SunMine Business Plan

SunMine
Kimberley, BC, Canada | SunMine.ca
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1 | Introduction

The SunMine solar farm is an innovative project aligned with Kimberley’s history of social entrepreneurship and community aspirations that are outlined in City policy and strategy documents.

SunMine is a solar photovoltaic plant to be constructed on the brownfield site of the former Sullivan Mine Concentrator in Kimberley, BC. The power generated will be sold to BC Hydro through their Standard Offer Program. The facility will generate 1.05 Megawatts of energy. The City of Kimberley will be the owner and operator of the SunMine facility.

This business plan provides an overview of the SunMine Project, and has been developed with several audiences in mind:

- Kimberley City Council – to provide the necessary information elected officials require to make an informed decision about investment in and construction of SunMine
- Taxpayers and the general public – to ensure the public is able to understand decision-making related to SunMine, including due diligence, risk management, rationale and benefits
- Partners - including Teck, EcoSmart, the BC Ministry of Energy and Mines Innovative Clean Energy Fund program, BC Hydro, the Columbia Basin Trust, the Southern Interior Development Initiative Trust and other potential investors – to ensure their expectations are consistent with planning processes

2 | Background

2.1 | Project history

The following list of significant activities is meant to provide a sense of the project development, but is not meant to be a comprehensive account:

- 2001: The Teck Sullivan Mine closes following nearly 100 years of operation
- 2003: The British Columbia Technical and Research Committee on Reclamation recognizes Sullivan Mine with a Metal Mining Citation for outstanding achievement in reclamation
- 2008: City and Teck are approached by EcoSmart
- 2008 – 2010: EcoSmart and City work to develop SunMine concept; apply for funding; undertake on-site energy testing with solar PV systems
- 2010: Teck’s completes full reclamation of the Teck Sullivan Mine and transitions to long term care and maintenance of the site
- 2011: SunMine selected to receive $1M in funding through the Province of BC Innovative Clean Energy Fund program
- 2011: Public presentation on the concept, preliminary business model and yield projections
- 2011: Teck announces it will contribute $2M
- 2011: 76% of voters are in favour of the City borrowing $2M toward the construction of SunMine, to be repaid through SunMine revenue
- 2011-2013: Roles, responsibilities, and ownership are negotiated
- 2012-2014: Due diligence undertaken, including preliminary design, energy verification, and 3rd party engineering review
- 2013: SunMine is identified as a City Corporate Strategic Priority by City Council
- 2013: Significant changes to project ownership structure are negotiated to comply with funders’ requirements
- 2013: Request for Qualifications Proposals is issued and evaluated; RFQ is issued and submissions are evaluated
- 2013-2014: 17 agreements and contracts are developed and concluded with 8 different organizations
- January 2014: Federal government, via Western Economic Diversification Canada, issues a formal decision not to fund the project and will not contribute the $1.6M contemplated, following three years of collaborative project development, and restructuring of ownership and project mechanics at their request; project is downsized from 1.65 MW to 1.05 MW
- April 2014: City Council decision to proceed with construction Summer 2014
3 | Context

3.1 | The Solar Industry

There are multiple ways to capture the energy from the sun. Photovoltaic (PV) cells are the most common method of generating electricity. PV cells generate electricity when solar radiation (as photons) strikes a PV semi-conductor to produce a difference in electrical potential (voltage). PV solar is becoming an economically competitive power source due to decreasing costs of technology and more rigorous standards being applied to conventional energy. Solar competitiveness has a mixed public perception due to the highly publicized challenges of North American solar panel manufacturers largely due to predatory ‘price dumping’ trade tactics and consolidation in the market for component suppliers. In reality, solar is growing as it becomes increasingly cost competitive with other forms of energy generation.

The cost of business

SunMine will be constructed through a fixed price contract with Conergy Canada for $4.7/watt, not including ancillary knowledge transfer activities. SunMine cost is affected by several factors:

- Challenging topography with bedrock outcroppings
- Working on a reclaimed mine site, with sedimentary variability
- Level of local contractor experience
- Work procedures and requirements for working within a legal mine area
- Comparatively high labour rates
- The relative decline of the Canadian dollar and purchasing goods in American dollars

A study by the U.S. Energy information Administration provides some context for the cost of new energy infrastructure.1 The capital cost of utility-scale energy projects ranges:

- Coal - From $2.9/watt for conventional combined cycle thermal (CCT) coal to $6.6/watt for advanced coal gasification with carbon capture
- Biomass – From $4.1/watt for fluidized combustion to $8.8/watt for CCT
- Wind – From $2.2/watt for onshore wind to $6.2/watt for offshore wind
- Solar – From $3.9/watt for photovoltaic to $5.1/watt for large-scale solar thermal

While solar remains somewhat expensive compared to traditional energy sources, solar has comparatively low operating costs, as the inputs are free. Another complimentary macro-trend is the move toward distributed generation. In short, it is far more efficient to produce energy where it is consumed due to efficiency losses through transmission and the significant expense of building transmission infrastructure. It is likely that new energy investments will be increasingly located nearby large industrial users throughout remote areas of the world, which is complementary to the flexibility solar offers.

In Canada, more stringent federal standards are being phased in that target emissions from thermal coal, the predominant source of energy in many provinces such as Alberta and Saskatchewan. Retrofitting these facilities with carbon capture and storage (CCS) increases generated electricity costs between 37 and 91 percent.2, 3 The first operational coal power CCS facility is in Wheyburn, Saskatchewan, and is owned and operated by SaskPower. It is offsetting the premium price on CCS by selling the CO2 for enhanced oil recovery in mature oil and gas reservoirs nearby.

Similarly, the U.S. Environmental Protection Agency has begun introducing new emissions regulations under President Obama’s Climate Action Plan that will make the construction of new coal-fired electricity uneconomical.4, 5, 6, 7

The most likely future of energy systems throughout Canada is that they will rely on a combination of conventional and renewable sources, but new generation will be based predominantly on natural gas fired thermal electricity.8 Natural gas is a relatively abundant energy source, and generates comparatively less emissions than coal generation. However, solar energy is increasingly recognized...
as an effective compliment to a well-rounded energy generation portfolio as a hedge against the volatility of commodity prices.\textsuperscript{9}

The market responds

The decision to invest in any energy project requires consideration of many factors: the cost and supply of inputs, capital, labour, demand and price for the energy, and the costs of financing. What is clear is that the market is showing increasing support for solar.

In 2012 solar was the fastest growing energy source in the United States, with PV installations growing 76% over 2011; there was 41% growth in 2013/2012, outstripping growth of all other energy sources.\textsuperscript{10} Globally, installed solar capacity grew by 35% or 37 Gigawatts in 2013, with the Asia-Pacific market representing 57% of the global market. Worldwide, PV generation is forecast to grow 70% by 2017.\textsuperscript{11} Global energy demand is forecast to continue growing and alternative energy sources will increasingly complement the existing energy mix in the transition to a low-carbon energy system.

The growth of installed PV capacity is largely due to the cost of producing PV panels, which has fallen dramatically in recent years. In 1970 solar modules were $70/watt, falling to $4/watt in 2005, and $0.7/watt today, declining 27% from 2011 to 2012 alone.\textsuperscript{12} This is largely due to increasing competition in manufacturing. Internalizing the costs of competing energy sources (e.g. carbon dioxide) and monetizing the benefits of solar relative to other energy generation will accelerate this trend and improve cost competitiveness.

Growth potential

The solar market holds great promise throughout Western Canada and particularly the Prairies Provinces where the solar resource is abundant. The emerging Western Canadian renewable electricity sector will benefit from a prominent project such as SunMine. The solar industry in Western Canada is currently made up of approximately 115 suppliers and service providers in disciplines ranging from electrical contractors and engineers, to civil engineering companies and electrical suppliers.

Provincial energy markets in Canada challenge the growth of solar PV. First, current regulations governing electricity systems do not account for the full costs of production in competing products, discounting the environmental benefits of solar. For example, the full costs of fossil fuels are only now being incorporated into pricing systems by accounting for the environmental costs of carbon. Second, few provincial energy markets offer long-term contracts for alternative energy – essential to securing project financing. While many utility-scale alternative energy projects exist despite this barrier, most installed capacity has benefited from public incentive programs that reduce financing needs.

The BC Hydro Standing Offer Program (SOP) provides published rates and long-term contracts to encourage the development of renewable energy generation in BC. In 2015 the BC Hydro rate for solar energy will be $0.11/kWh, rising with the cost of inflation. Ontario offers a tariff rate of $0.288 for projects of comparable size to SunMine. The Canadian Solar Industries Association has estimated the true value of solar (when the full economic benefits are incorporated in terms of social, environmental, and cost reliability) to be between $0.155 – 0.229/kWh in the Alberta market.

In the context of the solar industry, SunMine will be unique:

1. The largest solar facility West of Ontario.
2. The first re-development of a large reclaimed mine site into a solar farm in Canada.
3. The first large solar project supported by a mining company in Canada.
4. The first utility scale solar facility developed, owned, and operated by a Canadian municipality.
5. The first 1000V DC solar installation outside of Ontario.
6. One of the first grid-connected solar PV installations in BC.
7. The first large-scale project in Western Canada to use solar trackers.

SunMine will plant the seeds of the solar industry in Western Canada. Value-added opportunities, in which raw and wholesale inputs are transformed into consumer goods, (primarily in goods and services) are often realized in the knowledge required to combine technologies in specific ways. Services related to the design, assembly, system integration, monitoring and maintenance, and fabrication of specific components are more likely to grow in geographic areas where solar capacity is installed.
3.2 | Kimberley overview

Like many mining towns, Kimberley’s history is a story of optimism and adventure, of resourcefulness and resilience. Kimberley has and continues to be intent on creating its future rather than awaiting it.

Located in Southeastern BC, Kimberley’s story begins in 1891 with the discovery of Galena at the North Star Mine – now the location of the popular Kimberley Alpine Resort. A year later four prospectors discovered what would become the largest lead-zinc mine in the world for much of the 20th Century - the Sullivan Mine. The mine fueled the growth of Kimberley and what would become the Consolidated Mining and Smelting Company (Cominco), and later Teck-Cominco.

In 1968, the community recognized that its mineral resources would eventually be depleted, and began to focus on developing recreational resources to attract visitors. In 1973, a Bavarian theme was adopted and the transition from mining to tourism and recreation destination began.

Since that time the Community has supported various social entrepreneurship ventures to facilitate economic diversification, including ownership and management of the ski hill; the commissioning and construction of several championship golf courses and an award-winning campground. Later the ski hill was packaged with a golf course for sale to the private sector; and in 2010 the Kimberley Conference and Athlete Training Centre (KCATC) was constructed to serve as a further draw for visitors.

Our history has been shaped by people with big ideas and an aversion to the word ‘no’. The City is a pioneer in economic resilience, shifting focus to a more diversified economy and further developing its tourism industry after an era of mining. SunMine continues this tradition of bold public sector leadership to ensure Kimberley’s continued evolution as a good place to be.

Kimberley: Opportunities for Success
SunMine Project, for local energy.

— Integrated Community Sustainability Plan, 2011
Pg.84
4 | Project Objectives

4.1 | Understanding Return on Investment

SunMine is a business venture that will generate returns for its owners, the citizens of Kimberley. However the return on investment for Kimberley and other project funders and partners is more than financial. Below outlines the return on investment for the project stakeholders:

Kimberley

Kimberley seeks to continue its evolution as a good place to be. SunMine is a symbol of Kimberley’s values and has the potential to inspire national and global audiences about Kimberley, and to motivate them to experience it for themselves.

As outlined in public communication leading up to the November 2011 Referendum, this project aims to enhance the City’s reputation as an environmentally conscious, amenity-rich destination to increase tourism and attract lifestyle migrants. SunMine will be a platform on which Kimberley will tell its story to a larger audience than would be possible otherwise, and to communicate with people whose values are aligned with Kimberley’s values.

Kimberley seeks to grow and diversify the City’s tax base through increased population and businesses, as well as to promote development of the regional knowledge-based economy to foster economic diversification and stability, and to generate quality jobs.

Over the medium to long-term, it is anticipated SunMine will demonstrate the potential of solar in the region, resulting in the construction of more solar capacity and demand for solar goods and services (design, construction, maintenance, operation). Similarly, it is anticipated that SunMine will generate awareness of Kimberley as a good place to live, and increase the population by attracting a lifestyle-driven mobile workforce who can choose to live and work from anywhere. Greater population will result in more local consumers to support businesses.

Teck

Teck is Canada’s largest diversified resource company and has deep roots in Kimberley. Teck’s Sullivan Mine in Kimberley operated for over 90 years before it closed in 2001.

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<table>
<thead>
<tr>
<th>Strategy</th>
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<tbody>
<tr>
<td>- Leverage partnerships to construct innovative, entrepreneurial solar farm pilot facility to share Kimberley’s values with national and global audiences</td>
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<tr>
<th>Activities</th>
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<tr>
<td>- Due diligence and business development</td>
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<tr>
<td>- Solar facility construction</td>
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<tr>
<td>- Operations</td>
</tr>
<tr>
<td>- Communications</td>
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<tr>
<td>- Visitor and lifestyle migrant attraction</td>
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<td>- Work with partners to maximize benefits</td>
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<tr>
<th>Output</th>
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<tbody>
<tr>
<td>- Business and operational plans, contracts</td>
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<tr>
<td>- Energy produced for local consumption</td>
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<tr>
<td>- Revenue generated</td>
</tr>
<tr>
<td>- # website hits</td>
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<tr>
<td>- # visitors / $ hotel room tax</td>
</tr>
<tr>
<td>- # email newsletters distributed</td>
</tr>
<tr>
<td>- Population</td>
</tr>
<tr>
<td>- # partnerships with post-secondary, First Nations, other communities</td>
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<thead>
<tr>
<th>Assumptions</th>
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<tr>
<td>- SunMine is constructed on time and on budget</td>
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<tr>
<td>- Risks are anticipated and mitigated</td>
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<tr>
<td>- Facility operates at break-even or better</td>
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<tr>
<td>- Communication is effective</td>
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<tr>
<td>- SunMine is an inspiring story that motivates action among visitors and migrants</td>
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<tr>
<td>- Others share Kimberley’s values, as embodied by the SunMine</td>
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<tr>
<th>Outcomes</th>
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<tr>
<td>- Full-time population growth; more local consumers, entrepreneurs, and tax-payers</td>
</tr>
<tr>
<td>- Resilient, diversified local economy</td>
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<tr>
<td>- Future investment and SunMine expansion</td>
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<td>- Increased City revenue</td>
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<tr>
<td>- Sustainable level of City services</td>
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<tr>
<td>- High quality of life for residents</td>
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SunMine is situated on reclaimed land on the former Teck Sullivan Mine site. As part of its long-term commitment to supporting vibrant, sustainable communities in areas where it operates, Teck’s support of SunMine, first announced in 2011, also includes a significant financial contribution and Teck employees are assisting in the project development. Teck’s involvement in SunMine also aligns with its focus on energy efficiency, which includes supporting the development of alternative sources of energy.

EcoSmart

EcoSmart approached the City of Kimberley in 2008 to begin discussions about the possibilities associated with unused brownfield land and unexploited solar resources. EcoSmart is a non-profit foundation based in Vancouver that promotes economically and ecologically smart projects by bringing together the public and private sectors. EcoSmart has played an integral role in developing SunMine concept and contributed technical expertise and their experience in publicly supported technological innovation.

Other Funders

Solar PV is a maturing industry in Western Canada. As is illustrated in Section 5.3, this project would not be possible without the participation of several partnering funding organizations that are helping to transfer globally competitive knowledge and technology to the region. Participating organizations each have specific objectives, through which they hope to accomplish the overriding objective of using knowledge to generate new economic activity.

The BC Ministry of Energy and Mines operates the Innovative Clean Energy (ICE) Fund program to encourage the development of new sources of clean energy and technologies to help support local economies in BC. The ICE Fund program is supporting SunMine with $1M in funding to demonstrate commercial technologies not currently used in BC, and in particular is funding SunMine solar tracker structures.

The Columbia Basin Trust (CBT) supports efforts by the people of the Basin to create a legacy of social, economic, and environmental well-being and to achieve greater self sufficiency for present and future generations. SunMine is aligned with a number of CBT Strategic Priorities.

The Southern Interior Development Initiative Trust makes strategic investments in sustainable economic development initiatives throughout the Southern Interior of British Columbia.

4.2 | City of Kimberley Strategies

SunMine is aligned with existing City strategies:

- The Official Community Plan (2005) - Strategic Goals (pg 12) and Economic Development objectives (pg 31) suggest that Kimberley seek innovative means of increasing tourism and expand and diversify the economic base through new economic opportunities that compliment a “lifestyle” community, and maintain the desirable cultural, environmental, recreational and social characteristics of the community

- Kimberley Economic Development Strategy (2009) – Objectives suggest that investing resources in initiatives that contribute to a community which is attractive to both new long-time residents (pg 4), and actions that include orienting marketing initiatives towards not only tourism and visitation, but as a place to live (pg 118)

- Integrated Community Sustainability Plan (2011) - SunMine is aligned with three community priorities, as well as their descriptions of success (pg 8, 9, 12, 14, 16); similarly SunMine is identified as a short term opportunity (pg 84)

- 2012 Corporate Plan, and the Corporate Strategic Plan (2013-2015) – SunMine is a City Corporate Strategic Priority under “Alternative energy opportunities”

- 2011 Referendum

The following is a comparison of the current status of potential project benefits in relation to the “Benefits to Kimberley” that were originally outlined to the public in a direct public information mail-out preceding the November 2011 referendum, in which 76% of voters were in favour of borrowing money toward construction of SunMine (see Appendix D for original FAQ).
### November 2011 Referendum FAQ

**“Benefits to Kimberley”**

- SunMine project demonstrates leadership and a commitment toward a more sustainable future for Kimberley
- SunMine will strengthen Kimberley’s reputation as an innovative and dynamic community that is attractive to new businesses and investment
- As the largest solar power plant in Western Canada, the project will attract interest from other communities and organizations interested in using a clean natural resource to generate power
- SunMine will ensure that Kimberley stands out from other communities giving us a unique competitive advantage to attract new businesses, residents and visitors

<table>
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<tr>
<th>Current Status</th>
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<tbody>
<tr>
<td>- As outlined in detail in the Business Plan Sections 4.1, 4.2, 4.3 the SunMine meets all of these benefits</td>
</tr>
<tr>
<td>- SunMine is aligned with City Strategy, as described in guiding policy documents including the Official Community Plan (2005), the Economic Development Strategy (2009), the Integrated Community Sustainability Plan (2011) (ICSP) – and identified as a priority in the 2012 Corporate Priorities, and the Corporate Strategic Plan (2013-2015). See Business Plan for details</td>
</tr>
<tr>
<td>- November 2011, 76% of voters voted in favour of the referendum to borrow $2M toward SunMine construction</td>
</tr>
<tr>
<td>- As outlined in Sections 3.1, 4.1, and 4.2, SunMine has broad direct and indirect benefits resulting from the unique innovative nature</td>
</tr>
</tbody>
</table>

- The project will help to diversify and improve resiliency in the local economy by inspiring innovative research and business opportunities based on clean energy and efficient technologies
- The project will generate unique educational opportunities that attract researchers and educators to the community to study and learn from this innovative project

<table>
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<tr>
<th>Current Status</th>
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<tbody>
<tr>
<td>- As outlined in Sections 3.1, 4.1, 4.2, and 4.3 SunMine has broad direct and indirect benefits resulting from the unique innovative nature</td>
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</table>

- The project will provide a long-term reliable revenue source for the City from the sale of solar-generated electricity (a clean and perpetually-available energy source) to BC Hydro
- There is significant potential to increase these benefits through future expansion of the project beyond the initial 1MWp stage

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<tr>
<th>Current Status</th>
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<tbody>
<tr>
<td>- SunMine will sell electricity to BC Hydro through a long-term electricity Purchase Agreement, though the initial installation of 1.05 MW is not likely to generate significant surplus income</td>
</tr>
<tr>
<td>- Expansion potential remains significant. PV solar is incremental and financial returns increase with scale</td>
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<tr>
<td>- Once the initial facility has been constructed, calculations are that the return for additional investment would be approximately 8% at 7MW of power. The Teck Substation would require upgrading beyond 7MW, and the cost-benefit has not been calculated. However there is sufficient land to host more than 200 MW of generating capacity</td>
</tr>
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### 4.3 | Delivering broad regional benefits

As part of its commitments to achievement of SunMine Project Objectives, Kimberley is working with educational institutions and First Nations in the region to maximise regional benefits.

Kimberley has completed a Letter of Understanding with College of the Rockies (CoTR) outlining a mutual commitment to work towards CoTR training opportunities integrated with SunMine. One possibility is to have CoTR Staff trained in monitoring and operation systems, and to have these skills integrated into a component of the Electrical Apprenticeship program.

Kimberley is working to complete a Letter of Understanding with Selkirk College outlining a mutual commitment to working towards applied research opportunities associated
Kimberley has been working with the St. Mary’s Indian Band to ensure SunMine experience helps our neighbours exploit their own solar potential. Kimberley has received a Letter of Support from the St. Mary’s Indian Band outlining their interest and recognizing Kimberley’s efforts in this regard.

5 | Execution and Financials

5.1 | Due diligence

SunMine has involved an unprecedented level of due diligence appropriate with the groundbreaking nature of this project.

- EcoSmart Preliminary Design: Under a fee-for-service contract with Teck, EcoSmart created preliminary design specifications that helped to undertake initial costing estimates and define preliminary project requirements, and procurement requirements

- Independent energy verification, November 2011: two independent verifications of energy output for solar exposure; completed by Focus Corporation and Applied Engineering Solutions, and DNV Kema

- Hatch Engineering Pre-feasibility study, March 2013: A pre-feasibility study was completed by a third party engineering company, retained through a competitive process managed by Teck, to consider the EcoSmart preliminary design and refine technical requirements eventually set out in the RFP

- Two-stage modified competitive process, August – October 2013: A modified competitive process was employed through which companies were invited to participate in a Request for Proposals following the evaluation of an open Request for Qualifications. The RFO was advertised on BC Bid and through the Canadian Solar Industries Association for four weeks.

The RFPs underwent a holistic evaluation of multiple criteria, including cost, technical feasibility, reputation and experience, and size and location of the bidding consortium. The competitive process also included an online Matchmaker service in which local suppliers with specific skills could offer their services to prime contractors

- 3rd party review of Conergy proposal by Jetson Consulting Engineers, January 2014: Jetson Consulting Engineers were engaged to provide a technical review of the viability of the successful proposal by Conergy

- Ongoing liaison with the Canadian Solar Industries Association to learn from the experiences of existing solar project developers and owners

- Jetson Consulting Engineers have been retained to verify completion of project work to required standards before payment is authorized

- Columbia Basin Trust has appointed a representative to SunMine Steering Committee who was centrally involved the business development process of large power projects constructed by Columbia Power

5.2 | Procurement Supplier Competition Process

The supplier for the Engineering, Procurement, and Construction Management (EPCM) of SunMine has been selected using best-practice procurement methods. A two stage competitive process included: phase 1) a Request for Qualifications (RFQ); followed by phase 2) a Request for Proposals (RFP) from pre-qualified companies.

July–August 2013 the RFQ was advertised broadly on BC Bid, the City Website, local papers and regional publications, as well as the Canadian Solar Industries Association membership for six weeks; 55 responses were received; following joint review by EcoSmart, Teck, and Kimberley, 9 companies were prequalified to receive the RFP.

The RFP was issued September 23, 2013 and closed November 12 after the initial closing was extended by 2 weeks. The competition process involved a site visit and information sessions for all RFP participants, as well as information clarification and documentation as necessary.
Three proposals to the RFP were received.

In addition to several Mandatory Criteria, RFP proposals were evaluated according to a number of Evaluation Criteria:

- Total Capital Cost
- Price, Product, Performance Warranties
- Reputation and Experience
- Technical Solution and Ability to Meet Benchmarks
- Firm Size and Location
- Ability to Collaborate

Evaluation Criteria were considered holistically. Following an internal review SunMine Steering Committee met on November 20, 2013 to undertake a joint evaluation. While due consideration was given to each proposal, the clear consensus was to select the proposal from Conergy Canada Inc. Conergy Canada is the Canadian subsidiary of a global group, Conergy AG and wholly owned by Kawa Solar Holdings Ltd. Conergy’s proposal was identified as the most technically complete, with the best combination of product and warranties, as well as the most competitive price. With deep global experience Conergy will take the most advanced and reliable technology available on the global market and introduce it to this new environment.

5.3 | Financial Information

SunMine has a $5.3 M construction budget. The project budget includes a split of $4.05M for the Engineer Procure Construct (EPC) contract, $1.1M for ancillary project costs, and $219,000 for performance, labour and material bonding, and contingency. The fixed-price construction contract will deliver a 1.048 megawatt MW solar facility, and is accompanied by an Operations and Maintenance (O&M) Contract with a 90% performance guarantee. The detailed Construction Budget appears in Appendix A.

Kimberley has concluded a 25-year Electricity Purchase Agreement with BC Hydro. This contract will pay $110.10 per megawatt hour produced, escalating at the rate of Consumer Price Index inflation annually, which is estimated to yield an average revenue of $244,000 per year.

After loan payments, operations and maintenance expenses, net revenue is expected to average $57,800 per year over 25 yrs. Kimberley’s loan will be paid off in 20 years and SunMine will generate $1,445,000 in total retained earnings over 25 years. The detailed Cashflow and Operating Budget appears in Appendix B.

During the October 6th, 2011 public meeting preceding the November 2011 referendum, an annual operating budget was presented that projected a $32,000 annual profit; yearly maintenance was estimated to be $20,000. The Operating Budget Cashflow in Appendix C is more conservative and estimates $85,000 in annual operations, maintenance, and administration expenses.

The combination of bonding, fixed-price contracting, and insurance, as well as City oversight with the support of a 3rd party Engineer minimizes construction risk to the City. The Conergy O&M contract with performance guarantee, product warranties, conservative assumptions about City operating costs, as well as planned training for City staff minimize business risk to the City and ensure sustainability.
## 5.4 | Agreement

The following list outlines SunMine agreements and their relevance.

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<tr>
<th>Agreement</th>
<th>Significance</th>
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<tbody>
<tr>
<td>1  Teck- EcoSmart -Kimberley Statement of Joint Interests</td>
<td>Outlines parties’ interests in SunMine and was the basis for negotiations.</td>
</tr>
<tr>
<td>2  SunMine Steering Committee Terms of Reference</td>
<td>Outlines the role, authority, membership, and functioning of the project Steering Committee</td>
</tr>
<tr>
<td>3  Teck-EcoSmart Service Agreement</td>
<td>Governs the provision of EcoSmart services to the project and their compensation.</td>
</tr>
<tr>
<td>5  Teck-Kimberley Road Right of Way</td>
<td>Land access agreement.</td>
</tr>
<tr>
<td>6  Teck-Kimberley Land Lease</td>
<td>Land use agreement.</td>
</tr>
<tr>
<td>7  Teck-Kimberley Contribution Agreement</td>
<td>Governs the relationship between Teck and Kimberley, and outlines use of Teck’s $2M contribution.</td>
</tr>
<tr>
<td>8  Teck-Kimberley Private Line agreement</td>
<td>Governs the terms and conditions for Kimberley delivering power to BC Hydro via Teck’s substation.</td>
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<tr>
<td>9  Kimberley – BC Hydro Standard Generator Interconnection Agreement</td>
<td>Technical agreement with BC Hydro.</td>
</tr>
<tr>
<td>10 Kimberley - BC Hydro electricity Purchase Agreement</td>
<td>Business agreement with BC Hydro securing long-term power purchase contract.</td>
</tr>
<tr>
<td>11 EcoSmart – BC Innovative Clean Energy Fund program Contribution Agreement</td>
<td>Governs use of provincial funding.</td>
</tr>
<tr>
<td>12 Kimberley – Federation of Canadian Municipalities Loan Agreement</td>
<td>Governs Kimberley’s low interest loan.</td>
</tr>
<tr>
<td>13 Kimberley – Prime Contractor Engineering, Procurement, Construction Service Agreement</td>
<td>Governs Kimberley expectations for final product and contractor’s compensation. Bonded, fixed price contract.</td>
</tr>
<tr>
<td>14 Kimberley – Owner’s Engineer Service Agreement</td>
<td>Governs Kimberley’s relationship with engineer providing direct advice and oversight to City.</td>
</tr>
<tr>
<td>15 Kimberley – Columbia Basin Trust Contribution Agreement</td>
<td>Governs terms and conditions for CBT Funding.</td>
</tr>
<tr>
<td>16 Kimberley – Conergy Operations and Maintenance Agreement</td>
<td>Governs the terms and conditions for operations and maintenance services, as well as a performance guarantee.</td>
</tr>
<tr>
<td>17 Kimberley – Southern Interior Development Initiative Trust Contribution Agreement</td>
<td>Governs terms and conditions for SIDIT Funding.</td>
</tr>
</tbody>
</table>
5.5 | Project Roles and Responsibilities

As 100% owner of SunMine the City of Kimberley will have ultimate responsibility for SunMine decisions. The City will be supported by the SunMine Steering Committee, which includes representatives from Teck, EcoSmart, and Columbia Basin Trust.

However, with nine participating funding and service organizations it is necessary to have a greater level of detail in understanding the interactions between organizations. This is outlined in three diagrams contained in Appendix C.

- Governance
- Reporting
- Flow of funding

6 | Communications

6.1 | Communications Approach

Communications will be an increasingly important focus as SunMine moves from business development and into construction and operation. In general, the communications approach will focus on coordination between different funding and partner organizations. The overriding strategy will be to create ongoing interest and media attention to drive traffic to the project website. In future phases of development, facilities to enhance public access are planned but these are not contemplated in the existing budget.

A schedule of press releases and storylines will be developed to follow the project from construction through to operation. Activities such as media familiarization tours will also be organized. Depending on funding, medium to longer-term activities might include infrastructure to support SunMine tourism and public visitation.

7 | Risk Management

The risks associated with the Sun Mine project fall into three broad categories:

- Business
- Legal

- Technical and operational

Business risks

1. Risk of insufficient revenue

Kimberley will repay its loan with the revenue from the sale of renewable energy to BC Hydro. The price received for electricity will be guaranteed through a 25 year power purchase contract with BC Hydro; estimates of annual energy generation are based on 30 years of data from the nearby Canadian Rockies International Airport, refined and confirmed by on-site testing conducted over 2010-2011. Further, Conergy is providing a two year performance guarantee through the Operations and Maintenance contract that the facility will produce at least 90% of the total design capacity and will pay the City the difference if it does not.

2. Risk of cost overruns during construction

Every effort has been made to refine cost estimates to develop a realistic project budget. The agreement with the prime contractor is a fixed-price contract for the engineering design, procurement, and construction of SunMine. The fixed price contract is premised on a well-defined Detailed Scope of Work developed in consultation with Conergy outlining the City’s expectations for the technical specifications and output of the final product. The detailed scope forms a clear definition of the project scope, delineating those requirements that are the contractor’s responsibility and the City’s responsibility. This will minimize unforeseen costs and potential work-order changes. In the event of changes to the scope of work, the City will have access to $200K for contingency or 5% of the Engineering, Procurement, and Construction contract through a non-interest loan from the Columbia Basin Trust.

The City directly employs a Project Coordinator who has been involved in the business development, and who will be on site during construction. Compensation for the Project Coordinator is a project expense that has been incorporated into the project budget.

The City will contract with a 3rd party Engineer to provide technical oversight during project construction, including certification of work completed to standards to authorize payment. Compensation for the 3rd party Engineer is a
project expense that has been incorporated into the project budget.

Finally, the project has performance, labour and materials bonding worth the total EPCM contract ($4M) to protect the City from unsatisfactory construction or sub-contractor payment liability, as well as a 10% hold-back on all payments until 30 days after the facility is commissioned and operational.

**Legal Risks**

1. **Risk that project permits are denied or take an unduly long time to acquire**
   
   This risk is very low considering the context of the project. Municipal permits and zoning have been put in place. An environmental assessment has been completed, confirming the minimal impacts. Formal First Nations consultation is not required in this case, but the St. Mary’s Indian Band has offered a Letter of Support for the project.

2. **Risk of not getting public approval**
   
   Public approval is essential. SunMine is aligned with community policy and planning documents, such as the Integrated Community Sustainability Plan developed with significant community consultation. In October 2011 voters were 76% in favour of the City borrowing $2M toward SunMine construction.

   Once the project is approved, a communications plan will be developed in conjunction with partners and funders, and will include full disclosure and consultation with the local residents.

**Technical and Operational Risks**

1. **Risk of lower than expected PV performance**
   
   The project will use established polycrystalline PV technology manufactured by Conergy. Polycrystalline PV is a proven technology that has been in use for more than half a century around the world. On-site testing of similar panels from 2010-2011 has confirmed energy yield projections based on data collected from the nearby Cranbrook airport, mitigating the risk of overestimating the system efficiency.

   In addition, the following warranties are part of the contract deal:

   - Conergy PV Modules (10 yr workmanship, 25 yr output warranty): Conergy is a global leader in PV modules; it sets standards, undertakes quality control, and works with JA solar - a Chinese manufacturer among top three producers in the world
   - ABB Power-One Inverters (10 yr warranty): one of the world’s largest components manufacturers
   - Deger Trackers (3 yr product, 25 yr corrosion warranty): Deger is a global leader in the manufacturer of solar components, design and integration systems

   Finally, Conergy is providing a two-year performance guarantee as part of the Operations and Maintenance that the facility will produce at least 90% of the total design capacity, and will pay the City the difference if it does not.

2. **Risk that maintenance and operation costs become higher than anticipated**
   
   Consultation with other project developers suggests that maintenance and operation costs between $0.02/watt and $0.05/watt should be anticipated. Cashflow projections were built around conservative O&M estimates totaling $0.078/watt. This estimate has been developed by combining the Operations and Maintenance contract with Conergy and the cost of City activities. As part of a blended Operations and Maintenance approach, the City of Kimberley will be performing annual cleaning, preventative maintenance, and associated costs, such as Winter road clearing. Conergy will provide a performance guarantee, maintain spare parts, response for major maintenance and repairs, and assistance and direction to City staff working with the system.

   Damage during snow removal, or damage by lightning or severe storms may increase maintenance costs. Such damage will not be covered by the manufacturer’s warranty but could be covered by a separate insurance policy. Similarly Kimberley will purchase loss of business insurance to protect the revenue stream. Appropriate mitigation measures include thorough training of maintenance personnel, proper lightning protection (included in the budget), and provision to shut down operations if severe storms are expected. The Deger tracking system is able to sense wind and snow loads and pivot on two axis, and thus able to lay flat to protect from wind or increase angle to shed snow.
3. Risk of tracking system malfunction
The Deger tracking systems is global best-in-class technology designed and manufactured in Germany. The tracking mechanism is a proven technology that has been in used for many years in many countries. There is, however, a limited risk that these mechanisms will malfunction. The mitigation strategy will have two parts:

- A requirement will be written into the tracker contract to ensure the supplier will guarantee performance in Canadian climatic conditions and have technical staff available on short notice to ensure proper operation; and

- Worse-case-scenario, if the trackers fail (e.g. in severe cold weather), the PV panels will be locked in the optimum fixed position, which will reduce peak output for the duration of failed tracker operation. However, this will still leave enough peak capacity to provide a viable electricity supply

4. Risk of higher than expected de-rating factors
All PV systems have de-rating factors, as some electricity generated by the PV modules is lost in the ancillary transmission elements and not available for distribution to the grid. De-rating factors are well known and inevitable; for example, most PV manufacturers guarantee close to 100% of rated performance when first installed, but typically reduce this to 87% after 25 years at a predictable rate. Other de-rating factors can include the following:

- High temperatures reduce PV cells efficiency, by 0.4% for each degree above 43 Degrees Celsius
- Dirt, dust and snow on the unit can similarly reduce efficiency to 95%; the City has budgeted to clean the panels three times per year
- Module mismatch, where there are output current conflicts, can reduce efficiency to 98%
- Wiring losses can decrease efficiency to 97%
- Inverter losses can decrease efficiency to 94%

One of the objectives of the project is to minimize the overall derating of the solar energy system by application of innovative PV technologies and careful selection and design of its elements.

- System performance guarantees with compensation for loss will be written into the Conergy contract
- Low temperature and wind exposure at SunMine site will eliminate temperature losses

5. Other technical risks
All other technical elements associated with the project (e.g., power transmission, roads, sub-station, PV support foundations) are fully established technologies with no changes in the associated risk.

6. Vandalism
Teck land is fenced and access is strictly controlled due to Teck’s obligations under the Mines Act. Additional fencing around SunMine site will be part of the Engineer, Procure, Construct contract, and security monitoring has been incorporated into the Administrative costs in the Cashflow projections.
8 | Performance Measurement

Net revenue is the bottom line performance measurement in business. Because SunMine has additional Project Objectives a collection of additional performance indicators will be tracked and reported on to demonstrate project success.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target</th>
<th>Measurement Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual energy generated</td>
<td>3,500 MWh*</td>
<td>December 2016</td>
</tr>
<tr>
<td># of products, processes or services proven through successful deployment in an operational setting</td>
<td>1</td>
<td>January 2015</td>
</tr>
<tr>
<td># of technologies completed and qualified through tests and demonstrations</td>
<td>3</td>
<td>January 2015</td>
</tr>
<tr>
<td># highly qualified personnel trained</td>
<td>30</td>
<td>December 2016</td>
</tr>
<tr>
<td># media references to SunMine</td>
<td>200</td>
<td>December 2016</td>
</tr>
<tr>
<td># visitors to the SunMine website</td>
<td>30,000</td>
<td>December 2016</td>
</tr>
<tr>
<td># instances of promotion of the turnkey system (domestic and international)</td>
<td>10</td>
<td>December 2016</td>
</tr>
</tbody>
</table>

*To be revised based on final facility capacity

9 | Conclusion

Kimberley has a proud history of community entrepreneurship that has been central to its evolution as a good place to be.

SunMine is an ambitious, unique project outside the scope of traditional municipal activities. Accordingly, this business plan is built around conservative assumptions and due diligence that reflect the risk tolerance of a public body accountable to the electorate for the use of public money.

As outlined in Section 4, Kimberley is motivated to pursue this opportunity by the broad-based benefits for the community and the region. We believe early adopters and those that focus on the “why not” rather than “why” will reap the opportunities in the solar sector.
10 | End Notes


3 Conference Board of Canada. Canada’s Electricity Infrastructure: Building a Case for Investment. 2011


6 Len Coad, formerly of the Conference Board of Canada, now of the Canada West Foundation estimates that the cost of energy produced for new Hydro facilities is $3/watt and $4/watt for new thermal coal (before carbon capture and sequestration).

7 Conference Board of Canada. Canada’s Electricity Infrastructure: Building a Case for Investment. 2011

8 Marc Jaccard. Sustainable Fossil Fuels; the unusual suspect in the quest for clean and enduring energy. 2005.


12 Full cost accounting is the concept of incorporating the full costs of producing a good or service, including any negative externalities. In the case of coal, the full costs of production would include emissions capture and sequestration.


14 Natural Resources Canada. Solar Resources Map. Accessible here: http://www.cansia.ca/sites/default/files/policy_and_research/solar_vision_2025_resource_map.png

15 This calculation is based on a compilation of two lists: 1) list of members of the Canadian Solar Industries Association located in Western Canada; and 2) list of suppliers who responded to the SunMine Request for Proposals and Matchmaker service.

16 The Stern Review is a seminal work in full cost accounting and calculating the economic impacts of climate change commissioned by the British government in 2006. Accessible here: http://webarchive.nationalarchives.gov.uk/+/http://www.hm-treasury.gov.uk/sternreview_index.htm

17 Many provinces, including Alberta, Saskatchewan, Manitoba, Nova Scotia, New Brunswick, PEI the North West Territories and Yukon do offer Net-Metering Programs that benefit renewable energy; in Net Metering, electricity generated by the consumer and fed into local distribution is measured and credited against the balance of electricity the consumer purchases; SaskPower offers a rebate of 20% of solar PV capital costs for net metered installations.

18 Alberta, Saskatchewan, Manitoba, Quebec, Nova Scotia, New Brunswick, the NWT and Yukon PEI offer different forms of net metering.


## Appendix A:

### SunMine Project Construction Budget

*Updated June 23rd, 2014*

<table>
<thead>
<tr>
<th>SunMine Construction Budget</th>
<th>Expense</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contractor (Conergy)</strong></td>
<td></td>
</tr>
<tr>
<td>Engineering, Procurement, and Construction Fixed Price Contract</td>
<td>4,047,972</td>
</tr>
<tr>
<td>Bonding - Performance, Labour and Materials</td>
<td>121,439</td>
</tr>
<tr>
<td><strong>City of Kimberley/Teck Resources Ltd.</strong></td>
<td></td>
</tr>
<tr>
<td>Course of Construction Insurance</td>
<td>24,839</td>
</tr>
<tr>
<td>Access Road Construction</td>
<td>10,650</td>
</tr>
<tr>
<td>Land Clearing and Grubbing</td>
<td>10,000</td>
</tr>
<tr>
<td>BC Hydro Network upgrades (280k offset by BC Hydro grant)</td>
<td>0</td>
</tr>
<tr>
<td>Interconnection Upgrade Costs</td>
<td>50,000</td>
</tr>
<tr>
<td>BC Hydro Monitoring Equipment</td>
<td>25,000</td>
</tr>
<tr>
<td>Teck Expenses (Prefeasability, EcoSmart, Interconnection Study)</td>
<td>806,702</td>
</tr>
<tr>
<td>Payment Certifier/Eng. Review (Jetson Consulting)</td>
<td>66,000</td>
</tr>
<tr>
<td>City Project Coordinator (Don Schacher)</td>
<td>50,000</td>
</tr>
<tr>
<td>Debt Reserve Contribution &amp; Loan Legal</td>
<td>27,500</td>
</tr>
<tr>
<td>Letter of Credit service</td>
<td>7,500</td>
</tr>
<tr>
<td>SunMine Communications, including website</td>
<td>5,000</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>5,252,602</td>
</tr>
<tr>
<td><strong>Project Contingency</strong></td>
<td>97,398</td>
</tr>
<tr>
<td><strong>GRAND TOTAL</strong></td>
<td>5,350,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SunMine Project Funding</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Kimberley (Borrowing)</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Teck Resources Contribution</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Innovative Clean Energy, BC Govt</td>
<td>1,000,000</td>
</tr>
<tr>
<td>Columbia Basin Trust Funding</td>
<td>300,000</td>
</tr>
<tr>
<td>Southern Interior Development Initiative Trust</td>
<td>50,000</td>
</tr>
<tr>
<td><strong>TOTAL PROJECT FUNDING</strong></td>
<td>5,350,000</td>
</tr>
</tbody>
</table>
## Appendix B:

### Cashflow and Operating Budget - 1.05 MW

*Updated June 23rd, 2014*

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Energy</th>
<th>Annual Energy</th>
<th>BCH tariff</th>
<th>Revenue MW ($</th>
<th>Loan Payment on $2 Mil</th>
<th>Revenue - Loan</th>
<th>O &amp; M Cost</th>
<th>Other Cost</th>
<th>Net Operating Cash Flow</th>
<th>Cumulative Cash Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>1,850</td>
<td>1,943</td>
<td>110.01</td>
<td>213,694</td>
<td>139,233</td>
<td>74,461</td>
<td>57,246</td>
<td>19,168</td>
<td>(1,953)</td>
<td>(1,953)</td>
</tr>
<tr>
<td>2016</td>
<td>1,841</td>
<td>1,933</td>
<td>111.99</td>
<td>216,483</td>
<td>137,633</td>
<td>78,850</td>
<td>58,028</td>
<td>19,551</td>
<td>1,270</td>
<td>683</td>
</tr>
<tr>
<td>2017</td>
<td>1,828</td>
<td>1,919</td>
<td>114.01</td>
<td>218,815</td>
<td>136,033</td>
<td>82,782</td>
<td>48,810</td>
<td>19,942</td>
<td>13,347</td>
<td>13,347</td>
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<tr>
<td>2018</td>
<td>1,815</td>
<td>1,906</td>
<td>116.06</td>
<td>221,172</td>
<td>134,433</td>
<td>86,739</td>
<td>44,338</td>
<td>20,341</td>
<td>35,406</td>
<td>35,406</td>
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<tr>
<td>2019</td>
<td>1,802</td>
<td>1,892</td>
<td>118.01</td>
<td>223,554</td>
<td>132,833</td>
<td>90,721</td>
<td>45,446</td>
<td>21,163</td>
<td>59,933</td>
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<tr>
<td>2020</td>
<td>1,789</td>
<td>1,879</td>
<td>120.27</td>
<td>225,962</td>
<td>131,233</td>
<td>94,729</td>
<td>44,521</td>
<td>24,984</td>
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<tr>
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<td>122.44</td>
<td>228,397</td>
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<td>98,764</td>
<td>47,719</td>
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<td>2022</td>
<td>1,764</td>
<td>1,852</td>
<td>124.64</td>
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<td>102,824</td>
<td>51,912</td>
<td>22,018</td>
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<td>126,433</td>
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<td>53,209</td>
<td>22,458</td>
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<td>2024</td>
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<td>235,857</td>
<td>124,833</td>
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<td>54,540</td>
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<td>238,398</td>
<td>123,233</td>
<td>117,165</td>
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<td>133.86</td>
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<td>123,333</td>
<td>57,267</td>
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<td>1,641</td>
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<td>90,433</td>
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</tr>
<tr>
<td>Total</td>
<td>42,607</td>
<td>44,738</td>
<td>6,106,756</td>
<td>2,502,660</td>
<td>3,604,096</td>
<td>1,545,073</td>
<td>613,957</td>
<td>1,445,065</td>
<td>1,445,065</td>
<td>1,445,065</td>
</tr>
</tbody>
</table>

**Average**: 1,704 MWh, 1,790 MWh, 11,106 MWh, 144,164 MWh, 61,803 MWh, 24,558 MWh

**Assumptions**:

1. Based on Conergy energy production estimates, 100% energy output
2. Degredation in year 2 of 0.49% and each year after 0.71%
3. Revenue/KWh escalates at CPI, estimated to be 1.8% per year
4. Maintenance costs based on information from Conergy, Jetson Consulting and City of Kimberley staff
5. Administration costs include 2.5% inflationary increase (blended 3% wages and materials at CPI 1.8%)
6. Loss of Income Insurance implemented in year 3

Updated April 25, 2014
Appendix C:

Governance, Reporting, and Flow of Funding Diagram

SunMine Governance

BC Hydro

City of Kimberley
City Council & CAO

Teck

EcoSmart

9. Steering Committee
- Project recommendations to CoK
- City Chaired, Terms of Reference

Engineering Procurement Construction Management Service Agreement

Consulting Engineer

City Project Coordinator

EPCM Prime Contractor

Construction Sub-Contractors
SunMine Reporting and Information Flow

9. Steering Committee
- Project decisions based on recommendations
- City Chaired, TOR

City Project Coordinator

Owner's Engineer

Teck Kimberley

City of Kimberley
City Council & CAO

Teck

EcoSmart

10. Project Working Committee
Weekly calls, sharing information on progress
- Chaired by Kimberley

EPCM Prime Contractor

ICE - BC Energy and Mines
Flow of Funding - Construction

- **Teck**
  - Gift Payment
  - Invoice Payment

- **City of Kimberley**
  - **CAO, Finance, EDO**
    - Payment
    - Invoice

- **EcoSmart**
  - Fee for Service Invoice
  - Invoice
  - Reimbursement

- **ICE**
  - BC Energy and Mines
  - Invoice
  - Reimbursement

- **EPCM Prime Contractor**
  - Invoice
  - Payment

- **Consulting Engineer**
  - Payment

- **City Project Coordinator**
  - Payment