ANALYSIS OF THE COMPETENCIES OF THE DEPARTMENT OF ENERGY NUCLEAR ENERGY PROGRAM IMPLEMENTATION ORGANIZATION (NEPIO) TECHNICAL WORKING GROUP IN COMPLIANCE WITH THE IAEA MILESTONE APPROACH

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[Abstract]

The study used Mixed Method Research Design to help Member States in planning the activities required in all phases in a new nuclear power program, and developing the competencies and capabilities required to start such activities; also, it aimed to address the competency gaps of the DOE NEPIO based on the IAEA Milestone Approach; the interventions taken by the DOE to address those competency gaps, and the respondents' feedback about the gaps such as lessons learned as a mechanism for promoting and encouraging experience sharing culture. Data and feedback for organizational effectiveness are analyzed using Quantitative Gap and Normal Probability Analysis; Descriptive with Hierarchical Cluster Analysis; and Quantitative Content Analysis. The Competency Gap based on this representation is present and that capacity building of Human Resource Development and Outsourcing are addressing it. The leadership part showed the importance of this study, which follows INIR report findings, where the application of the Knowledge Management Method of After-Action Review is needed to engage stakeholders. The highest priority for countries embarking on nuclear work in progress is safety. The lessons on safety perspectives as shown in the responses were lacking, but in the Knowledge Management system in this context, efficiency is measured by lessons documented over lessons used, and where it is essential of high reliability, nature, significance, and cost-effectiveness. Underlining the importance of the competency framework toward universalization and full implementation, leaders are conscious of their responsibility and take steps visibly, considering national conditions while protecting sensitive information, and contribute to strengthening and building confidence in the effectiveness of national nuclear infrastructure. In addition, it urgently needed national and international technical capabilities, relationships, and trust, where "capacities" must also be developed before a crisis through frequent engagement, including exercises such as competency assessment. Communicate more generously the results of missions that does not compromise the confidentiality of sensitive information, while assessing the reliability of the IAEA capacity-building models to the protection of the Filipino people, their property, the society, and the environment.

Keywords: Measurement Theory, IAEA Milestone Approach, Competence

Biographical notes: The author, Joefre P. Cerbolles, is a Chemical Engineer and has a Master's in Public Administration working at the Department of Energy – Geo-Scientific Research Fuel Testing Laboratory Division (GRFTLD). Current interest in Nuclear Governance and Security Non-Traditional Study.

1. Introduction

This study aims to measure the competencies of the Technical Working Group Head/s and Members of the Philippines Department of Energy Nuclear Energy Program Implementing Organization (PH DOE-NEPIO) on the first three of nineteen infrastructures 1. National Position 2. Safety 3. Management, that was based on the policy[1] issued by the entity and their participation on the Integrated Nuclear Infrastructure Review(INIR) by International Atomic Energy Agency(IAEA)[2]. Using a latent variable (planning and studying) approach in measurement theory [3], in the management approach using Hierarchical Cluster Analysis (HCA) of categorical variables for comparison to IAEA capacity building model and getting feedback from the lessons learned to relate to governance philosophies by latent content analysis, insights can be drawn, and policy recommendations based on the gaps can be provided.

This work follows a mixed method approach[4], competency gap calculation, an accounting of capacities to deliver a mandate made transparent on a micro level applicable to macro level. Clustering method of categorical variables compared to IAEA capacity building model[5], and After-Action Review (AAR) to analyze qualitative/latent content and comparing with existing body of literature as a proof of concept[6] based on its relation to governance philosophies[7]. And its significance is to empirically evaluate and confirm the IAEA competency framework of milestone approach model[8] using six variables[9] on a survey with Principal Component Analysis (PCA).

2. Methodology

Knowing the competency of the individual and group, is to determine the competency levels, the existing and competency requirement for a role [10].

The competency gap, δCI_{ER}, of an employee for a role is calculated from Equation (1)

$$\delta CI_{ER} = \sum_{j=1}^{p} \left[\left(C_{EL} - C_{RL}/_{3} \right) * (C_w)_J \right] \qquad (1)$$

The competency gap of a team in a specific competency is calculated using Equation (2)

$$\delta CL = \sum_{i=1}^{n} \left[C_{EL} - C_{RL}/_{3} \right]_i /n \qquad (2)$$

At organizational level workforce competency gap for a role is computed using Equation (3)

$$\delta CI = \sum_{i=1}^{n} \left(\sum_{j=1}^{p} \left[\left(C_{EL} - C_{RL}/_{3} \right) * (C_w)_J \right] \right) /n \qquad (3)$$

Ward's hierarchical clustering method is a minimum distance clustering that uses an analysis of variance approach to evaluate the distances between clusters it tries to reduce the Sum of Squares (SS) of any two clusters that could be formed at each step of the analysis[11]. While Principal Component Analysis used to reveal the hidden structure within the data sets to visually represent the relationships between samples and variables that provides insights into how measured variables cause samples to be like, or how they differ from each other[11]. Applications of these can be found in various literature published in IntechOpen.

To interpret and understand the data for research question # 3, a latent content analysis based on the idea and theoretical lenses underscoring the importance of giving meaning to the text response, and avoiding bias used Kruyen & Van Genugten study appendix[6].

A review from a research framework that uses the mode of inductive – deductive spectrum with an opinion, empirical, archival scanning, analytic strategy in its domains both formal and informal techniques.

3. Results and Discussion

Research Question #1: What are the competency gaps of DOE NEPIO based on the IAEA Milestone Approach? Questions in the questionnaire is to rate the existing C_{EL} and required C_{RL} competency for C1, C2, C3, C4, C5 and C6 to (High=3, Medium=2, Basic=1, NA=0, None=0)

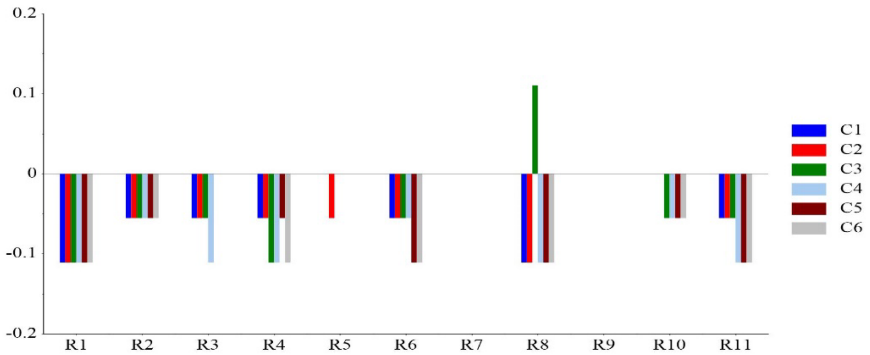

Fig. 1. Respondents Gap Chart

Calculated organizational level workforce competency gap for a role is a laggard with numerical resultant equivalent of -3.43 in terms of a nested variable (planning and studying) for this phase 1 competence latent construct defined by the observable variable test items to characterize the respondents based on their responses see Fig. 1, a dynamical measurement relative to the issued policy in 2016 to March 2022.

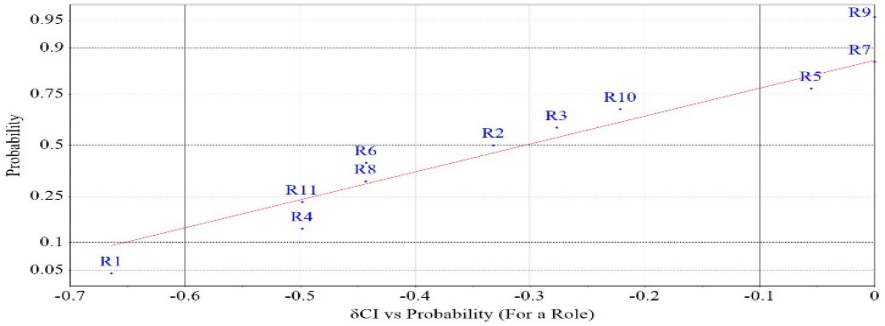

Fig. 2. Probability Chart of the Respondents to Deliver Plans and Studies

Only three (3) respondents have a high probability of delivering the task required by their mandate based on their assumptions or claims, which are subjects for further research Fig. 2. .

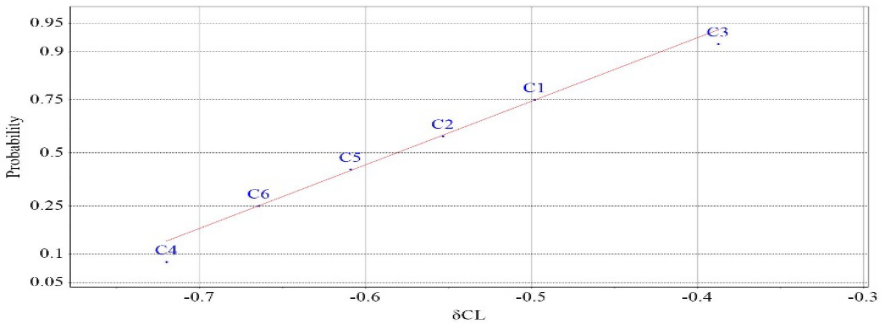

Fig. 3. Probability of the Variables that can be done given the workforce in this Study.

The order of the variables, based on the probability they can be done, has also been revealed (see. Fig. 3.) and can be verified by the DOE publications and issuances. It forms an artifact visible in the organization based on the Schein Culture Model.

Research Question #2: What are the interventions taken to address those competency gaps?
Questions in the questionnaire are based on the goal of the DO2016-10-0013 and EO 116, how does DOE address this competency gap in C1, C2, C3, C4, C5 and C6? By selecting all that apply.

1. By establishment of HR development programmes
2. By specialized training
3. Through further studies (Masters, PhD)
4. Through participation in knowledge networks
5. Through Knowledge Management
6. By reorganization
7. By outsourcing (use of external support)
8. Competency Management System
9. Not Applicable

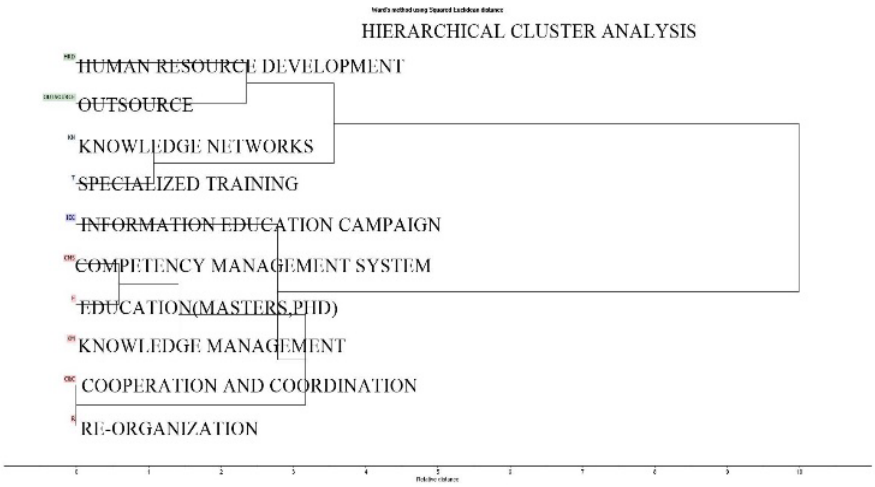

Fig. 4. Result of HCA of the organization intervention measures

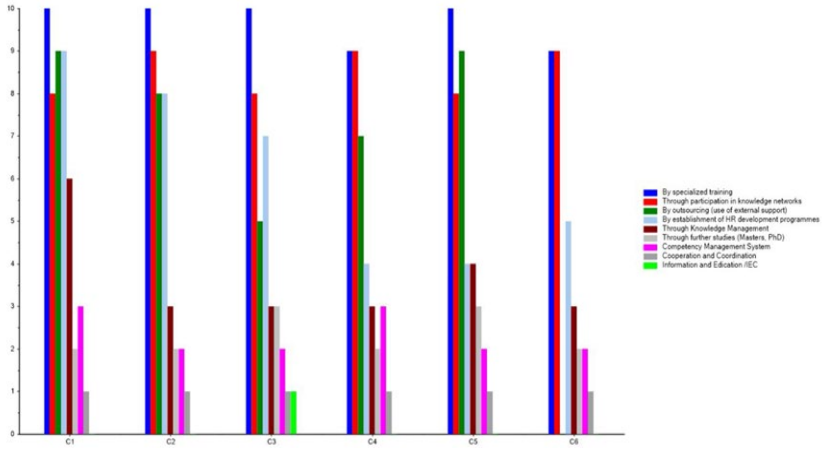

Fig. 5 Intervention Measure/s on the six observable variables (C1 to C6)

For the intervention measures, Human Resource Development, Outsourcing, Knowledge Networks, and Training are the norm see Fig.4. In this comparative analysis the value of higher education must be examined versus relying on outsourcing, which differs from the IAEA capacity building model see Fig. 5 where 87% suggested training and only seventeen percent on education. The view of institutional learning here is away from education but towards training, without a clear distinction conceptually between education and training we are in danger of losing something of importance, such in our context the required publication in a refereed journal or creative work, promoting a culture of research by the Commission on Higher Education a level of outcome or competency aligned with the Philippine Qualification Framework demands from Graduate degrees program. Here the respondents have also missed the recommendation of INIR findings on the expansion of NEPIO which the Department Order 002016-10-0013 eventually succeeded by the Executive Order 116 which is a reorganization. While outsourcing is the antithesis to competence these depend on the principal agent dynamic goals relative to a period where national capabilities does not exist.

Research Question # 3
Using the After-Action Review Methodology, what is the respondents' feedback about the gaps?
Questions in the questionnaire are asked to share the lessons learned, and explain any unexpected outcomes (positive or negative), in C1, C2, C3, C4, C5 and C6?

Following these guide questions:
1) What was supposed to happen?
2) What actually happened?
3) Why were there differences?

4) What have we learned?

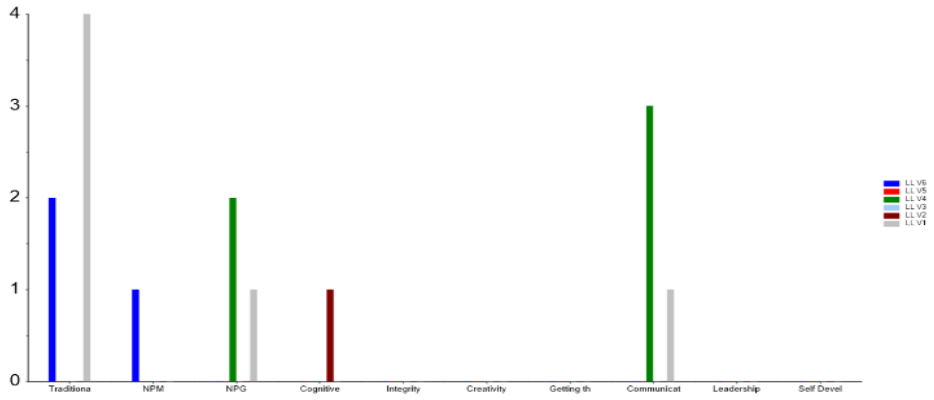

Fig. 6. Latent content analysis using Kruyen & Van Genugten appendix [6]

In the informal and hidden part, or invisible culture, the leadership part shows again its importance in this study see Fig. 6, as with the INIR report findings in which articulations of its recommendations concretize these areas of needs for further actions, in a succinct way in writing valid for engaging stakeholders where relationships, and trust, where "capacities" must also be developed[12] a result latent content analysis reveals these gaps in the organization on its effectiveness[13], and efficiency[14] in this context. A room for improvement in leadership, integrity, creativity, self-development, and of getting things done parts. A theoretical analysis[15] and practical significance based on a response suggests principal agent theory and have been seen with issuing Executive Order 116[16] or the Study for the adoption of a National Position on a Nuclear Energy Program and Executive Order 164[17] Adopting a National Position on a Nuclear Energy Program. Latent content analysis[18] gives us a simple insight and indicator that explains the gap between stated policy and intended learning outcomes an understanding for more control and less ambiguity until an institution gives it a meaning and make sense of their experiences i.e., nuclear governance in a sharing culture. Based on the idea of competence (Fig.6) this category can generate a theory[13] and see where gaps and areas that need further actions or latent itself can show that something is undeveloped, or that it remains untapped. And respondents or any actors should invest more in behavior that gives meaning to action, and a powerful sense of intrinsic motivation to work tirelessly toward the goal at the highest technical standards.

4. Conclusion and Future work

Given these deficiencies in planning and studying, the author proposes to advance the competence-based idea for the succeeding policies, and business management school of thoughts[19] was applied in the recommendations in cross reference to INIR Reports and Competency Framework(NIDS)[8] in a systematic method to fuse theory to practice and an assumption for a better governance despite its limitations[20]. Its significance to the universalization of NIDS competency framework and INIR reports as metadata at the document level and that latent variable as a means of classification based on grounded theory coding for hypothesis testing for quantitative data-based analysis.

Following are nine recommendations:

1. Starting Role Competency Matrix (RCM) and RCM Analytics
2. Developing Decision Support Tools by Stakeholder Participation and Group Modelling/ Integrated Scenario analysis
3. IAEA competence assessment methodology
4. Establishing a knowledge-based organization by having a Knowledge Management Policy (ISO Standards compliant)
5. Extending Knowledge Networks
6. Talent Development Reporting Principles (TDRP) Framework
7. Interuniversity cooperation and joint research programs and construction of training centers and develop strategic partnership with the universities and others in the nuclear field
8. Adopt the NAMA (Needs, Availability, Missing, Action) framework
9. Self-development by E-Learnings, undergo certifications such as in World Institute for Nuclear Security(WINS)

Inference on the level of measurement validity that the measures have reached:

APPENDIX A: CHRONBACH ALPHA

For Research Question #1
$C_{EL=}$ *0.911*
$C_{RL=}$ *0.884*
For Research Question #2
Categorical Variables in HCA= 0.975
For Research Question #3
The data for the grounded theory methodology content analysis was based on Peter M. Kruyen & Marieke Van Genugten's appendix of the research study entitles "Opening up the black box of civil servants' competencies."

APPENDIX B: PRINCIPAL COMPONENT ANALYSIS

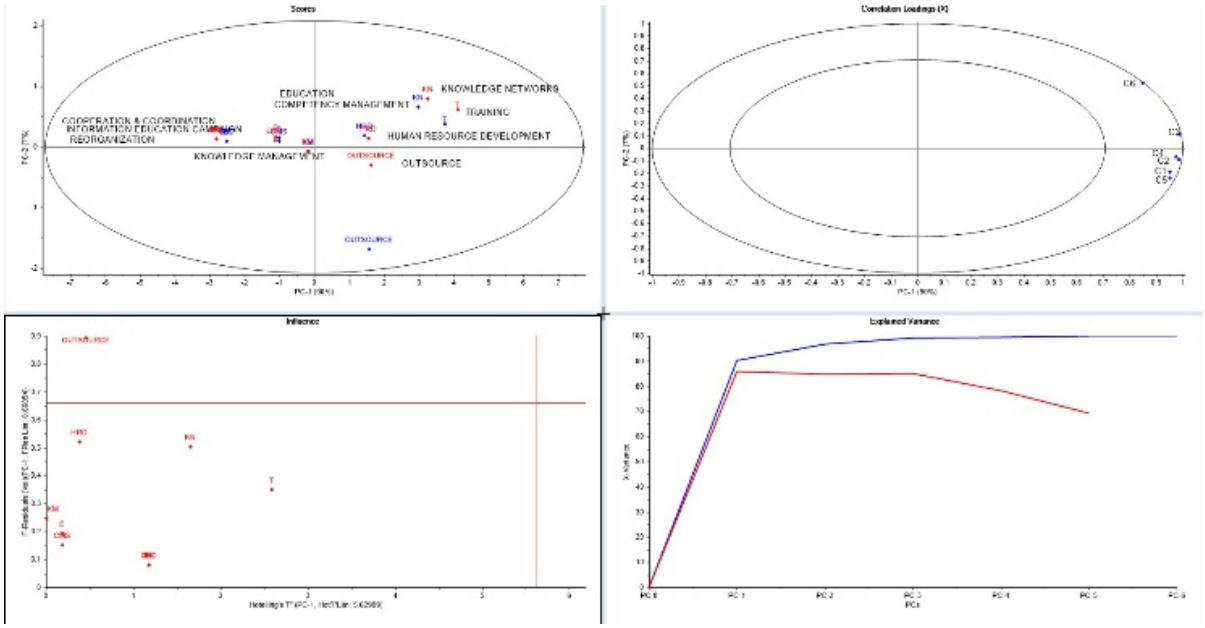

Fig. 7. Outlier Identification

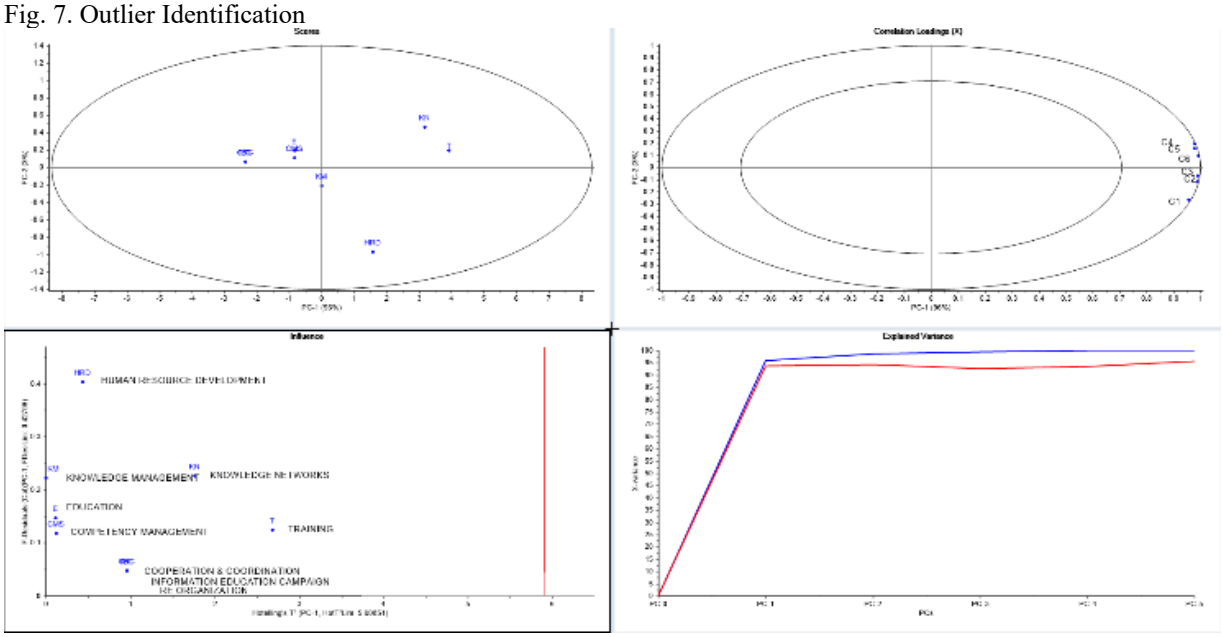

Fig. 8. Recalibration without the outlier

Empirical observation has also been made in this domain see Fig. 7. and Fig. 8. on competence building of where outsourcing is opposite of the concept.

NOMENCLATURE

Where:
R = respondent (R1….R11)
C = variable or the competency
C1 = Identification of the knowledge needed to fulfill all functions and responsibilities assigned and identify where, how, when and under what conditions this knowledge can be obtained.
C2 = Establishing working groups to coordinate the preparation of pre- feasibility studies evaluating various parts of introducing nuclear power.
C3 = Preparing a strategy and plan for stakeholder involvement, including public communication, and putting the plan into practice in consultation with the relevant agencies, opinion leaders and key stakeholder groups.
C4 = Preparing a notional schedule and timeline for developing the national infrastructure for nuclear power and implementation of the first nuclear power project (some refer to this document as a roadmap).
C5 = Preparing a comprehensive report defining and justifying a national strategy for nuclear power that includes an assessment of the national capacity related to each of the 19 infrastructure issues and a plan to guide the implementation of the programmed.
C6 = Coordinating the self-evaluation of the status of national nuclear power infrastructure development.
C_{EL} *= the competency level of an employee, which is rated on a scale of 1(L1)–3(L3).*
C_{RL} *= required competency level for a role, which is rated*
on a scale of 1(L1)–3(L3).
C_W *= the competency weight.*
p=the number of competencies. If we have 6 competencies
for a role, then the value of p will be "6"
n=the number of employees in the project/organization.

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End Note

The work was performed with ethical research considerations and compliance with ethical and privacy laws and did not have access to dedicated resources and under pandemic conditions in December 2021-March 2022 and to obtain only approved request. So, the results provide preliminary information as seen from the researchers viewpoint and that time. Also, since it is a national responsibility belonging to the sphere of Philippine State, explicit reference to the common and current understanding is based on the policies issued. This creative work was the output required by the Department of Energy and Polytechnic University of the Philippines In-House Program for Master's in Public Administration in compliance with the Commission on Higher Education Memo No. 15 series of 2019.