Project Management Plan of

BIOMASS ENERGY PROJECT

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Executive Summary

The object of this project is to demonstrate and assess the economic and environmental potential of various options for wood-based bio-energy in comparison to conventional fossil fuel energy sources in rural, commercial, institutional, and industrial facilities in Alberta.

The project shall assist wood energy stakeholders in establishing and optimizing the contribution of wood-biomass energy in renewable energy targets central to sustainable woodlot management, forestry, waste-wood management, and rural, economic development objectives.

Wood-based bio-energy is in its infancy in Alberta, and offers rural enterprises a feasible opportunity for economic development that improves their energy efficiency, security, and independence.

Wood-fuel resources from the forest industry, private woodlots, plus industrial/commercial wood residues for heat or heat/electricity co-generation are widely available in Alberta and can be used by communities, commerce, institutions, and industry, thereby increasing the cost-effectiveness of their operations and improving their energy efficiency.

The increased use of wood-based, bio-energy can have a significant contribution to greenhouse gas reduction targets.

The Province of Alberta can take the lead in supporting the development of efficient and cost-effective, wood-based, bio-energy by engaging and organizing potential stakeholders, working to remove existing wood energy barriers, and demonstrating the utility of wood heating.

The Biomass Energy Project (BEP) is a $1,405,000 capital investment to install a new pellet boiler and upgrade the Eastlink Recreation Centre (ERC) heating system. The project involves replacing one of the older used propane boilers with a new 400 kW wood pellet boiler. The new boiler supplies 80-85% of the heat demand for the entire ERC. The project also saw upgrades done to the building heating system and the joining of the two separate heating systems. The pellet boiler is housed in a standalone container outside the building. There is also a 45 tonne pellet storage silo.

In 2014 the District of Grand Prairie (DoGP) was approached about switching the heating from propane to biomass. A proof of concept study was completed by M/s. SKP Projects. Based on this study the DoGP decided to seek funding in support of the project. Mid of 2014 saw DoGP staff continuing to develop the project until end of 2014 when a project manager Mr. Jose Mourinho from SKP Projects was hired to oversee the development. Engineering was planned to be completed by February 2015.
Construction is planned to be completed in May 2015 with start-up beginning in the end of May of the same year.

1. Initiating Process

1.1 Background

At one time in Canada, the combustion of biomass, especially wood, was the primary source of energy for heating and cooking in homes and process heat and steam for industries. Today our country's dependence on biomass has changed, with the use of abundant, low cost fossil fuels.

However, biomass remains an important part of our country's energy picture, supplying about 3 per cent of our primary energy demand, the second largest source of renewable energy after hydroelectricity.

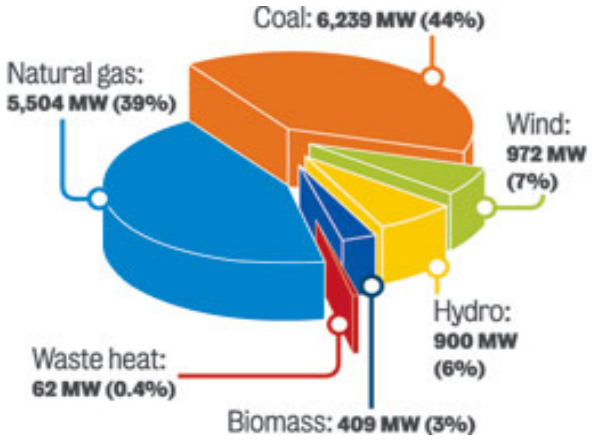
A major application of biomass is found in the forest products and pulp and paper industries. By burning bark, wood chips, sawdust and "pulp liquor" (a mixture of pulping chemicals and organic material), saw mills and pulp and paper plants create heat for drying kilns and produce steam and electricity to meet their needs or to sell to the grid. In terms of installed electrical capacity, these industries have about 1,866 MW.

Beyond the pulp and paper industry, several independent power producers generate electricity from the burning of wood wastes and other biomass materials. Currently there about 20 of these plants, with an installed capacity of about 1378.1 MW out of which around 9 plants are operating in Alberta having accumulative capacity of around 400 MW.

On a smaller scale, the burning of biomass, particularly firewood, continues to supply space heating in many Canadian homes. According to Natural Resources Canada, about 26 per cent of Canadians use wood for home heating. This use is most prevalent in Atlantic Canada.

There are also a few biomass-based district heating systems in Canada. These systems burn biomass to provide heat or electricity, and sometimes both, to buildings in a community. Communities such as Grande Prairie, Alberta, have invested in new district systems fuelled by wood waste from nearby sawmills.

In Atlantic Canada, existing district heating systems have been modified to burn wood wastes, thereby lowering reliance on fossil fuels. Canada's wood pellet production capacity grew from 500,000 tonnes in 2002 to 4 million tonnes in 2014.



List of all biomass, biogas and waste heat recovery power plants in Alberta:

Name	Date	Capacity (MW)	Location	Owner	Type
Alberta Pacific Forest	1993–2012	131	Athabasca	Alberta Pacific Forest	Biomass
Bear Creek Steam Turbine	2002	30	Grande Prairie	TransCanada	Biomass
Dapp Biomass Project	1999	16	Dapp	Verdant Energy	Biomass
Grande Prairie Gen. Station	2005	25	Grande Prairie	TransAlta	Biomass
Hinton Pulp Units 1&2	1985–2011	50	Hinton	West Fraser Timber	Biomass
Peace River Pulp Mill	1990–2012	52	Peace River	Daishowa-Marubeni International	Biomass
Valley Power	1996	12	Drayton Valley	Algonquin Power	Biomass
Grande Prairie Pulp Mill	(2011)	(33)	Grande Prairie	Weyerhaeuser Canada	Biomass
Grande Prairie Pulp Mill	2011	48	Grande Prairie	Weyerhaeuser Canada	Biomass

Advantages of biomass energy

Biomass energy is increasingly popular as an alternative energy source for a variety of reasons:
- It is widely available.
- It is a renewable resource, when it is sustainably used and managed.
- It results in less waste being sent to landfills. Burning unusable waste materials such as bark, construction wastes and tree clippings helps to reduce the pressure to expand local landfill sites while generating useful energy.
- It can help provide answers to the climate change issue. Using biomass energy does not increase atmospheric levels of carbon dioxide, a primary greenhouse gas, because of the cycles of regrowth for plants and trees. The use of biomass can also decrease the amount of methane, another greenhouse gas, which is emitted from decaying organic matter.

1.2 Business Need

Promoting biomass energy

A number of important initiatives are under way at government, utility and industry levels to encourage the development of biomass energy in Canada.

Government programs

Federal Government policies and incentives can play an important role in encouraging the adoption of biomass energy. These can take the form of:

- research programs to develop the potential of biomass energy technologies
- investment subsidies (such as grants and loans) to developers to support the capital cost of biomass power plants
- renewable portfolio standards that require utilities and retailers to provide a certain portion of their power and energy sales from renewable sources such as biomass
- procurement of new generation from renewable energy sources for government facilities

Utility programs

Several utilities have started to invest in renewable energy, developing or purchasing biomass generation to supplement their power supplies. In Alberta, for example, EPCOR purchases green power generated from various sources including biomass. Manitoba Hydro is studying the potential for electricity generation from agricultural wastes. And BC Hydro has set a voluntary goal of generating 93 per cent of all its electricity through green energy generated from resources such as biomass.

A growing number of utilities are also marketing and selling renewable power to consumers through green power marketing and green pricing — utility-sponsored programs that allow electricity consumers to support the development of renewable energy resources. These programs could increase the future use of biomass.

Challenges and opportunities:

Biomass is being applied in new and innovative ways to heat homes, generate electricity and fuel vehicles. This has led to a growing biomass energy industry in Canada and worldwide. Future growth of the industry will be shaped by different challenges and opportunities:

- **Huge untapped potential**

Canada has vast amounts of biomass, much of which remains unused.

- **Cost competitiveness of technologies**

One of the barriers facing expansion of biomass power is the need to make the industry more competitive with traditional fossil fuel power plants, which often can produce electricity at much lower costs. The technology used to generate electricity from biomass has become more efficient and cleaner over time, but the costs of capital equipment are relatively high and fuel costs remain high, because of collection, transportation and handling costs.

- **Transmission issues**

Another barrier to developing more electricity from biomass is access to transmission. Often the best sources of biomass materials are in remote locations, distant from power grids and far from cities where electricity is heavily used. So the development of biomass plants, which supply power to the grid, may require the need for new or expanded transmission facilities.

- **Environmental concerns**

Biomass energy has some environmental impacts. When burned, biomass resources release air emissions, such as particulate matter and sulphur dioxide, to the atmosphere. These emissions depend on the choice of biomass materials and the technologies and pollution controls used. The development of large-scale energy crops, such as corn, for the production of biofuels could lead to increases in pesticide and fertilizer use that are harmful to wildlife and habitat. And producing energy, in addition to lumber and paper, could put more stress on Canada's forest resources. For more information, see renewable energy and the environment.

- **Competing demands for biomass feed stocks**

One of the uncertainties facing future development of biomass energy is competition for biomass materials. For example, animal manures have value as fertilizers, waste paper can be recycled and wood chips can be used in landscape mulches. Also using crops such as corn or sugar cane to produce biofuels could potentially conflict with the need to produce food.

- **Government policies**

Environmentalists and industry say that more government support and policies are critical to stimulating a strong biomass industry in Canada. Ontario's Feed-In Tariff (FIT) program, for example, offers guaranteed prices for bioenergy producers.

1.3 Project Charter

Project Title: Biomass Energy Project
Project Sponsor: CoGP (City of Grand Prairie) **Date Prepared:** 2014-04-15
Project Manager: Mr. Jose Mourinho **Project Customer:** ELC (Eastlink) Recreation Centre

Project Purpose or Justification:

Justification:

- Promoting use of clean energy by undertaking Biomass energy project
- Gain credit from Government under different programs
- Capacity expansion by various industry sectors
- Incremental demand for commercial space by tapping into the market where feedstock is disposed as scrap

Purpose:

- Increase use of renewable capacity to supply the national demand for various industries and its products
- Increase the production capacity to use the opportunity to cleaner and greener environment

Project Description:

The objective of this project involves replacing one of the older used propane boilers with a new 400 kW wood pellet boiler. The new boiler supplies 80-85% of the heat demand for the entire ERC.

Secondly, the project is to modify the infrastructure of the building to combine the heating systems of two buildings to layout the common piping and to facilitate the heat supply to both the buildings from the single boiler.

Project and Product Requirements:

Schedule: Meet or beat established project milestones considering allocated contingencies
Budget: Implementing the project within budget considering allocated contingencies
Scope: Conform to project requirements without adverse effects on milestones or budget
Safety: No recordable injuries more than the industry average
Legal compliance: Complete project without permit violations
Quality: passing the final inspection test according to CAC standards

Initial Risks:

- Fire and explosion which may occur because of using flammable liquids for engine combustion, plastics and combustible materials, welding works, heaters in warehouses, transformers for electricity supply, and compressors
- Catastrophic risks such as winds, storms, hurricanes and cyclones, ground subsidence, landslides and rock falls
- Defects in workmanship such as carelessness in handling equipment which may cause innumerable damages to the own work as well as to third parties
- Errors in calculation or design and employment of defective or inadequate material
- Accidents in plant site that may result in insufficient labour resources

	Project Objectives	Success Criteria	Person Approving
Scope	To manage scope without adding unnecessary requirements to the project	Delivering fully operational cement plant satisfying client requirements	Project manager and project sponsor/customer
Time	To complete the project on time. Time~~ 4 months 15 days	Implementing the project on time considering allocated 10% contingency	Project manager
Cost	To stay under budget and incur as few incidental expenditures as possible	Implementing the project within budget considering 10% contingency	Project manager
	Budget ~~ $1.28 million		
Quality	Conform to project requirements with high quality deliverables	Completing the project without permit violations and getting final operating license	Canadian Standards Association (CSA)

Summary Milestones	**Due Date**
All industrial and government permits obtained	20/12/2014
All design and engineering plans documents are ready	05/01/2015
All contracts awarded & facility construction begins on site	25/02/2015
Facility construction ends	28/04/2015
Equipment installation ends and testing starts	10/05/2015
Final approvals and hand over to the client	20/05/2015

Estimated Budget:

This project is estimated to require $ 1.28 million budget with 10% contingency. This estimation is obtained based on previously done similar project and meetings with subject matter experts.

Project Manager Authority Level Staffing Decisions:

The project manager will have the authority to release or bring in any necessary resources to contribute to the project team.

Budget Management and Variance:

The project manager has authority to make decisions about controlling and allocating the project budget pending approval from the project sponsor.

Technical Decisions:

The project manager has the authority to make technical decisions about the project. However, all technical decisio will be made in advisement with the subject matter experts on the project.

Conflict Resolution:

The project manager will be expected to negotiate between stakeholders and resolve any conflicts that may arise during the project.

Escalation Path for Authority Limitations:

Any items or issues that are not resolved by the project manager or project team will be taken to the director level. If not resolved there, the issue will flow to the executive level.

Approvals:

Project Manager Signature	**Sponsor / Originator Signature**
JOSE MOURINHO	CoGP-City of Grand Prairie
Project Manager Name	**Sponsor / Originator Name**
Date	**Date**

1.4 Stakeholder Register

Please refer to the appendix.

2. Planning Process

2.1 Integration Management

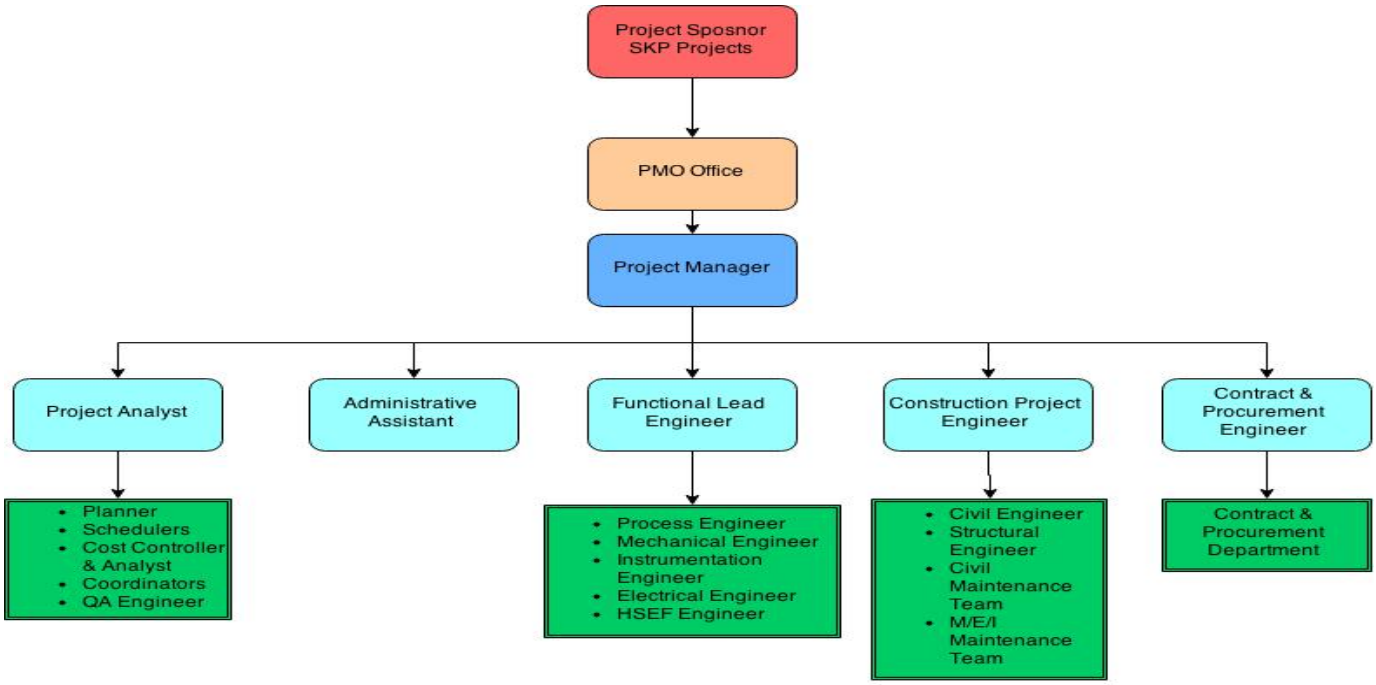
In this project, project manager is responsible for an effective project integration management as the success of the project is highly dependent to it and helps to satisfy the stakeholders.

2.1.1 Integration Management Approach

In the first step, the project manager developed the project charter to provide a formal authorization of a project through proper documentation of the initial requirements satisfying the needs and specifications of the stakeholders. After the project charter is signed by both the project manager and the project sponsor/owner, the project manger will use the project charter for organizing all the required resources for the successful completion of the project. He will also determine the external as well as internal environment that can influence the project. Then, he will start to prepare a detailed documentation of project management plan which is beneficial for the project manager to understand the project and execute it properly. The project plan will guide the project manager as well as the team members for directing and managing the execution of the project properly. In the next steps, the project manager will direct and manage project execution, monitor and control project work, perform integrated change control, and finally close the project.

2.1.2 Project Team

In this project, Mr. Sulay Parekh, the CEO of SKP Projects Company, is the sponsor and CoGP is the client for the Eastlink recreation centre BEP project. The project team is shown in the following diagram. The project analyst, construction project engineer, principal engineer, and contract officer are respectively representative of project support staff, civil engineering team, technology engineering team, and contract and purchasing department.



2.1.3 Manage Change

***Project Changes*:** These are changes in activities done within the company and must be incorporated to allow the project to proceed on schedule and to provide a fully functional facility. The change may be generated as a result of differing site conditions, errors in the design, or changes in the equipment specifications. Funding for these changes is covered by the technical contingency funds and is managed by the project manager. These changes will receive top priority for implementation. Approval authority for these changes rests with the project sponsor and must be processed through the project manager.

Contract Changes: These are generally requests for changes to the contracts initiated by the sponsor/owner. Such changes after contract award are normally very expensive and may delay completion of the project. They should be held to a minimum. The project team will maintain a priority list of deferred changes with preliminary cost estimates. All requests for these changes will be submitted to the contract officer. When required, the PM, will provide a written scope of work, preliminary cost estimate and impact statement for the proposed program change. The PM will review the proposed change with the contract officer to determine if the change is out of project or contract scope, exceeds available funds or if the change should be deferred.

2.2 Scope Management Plan

2.2.1 Scope Statement

The scope for the Biomass Energy Project (BEP) is defined through a comprehensive requirements collection process. First, a thorough analysis was performed on the company's previous Biomass energy projects. The project description and deliverables are developed based on the requirements collection process and input from subject matter experts in the Renewable/Green fuel industry. This process of expert judgment provided feedback on the most effective ways to meet the original requirements of constructing/ Refurbishing the existing plant/ facility.

Project Goal:

The goal of this project is to demonstrate and assess the economic and environmental potential of various options for wood-based bio-energy in comparison to conventional fossil fuel energy sources in rural, commercial, institutional, and industrial facilities in Alberta.

The project shall assist wood energy stakeholders in establishing and optimizing the contribution of wood-biomass energy in renewable energy targets central to sustainable woodlot management, forestry, waste-wood management, and rural, economic development objectives.

Project Objective:

The objective of this project involves replacing one of the older used propane boilers with a new 400 kW wood pellet boiler. The new boiler supplies 80-85% of the heat demand for the entire ERC.

Secondly, the project is to modify the infrastructure of the building to combine the heating systems of two buildings to layout the common piping and to facilitate the heat supply to both the buildings from the single boiler.

Project Requirements:

- Getting initial permits, final tests, and getting final operating license
- Subcontracting the construction of four major departments and some of the equipment
- Purchasing other equipment and installation of equipment
- This project requires about 100 in-field and office staff

Primary propane gas boiler to be replaced with the wood pellet boiler with increased capacity to supply the heat to water and air in both the buildings.

The changes and modifications of 2 different facilities to one to obtain the heat from one common boiler. To continue the use of 2 secondary propane boiler acting as the booster or backup to the primary wood pellet boiler. In case of emergency/ breakdown, the secondary boilers will act as backup to prevent the abrupt disruption in services of the facility and continue the services for the minimum duration to run at minimal time.

Assumptions:

Staff and trade with required expertise will be available (or be hired)

A large percentage of the staff has enough experience so training is not required

Material and equipment will be available (or be procured)

Latest technology will be used to deliver the best quality with minimum negative environmental impact

The client/sponsor or his representative will be available for interaction

Enough information will be available for initial budget and schedule forecast

The detailed description of the project based on client requirements is in place

Required infrastructure to support the project is ready prior to the start of the project

Adequate funding has already been obtained for the project

In Scope	**Out of Scope**
Getting industrial and boiler installation permits	Construction of a road from Grand Prairie to the plant site for Wood pellet transit
Soil mechanic studies, topographic maps, and land preparation and site survey and studies	Construction of a road from the plant site to the mining area, or building a conveyor belt which will transport the raw material from the mine
Civil, structural , and technological design	Disposable and removal of scrap from the existing facility
Subcontract civil and technological constructions	Construction of supporting side buildings
Select equipment, procurement, and installing equipment	
Final tests and getting operating license	

2.2.2 Work Breakdown Structure (WBS)

Please refer to the appendix.

2.2.3 Scope Management Approach

For this project, scope management will be the sole responsibility of the project manager. The scope for this project is defined by the scope statement and Work Breakdown Structure (WBS). The project manager and sponsor will establish and approve documentation for measuring project scope which includes deliverable quality checklists and work performance measurements. Proposed scope changes may be initiated by any member of the project team. All change requests will be submitted to the Project Manager who will then evaluate the requested scope change. Upon acceptance of the scope change request the PM will submit the scope change request to the project sponsor for approval.

2.3 Time Management

2.3.1 Develop Schedule

The overall duration of the project is estimated at 4.5 months, with start and end dates of Jan 1, 2015 and May 20, 2015, respectively. The WBS Dictionary shown and the Schedule in the appendix presents the project schedule. Activity sequencing is used to determine the order of work packages and assign relationships between project activities. Activity duration estimating is used to calculate the number of work periods required to complete work packages.

2.3.2 Control Schedule

Once a preliminary schedule has been developed using Gantter, it will be reviewed by the project team and any resources tentatively assigned to project tasks. The project team and resources must agree to the proposed work package assignments, durations, and schedule.

The project schedule will be reviewed and updated as necessary on a bi-weekly basis with actual start, actual finish, and completion percentages which will be provided by task owners. The project manager is responsible for holding bi-weekly schedule updates/reviews; determining impacts of schedule variances; submitting schedule change requests; and reporting schedule status in accordance with the project's communications plan. The project team is responsible for participating in bi-weekly schedule updates/reviews; communicating any changes to actual start/finish dates to the project manager; and participating in schedule variance resolution activities as needed. The project sponsor will maintain awareness of the project schedule status and review/approve any schedule change requests submitted by the project manager. A variance of +/- 0.1 in the schedule performance index will change the status of the schedule to cautionary as indicated in the following table.

Between 0.9 and 1.1	Green
Between 0.9 and 0.8 or Between 1.1 and 1.2	Yellow
Less Than 0.8 or Greater than 1.2	Red

2.4 Cost Management

The project manager will be responsible for managing and reporting on the project's cost throughout the duration of the project. During the monthly project status meeting, the PM will meet with the sponsor and executive manager to present and review the project's cost performance for the preceding month. Performance will be measured using earned value. The PM is responsible for accounting for cost deviations and presenting the project sponsor with options for getting the project back on budget. The project sponsor has the authority to make changes to the project to bring it back within budget.

2.4.1 Estimate Costs

The budget for this project is detailed below.

No.	Description	Estimated Budget ($)
0	**Project Management Team**	**171552**
1	**Engineering & Design Phase**	**42160**
1.1	Process Engineering/ Design	10880
1.2	Safety / Environment Engineering Design	4400
1.3	Mechanical Equipment Design /Engineering	9600
1.4	Piping Engineering / Design	
1.5	Civil Engineering / Design	5120
1.6	Electrical Engineering / Design	5760
1.7	Instrument Engineering / Design	6400
2	**Procurement Phase**	**58240**
3	**Construction Phase**	**257350**
3.1	Temporary Facilities	13520
3.2	Concrete & Steel Structure	28000
3.3	Equipment & Piping Work	125892
3.5	Electrical & Instrument Installation & Testing	41730
3.6	Painting	18192
3.7	Insulation/ Fire Proofing / Refractory	25000
3.8	Precommisioning	5016
4	**Boiler & Storage Tank Capital Cost**	**750000**
	Sub Total	**1279302**
5	Contingency (10 %)	127930.2
	Total Budget	**1407232.2**

2.4.2 Control Costs

Performance of the project will be measured using Earned Value Management. The following four Earned Value metrics will be used to measure project cost performance:

- Schedule Variance (SV)
- Cost Variance (CV)
- Schedule Performance Index (SPI)
- Cost Performance Index (CPI)

A variance of +/- 0.1 in the cost performance index will change the status of the cost to cautionary. If the CPI has a variance of between 0.1 and 0.2 the PM must report the reason for the exception. If the CPI has a variance of greater than 0.2 the PM must report the reason for the exception and provide management a detailed corrective plan to bring the projects performance back to acceptable levels.

2.5 Quality Management

2.5.1 Assure Quality

Quality assurance is the responsibility of the project manager. Prior to substantial completion and final acceptance of the plant, periodic conformance inspections will be conducted on an department-by-department basis or on a functional basis by the PM. The purpose of these conformance inspections is to minimize delays and insure efficient turnover. The contractors should correct any construction deficiencies identified during these visits before a final turnover is scheduled. The following metrics will be used on the project:

- Completion and documentation of all quality review processes.

100% compliance with American Concrete Institute Codes (ACI)

100% compliance with American Society for Testing and Materials Codes (ASTM)100% compliance with Canadian Standards Association (CSA) standards

Written acceptance by the project sponsor

2.5.2 Control Quality

The project manager will use the following checkpoints to monitor project quality, and will provide detailed feedback to the project sponsor concerning the audit and review results as defined in the communication plan.

***Progress reviews*:** Progress documents should be reviewed by the project team on regular basis.

General building inspections: The construction project engineer will be dedicated full time on this project for construction inspection and coordination. The project team will make periodic site visits to observe compliance.

Testing: These testing will be done during installation of equipment. Testing will be in accordance with the contract documents, including in-house-made equipment, electrical instruments, and imported mechanical equipment.

Code compliance: Cement Association of Canada (CAC) will perform plan reviews and required inspections of the buildings and equipment prior to issuing the final permit. They will try to assess the plant according to Canadian Standards Association (CSA), American Concrete Institute (ACI) and American Society for Testing and Materials Codes (ASTM) standards.

Final Inspections: Parties included in the key final inspections will include the project manager, project sponsor, principal engineer, construction project engineer, and appropriate project team members. Additional participants may include certain contract representatives.

One year warranty inspection: This inspection will be scheduled with the contractor representatives 11 months after substantial completion.

2.6 Human Resource Management

2.6.1 Roles and Responsibilities

Role	**Major Responsibilities**
Project Sponsor/Owner/ Client	Make decisions on key business issues
Executive Manager /	Representative of the sponsor/client when he is not available The primary point of contact representing user requirements Support the PM in coordinating and validating user requirements and requests for changes Attends all design and project review meetings, contractor selection activities, and the government's conformance review meetings
Project manager	Ensure project is managed properly to achieve goals Prepare Project Management Plan Coordination among teams, and mentoring and coaching of team members External Communications and communication with executive-level management Forecasting issues before they become issues and dispute resolution Process and negotiate change orders
Project analyst	Project documentation Performance measure and project status reporting Budget reporting and payments Schedule analysis and reporting Risk identification and analysis

Administrative Assistant	Developing, preparing and distributing reports Assisting in all administrative matters. Support entire project team ensure office and staff follow established procedures including employee orientation and training Mail distribution
Contract/Procurement Officer	Representative of the contract and purchasing department Responsible for all contractual obligations Process bid proposals
Construction Project Engineers	Coordinates project field activities Performs regular site visits Observes the progress of in-place construction elements for conformance with contract requirements Propose schematic design of the buildings Preparing bid documents including specifications Providing cost estimates
Principal Engineer	Representative of engineering group that includes electrical, mechanical, Instrumentation, Process, Civil and HSEF engineers Conceptual design of mechanical equipment and electrical instruments based on requirements, Preparing bid documents including specifications Providing cost estimates Assisting in providing project observation for in-place elements for review of

2.6.2 Manage Staffing

In this project for activities which are not contracted out, the project staff will consist entirely of internal resources. The PM will negotiate with functional and department managers in order to identify and assign resources in accordance with the project organizational structure. All resources must be approved by the appropriate functional/department manager before the resource may begin any project work.

The PM will review each team member's assigned work activities at the onset of the project and communicate all expectations of work to be performed. The project manager will then evaluate each team member throughout the project to evaluate their performance and how effectively they are completing their assigned work. Prior to releasing project resources, the project manager will meet with the appropriate functional manager and provide feedback on employee project performance. The functional managers will then perform a formal performance review on each team member. Although the scope of this project does not allow for ample time to provide cross-training or potential for monetary rewards there are several planned recognition and reward items for project team members.

2.7 Communications Management

2.7.1 Communication Matrix

What (Content)	Audience	When/How Often	How	Who (Provider)
Project Progress	Project team, project sponsor, executive management	Bi-weekly	Project progress report, progress meeting	Project manager project analyst
Project Status	Project manager, project sponsor	Monthly	Project status meeting	Project team
Project Deliverables Review	Project analyst	End of each month / All department	Project review meeting	Project manager
Subcontract Compliance	Project manager contract officer	Weekly	Vendor meeting	Vendor representative, project team
Project Risks and Issues	Project team	As needed	Risk register and issues log	Project manager, project team
Project Changes	Project sponsor, Executive management	As needed	Project change request	Project manager
Public Input or Notifications	Public	As needed	Public meeting	Executive manager
Notifications	Employees who may be affected	As needed	Email	Responsible individual

2.8 Risk Management

This section defines how risk management will be structured and performed on the project. The project team will use the risk register on to store project risks, including their definition, category, probability of occurrence, and potential impact.

2.8.1 Risk Management Approach

The approach taken to manage risks for this project included a methodical process by which the project team identified, scored, and ranked the various risks. The most likely and highest impact risks should be added to the project schedule to ensure that the assigned risk managers take the necessary steps to implement the mitigation response at the appropriate time during the schedule. Upon the completion of the project, during the closing process, the project manager will analyze each risk as well as the risk management process. Based on this analysis, the project manager will identify any improvements that can be made to the risk management process for future projects. These improvements will be captured as part of the lessons learned knowledge base.

2.8.2 Identify Risks

Following methods are used by the PM to identify the risks associated with this project.

***Expert Interview*:** Two Expert Interviews were held for this project. The interviews revealed several risks which were then mitigated by making changes to the project plan. The remaining risks are included in the Risk Register.

***Risk Assessment Meeting*:** A risk assessment meeting was held with key team members and stakeholders. The risks identified during this meeting were added to the project plan and Risk Register.

***Historical Review of Similar Projects*:** The project team reviewed the history of similar projects in order to determine the most common risks and the strategies used to mitigate those risks.

2.8.3 Risk Register

Please refer to the appendix.

2.8.4 Monitor and Control Risks

The project manager will maintain the risk register on the project website. Risks that the team has identified as high risk will be monitored weekly by the project manager. All risks will be reviewed monthly at a project team meeting and with project sponsors. At the end of the project, risks will be reviewed and entered as lessons learned as appropriate.

The most likely and greatest impact risks should be added to the project plan to ensure that they are monitored during the time the project is exposed to each risk. During the bi-weekly project team

meeting the PM will discuss the status of risks; however, only risks which fall in the current time period will be discussed. Risk monitoring will be a continuous process throughout the life of this project. As risks approach on the project schedule the PM will ensure that the appropriate team member provides the necessary status updates which include the risk status, identification of trigger conditions, and the documentation of the results of the risk response.

2.9 Procurement Management

This procurement management plan sets the procurement framework for this project. It will serve as a guide for managing procurement throughout the life of the project and will be updated as acquisition needs change. This plan identifies and defines the items to be procured, the types of contracts to be used in support of this project, the contract approval process, and decision criteria.

2.9.1 Procurement Management Approach

The PM is ultimately responsible for managing vendors. In order to ensure the timely delivery and high quality of products from vendors the PM will meet weekly with the contract officer as the representative of the contract and purchasing department and each vendor to discuss the progress for each procured item. The meetings can be in person or by teleconference. The purpose of these meetings will be to review all documented specifications for each product as well as to review the quality test findings. This forum will provide an opportunity to review each item's development or the service provided in order to ensure it complies with the requirements established in the project specifications. It also serves as an opportunity to ask questions or modify contracts or requirements ahead of time in order to prevent delays in delivery and schedule. The PM will be responsible for scheduling this meeting on a weekly basis until all items are delivered and are determined to be acceptable.

2.9.2 Contracting Process

All items and services to be procured for this project will be solicited under firm-fixed price contracts.

Contractor Selection:

Step 1: The project team especially SMEs will work with the contracts and purchasing department to define the item types, quantities, services and required delivery dates.

Step 2: The contracts and purchasing department will then solicit bids from various vendors in order to procure the items within the required time frame and at a reasonable cost under the firm fixed price contract once the vendor is selected. This contract will be awarded to the winning contractor.

Material Procurement:

Step 1: The project team especially engineers and SMEs will work to determine what items or services will require procurement from outside vendors. This will be determined by using design documents and conducting a cost analysis of products or services which can be provided internally and compared with purchase prices from international or domestic vendors.

Step 2: Once cost analysis is complete and the list of items and services to be procured externally is finalized, the project team will send the results to contraction officer. Contraction officer is the connection point between project team and purchasing and contracts department.

Step 3: The purchasing and contracts department will complete solicitations and send out Request for Proposals (RFP) to outside vendors. The department will start collecting the proposals.

Step 4: Once proposals have been received by all vendors the approval process begins. A review of all vendor proposals will be conducted to determine which meet the criteria established by the project team and the purchasing and contracts department. The criteria for the selection and award of procurement contracts under this project will be based on the following decision criteria:

- Ability of the vendor to provide the service by the required delivery date
- Quality
- Cost
- Expected delivery date
- Comparison of outsourced cost versus in-sourcing
- Past performance

Step 5: All purchases require the approval of the project manager and the Contract Review Board. The Contract Review Board consists of representatives from the project team, purchasing and contracts department, finance, and the project manager.

2.9.3 Procurement Risks and Constrains

Risks:

Project risks will be managed in accordance with the project's risk management plan. However, for risks related specifically to procurement, there must be additional consideration and involvement. The project team will include the project sponsor and a designated representative from the contracting department in all project meetings and status reviews. Additionally, any decisions regarding procurement actions must be approved by the project sponsor or. Any issues concerning procurement actions or any newly identified risks will immediately be communicated to the project's contracting department point of contact as well as the project sponsor.

- Unrealistic schedule and cost expectations for vendors
- Manufacturing capacity capabilities of vendors
- Conflicts with current contracts and vendor relationships
- Configuration management for upgrades and improvements of purchased technology
- Potential delays in shipping and impacts on cost and schedule
- Questionable past performance for vendors
- Potential that final product does not meet required specifications

Constraints:

There are several constraints that must be considered as part of the project's procurement management plan. These constraints will be included in the RFP and communicated to all vendors in order to determine their ability to operate within these constraints. These constraints apply to several areas which include schedule, cost, scope, resources, and technology:

- ***Schedule:*** Project schedule is not flexible and the procurement activities, contract administration, and contract fulfillment must be completed within the established project schedule.
- ***Cost:*** Project budget has contingency and management reserves built in; however, these reserves may not be applied to procurement activities. Reserves are only to be used in the event of an approved change in project scope or at management's discretion.
- ***Scope:*** All procurement activities and contract awards must support the approved project scope statement. Any procurement activities or contract awards which specify work which is not in direct support of the project's scope statement will be considered out of scope and disapproved.
- ***Resources:*** All procurement activities must be performed and managed with current personnel. No additional personnel will be hired or re-allocated to support the procurement activities on this project.
- ***Technology:*** Parts specifications have already been determined and will be included in the statement of work as part of the RFP. While proposals may include suggested alternative material or manufacturing processes, parts specifications must match those provided in the statement of work exactly.

2.9.4 Contract Changes

The change management process will document all changes to the contract in accordance with project and all standard policies and procedures, for example, change must be written and oral orders will not be used. Changes will include change orders and claims resulting from either the design or construction phases of the contract. During issue initiation, potential changes are identified, a technical review is completed, change approval is granted based on the value of the change, and approval is issued to the contractor to proceed with the change. The contract and purchasing department, in conjunction with the project team, will evaluate change proposals.

2.10 Stakeholder Management Plan

2.10.1 Manage Stakeholder Expectations

As part of identifying all project stakeholders, the project manager will communicate with each stakeholder in order to determine their preferred frequency and method of communication. This feedback will be maintained by the project manager in the project's Stakeholder Register. Standard project communications will occur in accordance with the Communication Matrix; however, depending on the identified stakeholder communication requirements, individual communication is acceptable and within the constraints outlined for this project.

In addition to identifying communication preferences, stakeholder communication requirements must identify the project's communication channels and ensure that stakeholders have access to these channels. If project information is communicated via secure means or through internal company resources, all stakeholders, internal and external, must have the necessary access to receive project communications.

Once all stakeholders have been identified and communication requirements are established, the project team will maintain this information in the project's Stakeholder Register and use this, along with the project communication matrix as the basis for all communications.

2.10.2 Stakeholder Engagement Matrix

Stakeholder	**Target Level**	**Actions**
Project Sponsor/Owner	High Interest High Power	• Weekly Meeting one-on-one. • Invite to weekly project briefings.
• Project Team Members • Project Analyst • Principal Engineer • Construction Project Engineer • Administrative assistant	High Interest Medium Power	• Weekly one-on-one meetings to discuss proje status. • Discuss their roles and power.
Vendors/ Subcontractors	Medium Interest High Power	• Discuss weekly status meetings. • Increase one-on-one meetings. • Suggest coffee after next status meeting. • Arrange vendor site visit for January.
Regulatory bodies	Non-essential Neutral	• Discuss role of the body in future planning sessions. • Invite as observer.

3. Executing, Monitoring and Controlling Process

The execution and monitoring process ensures that planned project activities are carried out in an effective and efficient way while ensuring that measurements against project plans, specifications, and the original project feasibility concept continue to be collected, analyzed and acted on throughout the project lifecycle.

3.1 Performance Data Gathering

During the project life cycle data will be collected about the project. The data will be collected from many sources, following sources and some of them:

- Team member's feedback
- Progress reports
- Change requests
- Risk identification reports
- Schedule variances
- Vendor's performance report

It is the project manager's responsibility to analyze the data to compare the project status with whatever planned parameters to insure deliverables are achieved. Weekly report should be done by the project manager presenting actual project performance vs. planned. During the project team biweekly meetings the report should be presented and discussed among the team members.

3.2 Performance Measurement

The project manager has the main responsibility to measure actual performance as compared to planned performance. For example, actual project schedules will need to be reviewed periodically and compared to baseline schedules in order to discern if the project is performing according to plan. If the project is not performing according to baseline, steps will be taken to get the project back on track. The same monitoring and analyzing should take place on budgets, quality, risks, scope, etc. While the Project Manager is responsible for relaying project status to parties outside the project team, the project team is expected to report status to the Project Manager. This includes communicating information on both a formal and informal basis. Please refer to the appendix for an example.

3.3 Project Status Reports

Status reporting is an integral part of the project management processes. It is the means by which the project team, the stakeholders, and executive management stay informed about the progress and key activities required to successfully complete the project.

The status report should be tailored to the project, but should be the same form for the full team. Status reports should be prepared by the project team detailing activities, accomplishments, milestones, identified issues, and problems. Status reports should follow a standard template so all reports are in the same format. The status report should be used to report key information including:

- Current status
- Significant accomplishments for the period
- Scheduled activities
- Issues

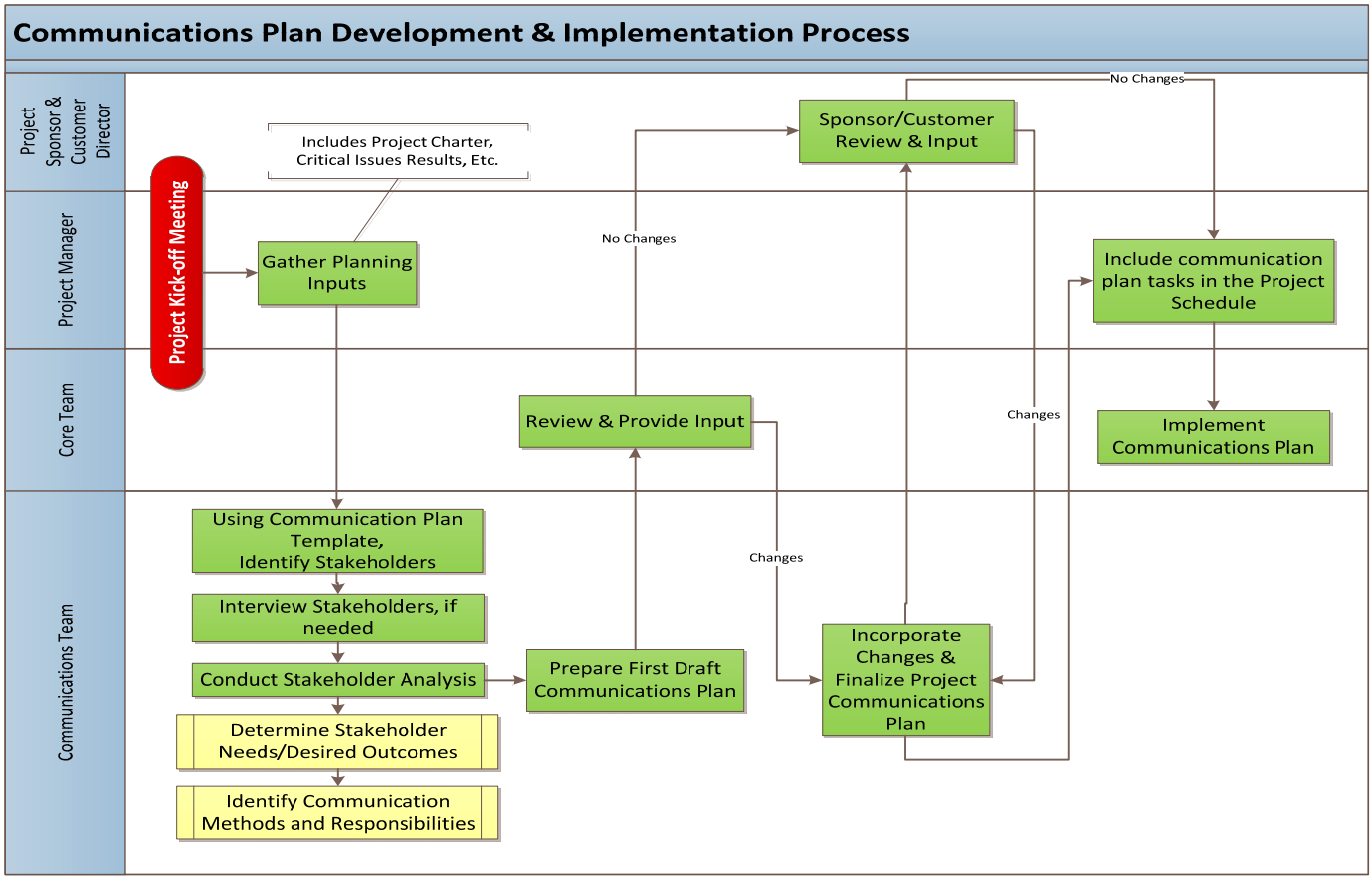
Along with the Status Report form, the following may be attached:

- Updated Gantt charts

3.4 Vendor & Stakeholder Management:

Vendors will be held to their contracts with SKP Projects for specified deliverables. The following process will be used to manage following vendors during this project.

- Real Madrid Mechanical Contractors
- Barcelona Electrical Contractors
- Bayern Instrument Contractors
- Manchester United Civil Contractors
- Arsenal Boiler & Storage Suppliers
- Manchester City Heavy Equipments Suppliers
- Atletico Mechanical Resources Supplier
- Liverpool Electrical & Instrument Supplier
- Juventus Civil & Structural Resources Supplier



4. Closing Process

4.1 Acceptance Criteria

The acceptance process for (Project Name) provides a roadmap for incremental acceptance by the customer of the software application and associated project deliverables at the following key milestones.

- Project Phase Concept Complete
- Phase Requirements Complete
- Phase Design Complete
- Phase Application Ready For Pilot
- Phase Application Ready For Statewide Rollout
- Phase Complete

The following project deliverables are subject to acceptance within the context of the above milestones.

Milestone	**Deliverables**
Project Phase Concept Complete	Project Initiation and Implementation Document, BEP Project Management Plan
Phase Requirements Complete	Biomass Energy Project Requirements Specification Template
Phase Design Complete	Boiler, Tank and other modifications Design Specification
Phase Application Ready For Commissioning	Boiler and System Integrity Testing, All the connected accessories and modified Pipes and Structures Integrity, Training Plan, User's Handbook, Business Continuity Plan
Phase Application Ready For Start up	Startup and Operation of the Heating System, Parameters and Feedstock availability
Phase Complete	1 Week Safe Operation and Output Feedback, Closeout Review, Lessons-learned

The following table defines the sequence of activities that must be performed in support of the acceptance process and who is responsible for those activities.

Activity	**Individual(s) Responsible**
Define acceptance criteria for milestones and deliverables in the current project phase	QA Manager, Project Manager, Sponsor, and Business Sponsor(s) for BEP
Identify and plan for verification and validation activities necessary to support acceptance criteria for deliverables subject to acceptance	QA Manager and Project Manager

Activity	Individual(s) Responsible
Complete project deliverables for milestone	Project team members responsible for project deliverable
Ensure completion of any necessary verification and validation activities for deliverables	QA Manager and Project Manager
Complete the Request for Acceptance form (Appendix A, first three sections). Refer to Section 4, Acceptance Criteria and Approval Required for Document Deliverables, for guidelines on document content and approvers.	Project Manager
Forward the Request for Acceptance form attached to the deliverables for the milestone and any outputs from verification and validation activities to the list of approvers for the milestone and its deliverables .	Project Manager
Schedule and conduct a meeting for approvers to review the milestone and its deliverables with respect to their acceptance criteria.	Project Manager
During acceptance review meeting, sign-off on acceptance and include any desired comments on signature page for milestone/deliverables. (Note: Rejected deliverables are returned to the deliverable owner to rework along with the Request for Acceptance forms and will be reviewed for acceptance again once the necessary changes have been made. Reasons for rejection are documented on the signature form. If sign-off is not obtained within five (5) business days, then the project will proceed as though acceptances were obtained, and an issue will be logged to escalate the official acceptance.)	QA Manager, Project Manager, IS Sponsor, and Business Sponsor(s) for current phase
Return Request for Acceptance Signature page to Project Manager	QA Manager, Project Manager, and Business Sponsor(s) for current phase
Submit completed Request for Acceptance form and signature pages to QA manager for inclusion in the Project Notebook	Project Manager
File Request for Acceptance form and signature pages in Project Notebook	QA Manager
Place accepted deliverables in the Project Notebook	QA Manager

Activity	Individual(s) Responsible
Ensure the new version of the deliverable is in the Project File repository and is marked as the current version	QA Manager
Report overdue Request for Acceptance signature pages as issues on status reports to management	Project Manager

Approvals

The signatures below indicate the approval of the (Contractors/Vendors Name) (BEP Project) Deliverable Review Process and Acceptance Criteria process and document.

Signature _____ Date _____

Signature _____ Date _____

Signature _____ Date _____

4.2 Review Meeting

The Review Team recommends one of the following dispositions at the review meeting conclusion to the Deliverable Owner:

- **Approve:** the deliverable is approved "as is" by the review team.
- **Approve with Recommended Changes:** if 1) all recommended changes and actions can be easily addressed and 2) the rework and actions are understood by both the reviewers and the Deliverable Owner and both parties agree that no further reviews are needed, the Deliverable Owner will make the changes and resolve the actions, and the QA Representative will verify the closure of these items.
- **Rework:** if recommended changes are required that significantly alter the deliverable, the deliverable will enter the rework phase, and the same group of participants will be asked to review the reworked document.

Exit Criteria for Reviews

In order to closely manage the process, the exit criteria for the process must be clearly defined. The exit criterion for the Deliverables Review Process includes:

- Items logged on the Log of Recommended Changes and Actions Form have been addressed and verified as complete.
- Review Verification Form is completed and signed.
- The deliverable was placed under configuration management system.
- Completed Log of Recommended Changes and Actions and Review Verification forms are placed in the Project Library.

4.3 Lessons Learned

The project manager should facilitate the meeting of lessons learned. Lessons learned should draw on both positive experiences– good ideas that improve project efficiency or save money, and negative experiences– lessons learned only after an undesirable outcome has already occurred. Lessons learned sessions are a valuable closure mechanism for team members, regardless of the project's outcome.

The lessons learned session is typically a meeting that includes the project team, stakeholder representation including external project oversight, auditors, and/or QA, executive management, maintenance and operations staff, project support staff.

Lessons learned and comments regarding project assessment should be documented, presented, and openly discussed with the intent of eliminating the occurrence of avoidable issues on future projects.

4.4 Contracts Closure

Project manager will work with the purchasing and contracts department to ensure formal closing of all contracts associated with the completed project which includes activities and interactions needed to settle and close any contract agreements established for the project

Contract closure involves verification that all work has been completed correctly and satisfactorily, updating of contract records to reflect final results, and archiving information for future use. Among other activities contract closure includes:

- Confirming the project has addressed the terms and conditions of the contracts
- Confirming completion of exit criteria for contract closure
- Formally closing out all contracts associated with the completed project

The project manager will estimate how much has to be paid or deducted from contractors. The project manager has to submit these documents to contractors within two weeks after closing the project.

4.5 Administrative Closure

The administrative closure process defines activities, interactions, and related roles and responsibilities of the project team members and other stakeholders involved in executing the administrative closure procedure for the projects. Performing the administrative closure process includes integrated activities to collect project records, analyze project success or failure, gather lessons learned, transfer the project products or services to production and/or operations, and archive project information for future use by the organization. Among other activities administrative closure includes:

Confirming the project has met all sponsor, customer, and stakeholder requirements

Verifying that all deliverables have been delivered and accepted

Validating exit criteria have been met

Appendix

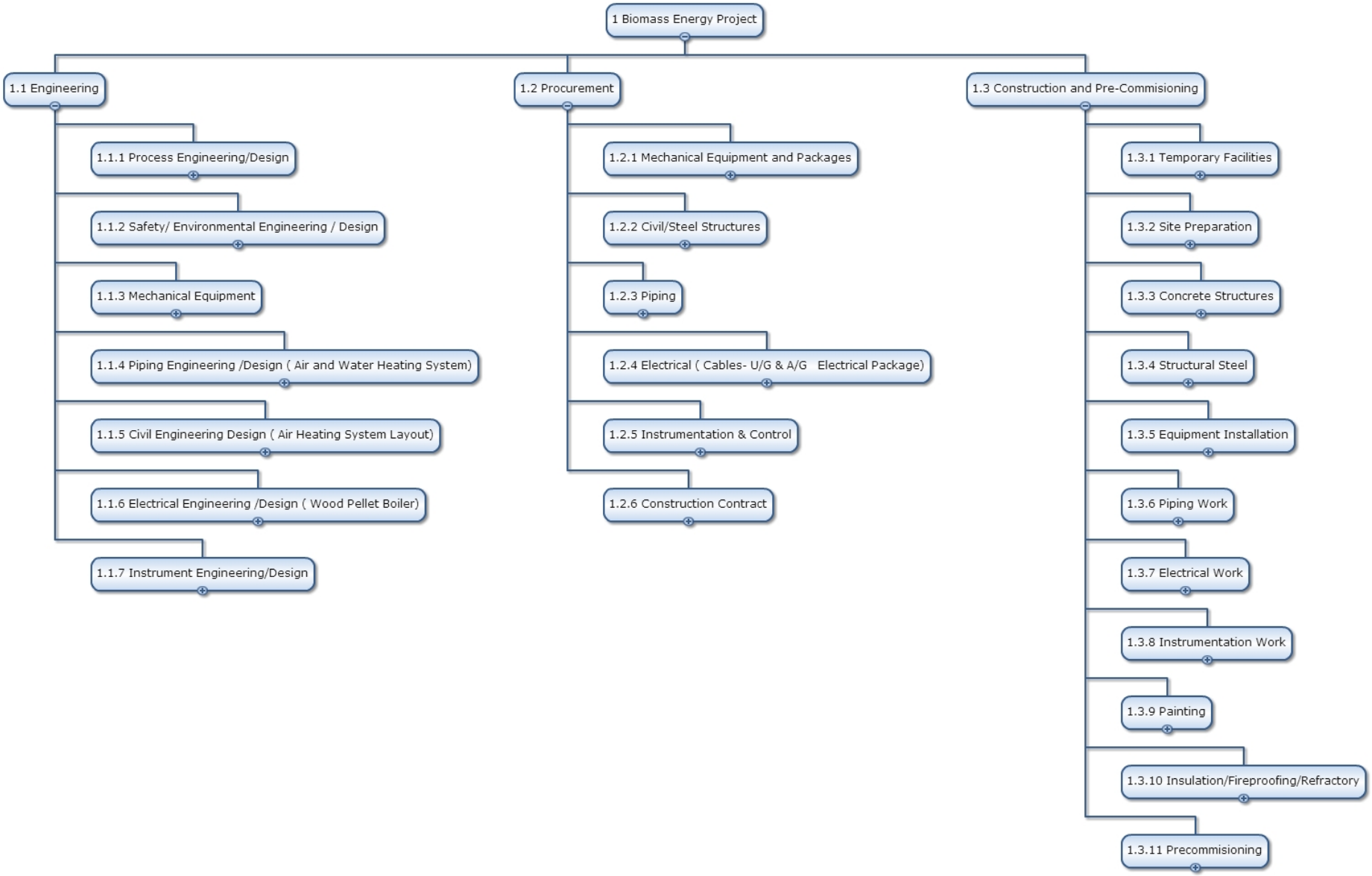
Stakeholder Register

Name	Position	Role	Communication Requirements	Project Expectations	Classification	Influence
City of Grand Prairie (CoGP),Alberta Government	Project sponsor	Provide funding and approvals	Monthly meeting, Weekly telephone and email updates	Project delivery based on requirements	Internal	Positive
Jose Mourinho	Project manager	Drive overall project direction and plans to effectively complete deliverables	Emails, face-to-face meetings, weekly regular meetings, phone, progress reports, status reports	Collaboration from everyone in the project team	Internal	Positive
Project Team	Planner/ Scheduler	Support project manager through project control processes	Weekly meetings, status reports, presentations, progress reports	Motivation from the project manager	Internal	Positive
	Mechanical Engineer					
	Electrical Engineer					
	Instrumentation Engineer					
	Operation & Process Engineer					
	HSEF Engineer					
	Civil & Structural Engineer					
	Mechanical Maintenance Team					
	Electrical Maintenance Team					

	Instrument MaintenanceTeam					
Lionel Messi	Procurement/ Contracting Engineer	Representative of the purchasing and contracts department	Bi-weekly meetings, status reports, presentations	Precise design requirements documents from the project team Durable relations with subcontractors and suppliers	Internal	Positive
Contractor Companies & Suppliers	Contractor Companies & Suppliers	Continued collaboration and interest in providing more material services to the company	Meetings, emails, phone	Timely orders Invoices paid according to negotiated terms	External	Positive
People and residents of City of CoGP	Local Communities	Participation in the stakeholder consultation process	Advertising	New job opportunities Repair and improvement of roads quality Reduced vehicle traffic and dust generation as a result of the use of an enclosed belt conveyor instead of heavy trucks for limestone transportation	External	Neutral
Government authorities & other regulatory bodies	Government authorities & other regulatory bodies	Participation in the process of project approval and issuing of necessary permits	Quarterly email updates , end of project report	Tax payments to the city and municipal budgets New job creation Compliance with government and municipal legislation	External	Neutral

Legend:	
Classification	Influence
Internal	Positive
External	Neutral
	Negative

Work Breakdown Structure (WBS)



Risk Register

Risk Identification					Current Assessment				Risk Management		
1	1b	2	3	3a	4	5	6	7	8	9a	10
No	Threat, Opp or Issue	Risk Description	Consequence	Category	Likelihood	Sustainability	Rating	Risk Status	Risk Response Strategy	Management Actions Planned	Comments
1	Threat	Planning Approvals Planning permission delays or permission not granted for boiler change Causes 1. Community complaints 2. Adjacency to residential areas 3. Failure to comply Planning legislation guidance 4. Perceived risk of not obtaining planning permission	1. Not able to implement technology of choice 2. Potential delays to the programme 3. Potential cost overruns	Approvals	3	5	8000	Red	Early discussions with Planners and on-going discussions with Case Officers	1. On larger/ complex projects appoint a Planning Consultant. 2. Pro-active discussions with the Planners.	Higher risk on smaller projects.
2	Threat	Costs Exceeded Over optimistic costs used at feasibility stage Causes 1. Costs based on assumptions and hence not comprehensive	1. Potential cost overruns	Financial	3	5	8000	Red	Upfront involvement of experienced contractor	1. Appoint experienced Cost Consultant in renewable advice 2.Ensure costs are comprehensive, including installation, supports, controls etc.	

										3. Consider Whole Life Costs approach	
3	Threat	<u>Incorrect Technology</u> Incorrect technology chosen at feasibility stage <u>Causes</u> 1. Decisions based on visual and or PR considerations rather than financial 2. Poor feasibility study/ advice	1. Performance reduction compared to expectations	Technology	4	4	6000	Red	Rigorous feasibility study including use of performance benchmarks	1. Carbon Trust to advise on best case 2. Appoint a Carbon advisor 3. Consider a Whole Life costings approach to demonstrate value 4. Desk study and tests to demonstrate feasibility of the proposal i.e. wind monitoring or boreholes at an early stage 5. Better due diligence on supplier 6. Appropriate choice of technology to match maintenance capability 7. Reduce complexity 8. Skilling up operational staff	

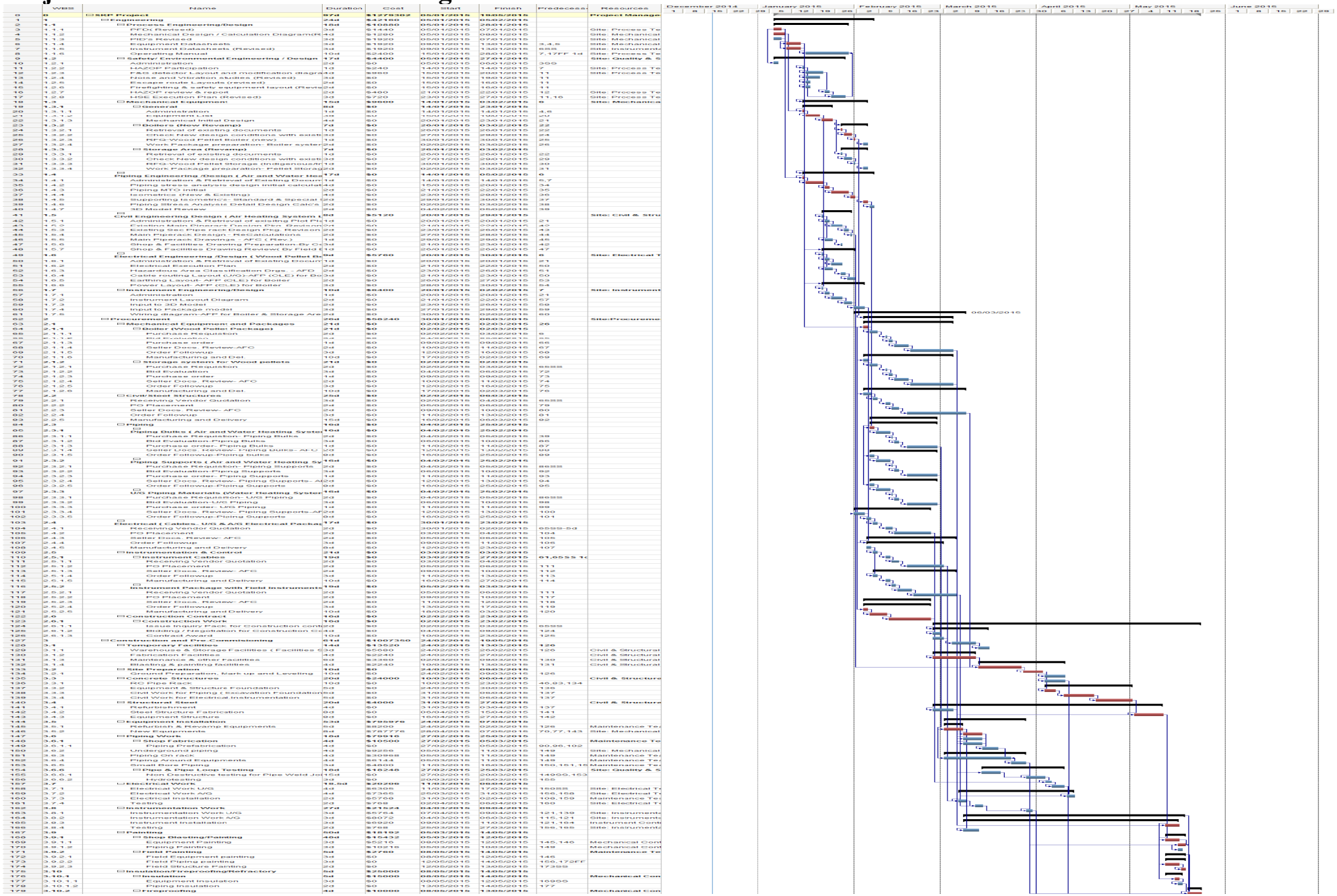
4	Threat	Planning Approvals Planning permission delays or permission not granted for photovoltaic panels Causes 1. Listed building issues 2. Complaints based on aesthetics	1. Not able to implement technology of choice 2. Potential delays to the programme 3. Potential cost overruns	Approvals	2	5	4000	Orange	Early discussions with Planners and on-going discussions with Case Officers	1. Comply with National and Local Authority guidance	L.A barriers should be minimal with a growing positivity towards this initiative
5	Threat	Environment Agency Approval Environment Agency extraction licence for open loop ground source and renewal may not be granted Causes 1. Current ground conditions	1. Not able to implement technology of choice 2. Potential cost overruns	Approvals	3	4	4000	Orange	Seek permission from Environment Agency as part of early feasibility study	1. Understand EA requirements	
6	Threat	Technology Conflicting technologies chosen at feasibility stage Causes 1. Decisions based on visual and or PR considerations rather than financial 2. Poor feasibility study/ advice 3. Chasing low carbon reduction targets	1. Performance reduction compared to expectations	Technology	3	4	4000	Orange	Rigorous feasibility study including use of performance benchmarks	1. Carbon Trust to advice on best case 2. Appoint a Carbon advisor 3. Consider a Whole Life costings approach to demonstrate value 4. Desk study and tests to demonstrate feasibility of	The key challenge is the integration of solar thermal with the DHW system for optimal

										the proposal i.e. wind monitoring or boreholes at an early stage 5. Better due diligence on supplier 6. Appropriate choice of technology to match maintenance capability 7. Reduce complexity 8. Skilling up operational staff 9. Undertake peer review of feasibility study	perfor manc e of the solar therm al and the syste m.
7	Threat	<u>Planning Approvals</u> Planning permission delays or permission not granted for biomass boilers <u>Causes</u> 1. Air quality issues 2. Transport deliveries 3. Perceived reluctance by some Local Authorities to give automatic approvals	1. Not able to implement technology of choice 2. Potential delays to the programme 3. Potential cost overruns	Approvals	2	4	2000	Orange	Early discussions with planners and on-going discussions with the case officer.	1. Carry out air quality assessment to demonstrate whether air quality is affected by proposals.	

8	Threat	<u>Natural ventilation</u> Natural ventilation not providing sufficient cooling/ventilation Causes 1. Incorrect assumptions 2. Buildings are used differently than anticipated 3. Late changes to the design/ layouts	1. Internal thermal comfort conditions not achieved	Design	4	3	600	Orange		1. Pro-active discussions with the building occupiers 2. Extensive and ongoing modelling of internal conditions 3. Protect and ensure the Natural Ventilation Strategy is clear, understood by all parties and not diluted/ changed as the design progresses	
9	Threat	<u>Equipment Availability</u> Plant/equipment only available from a few specialist suppliers Causes 1. Low demand 2. High costs in manufacturing components	1. Potential high costs of equipment 2. Lack of availability or long lead-in time	Training	4	3	600	Orange		1. Aim to use more standard technologies where possible 2. Plan for long lead-in time	
10	Threat	<u>Ground source heat pumps insufficient</u> Open loop ground source heat pumps not delivering sufficient heating or cooling <u>Causes</u> 1. Pilot drill not undertaken 2. Decision based on surrounding buildings	1. Potential failure to meet energy demands of building 2. Performanc e reduction compared to	Delivery	3	3	400	Amber		1. Accurate energy modelling/calc ulations 2. Early performance testing (i.e. open loop boreholes) 3. Analyse the output of other	

			expectation							local boreholes	
11	Threat	<u>Technology Familiarity</u> Design and Build contractors being unfamiliar with biomass energy technologies	1. Potential cost increase	Contractual	2	2	20	Green		1. Ensure contractors are vetted correctly	

Project Schedule Performance Management



Document Change Log

Document Change Log				
Document Version	**Date**	**Author**	**Input Provided By**	**Changes Made**

Document Change Log Instructions:

1. Enter appropriate information into each column.
2. Note DRAFT version in the Document Change Log and Document Version in the footer until the document is approved as a final document. Various drafts of this document may be distinguished using the date in the document file name.
3. Note the final document as Version 1.0 in the Document Change Log as well as the Document Version in the footer.
4. Minor changes made to the document in the future (i.e., change in Business Unit Lead) should be noted as an additional document within the same version. For example, a minor change after the final document has been approved would be Version 1.1.

Major changes, such as those outlined within an approved Project Change Request, should be noted as the next version of the document. For example, a major change allowing additional deliverables to be added through a Project Change Request would lead to Version 2.0 of the document.