ASSESSMENT OF PROJECT MANAGEMENT MATURITY AT LANDSVIRKJUN – POWER PROJECTS DEPARTMENT DIVISION

Kasu Girma
Ethiopian Electric Power – EEP
Aluto Geothermal Project Office
P.O. Box 1233
Addis Ababa
ETHIOPIA
girmakasu@gmail.com

ABSTRACT

This report is focused on assessment of project management maturity at Landsvirkjun-Power Projects Department Division. Interviews, a five level project management maturity model and the ten Project Management Body of Knowledge (PMBoK) areas were used as the main assessment tools. The results indicate that, the project management maturity level at the Power Projects Department is at level 3. A future plan is proposed to do a similar assessment in a power company in the home country of the author.

1. INTRODUCTION

1.1 General overview

Project management practice can be applied in project based organisations as well as in business organisations. According to the Project Management Body of Knowledge (PMBoK) (PMI, 2013), project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. This application of knowledge requires the effective management of the project management processes. Such management process is very important in project based organizations, for instance, in the energy sector. This applies especially in geothermal energy research and development as geothermal project activities can be take a long time to meet project deliverables. Integrated and well organized management processes like organizational project management are therefore very important for such projects and others. Organizational Project Management (OPM) is a strategy execution framework utilizing project, program, and portfolio management as well as organizational enabling practices to consistently and predictably deliver organizational strategy producing better performance, better results, and a sustainable competitive advantage (PMI, 2013).

An organization measures its capabilities, then plans and implements improvements towards the systematic achievement of best practices (PMI, 2013). One way of measuring capability or maturity of organization project management practices is deploying of an assessment tool by using interviews and different maturity models. Different project management maturity models are developed to measure project management maturity of organizations. The PM solutions project management maturity model is one of the maturity model tools that was adopted and used to measure project management maturity

level of the Projects Department Division of Landsvirkjun, the national power company of Iceland. The purpose of the assessment is to measure the maturity of project management practices at the Power Projects Department and give recommendations for future improvement.

1.2 Scope

The scope of the project was:

- To assess the project management maturity level at Landsvirkjun, Power Projects Department Division;
- To establish the department's progress in maturity level and give recommendations for future improvement

1.3 Methodology

The maturity assessment was done through following steps:

1. Document review;
2. Assessing project management practices at selected department offices by using a sample questions survey and conducting face to face interviews;
3. Evaluate the gathered information and determine the maturity level of each knowledge area through using the five levels of PM maturity model.

1.4 Why do assessments?

As stated by Alice Zavala (2005) doing the maturity assessment at organization can give the following stated benefits to organization. The Power Projects Department also can benefit from the assessment through other advantages as the assessment:

- Provides a clear picture of current state and define future state;
- Identifies the gaps and provides a roadmap for organization change;
- Motivates the organization to reach a better state;
- Motivates individuals to grow and develop current skills and educate the organization on best practices.

During the assessment, interviews were only conducted with a few selected people at the department.

1.5 Description of the company

Landsvirkjun is exploring a number of potential power projects all over the country (approximately 20). These projects are at varying stages within the preparation and authorization process which involve a detailed feasibility and environmental study. There is also a long-term planning and authorization process during which institutions, stakeholders and the public are given the opportunity to provide feedback during the various stages of each project. Good quality information is essential for preparing the initial power project layout to ensure minimum environmental impact (Landsvirkjun, 2014).

The Research and Development division is responsible for developing new power projects from prefeasibility design phase and up to tendering and construction phase when Construction Division takes over. Within the Research and Development Division, Power Projects Department "owns" the projects and provides most of the project managers, Research Department provides project managers for exploration and resource research, Environmental Department provides project managers for

environmental and planning activities and Internal Department provides project control. The organizational chart of the company is shown in Figure 1.
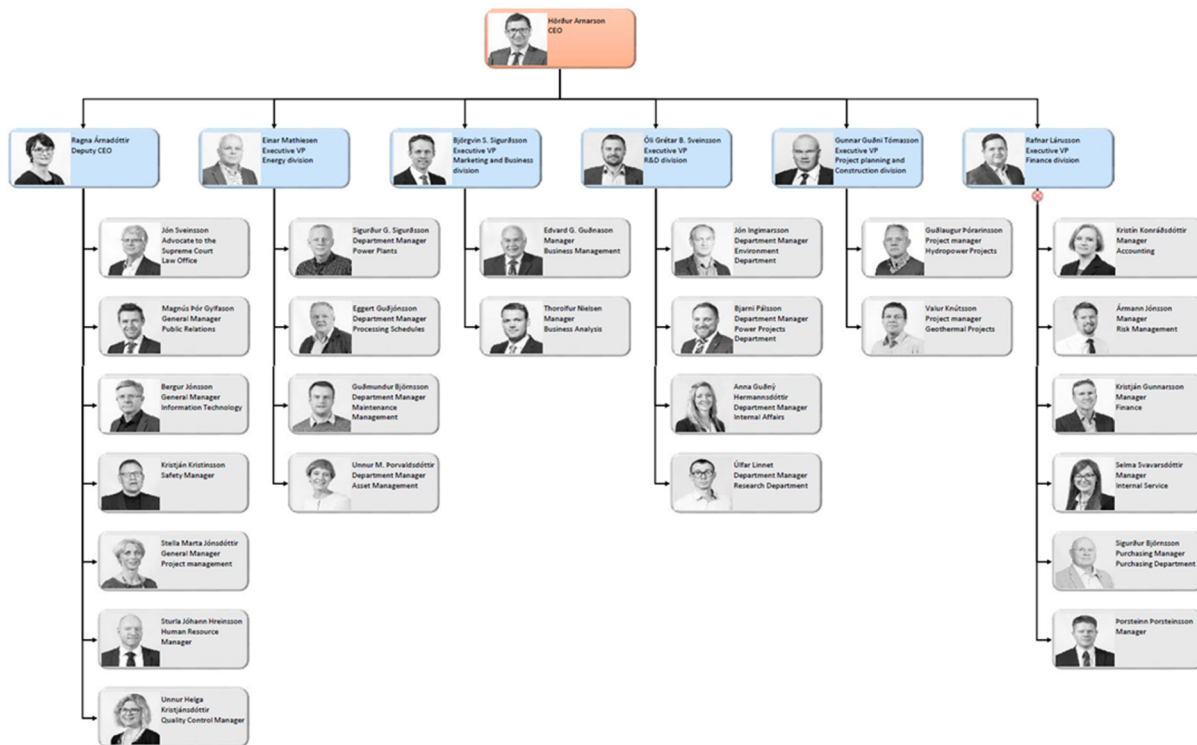

FIGURE 1: Landsvirkjun organisational chart

2. LITERATURE REVIEW

Project management maturity refers to the progressive development of project management practice in project, program and portfolio management in a project based organization. Before dealing with the maturity assessment it is important to understand the project management terminology definitions and concepts as described below.

2.1 Project and project management

A project is a temporary activity which has definite starting and end. According to PMBoK, project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements. Project management is accomplished through the appropriate application and integration of 47 logically grouped project management processes, which are categorized into five process groups (initiating, planning, executing, monitoring and controlling, and closing) (PMI, 2013).

2.2 Program and portfolio management

According to PMBoK (PMI, 2103), program is defined as a group of related projects, subprograms, and program activities managed in a coordinated way to obtain benefits not available from managing them individually while program management is the application of knowledge, skills, tools, and techniques to a program in order to meet the program requirements. A project may or may not be part of a program but a program will always have projects.

A portfolio refers to projects, programs, sub-portfolios, and operations managed as a group to achieve strategic objectives while portfolio management refers to the centralized management of one or more portfolios to achieve strategic objectives. The projects or programs of the portfolio may not necessarily be interdependent or directly related (PMI, 2013).

2.3 Project Management Maturity Model (PMMM)

Project management maturity refers to the progressive development of an enterprise-wide project management approach, methodology, strategy and decision making process. Project Management Maturity Model (PMMM) is a formal tool developed by PM Solutions and used to measure an organisation's project management maturity. Once the initial level of maturity and areas for improvement are identified, the PMMM provides a roadmap, outlining the necessary steps to take toward project management maturity advancement and performance improvement (Crawford, 2006).

2.4 Project Management Body of Knowledge (PMBoK)

Project management body of knowledge describes that the overall knowledge with in the profession of project management and includes tools and techniques used to manage project management process and practices. There are ten knowledge areas according to the PMBoK guide (PMI, 2013) as described below.

1. Project integration management
Project integration management includes the processes and activities to identify, define, combine, unify, and coordinate the various processes and project management activities within the project management process groups.

2. Project scope management
Project scope management includes the processes required to ensure that the project includes all the work required and to complete the project successfully. Managing the project scope is primarily concerned with defining and controlling what is and is not included in the project.

3. Project time management
Project time management includes the processes required to manage the timely completion of the project. Plan schedule, define and sequence activity, resource and duration estimation, develop and control schedule are the processes required in project time management.

4. Project cost management
Project cost management includes the processes involved in planning, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.

5. Project quality management
Project quality management includes the process and activities of the performing organization that determine quality polices, objectives, and responsibilities so that the project will satisfy the needs for which it was undertaken. It works to ensure that the project requirements, including product requirements, are met and validated.

6. Project human resource management
Project human resource management includes the processes that organize, manage, and lead the project team. The project team is comprised of the people with assigned roles and responsibilities for completing the project.

7. Project communications management
Project communications management includes the processes required to ensure timely and appropriate planning, collection, creation and distribution, storage, retrieval, management, control, monitoring and the ultimate disposition of project information.

8. Project risk management
Project risk management includes the processes of conducting risk management planning, identification, response planning, and controlling risk on a project. The objectives of project management are to increase the likelihood and impact of positive events, and decrease the likelihood and impact of negative events in the project.

9. Project procurement management
Project procurement management includes the processes necessary to purchase or acquire products, services, or results needed from outside to the project team. The organization can be buyer or seller of the products, services, or results of a project. It includes the contract management and change control processes required to develop and administer contracts or purchase orders issued by authorized project team members.

10. Project stakeholder management
Project stakeholder management includes the processes required to identify the people, groups, or organizations that could impact or be impacted by the project, to analyse stakeholder expectations and their impact on the project, and to develop appropriate management strategies for effectively engaging stakeholders in project decisions and execution.

3. METHODOLOGY

The main methods used in this assessment were interview and five levels of maturity model from PM Solutions project management maturity model.

3.1 Interview

Face to face interviews with 5 project managers were conducted in this assessment to gather data about the project management practices at Landsvirkjun-Power Projects Department. They were conducted with 5 project managers at the Power Projects Department in their offices. The department manager and four project managers were selected for interviews, as listed below:

1. Dr. Bjarni Pálsson, manager, Power Projects Department, R&D Division.
2. Ms. Anna Gudný Hermannsdóttir, manager internal matters, Power Projects Department, R&D Division.
3. Dr. Egill Júlíusson, project manager geothermal projects, Research Department, R&D Division.
4. Mr. Kristján Einarsson, project manager geothermal projects, Power Projects Department, R&D Division.
5. Mr. Albert Gudmundsson, project manager hydro power projects, Power Projects Department, R&D Division.

These managers were selected for interview based on their knowledge and experience they had regarding project management practices. General criteria for the selection of people to interview was:

- To limit the scope of the assessment and minimize the complexity because it is impossible to assess the whole company within a short time;
- To get information easily from those who have more knowledge and experience about project management practices at the department.

The sample interview questions used in this report are prepared based on ten knowledge areas of PMBoK and by reviewing the maturity assessment documents done by Holmes and Walsh (2005) and Temesgen (2013) for guidance as described in Table 1 Appendix I.

3.2 Model

The model used in this assessment was adopted from project management maturity (Pennypacker and Grant, 2003) but it is redrawn based on the recent PMBoK by using the ten knowledge areas (PMI, 2013) and five level maturity of PM solutions project management maturity model as shown in Figure 2 below. The key characteristics of the five level maturity model were used as criteria to evaluate each component of knowledge areas based on the qualitative data result obtained from conducted interviews.

PM Solutions Project Management Maturity Model	Level 1 Initial process	Level 2 Structured process and standards	Level 3 Organisational standards and institutionalized	Level 4 Managed process	Level 5 Optimizing process
Project integration management					
Project scope management					
Project time management					
Project cost management					
Project quality management					
Project human resource management					
Project communications management					
Project risk management					
Project procurement management					
Project stakeholder management					

SEI maturity levels

PMI knowledge areas

Each knowledge area is broken down into specific components. Specific components are used to measure maturity. The detailed specific components are presented in Table 1 under Appendix II.
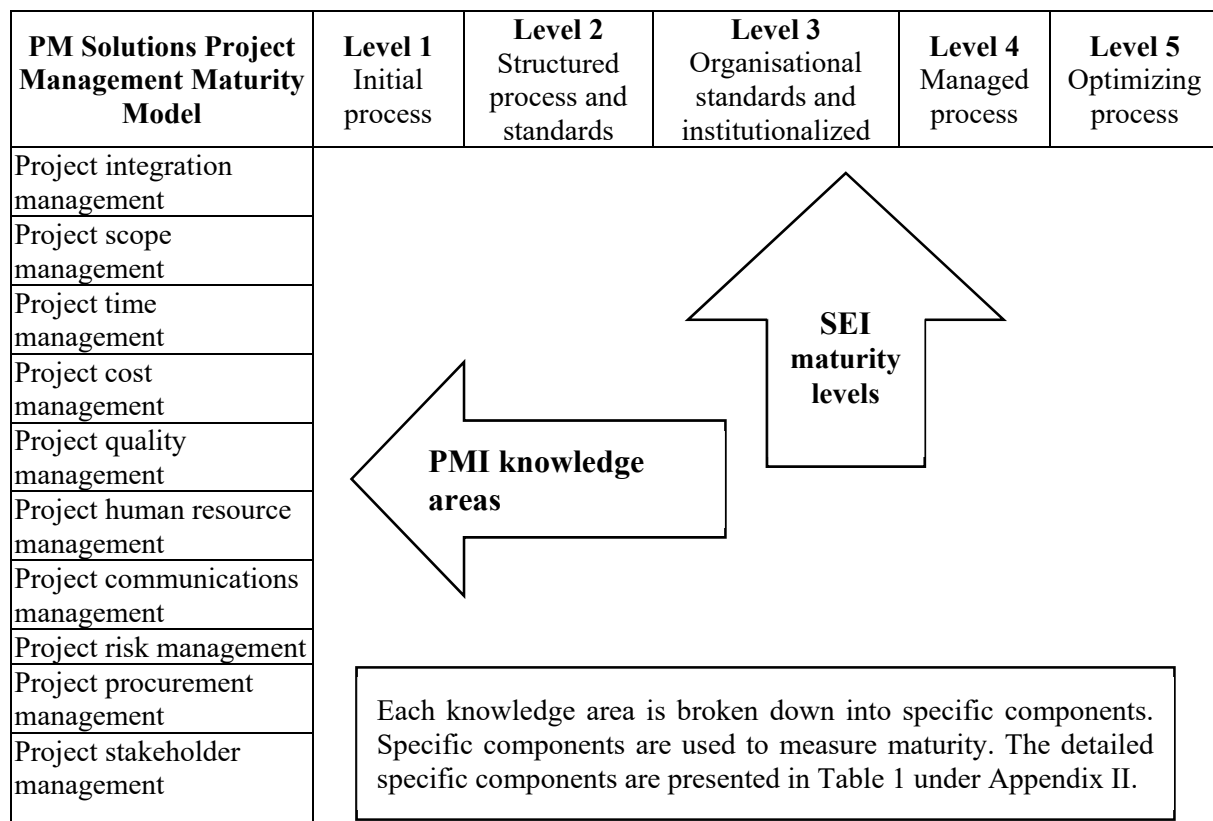
FIGURE 2: PM Solutions project management maturity model

The five maturity levels of PM solutions project management maturity model (Pennypacker & Grant, 2003) similar to those in the SEI capability maturity model are described here below.

Level 1: Initial process
"There is recognition on project management processes but there are not established practices and standards, and individual project managers are not held to specific accountability by any process standards. Documentation is loose and ad hoc and metrics are informally collected on an ad hoc basis. Management understands the definition of a project, that there are accepted processes and is aware of the need for project management" (Pennypacker, 2001).

Level 2: Structure process and standards
"Many project management processes exist in the organisation, but they are not considered organisational standards. Documentation exists on these basic processes and management supports the implementation of project management, but there is neither consistent understanding, involvement, nor

organisational mandate to comply for all projects. Functional management is involved in the project management of larger, more visible projects and these are typically executed in a systematic fashion. There are basic metrics to track project cost, schedule, and technical performance, although data may be collected/correlated manually. Information available for managing the project is often a mix between summary level data and detailed level data" (Pennypacker, 2001).

Level 3: Organisational standards and institutionalized process
"All project management processes are in place and established as organisational standards. Nearly all projects use this process with minimal exception – management has institutionalized the processes and standards with formal documentation existing on all process and standards. Project management processes are typically automated and management is regularly involved in input and decision making. Each project is evaluated and managed in light of other projects" (Pennypacker, 2001).

Level 4: Managed process
"Project is managed by considering the past performed and future expectation. Management uses efficiency and effectiveness metrics to make decisions and understands the impacts on other projects and to evaluate all projects, changes and issues from cost estimates, baseline estimates, and earned value. Project information, project management processes and standards are integrated with other corporate systems and processes. Processes and standards are documented. Management clearly understands its role in project management process and execute it well, managing at right level. Management styles and project management requirements for different sizes/complexities of projects are clearly differentiated" (Pennypacker, 2001).

Level 5: Optimizing process
"Processes are in place and actively used to improve project management activities. Lessons learned are regularly examined and used to improve project management processes, standards, and documentation. Management and organisation are not only focused on effectively managing projects but also on continuous improvement. The metrics collected during execution are used to understand performance of projects and for making organisational management decision for the future" (Pennypacker, 2001).

4. RESULTS

The direct results of the assessment gathered by using interviews are presented in Appendix I but the summary of the results is described below for each knowledge areas.

4.1 Project management knowledge areas

Project integration management
The direct result from interviews for the project integration management is given in Table 1 as shown in Appendix I and similar procedure for the rest of the knowledge areas. Project management processes were applied to power projects, especially to large projects. All projects were executed in a professional manner but sometimes the goals were not achieved within the planned time and cost, because in many cases unforeseen events lead to additional costs and time. For instance, permit issues, and geology are the main events. The project charter includes information regarding 'what, when, where, how and to whom' is available for project activities. Overall change control was performed by steering committee meetings to identify, evaluate, recommend and update plan of the changes. Generally, there was a coordinated system to plan, execute, monitor and control the project's activities.

Project scope management
The project scope is determined based on the project portfolio, company strategy and functional targets of project by steering committee (management) in meeting minutes. Management plan scope, collect

requirements, define scope, create work breakdown structure (WBS) and control scope processes were effectively used in the entire project activities. Scope change control was handled by steering committee to determine the causes of changes and evaluate before updating the plan.

Project time management
Project management software, MS Project and standard MS Excel, were the common systems used at organizational level for scheduling, estimating and work packages. Milestone plan and Gantt chart were the main tools used in time management process. The full Gantt chart was saved in house software share point (GoPro) – filing documentation system. The colour indictors (green, yellow and red lights) were used to manage time in '*villi*' (project overview system or VERKEFNAYFIRLIT). The project time management document was available to project members by standard Excel template and also via department's web. The baseline schedules were not always maintained for each project because of different problems that could occur during the progress (sometimes in case of design).

Project cost management
The central database - MS Dynamics Ax (company software), Cognos, Earned Value and homemade Project Overview System 'Villi' were built for tracking cost changes. The standard Excel template was used for small projects and standard document was available for project team members. Both scope changes and cost estimations can be approved by management but sometimes scope changes were not approved in a formal way. The project cost was assigned based on project size, tasks and time.

Project quality management
Power Projects Department uses the organizational quality standards defined by the company. Regular ISO 9001, ISO 14000, ISO 18000, internal and external audits, stage gate process and external permit related process such as EIA, development permits were standards recognized by the company for quality assurance process and used to identify and measure product quality. The quality metrics (internal and external review process), process analysis (stage gate process), and project documents (Villi) were tools used to manage project quality.

Project human resource management
The project department has defined roles and responsibilities for project plan, execution and control in a simple organisational chart. Organization charts, networking, expert judgment, and meetings were tools used for planning HR management. Sometimes the project management attended training courses provided by project management office or project department and also informally through internal and external online. Furthermore, encouragement was given to project management members to apply for International Project Management Association (IPMA) certificates. The skill level of PM was defined based on experience and education as well as the department started to define PM to IPMA, at least level D, C or B and use IPMA guideline as reference.

Project communications management
The standard Excel sheet and Share Point (GoPro) were used to plan communications management for all projects. The most common communication management tools were meetings and sometimes external web and internal project 'Villi', email, and mobile phone were used. The final reports, lessons learned and previous experience were documented in the filing system Share Point (GoPro) and utilized informally for other projects.

Project risk management
Risk identification was done for each project at stage gate process, before any field exploration and during the whole project. Monte Carlo analysis for cost, decision trees are used typically for deciding drilling targets, scenario analysis, SWOT analysis, contingency plan and @Risk techniques were used in risk management. There was a defined and implemented process used to measure derivable risk lights (red, yellow and green) by standard Excel sheet and available to project team members.

Project procurement management
The procurement management process was available as written formal working procedure and formats for procurement plan execution. Not only procurement department but also project team and project managers had responsibilities on planning and requisitioning items as per organizational evaluation criteria. The schedules and cost targets were available during the purchasing process depending on the project size.

Project stakeholder management
The stakeholder management process was required to identify the people, groups and organisations that could impact or be impacted by projects. The stakeholder analysis, expert judgment and meetings tools were used to identify stakeholders. Project manager had responsibility to plan, manage, control and for decision making in stakeholder management. Most of the time the availability of relevant information for identified stakeholders was based on the communication plan.

4.2 Lessons learned

Lessons learned, final reports, previous experience and other related files were saved in house software share point (GoPro – filing documentation system), and available for all project team and utilized for other projects depending on the type of projects and their relevancy. Project managers were nominated and assigned to projects based on the necessary experience, knowledge and education level. Generally, there was good project management processes application to all projects and a plan for continuous improvement.

5. DISCUSSION

Five people were selected for interviews. Most of their responses on interview were in good alignment, even if there some different ideas were experienced. The interviews took one month, more than the planned time. The main reason was that the selected people were busy and hence it was difficult to schedule the face to face interviews.

A sum up of the final results is shown Table 1 below. A detailed evaluation of each knowledge area, by using the key characteristics of the five levels maturity as criteria, is shown in Table 1 under Appendix II. From the result, it is concluded that most of knowledge areas are at maturity level 3 while a few of them are below level 3. This indicates that all organizational standards and processes were not applied to all knowledge areas.

TABLE 1: Maturity results of each knowledge area

| No. | Knowledge areas | PM solutions PM maturity levels | | | | | Actual |
		1 Initial process	2 Structur. process	3 Org. standards	4 Manag. process	5 Optimiz. process	
1	Project integration management			3			3
2	Project scope management			3			3
3	Project time management			3			3
4	Project cost management			3.67			3.67
5	Project quality management			3			3
6	Project human resource management		2.50				2.5
7	Project communications management			3.33			3.3
8	Project risk management		2.83				2.8
9	Project procurement management			3.50			3.5
10	Project stakeholder management		2.50				2.5
	Power projects dept. maturity level						**3**

As we can see from the result project management integration had maturity level of 3. Most of power projects were executed in professional manner by applying the organizational standards and processes, but sometimes the goals were not achieved within the planned time and cost, because in many cases unforeseen events lead to additional cost and time. There were the integrated systems and process of knowledge areas in execution and controlling of project activities.

The scope, time, cost and quality management also were at maturity level 3. This means that standardized, documented, repeatable processes were available and applied to most of projects. The schedule integration process of scope, time, cost and quality were developed and implemented with program schedules at organizational standard's level. The organization had a standardized and documented quality system (ISO 9001, 14000, 18000) used at organizational level for most of power projects.

Project human resource and stakeholder management had maturity level greater than 2. It indicates that basic processes of HRM were well defined and applied to all projects. In the case of stakeholder management, also basic processes were defined and applied to most projects. Management supports and encourages staff to apply the stakeholder management process more in project management practice.

Project communications and risk management were at maturity level 3. It indicates that all organisational standards and repeatable processes were applied to most projects. The standard Excel sheet and share point (GoPro) were used to plan communications management for all projects. The standard project risk management plan was available to identify, analyse and mitigate risks before all filed exploration and during whole project progress for each project but not all processes were applied to all projects. There was a defined process which was applied to most of projects to measure derivable risk lights (red, yellow and green) by standard Excel sheet and Share Point (GoPro).

Project procurement had maturity level greater than 3. This indicates that all standards and repeatable processes were applied to all projects. There was a standard working procedure for executing procurement processes. Generally, the demonstration of each knowledge area's maturity level results of project maturity at Power Projects Department is shown using spider diagram as shown in Figure 3 below.
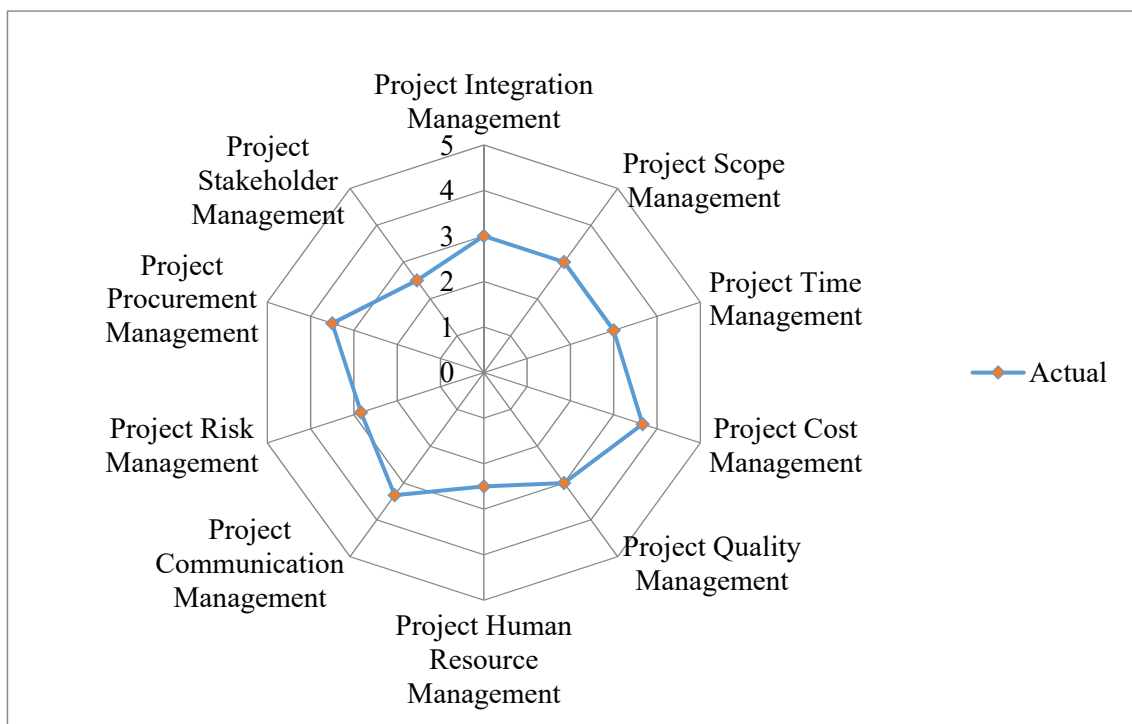

FIGURE 3: Actual result of maturity level of each knowledge areas

6. CONCLUSIONS AND RECOMMENDATIONS

Results from the assessment indicated that the Power Projects Department has used a lot of organisational standard resources in the implementation of most of power projects, especially large projects. But sometimes the baseline schedule (in case of some projects) was not kept within the planned resources, because in many cases unforeseen events occurred and lead to additional resources being required.

It is concluded that the overall project management maturity at Power Projects Department is at maturity level 3. This indicates that most organizational standards and processes were achieved by most of project management knowledge areas and applied to all projects. However, in some cases, knowledge areas were not completely standardized and thus processes not applied properly and ineffectively. The assessment tool also identifies areas to be focused on for improvement.

It is recommended that formal training be provided based on project management knowledge areas including organisational standards, and processes of project management, for the project team and others. This can increase the ability to implement all the standards and processes to all projects easily and will increase department as well as organisation performance, project deliverables and organisation changes, including individuals.

The act of measuring the project management maturity can help this organization to improve its effectiveness in project delivery. Doing more assessments at the Power Projects Department as well as to the whole company will thus help to understand the current status, measure performance, identify problem areas and plan future continuous improvements.

It is proposed to do a similar future assessment in a power company in the home country of the author. The plan is described in Appendix III.

REFERENCES

Crawford, J.K., 2006: Project management maturity model (2nd ed.). Auerbach Publications, Taylor & Francis Group, Boca Raton, FL, US, 235 pp.

Holmes, S.J, and Walsh, R.T., 2005: *Conducting effective project management maturity assessment interviews.* Integrated Management Systems, Inc., Ann Arbor, MI, US, 32 pp.

Landsvirkjun, 2014: Potential power projects – Annual report 2014. Landsvirkjun, website: *http://annualreport2014.landsvirkjun.com/research-and-development/power-projects.*

Pennypacker, J.S., and Grant, K.P., 2003: Project management maturity: An industry benchmark. *Project Management Journal, 34*, 4-11.

PMI, 2013: *A guide to the project management body of knowledge PMBOK® guide* (5th ed.). Project Management Institute Inc. (PMI), Newton Square, PA, US, 589 pp.

Temesgen, T.W., 2013: *Assessment of project management capability (a case study at Mesfin Industrial Engineering PLC, Mekelle – Ethiopia)*. KTH Royal Institute of Technology, Stockholm, Sweden, MSc thesis, 36 pp.

Zavala, A, 2005: *Organizational project management maturity assessments*. Project Management Institute Inc. (PMI), San Francisco, California, United States, 45 pp.

APPENDIX I: Project Management Maturity assessment at Landsvirkjun – Power Projects Department Division - summary of results and sample of interview questions

TABLE 1: Project integration management results

No.	Project integration management	Mark 'x' in circle if you agree
1	Are all the projects executed in professional manner within planned time and cost?	◯ Yes - **X**, but in many cases unforeseen events lead to additional cost and time. E.g. permit issue, geology, etc.
		◯ No
		◯ Not sure /Not applicable
2	Do you use the project charter?	◯ Yes – **X**, in the project overview system; VERKEFNAFIRLIT/ "Villi"
		◯ No
		◯ Not sure /Not applicable
3	Does the overall change controls manage actual changes when they occur?	◯ Yes – **X**, in the project overview system decision taken in the steering committee meetings.
		◯ No
		◯ Not sure /Not applicable
4	Who has responsibility in project planning, execution, and control? And approved by whom?	◯ General Manager – **X**, approved by general manager
		◯ Deputy Manager
		◯ Project Manager -**X**, prepared by project managers
5	Does all project process management apply to all projects?	◯ Yes – **X**, mostly apply to large power projects.
		◯ No
		◯ Not sure /Not applicable

TABLE 2: Scope management results

No.	Scope management	Mark 'x' in circle if you agree
1	Do you use all the scope management processes and apply to projects?	○ Collect requirements – **X**, this can be accepted at steering committee meetings stated in
		○ Define scope – **X**, meeting minutes and presented in an updated project dates in Villi.
		○ Create WBS - **X**
		○ Verify scope - **X**
		○ Control scope – **X**
2	Do you provide standard scope management documents for customers?	○ Yes – **X**, it is special template but most use only steering committee meeting minutes
		○ No
		○ Not sure
3	How is scope of project determined?	○ Direction from management? – **X**, it depends; most projects are aimed to support the project portfolio and company strategy but have a lot of external restrictions.
		○ Developed from functional targets? – **X**
		○ Direction from customers**?**
		○ Other, if so describe _____
4	How is scope changed and controlled?	○ Direction from management? – **X**, by decision in steering committee
		○ Direction from customers?
		○ Change notice form project office?
		○ Other, if so describe _____

TABLE 3: Time management results

No.	Time management	Mark 'x' in circle if you agree
1	What type of documents do you use for time management?	○ Milestone plans – **X**,
		○ Project plans - Gantt chart - **X**
		○ System plans
		○ Master schedule plan - **X**
		○ Other, if so describe
2	What type of tools/ techniques do you use for time management process?	○ Project management software -MS Project – **X**
		○ MS Excel – **X**, in some cases (small projects)
		○ List of tasks - **X**
		○ Other, if so describe – **X**, In house software (share point – GoPro)
3	Is the baseline schedule maintained for each projects?	○ Yes- **X,** most of the time but it depends on the type of projects.
		○ No
		○ Not sure

4	Is the planned schedule available for all project teams via web or email?	○ Yes – **X,** an overview should be in 'Villi' but the full Gantt chart and MS project is saved in GoPro - filing system and restricted access to only those concerned, i.e. project team
		○ No
		○ Not sure

TABLE 4: Cost management results

No.	Cost management	Mark 'x' in circle if you agree
1	What systems / tools do you currently use to manage your project cost? Is standard method practiced for resource planning, cost estimation and budgeting? Yes /No – **Yes**	○ Project management software - MS Project ○ MS Excel – **X,** for small projects ○ Earned Value Management / Forecasting ○ Other, if so describe - **X,** MS Dynamics Ax, Cognos, Villi
2	How are project costs assigned?	○ By project - **X** ○ By tasks and time - **X** ○ By department ○ WBS ○ Other, if so describe _____
3	What method do you use for tracking costs? Is there a built system for cost tracking? Yes/No - **Yes**	○ Central database - **X,** MS Dynamics Ax, Cognos, Villi ○ Project manager maintains a spreadsheet ○ Project engineers' spreadsheet ○ Other, if so describe _____
4	Are scope changes and cost estimates approved by management?	○ Yes - **X,** by management but sometimes scope changes are not approved in a formal way ○ No ○ Not sure/Not applicable

TABLE 5: Quality management results

No.	Quality management	Mark 'x' in circle if you agree
1	Is there software based systems / tools that you currently use to manage your project quality? Is the company ISO certified? Yes/No- **Yes**	○ Quality management and control tools – **X,** IS O 9001, 14000, 18000 ○ Seven Basic Quality Tools ○ Quality metrics and audits - **X,** Review process (external review and stage gate process) ○ Process analysis - **X** ○ Project documents – **X,** Project overview system - Villi ○ Not applicable

2	Are quality goals methods and systems established for each project?	⭕ Yes
		⭕ No - **X,** they have to meet internal and external criteria
		⭕ Not sure
3	Are quality assurances processes established and recognized by your organization?	⭕ Yes - **X,** Regular ISO 9001, 14000 and 18000, internal and external audits, stage gate process, and external permit related process such as; EIA, development permits, etc.
		⭕ No
		⭕ Not sure
4	Are there performance/quality standards used to identify and measure project's product quality?	⭕ Yes – **X,** ISO 9001, 14000, 18000
		⭕ No
		⭕ Not sure

TABLE 6: Human resource management results

No.	HR management	Mark 'x' in circle if you agree
1	Are your project management practices and process consistent across divisions and functional groups?	⭕ Yes - **X**
		⭕ No
		⭕ Not sure
2	What systems / tools do you currently use to plan HR management in your projects?	⭕ Organization charts and position descriptions - **X**
		⭕ Networking - **X**
		⭕ Organizational theory
		⭕ Expert judgment - **X**
		⭕ Meetings - **X**
		⭕ Other, if so describe
3	Are PM training courses identified and training provided?	⭕ Yes - **X,** internal online, external and encourage Project managers to take IPMA certificates and sometimes PMO also provides the training
		⭕ No
		⭕ Not sure
4	Do you have defined roles and responsibilities for all project members?	⭕ Yes - **X,** in most cases some projects team and others are described in a simple organization chart
		⭕ No
		⭕ Not sure/Not applicable
5	Do you have a defined skill level for project manager?	⭕ Yes - **X,** usually based on experience and education level, but currently at least IPMA level D, C, B
		⭕ No
		⭕ Not sure/Not applicable

TABLE 7: Communications management results

No.	Communications management	Mark 'x' in circle if you agree
1	What kind of techniques and tools do you use to plan communications?	◯ Communication requirements analysis ◯ Communication technology – **X,** external web and internal project Villi ◯ Communication models and methods - **X,** on standard Excel template (who will take to who, when, how often) for all projects ◯ Meetings – **X,** primary tool ◯ Other, if so describe _____
3	Does project manager share lessons learned with project members?	◯ Yes - **X,** informal – experience shared at department meetings ◯ No ◯ Not sure /Not applicable
4	Are final reports, lessons learned and previous experiences well organized, documented and utilized for other projects?	◯ Yes – **X,** but not very well organized ◯ No ◯ Not sure

TABLE 8: Risk management results

No.	Risk management	Mark 'x' in circle if you agree
1	When is project risk analysed?	◯ Before all field exploration -**X** ◯ After every project phase - **X,** stage gate process ◯ After accomplishing every key event ◯ After reaching every milestone ◯ After every progress evaluations ◯ Other, if so describe - **X,** during the whole projects
2	Are the areas of risk identified and mitigated for each project?	◯ Yes – **X,** standard Excel sheet ◯ No ◯ Not sure/Not applicable
3	Is there a defined process to measure deliverables?	◯ Yes - **X,** standard Excel sheet ◯ No ◯ Not sure /Not applicable
4	What methods or tools do you use to manage and control risk?	◯ Monte Carlo analysis - Modelling and simulation - **X,** for cost ◯ Decision tree analysis - **X,** typical for deciding drilling targets ◯ Scenario analysis ◯ Gantt charts ◯ SWOT analysis - **X** ◯ Other, if so describe - **X,** @Risk, contingency plans

5	Are there standard documents provided of risk management for project members and customers?	○ Yes – **X,** in Excel sheet form ○ No ○ Not sure /Not applicable
6	Is the risk analysis done for each project?	○ Yes - **X,** has to be in place to go through a stage gate, ○ No

TABLE 9: Procurement management results

No.	Procurement management	
1	Is there a written formal working procedure and format for procurement works?	○ Yes - **X,** documented in the quality system ○ No ○ Not sure /Not applicable
2	Is the procurement management process applied to all projects?	○ Yes - **X,** to most of projects ○ No ○ Not sure /Not applicable
3	Does the procurement department take lead on planning, requisitioning items?	○ Yes - **X,** always included with the project team and procurement department assists PM with planning and requesting ○ No ○ Not sure /Not applicable

TABLE 10: Stakeholder management results

No.	Stakeholder management	Mark 'x' in circle if you agree
1	Is the stakeholder management process required to identify the people, groups or organisations that could impact or be impacted by the project?	○ Yes - **X** ○ No ○ Not sure /Not applicable
2	What tools do you use to identify stakeholders in your project?	○ Stakeholder analysis - **X,** they fill in a standard form in meetings with various experts ○ Expert judgment - **X** ○ Meetings - **X** ○ Other, if so describe
3	Is the relevant information available for all identified stakeholders?	○ Yes - **X,** most of the time and they have plan to do better according to the communication plan ○ No ○ Not sure /Not applicable

4	Who has a responsibility to plan, manage, control, and make decisions in stakeholder management process?	○ General Manager ○ Deputy Manager ○ Project Manager- **X,** PM develops and executes the stakeholder plan but steering committee/ sponsor has to approve the plan ○ Primary customers ○ Other, if so describe _____

APPENDIX II: Detailed evaluation of knowledge areas

Based on the result obtained from interview the maturity level of 47 detailed components of knowledge areas were evaluated (Table 1 below) using some key characteristics of five level maturity model as criteria to find the overall maturity level of project management at Power Projects department. The key characteristics were taken from project management maturity model (Crawford, J.K., 2006).

Level 1: Initial process
➤ Ad hoc process and management awareness

Level 2: structured process and standards
➤ Basic processes, not standard on all projects, used on large, highly visible projects
➤ Management supports and encourages use

Level 3: organizational standards and institutionalized management
➤ All processes, standards for all projects, repeatable
➤ Summary and detailed information

Level 4: Managed process
➤ Process integrated with corporate process
➤ Management uses data to make decisions specific

Level 5: Optimizing process
➤ Process to measure project effectiveness and efficiency
➤ Process in place to improve project performance
➤ Management focuses on continuous improvement

TABLE 1: Assessment result of each knowledge area maturity level

No.	PMI knowledge areas	PM solutions maturity levels					Mean
		1	2	3	4	5	
		Initial process	Struct. process	Org. standards	Managed process	Optim. process	
	Project Integration Management						**3**
1	Develop project charter			3			
2	Develop project management plan				4		
3	Direct and manage project work			3			
4	Monitor and control project work			3			
5	Perform integrated change control		2				
6	Close project or phase			3			
	Project Scope Management						**3**
7	Plan scope management				4		
8	Collect requirements			3			
9	Define scope			3			
10	Create WBS			3			
11	Validate scope		2				
12	Control scope			3			
	Project Time Management						**3**
13	Plan schedule management				4		
15	Activity definition			3			
15	Activity sequencing			3			
16	Estimate activity resource			3			
17	Estimate activity duration			3			
18	Schedule development			3			
19	Schedule control		2				
	Project Cost Management						**3.67**
20	Cost estimating				4		
21	Cost budgeting				4		
23	Determine budget			3			
	Project Quality Management						**3**
24	Plan quality management			3			
25	Perform quality assurance			3			
26	Quality control			3			
	Project Human Resource Management						**2.5**
27	Plan HRM			3			
28	Aquire project team			3			
29	Develop project team		2				
30	Manage project team		2				
	Project Communications Management						**3.33**
31	Plan communications management				4		
32	Manage communications			3			
33	Control communications			3			
	Project Risk Management						**2.83**
34	Plan risk management			3			
35	Identfy risks			3			
36	Perform qualitative risk anaysis			3			
37	Perform quantitative risk anaysis			3			
38	Plan risk responses		2				
39	Control risks			3			
	Project Procurement Management						**3.50**
40	Plan procurement management				4		
41	Conduct procurements			3			
42	Control procurements			3			
43	Close procurments				4		
	Project Stakeholder Management						**2.5**
44	Identify stakeholderes			3			
45	Plan stakeholder management			3			
46	Manage stakeholder engagement		2				
47	Control stakeholder engagement		2				

APPENDIX III: Future plan – Assessment at Ethiopian Electric Power (EEP)

The plan is to carry out a similar assessment at Ethiopian Electric Power company using the project maturity tools studied in Iceland. The objective of the assessment is to establish the level of project maturity in the company and recommend areas of improvement.

Why do assessments at the company?
As stated by Alice Zavala (2005) doing the maturity assessment at organization can give the following stated benefit to organization. The Power Company can benefit from the assessment through other advantages as the assessment:

- Provides a clear picture of current state and define future state;
- Identifies the gaps and provides a roadmap for organization change;
- Motivates the organization to reach a better state;
- Motivates individuals to grow and develop current skills and educate the organization on best practices.

The assessment will be carried out through the following procedure:

a. Prepare for interviews
   ➢ Document and review interview guidelines,
   ➢ Prepare questions,
   ➢ Determine interview team,
   ➢ Prepare supporting templates and documentation guidelines.
b. Conduct interviews
   ➢ Individual interviews or small-groups, it depends.
c. Assessment findings
   ➢ Analysing results, comparing scores, information sorting,
   ➢ Prepare and complete assessment deliverables,
   ➢ Create report and presentation of findings and recommendations,
   ➢ Report to management.

The assessment will be carried out according to the planned schedule as shown in Table 1 below.

TABLE 1: Time schedule of project management maturity assessment

No.	Stage description	Months											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Preparing proposal	■											
2	Approval of proposal	■											
3	Preparing interview Schedule/Questionnaire survey		■										
4	Booking appointments		■										
5	Conduct interviews			■	■								
6	Evaluating and analysing the result					■	■						
7	Report writing							■	■	■			
8	Checking by supervisor										■		
9	Finalize the report											■	
10	Approval of report by supervisor												■
11	Presentation to management of company												■