase 3.

Action taken since the 2017 INIR mission

The GNPPPO has developed work effort estimates and the associated cost estimates for NPG, the Nuclear Regulatory Authority (NRA) and the GNPPPO across all three phases of nuclear power infrastructure development. The study estimated a level of effort in person-weeks for activities for each organization related to all 19 infrastructure issues. Actual costs were estimated for each activity using UN professional fees for international consultants and approved professional fees established by the Ministry of Works and Housing.

The GNPPPO has also estimated the cost to connect a 1000 MWe NPP at each candidate site to the electrical grid in 2030. This was done with an analogous estimating technique using prices from similar projects undertaken recently on an international competitive bidding basis to cost the project for both substation works and associated transmission line works.

The GNPPPO's work effort and cost estimates did not include costs for other organizations with responsibilities for nuclear power infrastructure development such as the Environmental Protection Agency (EPA) and various organizations with responsibilities related to emergency preparedness and response (EPR).

The follow-up INIR team was informed that the government organizations involved in the programme would continue to fund their costs related to nuclear power infrastructure through their annual institutional budgetary allocations. In addition, the NPG Board has resolved to issue shares through a private placement offer to raise capital for Ghana's nuclear programme. A proposal to this effect has been developed and is planned to be submitted to several parastatal enterprises.

Recommendation status: Work in progress

2017 Mission Suggestion	
S-4.1.1	The GNPPPO is encouraged to identify how adequate funds for radioactive waste and spent fuel management and decommissioning will be assured.

Action taken since the 2017 INIR mission

The GNPPPO has approved a technical study on options for funding radioactive waste and spent nuclear fuel management and decommissioning which includes information about the practices in and experiences of several countries. The study makes a recommendation for how to assure funding for each aspect.

The follow-up INIR team was informed that relevant stakeholder organizations including NRA, the central bank of Ghana, the Ministry of Finance and the Ministry of Energy were engaged during the study.

Suggestion status: Completed

2017 Mission Recommendation	
R-4.2.1	The GNPPPO should analyse and develop proposals for NPP financing options, assessing their viability and their implications for Ghana.

Action taken since the 2017 INIR mission

A technical study has been conducted by the GNPPPO to analyse various financing options for Ghana's first NPP. The study has been approved by the GNPPPO Board. Preferred options were recommended based on implications, appropriateness, feasibility and favourability in the Ghanaian context.

The GNPPPO has proposed several strategies the government could pursue to reduce financial risk in a future NPP project.

Recommendation status: Completed

2017 Mission Suggestion	
S-4.2.1	The GNPPPO is encouraged to continue its work to identify potential investment by industrial consumers in its nuclear power programme.

Action taken since the 2017 INIR mission

The GNPPPO considered this concept and its implications in detail during its technical study on financing options for Ghana's nuclear power project and determined that the amount of time needed to engage such consumers to raise finance and conclude contracts would be prohibitive,

and that the country’s current level of industrialization and electricity market structure would constrain pursuit of this type of investment.

Suggestion status: Completed

5. Legal framework

2017 Mission Suggestion	
S-5.2.1	Ghana is encouraged to further assess Act 895 and plan for its amendment as necessary to provide for specific matters that may still need to be addressed.

Action taken since the 2017 INIR mission

The GNPPPO legal team conducted an assessment of areas of Act 895 that require amendment in relation to the nuclear power programme. The follow-up INIR team was informed that the process for amending the law is already underway, starting with a stakeholder engagement phase to ensure that all identified issues — including those not related to nuclear power — will be addressed in a single amendment process. Subsequent steps include policy approval from the cabinet, drafting by the attorney general, reapproval by the cabinet and consideration and approval by the parliament.

The follow-up INIR team was informed that NRA plans to have the proposed amendment sent to parliament by the end of 2020, by which time the Act will have been in force for five years.

Suggestion status: Completed

2017 Mission Suggestion	
S-5.3.1	Ghana is encouraged to complete its assessment of the adequacy of other national laws that may affect the nuclear power programme and to prepare a plan for submitting required amendments to the national approval process.

Action taken since the 2017 INIR mission

The GNPPPO completed its assessment of other national laws that may affect the nuclear power programme and determined that the Environmental Protection Agency Act (Act 490) needs to be amended. The follow-up INIR team was informed that EPA is aware of this need and is engaged on the issue through regular meetings of the GNPPPO Board.

The follow-up INIR team was informed that it is planned that Act 490 will be consequentially amended as part of the planned amendment of Act 895 (see **S-5.2.1**).

Suggestion status: Completed

6. Safeguards

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

7. Regulatory framework

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

8. Radiation protection

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

9. Electrical grid

2017 Mission Recommendation	
R-9.1.1	Ghana should complete its study of the national and West African grid systems, covering all relevant requirements for nuclear power.

Action taken since the 2017 INIR mission

GNPPO has conducted a preliminary NPP grid integration study covering the capabilities of the existing grid in relation to available NPP technology including the grid's ability to reliably take an NPP's base load output, its ability to withstand a loss of the plant's output and its ability to reliably supply off-site power during outages and in an emergency.

The following were considered in the study:

- Anticipated future growth of grid capacity;
- Load flow analysis including transmission losses;
- Short circuit analysis;
- Contingency studies; and
- Transient and dynamic studies to determine the effect of loss of either the NPP or any other major power plant on the grid.

The follow-up INIR team was informed that this study took into account the existing interconnections with neighbouring countries and existing contracts to supply neighbouring countries; for example, VRA has fixed long term contracts with utilities in Burkina Faso, Togo and Benin. The team was also informed that significant enhancements are already underway to synchronize the three networks in the West African Power Pool (WAPP) into a single network and that this work will be completed well in advance of the planned introduction of nuclear power in Ghana.

Recommendation status: Completed

10. Human resource development

2017 Mission Recommendation	
R-10.2.1	The GNPPO should complete its Phase 1 work on national human resource development planning and submit a summary document to the GNPPO Board.

Action taken since the 2017 INIR mission

A national human resource plan for the nuclear power programme has been developed with input from all key organizations and was approved by the GNPPO Board in June 2019.

The follow-up INIR team was informed that several universities in Ghana plan to introduce nuclear related courses into their existing degree programmes, including through cross-collaboration with foreign universities. The GNPPO is also engaging with the Council on Technical and Vocational Education and Training (COTVET) to raise awareness about the types of programmes and facilities needed to prepare skilled artisans and technicians to support the nuclear power programme.

Recommendation status: Completed

11. Stakeholder involvement

2017 Mission Recommendation	
R-11.1.1	The GNPPO should develop a plan to implement its Stakeholder Engagement Strategy with a schedule of identified activities, responsibilities and required resources.

Action taken since the 2017 INIR mission

The follow-up INIR team was informed that a high-level stakeholder involvement plan for the period 2017–2019 was developed after the INIR Phase 1 mission in January 2017, which included a set of generic activities to be implemented in four areas: Engagements, Public Education and Awareness Creation; Communication; Surveys; and Training. The Nuclear Power Institute (NPI) Annual Reports for 2017 and 2018 describe certain stakeholder engagement activities undertaken during those years.

The follow-up INIR team was informed that the GNPPO is planning to develop more detailed schedules of specific activities to address issues identified by surveying public opinion and implement the GNPPO's Stakeholder Engagement Strategy.

Recommendation status: Work in progress

2017 Mission Recommendation	
R-11.1.2	Ghana should conduct a survey to determine the public's knowledge of and receptiveness to nuclear power.

Action taken since the 2017 INIR mission

The GNPPPO, in collaboration with the Ghana Statistical Service (GSS), conducted a pilot survey in 2018 on the perception and receptiveness of the public to nuclear power. It addressed several issues including knowledge of and perceived safety of nuclear power, acceptance of an NPP near the community, concerns about or support for the inclusion of nuclear power in the national energy mix and willingness to work in an NPP.

The follow-up INIR team was informed that a national survey is planned in 2020, incorporating lessons learned from the pilot survey.

Recommendation status: Completed

12. Site and supporting facilities

2017 Mission Recommendation	
R-12.1.1	The GNPPPO should complete its study to identify NPP candidate sites.

Action taken since the 2017 INIR mission

The GNPPPO adopted a staged approach process for the determination of candidate sites. The first stage, a survey of the entire country using high-level general criteria, resulted in the identification of regions of interest. The second stage, using more specific criteria, led to the determination of 14 potential sites.

Desktop studies and field investigations were conducted in the third stage to screen the 14 potential sites using exclusionary and discretionary criteria related to geology, seismology and geotechnical hazards, hydrology, population and emergency planning, environment, land and infrastructure, human induced events, meteorology and atmospheric dispersion. Four candidate sites were identified.

Recommendation status: Completed

13. Environmental protection

2017 Mission Recommendation	
R-13.2.1	The GNPPPO should complete the review of Ghana's existing environmental protection framework.

Action taken since the 2017 INIR mission

A team from NRA, NPI, EPA, VRA and GAEC conducted a review of Ghana's environmental protection framework with regards to its suitability for a nuclear power project. The review identified gaps and conflicts related to the need to ratify and implement some international legal instruments in the field of environmental protection, to revise environmental impact assessment (EIA) guidelines and procedures and to develop memoranda of understanding between key organizations.

The team developed recommendations and an action plan identifying the key responsible organizations to address each issue. The follow-up INIR team was informed that the implementation of this action plan is planned to begin in 2020 and will be overseen by an interagency committee.

Recommendation status: Completed

14. Emergency planning

2017 Mission Suggestion	
S-14.1.1	Ghana is encouraged to review and clarify as necessary the interfaces between the National Disaster Management Plan (NDMP), the National Nuclear and Radiological Emergency Response Plan (NNRERP) and the National Chemical, Biological, Radiological and Nuclear Emergencies Response Plan (NCBRN-ERP).

Action taken since the 2017 INIR mission

A revision of the National Nuclear and Radiological Emergency Response Plan (NNRERP) is ongoing. The revision will reflect recent national developments and address EPR considerations for nuclear power and for nuclear security events in a manner consistent with GSR Part 7. This revision is planned to be completed by the end of June 2020.

A further review will then address the linkages and consistency between the NNRERP, the National Disaster Management Plan (NDMP) and the National Chemical, Biological, Radiological and Nuclear Emergencies Response Plan (NCBRN-ERP). This work and the final approval of the NNRERP by the National Disaster Management Organization (NADMO) are expected to be completed by December 2020.

The follow-up INIR team was informed that the review of the three plans is being done under NADMO by the National Technical Advisory Committee for Nuclear and Radiological Disasters, which includes among other stakeholders NADMO, the National Security Secretariat and NRA.

Suggestion status: Work in progress

15. Nuclear security

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

16. Nuclear fuel cycle

2017 Mission Recommendation	
R-16.1.1	The GNPPPO should consider a broader range of nuclear fuel cycle options for the first NPP as an input to the development of a national nuclear fuel cycle policy.

Action taken since the 2017 INIR mission

The GNPPPO has made updates to its draft nuclear fuel cycle policy guidance and nuclear fuel cycle implementation strategy documents since the 2017 INIR mission and continues to study the implications of various front end and back end nuclear fuel cycle options for the first NPP.

Recommendation status: Work in progress

17. Radioactive waste management

There were no recommendations or suggestions in this area in the 2017 INIR Mission

18. Industrial involvement

2017 Mission Recommendation	
R-18.1.1	The GNPPPO should develop a policy for national industrial involvement in the nuclear power programme.

Action taken since the 2017 INIR mission

In 2019, the GNPPPO with the support of the GSS and the Association of Ghana Industries (AGI) conducted an appraisal of selected businesses to identify products, services and expertise that could potentially be used in an NPP project. In September 2019 the GNPPPO Board endorsed a report with recommendations for amending the existing Local Content and Local Participation Regulations for the Electricity Supply Industry (LI 2354 of 2017). The report included proposed targets in six areas for Ghanaian participation in both an initial and a second NPP project, using the results of the GNPPPO's local industry appraisal as a basis.

The follow-up INIR team was informed that the Government of Ghana prioritizes the implementation of local content regulations and has given it prominence in the Coordinated Programme of Economic and Social Development Policies.

In May 2019, the Electricity Supply Local Content and Local Participation Committee was inaugurated to help promote local participation in the electricity supply industry. The follow-up INIR team was informed that the GNPPPO’s recommendations would need to be submitted to this committee to initiate a process to update LI 2354.

The follow-up INIR team was further informed that a national policy regarding local content and local participation in the electricity supply industry is currently being developed and that inputs specific to the nuclear power programme are being considered as part of this process.

Recommendation status: Work in progress

2017 Mission Suggestion	
S-18.1.1	The GNPPPO is encouraged to engage potential NPP suppliers to better understand where Ghanaian industry could participate and to develop awareness of the required quality standards and procedures for qualification of contractors.

Action taken since the 2017 INIR mission

The follow-up INIR team was informed that the GNPPPO has engaged with potential NPP suppliers. Discussions with those suppliers regarding Ghanaian industry participation and its implications for an NPP project have been limited to date, but the follow-up INIR team was informed that GNPPPO plans to facilitate dialogue in this regard, including with local industries, the Association of Ghana Industry and the Ghana Institution of Engineering (GhIE) through the annual Ghana Industrial Summit and Expo (GISE).

Suggestion status: Work in progress

19. Procurement

There were no recommendations or suggestions in this area in the 2017 INIR Mission.

APPENDIX 2: LIST OF PARTICIPANTS

FOLLOW-UP INIR MISSION REVIEW TEAM	
Mr Anthony STOTT	Team Leader, IAEA
Mr Sean DUNLOP	Mission Coordinator, IAEA
Ms Itimad SOUFI	International Expert

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Ms Stella NTIWAA	Nuclear Power Ghana
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Mr Salifu ADDO	Energy Commission
Mr Isaac ENNISON	Energy Commission
Mr Robert SOGBADJI	Ministry of Energy

Ms Angelina MENSAH	Environmental Protection Agency
Ms Andriana N.K. NELSON	Environmental Protection Agency
Ms Bellona VITTOR-QUAO	Volta River Authority
Mr Adolf AWUA	Ghana Atomic Energy Commission
Ms Brigitte ARNUSOR	Ghana Atomic Energy Commission
Ms Akua Adomah ADDAI	Ghana Atomic Energy Commission
Ms Safakor Sui AKWAYENA	Ghana Atomic Energy Commission
Mr Franklin Nana ADDAI	Bui Power Authority

APPENDIX 3: REFERENCES

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APPENDIX 4: ABBREVIATIONS

BPA	Bui Power Authority
COTVET	Council on Technical and Vocational Education and Training
EPA	Environmental Protection Agency
GAEC	Ghana Atomic Energy Commission
GhIE	Ghana Institution of Engineering
GISE	Ghana Industrial Summit and Expo (GISE)
GNPPO	Ghana Nuclear Power Programme Organization
GRIDCo	Ghana Grid Company Limited
GSR	General Safety Requirements
GSS	Ghana Statistical Service
IAEA	International Atomic Energy Agency
INIR	Integrated Nuclear Infrastructure Review
LI	Legislative Instrument
NADMO	National Disaster Management Organization
NCBRN-ERP	National Chemical, Biological, Radiological and Nuclear Emergencies Response Plan
NDMP	National Disaster Management Plan
NNRERP	National Nuclear and Radiological Emergency Response Plan
NPG	Nuclear Power Ghana
NPI	Nuclear Power Institute
NPP	Nuclear power plant
NRA	Nuclear Regulatory Authority
PCR	Programme Comprehensive Report
SNEP	Strategic National Energy Plan
VRA	Volta River Authority
WAPP	West African Power Pool