Presented at *Short Course VIII on Exploration for Geothermal Resources*,
organized by UNU-GTP, GDC and KenGen, at Lake Bogoria and Lake Naivasha, Kenya, Oct. 31 – Nov. 22, 2013.

PLANNING OF GEOTHERMAL PROJECTS IN KENYA

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ABSTRACT

The project cycle for the geothermal projects as implemented by KenGen comprises four phases and nine steps. The phases are resource exploration, resource assessment, plant construction and operation phases. The exploration phase is further subdivided to three development steps: existing data review, detailed surface exploration and exploration drilling. The resource assessment phase is divided into two steps: appraisal drilling and feasibility study. The construction phase comprise two steps; production drilling and construction of the steam gathering pipe network, power plant and transmission line construction. The work plans developed are used by the execution team as a road map to power plant commissioning which is the ultimate development objective and are also used for soliciting for funds from funding institutions. The planning entails scheduling of the various activities comprising the project activities and how they interrelate. The activities comprise the legal or regulatory requirements, procurement processes that include seeking for KenGen's and funding institution approvals, activities of the funding institutions leading to credit award and the actual site works. The planning aims at optimizing time, cost and procurement of human capacity not resident within KenGen's staff within the legal, regulatory and policy framework existing for each specific project. Project planning computer programs are used particularly Microsoft Project and the key planning outputs are Gantt charts, procurement plans, budgets, cash flow plans and progress reports.

1. INTRODUCTION

1.1 Definitions of work plans

Work plans may be defined as a series of interrelated tasks and activities which when implemented successfully will realize the goals and objectives of a specific project.

1.2 Why project plan

Project planning is an aspect of project management. Project management, a professional discipline, may be defined as "the overall planning, coordination and control of a project from inception to completion aimed at meeting a Client's requirements in order to produce a functionally and financially viable project that will be completed on time within authorized cost and to the required quality standard" (Pearson Education Limited, 1999).

The above definition is more applicable to perspective of the appointed project manager. However, the project plans serve various purposes to various parties involved with the project.

1.2.1 Project owner

Geothermal projects require colossal sums of money to implement. Very few individual institutions and third world governments can implement a sizable geothermal project from internal resource without resulting to soliciting for external funding. Therefore a project plan provides the owner with total project cost, project development period where the project will not make money, cash inflows and outflows and likely profitability. These data is very important for the owner as they approach prospective financiers.

1.2.2 Financiers

Banks are very willing to loan out funds. However, they are averse to adverse risk exposure. They will evaluate a long list of potential risks and in particular administration risks and projected profitability as a basis for servicing of the loan to be advanced. Often times, bilateral and multilateral financial agencies have required engagement of consultants to enhance project management functions. A well packaged project plan assures the banks of a capable project management team. The project plans also provides the banks with an instrument for economic and financial project evaluation. The work plans act as a basis for owner's contractual obligations with the bank and a reference for project progress evaluation and monitoring.

1.2.3 Project execution management team

To the execution team, the work plans are the road map for the project implementation. They capture the projects concepts, requirements, identifies what needs to be done, assigns responsibility to those who will do what needs to be done, defines how it will be done and identifies and assigns the requirements to enable the work to be done. In many times they also identify the authorities and approval to be sought in the process of the project implementation.

The work plans further highlights the milestones that must be achieved and thereby identify the critical aspects of the project. They also act as instruments of communication. In addition, they serve as instruments of performance measurement and control. Regularly the project implementation progress is assessed against the set out milestones in the work plan and where discrepancies occur adjustments are made. On the other hand costs are monitored to ensure that the project has sufficient funding and to address any budget overruns.

1.2.4 Resource persons

They are a reference for level of performance requirement and additional departmental planning.

1.3 Project cycle

A project is time-bound, with definite start and a finish date. A project cycle can be thought as a sequence of logically linked activities in which each is necessary and is a prerequisite for the next stage in the cycle. Project generally grouped into five distinct categories (Figure 1).

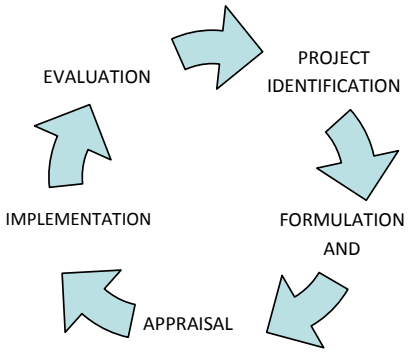


FIGURE 1: Project Cycle

1.3.1 Project identification

Identification is the very beginning of the project cycle. At this point the project is defined in very general terms. In many times, at this step, there more questions than answers.

1.3.2 Project formulation and preparation

This stage includes pre-feasibility and feasibility stages. It involves a consideration of all aspects namely; technical, financial, economic, social, cultural, managerial and political aspects. The basic rational of the project is thus examined at this stage especially to identify obvious reasons why the project may not or is unlikely to go on.

1.3.3 Appraisal

Appraisal stage is when detailed project is undertaken especially, where donors are involved, they will involved there technical team, internal staff or consultants, and the resulting plan will be implemented.

1.3.4 Implementation

This entails the execution of the agreed works plan.

1.3.5 Evaluation

Where donors are involved, project evaluation is carried to identify lessons learned. In particular the evaluation will refer back to the project objectives and the work plans and establish whether the objectives were met and if the work plan were appropriate.

The work plans are a result of the work done during project formulation and preparation and the appraisal. It is prudent to note that the works plans provide value to the entire project phases.

1.4 Project parameters

During a projects life, management focuses on three basic parameters; quality, cost and time (Figure 2). However, for those working in donor funded and government owned projects must in addition factor in the law, policy, rule and regulations which can derail the project if not observed. These parameters must be specified in detail during the planning of the project and are to be adhered to during implementations. These parameters are addressed through specifications, budgets, time schedules and the various policies, rules and regulations applicable to a specific project.

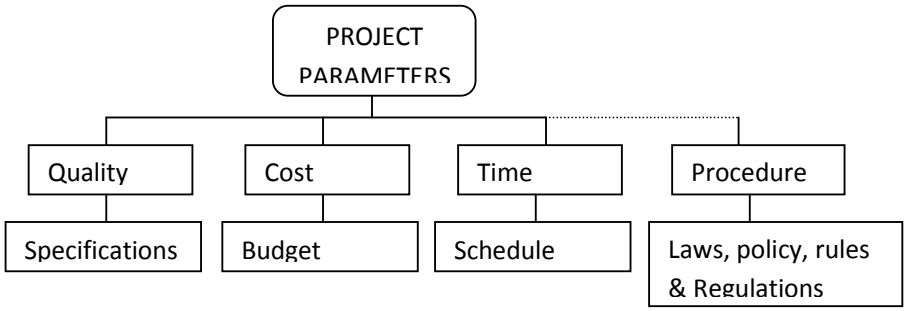


FIGURE 2: Basic Project Elements

1.5 Key project inputs

Projects use specific inputs (resources) to produce particular outputs over a specified time period in order to meet an identified development need of clearly identified target group. The key project

resources are people, equipment and materials. The work plans identify, plans for, costs and optimizes the use of each of the resources.

1.6 Planning process

The crucial phase involves the breaking down of the various activities and tasks required to complete the project along the three basic parameters while taking to consideration of the law, policy, rules and regulations. The steps involved in planning include:

- Establish the project objectives
- Choose a basic strategy for achievement of the objectives
- Break the project down into subunits of task and activities
- Determine the performance standards for each subunits
- Determine how much time is required to complete each subunit
- Determine the proper sequence for completing the subunits and aggregate this information into a schedule for the total project
- Determine the cost of each subunit and aggregate costs into the project budget
- Determine the staff organization, including the number and kind of position and the duties and responsibilities of each
- Determine what training, if any is required for project team members
- Identify the applicable laws, policy, rules and regulations

2. REVIEW OF THE DEVELOPMENT PHASES

Mwangi (Mwangi, 2007) has reviewed the planning concept used in geothermal project planning in Kenya. The entire geothermal project cycle can be summarized as shown in Figure 3 (Price Water House Coopers, 2007). There are four major phases and nine key steps in the development of geothermal project.

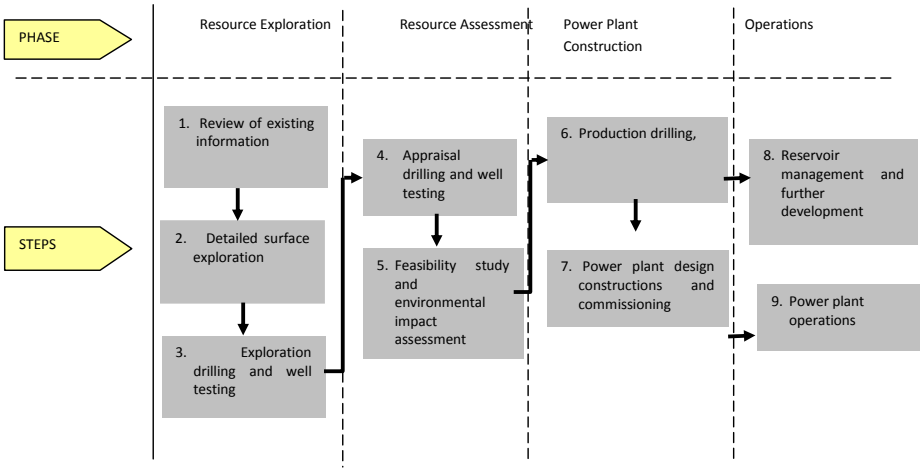


FIGURE 3: Geothermal development phases

PHASE 1: RESOURCE EXPLORATION

Step 1: Review of Existing Data

Objective: The objective is to collate available data gathered overtime by various agencies involved in studies and research with the aim of identifying gaps on the information base and strategizing on further works.

Scope of work: This entails a desktop review and analysis of existing data by various disciplines of earth sciences (geology, geophysics and geochemistry) and engineering (surface heat measurement).

Duration: The duration for this step may only be a month. Various disciplines would be involved.
Organization: KenGen has an in-house capacity and carries out this exercise
Output: An inception report would result detailing the information gap and the detailed program for undertaking surface exploration.
Costs: The cost is negligible

Step 2: Detailed surface exploration

Objective: The objective is to define the resource by its key system characteristic namely: existence of a heat source in the form of hot magmatic body near earth surface, existence of hydrological system, its characteristics (i.e. flow direction) and geological structures controlling it and area extent of the prospect.
Scope of works: This entails field measurements, sample collections, laboratory tests, studies and analysis by various disciplines of earth sciences (geology, geophysics and geochemistry) and engineering (surface heat measurement). In addition, baseline environmental studies are undertaken.
Organization: KenGen has internal capacity that carries out this step. It also engages consultants to offer peer review services.
Duration: For most fields, surface works takes about three months.
Out Put: The main output from this step is a conceptual model of the geothermal system and siting of the discovery (exploration) wells.
Cost: The budget for this step has been within US$ 0.5 million per prospect.

Step 3: Exploration drilling

Objectives: The main objective is to prove the resource inferred by the geoscientific studies by drilling a discovery well at the best point according to the conceptual model and confirm the results with one or two additional wells.
Scope of work: This step marks the beginning of the physical development on any prospect. The key activities in this step include:

- Main access road and drill pad construction
- Establishment of drilling water and pumping installation. The pumping may be powered by diesel driven generators or electricity where economically accessible.
- Acquisition of land entry rights through negotiation for compensation or purchase
- Other logistical requirements e.g. accommodation, storage, security, offices etc.
- Drilling and testing of three exploration wells.
- Acquisition of environmental license.

Organization: For short distances of access roads, KenGen has internal capacity and undertake the civil works. For long stretches of access road, KenGen contracts out the earth works. The water installation works are also contracted out except operating and maintenance of the plants, which is done in-house. The drilling works can either be contracted or carried out internally depending on rig availability. The application for environmental clearance is done in-house.
However, KenGen engages consultants for peer review.
Output: Resource discovery by discharging wells and most importantly a go or no go decision for further development.
Duration: One year is allowed to undertake the initial logistical requirements. These include opening the area up by construction of roads, establish water supply system from surface sources or drilling of borehole and the related pipeline , pumping system

and power sources. The time allows acquisition of land access rights and the compensation processes. Drilling requires storage facilities and security systems e.g. fencing, store house or containerized storage. Within the same period, procurement of overseas materials is carried out and contracts for provision of local materials made. The materials may require some advance preparation e.g. slotting. Six months is allowed for the actual drilling.

Cost: For the advance logistical requirements, a budget figure of US$ 5.2 million is allowed. The well cost are estimated at US$ 4.3 million per well using KenGen rigs. However, the actual cost for this step varies from one prospect to another.

PHASE 2: RESOURCE ASSESSMENT

Step 4: Appraisal drilling and well testing

Objective: Appraisal drilling follows a successful drilling exploration program. It is aimed at:

- Sizing the resource in terms of possible output necessary for power plant sizing;
- Determining well productivity characteristics (average fluid output per well and steam fraction) necessary for determining cost of investments and drilling requirements.
- Determining the reservoir fluids characteristics in particular, pressure at the surface (wellhead), dissolved solids that may lead to deposition and dissolved gas content which impact power plant designs and performance.
- Proving a certain fraction of required steam for a plant as a precondition for funding

Scope of work: The standard practice for KenGen is to drill and test six appraisal wells and may increase this number to nine if necessary.

Output: All the above data is obtained in preparation of feasibility study. Data and go or no go decision

Organization: The drilling is carried out in-house if KenGen has an available rig but KenGen may contract a rig but manage the drilling process. KenGen has in recent past contracted drilling consultancy and supervision to beef up its capacity. The additional civil works are carried out in-house. Where earth moving equipment shortages are encountered, these are hired on short contracts.

Duration: The total duration takes about 15 months. Drilling takes about 12 months while testing of the last well is allowed 3months to heat up and be flow tested.

Costs: The well costs is estimated at about US$ 4.3 per well including the civil works. Testing is estimated at US$ 40, 000 per well

Step 5: Feasibility study

Objective: The main objectives of the feasibility studies are:

- Matching existing power plant technologies to resource characteristics and establish a preliminary design
- Carrying out a financial and economic analysis to establish project viability
- Identifying resource management issues that will arise during exploitation and how to mitigate them
- Undertaking environmental impact study scoping

Scope of work: This is mainly a desktop study. It essentially collates all the data so far accumulated and relates it to the proposed power project. One key aspects taken to consideration

is simulation studies establish sustainable resource exploitation and coming up with the preliminary design parameters

Output: Bankable feasibility study which KenGen and funding institutions would use for funding purpose. In addition the feasibility study proposes the appropriate technology to be used to optimize the resource.

Organization: This step has been contracted to consultants especially because of the comfort of the lending institutions. However, both KenGen's Board of Consultants and KenGen staff would review the reports.

Duration: The feasibility study is allowed a six months period.

Costs: This may take up to US 2 million depending on the scope of the project.

PHASE 3: POWER PLANT DEVELOPMENT

Step 6: Production drilling

Objective: At this stage of development, a decision to construct a plant is already made. The drilling is therefore to provide sufficient steam to run the plant. Additional wells are drilled for reinjection purpose. One reinjection well is required for every 4 production wells.

Scope of works: There would be additional civil works to provide additional access roads and site construction. Wells would be drilled to provide sufficient steam plus about 10% excess at start-up. The wells would be tested. Procurement activities would continue in this step.

Organization: All civil works would be carried out in-house. Drilling would be carried out both in-house and through contracts depending on rigs availability. Well testing would be carried out in-house. A drilling consultancy and supervision may be considered to offer support to the existing drilling management staff.

Duration: Allows 60 days per well and is subject to the number of wells to be drilled. For estimation purpose, we assume exploration will be 50% successful, appraisal 75% successful and production wells 90% successful. For 140 MW plant allowing 10% excess steam at start-up we require 25 production wells. The duration will be 4 years using one rig and 2yrs with two rigs.

Costs: The well costs is estimated at about US$ 4.3 per well including the civil works. Testing is estimated at US$ 40, 000 per well.

Step 7: Power plant design, construction and commissioning

Objective: Detailed design, procure and construct the steam gathering system, power plant substation and transmission lines

Scope of works: Design, procure, construct, commission the plant and undertaking a comprehensive environmental impact studies.

Organization: KenGen appoints a project team. The project team contracts a consultant to supervise the construction contractor. KenGen and the consultants tender, shortlist and contract a contractor(s). The contractor designs, procures and install the plants and its accessories. KenGen would carry out the full EIA.

Duration: It takes about 30 months to construct the power house, manufacture and ship the turbine and their accessories. The steam field and the transmission lines will be constructed in parallel.

Cost: The power plant including the power house and all that goes into the power plant are estimated at US$ 2.5 million per MW for plants less than 50 MW, US$2.3 million those between 50 and 100 MW and US1.8 Million for plants size larger than 100 MW. The steam pipeline cost is estimated at US$ 25 million for a 70 MW plant and US$ 37.5 million for a 140 MW plant.

Step 8: Reservoir management

Objectives: Monitoring to ensure steam availability to the plant, monitor pressure drawdown and scaling problems.
Scope of Work: Entails regular measurement of well productivity, wellhead pressure and chemical composition of the well effluent. It may involve tracer injection and cold re-injection activities.
Organization: This is carried out internally.
Duration: Will be carried out for the entire operation period of the plant.
Cost: Will greatly vary. This is operations and maintenance cost.

Step 9: Operations

Objective: This entails the operations and maintenances of the power plant to ensure continuous generation.
Scope of works: This will include operation of the plant on a 24hr basis, regular maintenance and scheduled overhauls over the plant life.
Organization: It is carried out internally. The staff requires to be trained for the plant operations.
Duration: Plant life
Cost: Operation and maintenance cost

3. LAW, RULES AND REGULATIONS

3.1 Geothermal Act, 1982

The act provides:

- For the purpose of exploration, the Minister of Energy authority in writing is required whose life is one year and may be renewable (Part II, Clauses 6).
- Reasonable notice of the intention to enter upon any land shall be given to the owner or occupier of the land.
- One needs to apply for geothermal license for the purpose of exploitation. The application to be accompanied by a fee. The life of the license is not greater than 30 years (Part II, Clause 7).
- The land owners shall be compensated for the losses incurred pursuant to geothermal development (Part IV, Clauses 18 – 23).

3.2 Environmental management and co-ordination act, 1999

The act provides:

- No project will commence without submission of a project report.
- The National Environmental Management Authority (NEMA) will evaluate the report and if in their opinion it will have major impact, the project owner will be required to carry out an environmental impact assessment study (EIA).
- The report is submitted back to NEMA with a fee.
- The Authority shall respond to the application within three months without which the applicant may proceed.
- Upon receipt of the EIA document, NEMA shall cause a notice to be published in the official government news print, the Kenya Gazette including a local newspaper.
- Nema will allow the public sixty days perusing and objecting to the proposed project. This period may be extended if an individual applies for extension.

- Only when the public and the Authority is satisfied, will the Authority issue an EIA licences

3.3 The public procurement and disposal act, 2005

(LEGAL NOTICE No. 174, Kenya Gazette Supplement No. 92, 29th December, 2006, Legislative Supplement No. 53)

This Act applies to any body in which the Government has a controlling interest. In summary the act requires that:

- All international tendering will be allowed 30 days to prepare tender. If one was to use pre-qualifications one has to allow at least 14 days to prepare the prequalification documents. This require advertisement in the local and where possible international journal etc.
- National tendering requires bidders to be allowed at least 21 days to prepare their bid. In addition if the projected cost is estimated over Kshs 6 million (US 0.75 million) for goods and works and US$ 0.375 million for services will require to be advertised in the local newspapers.
- The tender documents are evaluated by a committee and approved by an official tender committee.
- The contract cannot be signed before 14 days after award to allow for complaints and appeal to the award.

3.4 Funding institution rules and regulations

3.4.1 Funding cycle

Receiving funding from donors follow a process that take about a year and may last longer. The process begins with project identification, formulation and appraisal. The funding for the project would then be presented for approval. The approving board meets once every about 4 to 6 months. After the approval, it still takes time to carry out financial negotiation

3.4.2 Procurement regulations

Prior to publication or invitation to pre-qualify or tender, the following documents are often time submitted to the funding institution for a approval without which the process may not be funded under the credit. These are:

- Invitation to tender
- Selection criteria for qualification (in detailed form)
- Tender documents, including specimen contract
- Draft notice specifying the fees for the purchase of the tender documents and their utilization, as well as list of the media in which the notice is to be published

In processes with pre-qualification, the following documents have to be submitted to the funding institution for comment prior to the invitation to tender:

- The evaluation report of the qualification, including the certificate or opinion of the consultant
- The recommendation on the list of bidders to be invited to tender

In processes with post-qualification, the following documents have to be submitted to funding institution for comment prior to the opening of the bids:

- The *evaluation report* of the qualification, including the certificate or opinion of the consultant

- The recommendation on the list of bidders whose financial bids are to be opened.

Prior to the award of the contract, the following documents are to submitted the funding institution for comment:

- The signed record of the bid opening
- The *evaluation report*
- The recommendation on the award
- The certificate or opinion of the consultant on the recommendation of the award
- If applicable, an explanation why the *binding period* could not be observed
- At the request of funding institution, if applicable, all or specific bids.

In addition the funding institutions require that the bidders be allowed at least 30 days to prepare pre-qualification bids and at least about 45 days to prepare actual bids.

3.5 The water act

The water act provides that authority is required for abstraction of water whether from surface bodies or underground. Geothermal projects require water for the drilling process and also the mining of the geothermal fluids falls within this categorization. This process requires an application to be made. A regional board would then consider the application and grant approval. This can take over six months.

4. SCHEDULING

As stated above a project has a specific start and finish date. The above information is generic and needs to be customized for a specific project. This activity is called scheduling. The steps involved in scheduling are:

- Enter the project phases, milestones and tasks into table on a paper, white board, a spreadsheet, or word processor. You may also enter the data into a Gantt chart or network diagram
- The next aspects is to calculate dates, start and finish for each activity and enter them in the table
- Link tasks with their appropriate relationships to one another. Note that some tasks cannot begin until certain previous undertaken task has been completed. Again certain tasks compete for resources hence a certain task may not begin until a limited resource is available.
- Review the program so as to take care of any deadlines and other date constraints
- Assign resources to the various tasks and optimize the resources so as not to over allocate resource thereby creating conflict or under allocate resources which leads to higher project costs
- Establish the budget for the project;
- It is increasing becoming a requirement to have a separate procurement plan. Hence one would extract the aspects of procurement from the main plan.

For a simple project, working with a paper or white board may be adequate. However, geothermal projects take many years and have very many interrelated tasks. In addition, optimization of the project plan requires working forward and backwards and can be very taxing. Several computer programs exist that aid the planners in the optimization of the work plans. The programs in particular aid the planners to:

- Calculate the start and finish dates
- Indicate whether assigned resources are actually available

- Inform you if the assigned resources are under allocated or overworked
- Alert you if you have an upcoming deadline
- Calculated the budget for you once the cost have been included in the program
- Help you to manage and control the project by highlighting activities that have not started after their start date and those that are delayed
- The programs enable the planners to get customized reports in different views e.g. Gantt, network diagram and table

Examples of the project planning computer programs are:

- Microsoft project
- Primavera
- Smart Draw

There are many others that could be found in the internet. In KenGen, Microsoft Project Software is widely use and in limited cases Primavera. The key outputs of interest to KenGen have been Gantt charts, procurement plans, budgets, cash flow plan and progress reports. A typical plan is shown in the appendix.

REFERENCES

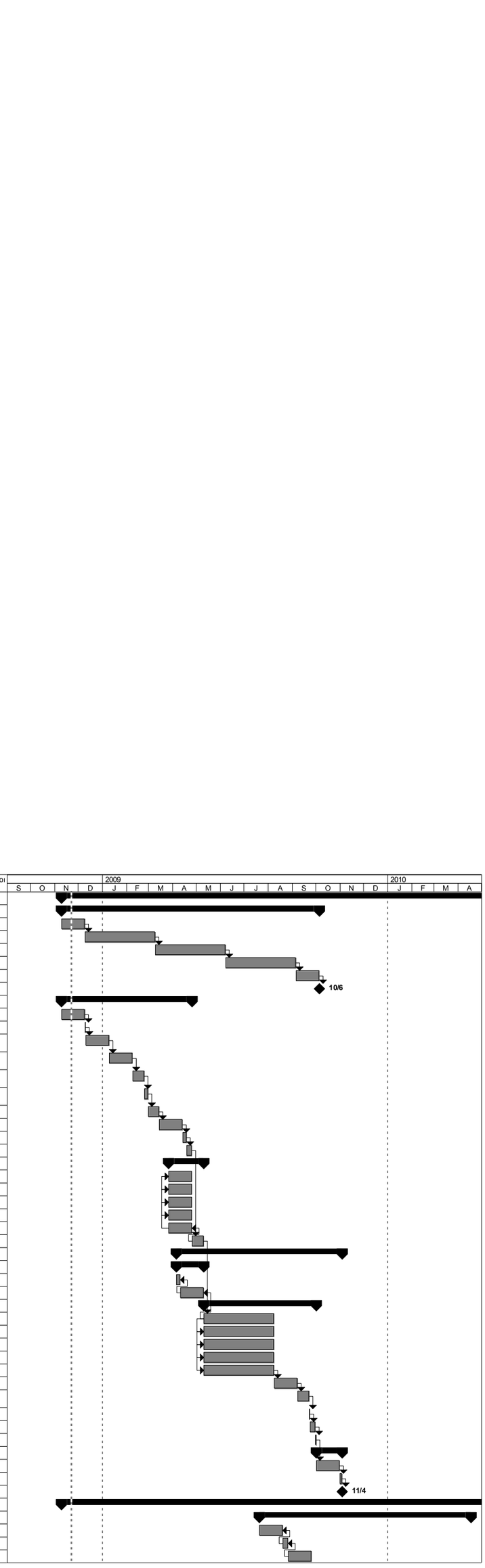
Mwangi, M.N., 2007: Planning Of geothermal projects: a case study on Kenya. *Papers and Presentation at "Short Course III on Surface Exploration for Geothermal Resources" Organized by UNU-GTP and KenGen in Naivasha Kenya, November 2007*

Pearson Education Limited, 1999: *Code of practice for project management for construction and development* (2nd ed.). Edinburgh Gate, Harlow, England, 217 pp

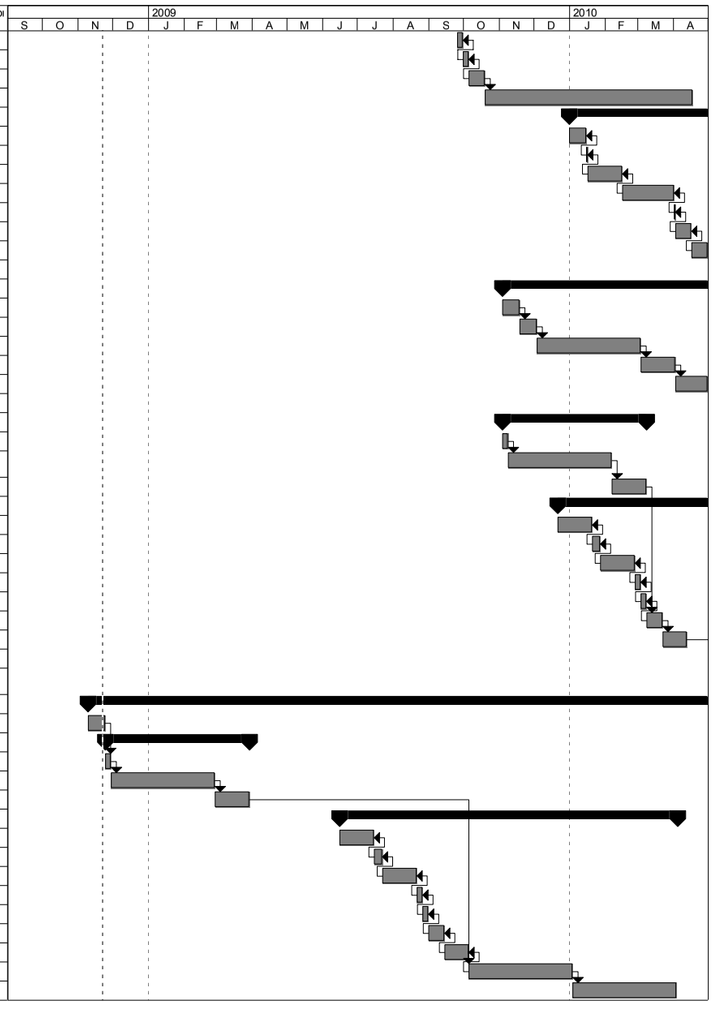
PriceWater House Coopers, 2007: *Establishment of a geothermal development company*. Draft Master and Business Plan, Nairobi, Kenya, July 2007.

APPENDIX

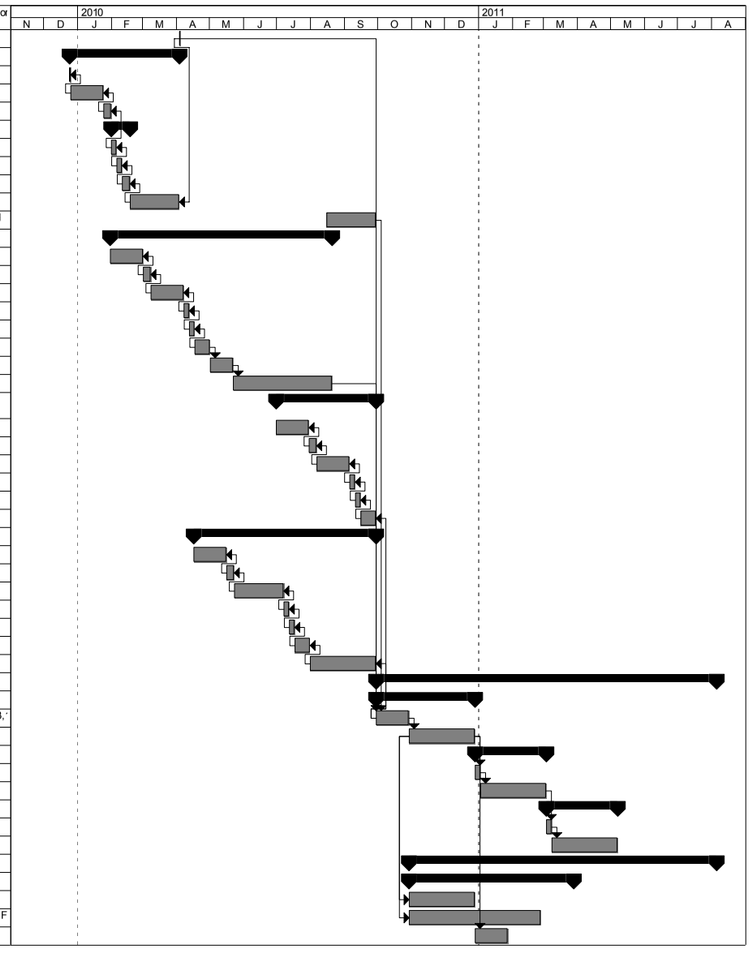
ID	Task Name	Duration	Start	Finish	Predecessor
1	**RESOURCE EXPLORATION**	**1071 d?**	**11/10/08**	**10/17/11**	
2	**Funding Application**	**330 d**	**11/10/08**	**10/6/09**	
3	Project Identification	30 d	11/10/08	12/10/08	
4	Project Formulation and Preparation	90 d	12/10/08	3/10/09	3
5	Appraisal	90 d	3/10/09	6/8/09	4
6	Funding institution Approval	90 d	6/8/09	9/6/09	5
7	Fianacial Agreements Negotiation	30 d	9/6/09	10/6/09	6
8	**Credit Effectiveness**	**0 d**	**10/6/09**	**10/6/09**	**7**
9	**Budgets Approval**	**167 d**	**11/10/08**	**4/26/09**	
10	Budget preparation	30 d	11/10/08	12/10/08	
11	Draft Submission	1 d	12/10/08	12/11/08	10
12	In-house Discussion and Review	30 d	12/11/08	1/10/09	11
13	Executive Presentation and Review	30 d	1/10/09	2/9/09	12
14	Presentation to Board of directors	15 d	2/9/09	2/24/09	13
15	Submission To Ministry Of Energy	5 d	2/24/09	3/1/09	14
16	Transmission to Treasurery	14 d	3/1/09	3/15/09	15
17	Treasurery's Approval	30 d	3/15/09	4/14/09	16
18	**Preparation of Works Orders**	**5 d**	**4/14/09**	**4/19/09**	**17**
19	**Prvovision of Works Orders**	**7 d**	**4/19/09**	**4/26/09**	**18**
20	**DATA REVIEW**	**45 d**	**3/27/09**	**5/11/09**	
21	Geology	30 d	3/27/09	4/26/09	22SS
22	Geochemistry	30 d	3/27/09	4/26/09	23SS
23	Geophysics	30 d	3/27/09	4/26/09	24SS
24	Heat Flux Data	30 d	3/27/09	4/26/09	25SS
25	Environmental Baseline Data	30 d	3/27/09	4/26/09	26SF
26	Inception Report	15 d	4/26/09	5/11/09	19
27	**SURFACE RECONNAISSANCE**	**212 d**	**4/6/09**	**11/4/09**	
28	**Obtain Survey Permit**	**35 d**	**4/6/09**	**5/11/09**	
29	Draft Application Letter and obtain signature	5 d	4/6/09	4/11/09	30SF
30	Minister's Permit (1yr)	30 d	4/11/09	5/11/09	32SF
31	**Actual Work**	**144 d**	**5/11/09**	**10/2/09**	
32	Geology	90 d	5/11/09	8/9/09	26
33	Geochemistry	90 d	5/11/09	8/9/09	32SS
34	Geophysics	90 d	5/11/09	8/9/09	33SS
35	Heat Flux Data	90 d	5/11/09	8/9/09	34SS
36	Environmental Baseline Data	90 d	5/11/09	8/9/09	35SS
37	Reports Individual Disciplines	30 d	8/9/09	9/8/09	36
38	Combined report- Conceptual Model	15 d	9/8/09	9/23/09	37
39	Presentation	1 d	9/23/09	9/24/09	38
40	In-house Review	7 d	9/24/09	10/1/09	39
41	Submission of Final Draft	1 d	10/1/09	10/2/09	40
42	**BOC Review**	**33 d**	**10/2/09**	**11/4/09**	
43	Post Reports	30 d	10/2/09	11/1/09	41
44	Actual Meetings	3 d	11/1/09	11/4/09	43
45	Go or No Go	0 d	11/4/09	11/4/09	44
46	**Exploration Drilling**	**1071 d?**	**11/10/08**	**10/17/11**	
47	**Overseas Procurement**	**271 d**	**7/21/09**	**4/18/10**	
48	Prepare tender	30 d	7/21/09	8/20/09	49SF
49	Advertise	7 d	8/20/09	8/27/09	50SF
50	Tender Period	30 d	8/27/09	9/26/09	51SF



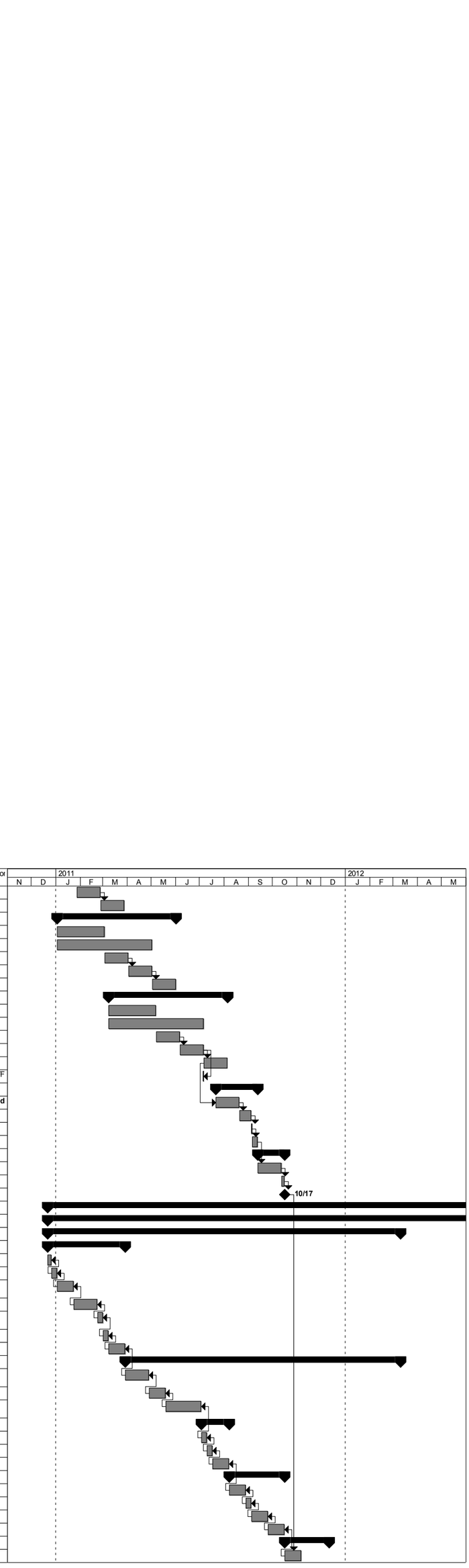
ID	Task Name	Duration	Start	Finish	Predecessor
51	Evaluation	5 d	9/26/09	10/1/09	52SF
52	Approval	5 d	10/1/09	10/6/09	53SF
53	Award & Appeal Period	14 d	10/6/09	10/20/09	8
54	Delivery	180 d	10/20/09	4/18/10	53
55	**EIA License acquisition**	**167 d?**	**1/1/10**	**6/17/10**	
56	Prepartion of Project Report	15 d	1/1/10	1/16/10	57SF
57	Submission of Project report	1 d?	1/16/10	1/17/10	58SF
58	Review By NEMA	30 d	1/17/10	2/16/10	59SF
59	Undertake EIA	45 d	2/16/10	4/2/10	60SF
60	Submit	1 d?	4/2/10	4/3/10	61SF
61	Advertise	14 d	4/3/10	4/17/10	62SF
62	Public Review	60 d	4/17/10	6/16/10	63SF
63	Obtain Licence	1 d?	6/16/10	6/17/10	83SF
64	**Acquisition of Land Rights**	**225 d**	**11/4/09**	**6/17/10**	
65	Identification of Owners	15 d	11/4/09	11/19/09	45
66	Approaching the Owners	15 d	11/19/09	12/4/09	65
67	Engage Owners into negotiations	90 d	12/4/09	3/4/10	66
68	Apply for approval	30 d	3/4/10	4/3/10	67
69	Enter into agreements	45 d	4/3/10	5/18/10	68
70	Pay Compensations	30 d	5/18/10	6/17/10	69
71	**Water Abstraction License**	**125 d**	**11/4/09**	**3/9/10**	
72	Compile Application	5 d	11/4/09	11/9/09	45
73	Review by WaterManagement Board	90 d	11/9/09	2/7/10	72
74	Obtain License	30 d	2/7/10	3/9/10	73
75	**Contract Earth Works**	**297 d**	**12/22/09**	**10/15/10**	
76	Prepare tender	30 d	12/22/09	1/21/10	77SF
77	Advertise	7 d	1/21/10	1/28/10	78SF
78	Tender Period	30 d	1/28/10	2/27/10	79SF
79	Evaluation	5 d	2/27/10	3/4/10	80SF
80	Approval	5 d	3/4/10	3/9/10	81SF
81	Award & Appeal Period	14 d	3/9/10	3/23/10	74
82	Mobilization	21 d	3/23/10	4/13/10	81
83	Road and Site Costruction	90 d	6/17/10	9/15/10	82,70
84	Construct storage facilities and temporary offices	90 d	7/17/10	10/15/10	83SS+30 d
85	**Establish Water Supply System**	**689 d?**	**11/10/08**	**9/30/10**	
86	Survey Sources of Water	15 d	11/10/08	11/25/08	
87	**Water Abstraction License**	**125 d**	**11/25/08**	**3/30/09**	
88	Compile Application	5 d	11/25/08	11/30/08	86
89	Review by WaterManagement Board	90 d	11/30/08	2/28/09	88
90	Obtain License	30 d	2/28/09	3/30/09	89
91	**Drilling Of Water Bore holes**	**293 d?**	**6/16/09**	**4/5/10**	
92	Prepare tender	30 d	6/16/09	7/16/09	93SF
93	Advertise	7 d	7/16/09	7/23/09	94SF
94	Tender Period	30 d	7/23/09	8/22/09	95SF
95	Evaluation	5 d	8/22/09	8/27/09	96SF
96	Approval	5 d	8/27/09	9/1/09	97SF
97	Award & Appeal Period	14 d	9/1/09	9/15/09	98SF
98	Mobilization	21 d	9/15/09	10/6/09	99SF
99	Actual Drilling	90 d	10/6/09	1/4/10	90,8
100	Water Works Construction	90 d	1/4/10	4/4/10	99



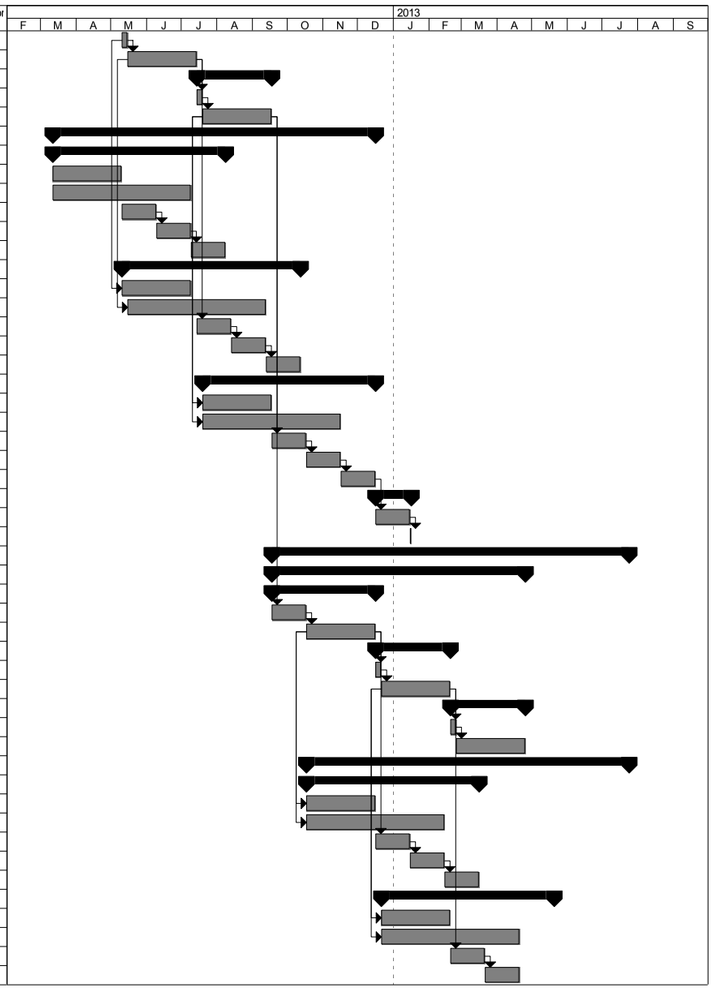
ID	Task Name	Duration	Start	Finish	Predecessor
101	Commissioning	1 d?	4/4/10	4/5/10	100
102	**Apply For Electricity Supply to Boreholes**	**100 d?**	**12/25/09**	**4/4/10**	
103	Compile Application	1 d?	12/25/09	12/26/09	104SF
104	Assessment	30 d	12/26/09	1/25/10	105SF
105	Quotation	7 d	1/25/10	2/1/10	107SF
106	**Payment**	**17 d**	**2/1/10**	**2/18/10**	
107	Prepare Request for Approval	5 d	2/1/10	2/6/10	108SF
108	Approval	5 d	2/6/10	2/11/10	109SF
109	payment	7 d	2/11/10	2/18/10	110SF
110	Design & Costruction	45 d	2/18/10	4/4/10	101SF
111	Laying Of Water Line	45 d	8/16/10	9/30/10	83SS+60 d
112	**Slotting of Liners**	**202 d**	**1/31/10**	**8/21/10**	
113	Prepare tender	30 d	1/31/10	3/2/10	114SF
114	Advertise	7 d	3/2/10	3/9/10	115SF
115	Tender Period	30 d	3/9/10	4/8/10	116SF
116	Evaluation	5 d	4/8/10	4/13/10	117SF
117	Approval	5 d	4/13/10	4/18/10	118SF
118	Award & Appeal Period	14 d	4/18/10	5/2/10	54
119	Mobilization	21 d	5/2/10	5/23/10	118
120	Actual Works	90 d	5/23/10	8/21/10	119
121	**Contract for Bulk Cement & Diesel Fuel**	**91 d**	**7/1/10**	**9/30/10**	
122	Prepare tender	30 d	7/1/10	7/31/10	123SF
123	Advertise	7 d	7/31/10	8/7/10	124SF
124	Tender Period	30 d	8/7/10	9/6/10	125SF
125	Evaluation	5 d	9/6/10	9/11/10	126SF
126	Approval	5 d	9/11/10	9/16/10	127SF
127	Award & Appeal Period	14 d	9/16/10	9/30/10	138SF
128	**Contract Cementing Services**	**166 d**	**4/17/10**	**9/30/10**	
129	Prepare tender	30 d	4/17/10	5/17/10	130SF
130	Advertise	7 d	5/17/10	5/24/10	131SF
131	Tender Period	45 d	5/24/10	7/8/10	132SF
132	Evaluation	5 d	7/8/10	7/13/10	133SF
133	Approval	5 d	7/13/10	7/18/10	134SF
134	Award & Appeal Period	14 d	7/18/10	8/1/10	135SF
135	Mobilization	60 d	8/1/10	9/30/10	138SF
136	**Drilling**	**310 d**	**9/30/10**	**8/6/11**	
137	**Well 1**	**90 d**	**9/30/10**	**12/29/10**	
138	Rig Mobilization	30 d	9/30/10	10/30/10	120,111,83,7
139	Actual Drilling	60 d	10/30/10	12/29/10	138
140	**Well 2**	**65 d**	**12/29/10**	**3/4/11**	
141	Rig Mobilization	5 d	12/29/10	1/3/11	139
142	Actual Drilling	60 d	1/3/11	3/4/11	141
143	**Well 3**	**65 d**	**3/4/11**	**5/8/11**	
144	Rig Mobilization	5 d	3/4/11	3/9/11	142
145	Actual Drilling	60 d	3/9/11	5/8/11	144
146	**Testing**	**280 d**	**10/30/10**	**8/6/11**	
147	**Well 1**	**150 d**	**10/30/10**	**3/29/11**	
148	Geology	60 d	10/30/10	12/29/10	139SS
149	Geochemistry	120 d	10/30/10	2/27/11	139SS,151F
150	Heat up	30 d	12/29/10	1/28/11	139



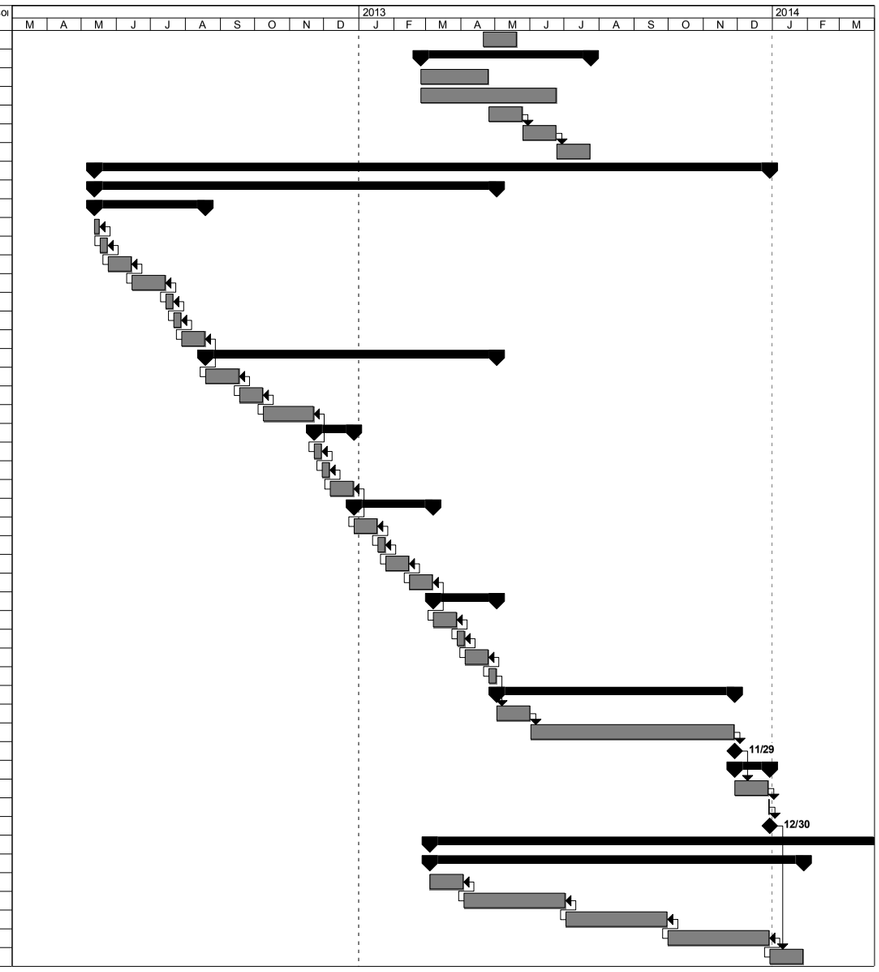
ID	Task Name	Duration	Start	Finish	Predecessor
151	Flow testing	30 d	1/28/11	2/27/11	150
152	Reports	30 d	2/27/11	3/29/11	151
153	**Well 2**	**150 d**	**1/3/11**	**6/2/11**	
154	Geology	60 d	1/3/11	3/4/11	142SS
155	Geochemistry	120 d	1/3/11	5/3/11	142SS
156	Heat up	30 d	3/4/11	4/3/11	142
157	Flow testing	30 d	4/3/11	5/3/11	156
158	Reports	30 d	5/3/11	6/2/11	157
159	**Well 3**	**150 d**	**3/9/11**	**8/6/11**	
160	Geology	60 d	3/9/11	5/8/11	145SS
161	Geochemistry	120 d	3/9/11	7/7/11	145SS
162	Heat up	30 d	5/8/11	6/7/11	145
163	Flow testing	30 d	6/7/11	7/7/11	162
164	Reports	30 d	7/7/11	8/6/11	163
165	Environment Management	1 d?	7/6/11	7/7/11	83SS,163FF
166	**In-house Reviews**	**53 d?**	**7/22/11**	**9/13/11**	
167	**Collation of data and reports**	**30 d**	**7/22/11**	**8/21/11**	**164SS+15 d**
168	Review initial Conceptual Model	15 d	8/21/11	9/5/11	167
169	Presentation	1 d?	9/5/11	9/6/11	168
170	Modification	7 d	9/6/11	9/13/11	169
171	**BOC Review**	**34 d**	**9/13/11**	**10/17/11**	
172	Posting of reports	30 d	9/13/11	10/13/11	170
173	Actual meetings	4 d	10/13/11	10/17/11	172
174	**Go or No Go**	**0 d**	**10/17/11**	**10/17/11**	**173**
175	**RESOURCE ASSESSMENT**	**1104 d**	**12/22/10**	**12/30/13**	
176	**Appraisal Program**	**946 d**	**12/22/10**	**7/25/13**	
177	**Rig Hire**	**445 d**	**12/22/10**	**3/11/12**	
178	**Pre-Qualification**	**98 d**	**12/22/10**	**3/30/11**	
179	Prepation of Expression of Interest	5 d	12/22/10	12/27/10	180SF
180	Obtain Banks No objection	7 d	12/27/10	1/3/11	181SF
181	Advertise (local media and international)	21 d	1/3/11	1/24/11	182SF
182	Bidding Period	30 d	1/24/11	2/23/11	183SF
183	Evaluation & Shortlist Report Preparation	7 d	2/23/11	3/2/11	184SF
184	KenGen's Approval	7 d	3/2/11	3/9/11	185SF
185	Obtain Banks No objection	21 d	3/9/11	3/30/11	187SF
186	**Tendering**	**347 d**	**3/30/11**	**3/11/12**	
187	Preparation of bidding Documents	30 d	3/30/11	4/29/11	188SF
188	Obtain Banks' no objection	21 d	4/29/11	5/20/11	189SF
189	Issue bid documents + tendering	45 d	5/20/11	7/4/11	191SF
190	**Technical Evaluation**	**35 d**	**7/4/11**	**8/8/11**	
191	Evaluation	7 d	7/4/11	7/11/11	192SF
192	KenGen Approval	7 d	7/11/11	7/18/11	193SF
193	Obtain Bank's no objection	21 d	7/18/11	8/8/11	195SF
194	**Commercial Evaluation**	**70 d**	**8/8/11**	**10/17/11**	
195	Invite bidders for tender openining	21 d	8/8/11	8/29/11	196SF
196	Evaluation	7 d	8/29/11	9/5/11	197SF
197	KenGen Approval & Appeal	21 d	9/5/11	9/26/11	198SF
198	Obtain Bank's no objection	21 d	9/26/11	10/17/11	200SF
199	**Contract Negotaition**	**56 d**	**10/17/11**	**12/12/11**	
200	Invite bidders for Negotiation	21 d	10/17/11	11/7/11	174



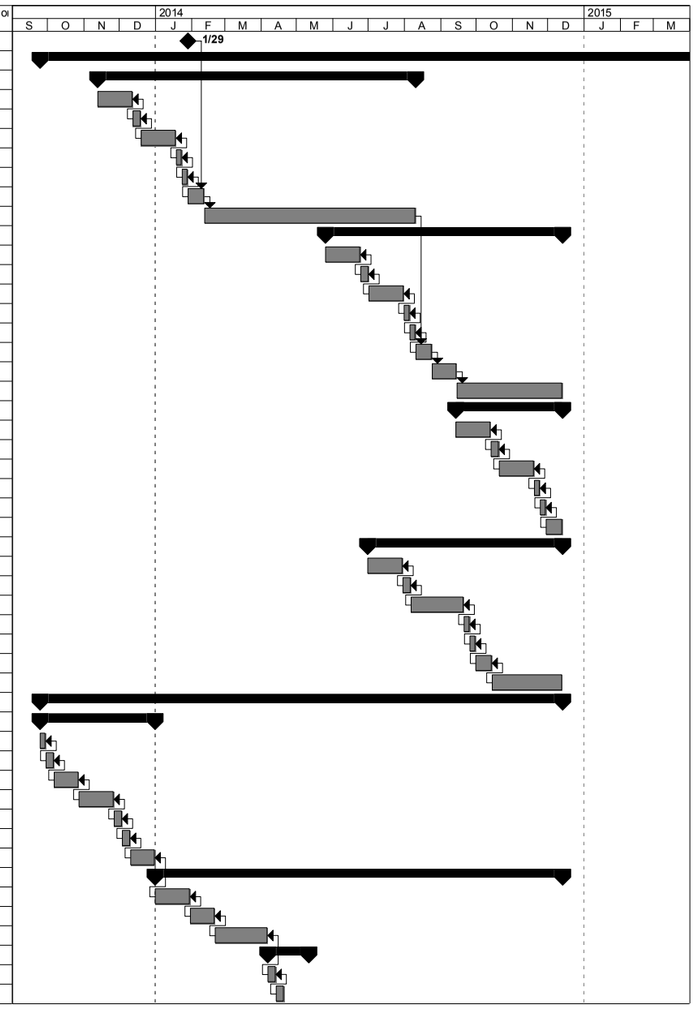
ID	Task Name	Duration	Start	Finish	Predecessor
251	Rig Mobilization	5 d	5/11/12	5/16/12	249
252	Actual Drilling	60 d	5/16/12	7/15/12	251
253	**Well 6**	**65 d**	**7/15/12**	**9/18/12**	
254	Rig Mobilization	5 d	7/15/12	7/20/12	252
255	Actual Drilling	60 d	7/20/12	9/18/12	254
256	**Testing First Three wells**	**280 d**	**3/12/12**	**12/17/12**	
257	**Well 4**	**150 d**	**3/12/12**	**8/9/12**	
258	Geology	60 d	3/12/12	5/11/12	249SS
259	Geochemistry	120 d	3/12/12	7/10/12	249SS
260	Heat up	30 d	5/11/12	6/10/12	249
261	Flow testing	30 d	6/10/12	7/10/12	260
262	Reports	30 d	7/10/12	8/9/12	261
263	**Well 5**	**155 d**	**5/11/12**	**10/13/12**	
264	Geology	60 d	5/11/12	7/10/12	251SS
265	Geochemistry	120 d	5/16/12	9/13/12	252SS
266	Heat up	30 d	7/15/12	8/14/12	252
267	Flow testing	30 d	8/14/12	9/13/12	266
268	Reports	30 d	9/13/12	10/13/12	267
269	**Well 6**	**150 d**	**7/20/12**	**12/17/12**	
270	Geology	60 d	7/20/12	9/18/12	255SS
271	Geochemistry	120 d	7/20/12	11/17/12	255SS
272	Heat up	30 d	9/18/12	10/18/12	255
273	Flow testing	30 d	10/18/12	11/17/12	272
274	Reports	30 d	11/17/12	12/17/12	273
275	**Exploration Strategy review**	**31 d**	**12/17/12**	**1/17/13**	
276	Data Collation	30 d	12/17/12	1/16/13	274
277	Presentation and Review	1 d	1/16/13	1/17/13	276
278	**Drilling of Remaining Three wells**	**310 d**	**9/18/12**	**7/25/13**	
279	**Drilling**	**220 d**	**9/18/12**	**4/26/13**	
280	**Well 7**	**90 d**	**9/18/12**	**12/17/12**	
281	Rig Mobilization	30 d	9/18/12	10/18/12	255
282	Actual Drilling	60 d	10/18/12	12/17/12	281
283	**Well 8**	**65 d**	**12/17/12**	**2/20/13**	
284	Rig Mobilization	5 d	12/17/12	12/22/12	282
285	Actual Drilling	60 d	12/22/12	2/20/13	284
286	**Well 9**	**65 d**	**2/20/13**	**4/26/13**	
287	Rig Mobilization	5 d	2/20/13	2/25/13	285
288	Actual Drilling	60 d	2/25/13	4/26/13	287
289	**Testing Remaining Three wells**	**280 d**	**10/18/12**	**7/25/13**	
290	**Well 7**	**150 d**	**10/18/12**	**3/17/13**	
291	Geology	60 d	10/18/12	12/17/12	282SS
292	Geochemistry	120 d	10/18/12	2/15/13	282SS
293	Heat up	30 d	12/17/12	1/16/13	282
294	Flow testing	30 d	1/16/13	2/15/13	293
295	Reports	30 d	2/15/13	3/17/13	294
296	**Well 8**	**150 d**	**12/22/12**	**5/21/13**	
297	Geology	60 d	12/22/12	2/20/13	285SS
298	Geochemistry	120 d	12/22/12	4/21/13	285SS
299	Heat up	30 d	2/20/13	3/22/13	285
300	Flow testing	30 d	3/22/13	4/21/13	299



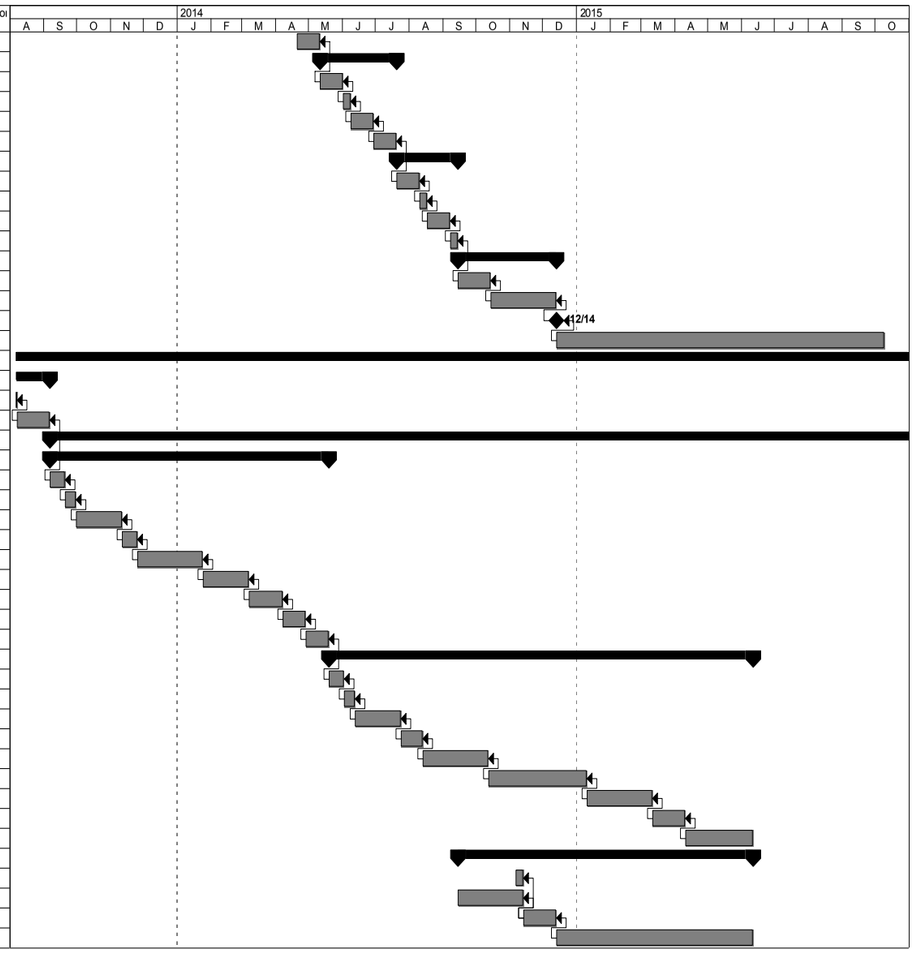
ID	Task Name	Duration	Start	Finish	Predecessor
301	Reports	30 d	4/21/13	5/21/13	300
302	**Well 9**	**150 d**	**2/25/13**	**7/25/13**	
303	Geology	60 d	2/25/13	4/26/13	288SS
304	Geochemistry	120 d	2/25/13	6/25/13	288SS
305	Heat up	30 d	4/26/13	5/26/13	288
306	Flow testing	30 d	5/26/13	6/25/13	305
307	Reports	30 d	6/25/13	7/25/13	306
308	**Feasibility Study**	**596 d**	**5/13/12**	**12/30/13**	
309	**Hire of Consultants**	**355 d**	**5/13/12**	**5/3/13**	
310	**Pre-Qualification**	**98 d**	**5/13/12**	**8/19/12**	
311	Prepation of Expression of Interest	5 d	5/13/12	5/18/12	312SF
312	Obtain Banks No objection	7 d	5/18/12	5/25/12	313SF
313	Advertise (local media and international)	21 d	5/25/12	6/15/12	314SF
314	Bidding Period	30 d	6/15/12	7/15/12	315SF
315	Evaluation & Shortlist Report Preparation	7 d	7/15/12	7/22/12	316SF
316	KenGen's Approval	7 d	7/22/12	7/29/12	317SF
317	Obtain Banks No objection	21 d	7/29/12	8/19/12	319SF
318	**Tendering**	**257 d**	**8/19/12**	**5/3/13**	
319	Preparation of bidding Documents	30 d	8/19/12	9/18/12	320SF
320	Obtain Banks' no objection	21 d	9/18/12	10/9/12	321SF
321	Issue bid documents + tendering	45 d	10/9/12	11/23/12	323SF
322	**Technical Evaluation**	**35 d**	**11/23/12**	**12/28/12**	
323	Evaluation	7 d	11/23/12	11/30/12	324SF
324	KenGen Approval	7 d	11/30/12	12/7/12	325SF
325	Obtain Bank's no objection	21 d	12/7/12	12/28/12	327SF
326	**Commercial Evaluation**	**70 d**	**12/28/12**	**3/8/13**	
327	Invite bidders for tender openining	21 d	12/28/12	1/18/13	328SF
328	Evaluation	7 d	1/18/13	1/25/13	329SF
329	KenGen Approval & Appeal	21 d	1/25/13	2/15/13	330SF
330	Obtain Bank's no objection	21 d	2/15/13	3/8/13	332SF
331	**Contract Negotaition**	**56 d**	**3/8/13**	**5/3/13**	
332	Invite bidders for Negotiation	21 d	3/8/13	3/29/13	333SF
333	Negotiation & Drafting of contract	7 d	3/29/13	4/5/13	334SF
334	Obtain Bank's no objection	21 d	4/5/13	4/26/13	335SF
335	Signing of contracts	7 d	4/26/13	5/3/13	288
336	**Contract Performance**	**210 d**	**5/3/13**	**11/29/13**	
337	Advance Payment	30 d	5/3/13	6/2/13	335
338	Study	180 d	6/2/13	11/29/13	337
339	Submission of Bankable report	0 d	11/29/13	11/29/13	338
340	**BOC Review Meeting**	**31 d**	**11/29/13**	**12/30/13**	
341	Data Collation	30 d	11/29/13	12/29/13	339
342	Presentation and Review	1 d	12/29/13	12/30/13	341
343	Go or No Go	0 d	12/30/13	12/30/13	342
344	**CONSTRUCTION PHASE**	**1921 d**	**3/5/13**	**6/8/18**	
345	**Funding Application**	**330 d**	**3/5/13**	**1/29/14**	
346	Project Identification	30 d	3/5/13	4/4/13	347SF
347	Project Formulation and Preparation	90 d	4/4/13	7/3/13	348SF
348	Appraisal	90 d	7/3/13	10/1/13	349SF
349	Funding institution Approval	90 d	10/1/13	12/30/13	350SF
350	Fianacial Agreements Negotiation	30 d	12/30/13	1/29/14	343



ID	Task Name	Duration	Start	Finish	Predecessor
351	Credit Effectiveness	0 d	1/29/14	1/29/14	350
352	**Production Drilling**	**745 d**	**9/25/13**	**10/10/15**	
353	**Overseas Procurement**	**271 d**	**11/13/13**	**8/11/14**	
354	Prepare tender	30 d	11/13/13	12/13/13	355SF
355	Advertise	7 d	12/13/13	12/20/13	356SF
356	Tender Period	30 d	12/20/13	1/19/14	357SF
357	Evaluation	5 d	1/19/14	1/24/14	358SF
358	Approval	5 d	1/24/14	1/29/14	359SF
359	Award & Appeal Period	14 d	1/29/14	2/12/14	351
360	Delivery	180 d	2/12/14	8/11/14	359
361	**Slotting of Liners**	**202 d**	**5/26/14**	**12/14/14**	
362	Prepare tender	30 d	5/26/14	6/25/14	363SF
363	Advertise	7 d	6/25/14	7/2/14	364SF
364	Tender Period	30 d	7/2/14	8/1/14	365SF
365	Evaluation	5 d	8/1/14	8/6/14	366SF
366	Approval	5 d	8/6/14	8/11/14	367SF
367	Award & Appeal Period	14 d	8/11/14	8/25/14	360
368	Mobilization	21 d	8/25/14	9/15/14	367
369	Actual Works	90 d	9/15/14	12/14/14	368
370	**Contract for Bulk Cement & Diesel Fuel**	**91 d**	**9/14/14**	**12/14/14**	
371	Prepare tender	30 d	9/14/14	10/14/14	372SF
372	Advertise	7 d	10/14/14	10/21/14	373SF
373	Tender Period	30 d	10/21/14	11/20/14	374SF
374	Evaluation	5 d	11/20/14	11/25/14	375SF
375	Approval	5 d	11/25/14	11/30/14	376SF
376	Award & Appeal Period	14 d	11/30/14	12/14/14	416SF
377	**Contract Cementing Services**	**166 d**	**7/1/14**	**12/14/14**	
378	Prepare tender	30 d	7/1/14	7/31/14	379SF
379	Advertise	7 d	7/31/14	8/7/14	380SF
380	Tender Period	45 d	8/7/14	9/21/14	381SF
381	Evaluation	5 d	9/21/14	9/26/14	382SF
382	Approval	5 d	9/26/14	10/1/14	383SF
383	Award & Appeal Period	14 d	10/1/14	10/15/14	384SF
384	Mobilization	60 d	10/15/14	12/14/14	416SF
385	**Hire of Second Rig**	**445 d**	**9/25/13**	**12/14/14**	
386	**Pre-Qualification**	**98 d**	**9/25/13**	**1/1/14**	
387	Prepation of Expression of Interest	5 d	9/25/13	9/30/13	388SF
388	Obtain Banks No objection	7 d	9/30/13	10/7/13	389SF
389	Advertise (local media and international)	21 d	10/7/13	10/28/13	390SF
390	Bidding Period	30 d	10/28/13	11/27/13	391SF
391	Evaluation & Shortlist Report Preparation	7 d	11/27/13	12/4/13	392SF
392	KenGen's Approval	7 d	12/4/13	12/11/13	393SF
393	Obtain Banks No objection	21 d	12/11/13	1/1/14	395SF
394	**Tendering**	**347 d**	**1/1/14**	**12/14/14**	
395	Preparation of bidding Documents	30 d	1/1/14	1/31/14	396SF
396	Obtain Banks' no objection	21 d	1/31/14	2/21/14	397SF
397	Issue bid documents + tendering	45 d	2/21/14	4/7/14	399SF
398	**Technical Evaluation**	**35 d**	**4/7/14**	**5/12/14**	
399	Evaluation	7 d	4/7/14	4/14/14	400SF
400	KenGen Approval	7 d	4/14/14	4/21/14	401SF



ID	Task Name	Duration	Start	Finish	Predecessor
401	Obtain Bank's no objection	21 d	4/21/14	5/12/14	403SF
402	**Commercial Evaluation**	**70 d**	**5/12/14**	**7/21/14**	
403	Invite bidders for tender openining	21 d	5/12/14	6/2/14	404SF
404	Evaluation	7 d	6/2/14	6/9/14	405SF
405	KenGen Approval & Appeal	21 d	6/9/14	6/30/14	406SF
406	Obtain Bank's no objection	21 d	6/30/14	7/21/14	408SF
407	**Contract Negotaition**	**56 d**	**7/21/14**	**9/15/14**	
408	Invite bidders for Negotiation	21 d	7/21/14	8/11/14	409SF
409	Negotiation & Drafting of contract	7 d	8/11/14	8/18/14	410SF
410	Obtain Bank's no objection	21 d	8/18/14	9/8/14	411SF
411	Signing of contracts	7 d	9/8/14	9/15/14	413SF
412	**Contract Performance**	**90 d**	**9/15/14**	**12/14/14**	
413	Advance Payment	30 d	9/15/14	10/15/14	414SF
414	Mobilization	60 d	10/15/14	12/14/14	415SF
415	Onsite	0 d	12/14/14	12/14/14	416SF
416	Drilling and Testing	300 d	12/14/14	10/10/15	369
417	**Custruction Phase**	**1766 d**	**8/7/13**	**6/8/18**	
418	**Interfacing with KPLC**	**31 d**	**8/7/13**	**9/7/13**	
419	Contact KPLC	1 d	8/7/13	8/8/13	420SF
420	Obtain counterpart Staff	30 d	8/8/13	9/7/13	423SF
421	**Power Plant Construction and Commissioning**	**1707 d**	**9/7/13**	**5/11/18**	
422	**Procure Consultants**	**255 d**	**9/7/13**	**5/20/14**	
423	Prepare expression of interest	14 d	9/7/13	9/21/13	424SF
424	Advertise	10 d	9/21/13	10/1/13	425SF
425	Tender period	42 d	10/1/13	11/12/13	426SF
426	Pre-qualify Consultants	14 d	11/12/13	11/26/13	427SF
427	Tender Documents	60 d	11/26/13	1/25/14	428SF
428	Tendering Process	42 d	1/25/14	3/8/14	429SF
429	Complete Tender Evaluation and Approval (two enve	31 d	3/8/14	4/8/14	430SF
430	Complete Aw ard, Negotion and Contract signing	21 d	4/8/14	4/29/14	431SF
431	Advance Payment and LC	21 d	4/29/14	5/20/14	433SF
432	**Procure Contractor**	**388 d**	**5/20/14**	**6/12/15**	
433	Prepare expression of interest	14 d	5/20/14	6/3/14	434SF
434	Advertise	10 d	6/3/14	6/13/14	435SF
435	Tender period	42 d	6/13/14	7/25/14	436SF
436	Pre-qualify Contractors	20 d	7/25/14	8/14/14	437SF
437	Tender Documents and Conceptual design	60 d	8/14/14	10/13/14	438SF
438	Tendering Process	90 d	10/13/14	1/11/15	439SF
439	Complete Tender Evaluation and Approval	60 d	1/11/15	3/12/15	440SF
440	Complete Aw ard, Negotion and Contract signing	30 d	3/12/15	4/11/15	441SF
441	Advance Payment and LC	62 d	4/11/15	6/12/15	451SF
442	**Construct Service Power line**	**270 d**	**9/15/14**	**6/12/15**	
443	Make Application	7 d	11/7/14	11/14/14	445SF
444	KPLC quotation Period	60 d	9/15/14	11/14/14	445SF
445	Make payment	30 d	11/14/14	12/14/14	446SF
446	Line Construction	180 d	12/14/14	6/12/15	451SF



ID	Task Name	Duration	Start	Finish	Predecessor
447	**Acquire Staff**	**1141 d**	**4/29/14**	**6/13/17**	
448	Acquire counterpart staff from Generation	30 d	4/29/14	5/29/14	431SS
449	Acquire operation Staff	180 d	12/15/16	6/13/17	455FF-360 d
450	**Complete Construction -Key Milestone**	**1064 d**	**6/12/15**	**5/11/18**	
451	Power plant and accessories	1064 d	6/12/15	5/11/18	416SS+180
452	Steamfield Surface equipment	1064 d	6/12/15	5/11/18	451SS
453	Transmission and Substation	1064 d	6/12/15	5/11/18	452SS
454	Commissioning of Plant	4 wks	5/11/18	6/8/18	453
455	Commencement of commercial operation	0 d	6/8/18	6/8/18	454