15.4 WOOD CHIP BOILER HEATING PLANT OPTION

FACILITIES INCLUDED:

- Recreation Center
- Quillayute Valley Middle School

PURPOSE:

Reduce the annual School District and Recreation Center heating costs by installing two (2) new wood chip boiler plants. The biomass boiler would also hedge against future fossil fuel cost increases.

EXISTING SYSTEMS:

The Quillayute Valley Middle School has a fuel oil boiler with a steam heating system. The Recreation Center has three (3) propane boilers delivering three different temperatures. The Recreation Center has a heating hot water system.

PROPOSED SCOPE of WORK:

<u>Quillayute Valley School District</u>

One (1) new 1,526 MBtuh wood chip boiler will be installed inside a 2,300 square foot (sqft.) boiler building. This boiler building will be constructed on the north side of the Quillayute Valley School District Maintenance Shop on Camas Avenue. The boiler building will house one (1) wood chip boiler; one (1) wood chip 24 hour storage bay; one (1) automatic chip feeding system; freeze protection; two (2) 120 V service outlets, four (4) 2-lamp T8 open-strip lighting fixtures with electronic ballasts, and the steam and condensate circulation system. The new biomass boiler will provide heating to the Quillayute Valley School District Middle School only. The new slab-on-grade masonry or metal boiler building will meet local building code requirements.

The new wood chip boiler plant steam system will be connected to the existing steam piping in the Quillayute Valley Middle School. This interconnection with the existing heating system will provide redundancy and keep infrastructure improvement costs to a minimum. All piping will be insulated per International Energy Code requirements.

Recreation Center

One (1) new 2,200 MBtuh wood chip boiler will be installed inside a 2,300 square foot (sqft.) boiler building. This boiler building will be constructed on the east side of the Recreation Center. The boiler building will house one (1) wood chip boiler; one (1) wood chip 24 hour storage bay; one (1) automatic chip feeding system; freeze protection; two (2) 120 V service outlets, four (4) 2-lamp T8 open-strip lighting fixtures with electronic ballasts, and the steam and condensate circulation system. The new biomass boiler will provide heating to the Recreation Center for the domestic, pool and space heating loads. The new slab-on-grade masonry or metal boiler building will meet local building code requirements.

The new wood chip boiler plant heating hot water system will be connected to the existing Recreation Center boiler piping systems. This interconnection with the existing heating system will provide redundancy and keep infrastructure improvement costs to a minimum. All piping will be insulated per International Energy Code requirements.

Table 1.0 Biomass Boilers for Heating Only Estimate

Biomass Boilers Equipment [1]	$ 650,000
Chippers[1] – Quantity 2	$ 8,000
Tax on Equipment	$ 54,614
Subtotal on Equipment:	*$ 712,614*
Consultant Engineering	$ 57,260
Subcontractors	$ 593,500
Travel & Subsistence	$ 27,120
Contingency	$ 132,864
Subtotal Direct Costs	*$ 810,744*
Self-performed Work	$ 351,946
B&O Tax	$ 5,813
CM Fee on Equipment	$ 52,640
Fee on Direct Costs	$ 202,686
Subtotal Self Performed Costs	*$ 613,085*
Estimated Siemens' Contract	$ 1,423,830
Tax on Siemens' Contract	$ 118,178
Project Estimated Costs	**$2,254,622**

[1] Owner purchased equipment

Table 2.0 Financial Return on Investment

$ 2.00	Cost per Ton
15,000	Annual Tons
$30,000	Fuel Cost
$66,560	2 FTEs
$10,000	Maintenance
$10,000	Miscellaneous
$137,054	Debt Payment - 5%

$253,614	Operating Cost

3,726	Annual MMBtu
$37.84	Cost per MMBtu
$126,923	Heating Revenue
$0	Electric Revenue

$126,923	Total Revenue

$(126,692) Annual Revenue
$(2,462,641) 20 year Cumulative Revenue
-109% Return on Investment

2007 Revision:

When this revised edition was put together by Siemens, there was still hope to undertake piping steam to the Aquatic Center, now closed, located about 1/3rd of a mile from the proposed boiler site. At approximately $350/linear foot, it was determined that piping steam to the Aquatic Center was not a viable, financial option. In addition, further discussions with Siemens revealed that some of the above calculations included two versions of equipment needed, in addition to the design fees. This analysis lead to a determination that for approximately $1m a wood-fired boiler system for the school could be developed.

Table 15.4.1: In-town, Biomass Heating Only Option – No Subsidy

Items	Description
Cost of Biomass Plant	$2,254,622
Financed Amount	$2,254,622
Average Cost per Green Ton of Fuel	$2.00 (Cedar Mills)
Annual Green Ton Consumption	15,000
Estimated Mega-watts of Electric Power	0
Annual Maintenance and Fuel Cost	$116,560
Annual MMBtuh Consumption	3,726
Annual Thermal Revenue*	$126,923
Total Annual Revenue	**$126,923**

* The revenue provides a 10% annual reduction in utility costs for QVSD and the Quillayute Valley Recreation Center.

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City of Forks
Heating Only Cash Flow Analysis

YEAR	Revenue	Operating Cost	Net Cost of Operations	Principal & Interest	Ongoing Support	Program Costs	Annual Contribution	Annual Net Cashflow	Cumulative Net Cashflow
0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1	$ 126,923	$ (116,560)	$ 10,363	$ (137,054)	$ -	$ (137,054)	$ -	$ (126,692)	$ (126,692)
2	$ 130,730	$ (120,057)	$ 10,673	$ (137,054)	$ -	$ (137,054)	$ -	$ (126,381)	$ (253,073)
3	$ 134,652	$ (123,659)	$ 10,994	$ (137,054)	$ -	$ (137,054)	$ -	$ (126,061)	$ (379,133)
4	$ 138,692	$ (127,368)	$ 11,323	$ (137,054)	$ -	$ (137,054)	$ -	$ (125,731)	$ (504,864)
5	$ 142,852	$ (131,189)	$ 11,663	$ (137,054)	$ -	$ (137,054)	$ -	$ (125,391)	$ (630,256)
6	$ 147,138	$ (135,125)	$ 12,013	$ (137,054)	$ -	$ (137,054)	$ -	$ (125,041)	$ (755,297)
7	$ 151,552	$ (139,179)	$ 12,373	$ (137,054)	$ -	$ (137,054)	$ -	$ (124,681)	$ (879,978)
8	$ 156,099	$ (143,354)	$ 12,745	$ (137,054)	$ -	$ (137,054)	$ -	$ (124,310)	$ (1,004,287)
9	$ 160,782	$ (147,655)	$ 13,127	$ (137,054)	$ -	$ (137,054)	$ -	$ (123,927)	$ (1,128,215)
10	$ 165,605	$ (152,084)	$ 13,521	$ (137,054)	$ -	$ (137,054)	$ -	$ (123,534)	$ (1,251,748)
11	$ 170,573	$ (156,647)	$ 13,926	$ (137,054)	$ -	$ (137,054)	$ -	$ (123,128)	$ (1,374,876)
12	$ 175,690	$ (161,346)	$ 14,344	$ (137,054)	$ -	$ (137,054)	$ -	$ (122,710)	$ (1,497,587)
13	$ 180,961	$ (166,187)	$ 14,774	$ (137,054)	$ -	$ (137,054)	$ -	$ (122,280)	$ (1,619,866)
14	$ 186,390	$ (171,172)	$ 15,218	$ (137,054)	$ -	$ (137,054)	$ -	$ (121,837)	$ (1,741,703)
15	$ 191,982	$ (176,307)	$ 15,674	$ (137,054)	$ -	$ (137,054)	$ -	$ (121,380)	$ (1,863,083)
16	$ 197,741	$ (181,597)	$ 16,144	$ (137,054)	$ -	$ (137,054)	$ -	$ (120,910)	$ (1,983,993)
17	$ 203,673	$ (187,045)	$ 16,629	$ (137,054)	$ -	$ (137,054)	$ -	$ (120,426)	$ (2,104,418)
18	$ 209,784	$ (192,656)	$ 17,128	$ (137,054)	$ -	$ (137,054)	$ -	$ (119,927)	$ (2,224,345)
19	$ 216,077	$ (198,436)	$ 17,641	$ (137,054)	$ -	$ (137,054)	$ -	$ (119,413)	$ (2,343,758)
20	$ 222,559	$ (204,389)	$ 18,171	$ (137,054)	$ -	$ (137,054)	$ -	$ (118,884)	$ (2,462,641)

Financial Summary

Program Cost	$ 2,254,622	**Annual Interest Rate**	2.00%
Rebates/Grants/Approp.	$ -	**Finance Period**	20
Downpayment	$ -	**Payments per Year**	4
Amount Financed	$ 2,254,622	**Total Interest Payments**	$ 486,464
Ongoing Support	$ -		
		Energy Escalation	3.0%
Annual Revenue	$ 126,923	**Operational Escalation**	3.0%
Annual Operating Cost	$ (116,560)	**Service Escalation**	0.0%
Simple Payback (years)	217.6		
20 year ROI	-109.2%		

Table 15.4.2: In-town, Biomass Heating Only Option – Minimum Subsidy

Items	Description
Cost of Biomass Plant	$2,254,622
Financed Amount	$154,622
Average Cost per Green Ton of Fuel	$2.00 (Cedar Mills)
Annual Green Ton Consumption	15,000
Estimated Mega-watts of Electric Power	0
Annual Maintenance and Fuel Cost	$116,560
Annual MMBtuh Consumption	3,726
Annual Thermal Revenue	$126,923
Total Annual Revenue	**$126,923**

* The revenue provides a 10% annual reduction in utility costs for QVSD and the Quillayute Valley Recreation Center.

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City of Forks
Heating Only Cash Flow Analysis

YEAR	Revenue	Operating Cost	Net Cost of Operations	Principal & Interest	Ongoing Support	Program Costs	Annual Contribution	Annual Net Cashflow	Cumulative Net Cashflow
0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1	$ 126,923	$ (116,560)	$ 10,363	$ (9,399)	$ -	$ (9,399)	$ -	$ 963	$ 963
2	$ 130,730	$ (120,057)	$ 10,673	$ (9,399)	$ -	$ (9,399)	$ -	$ 1,274	$ 2,238
3	$ 134,652	$ (123,659)	$ 10,994	$ (9,399)	$ -	$ (9,399)	$ -	$ 1,594	$ 3,832
4	$ 138,692	$ (127,368)	$ 11,323	$ (9,399)	$ -	$ (9,399)	$ -	$ 1,924	$ 5,756
5	$ 142,852	$ (131,189)	$ 11,663	$ (9,399)	$ -	$ (9,399)	$ -	$ 2,264	$ 8,020
6	$ 147,138	$ (135,125)	$ 12,013	$ (9,399)	$ -	$ (9,399)	$ -	$ 2,614	$ 10,634
7	$ 151,552	$ (139,179)	$ 12,373	$ (9,399)	$ -	$ (9,399)	$ -	$ 2,974	$ 13,608
8	$ 156,099	$ (143,354)	$ 12,745	$ (9,399)	$ -	$ (9,399)	$ -	$ 3,345	$ 16,953
9	$ 160,782	$ (147,655)	$ 13,127	$ (9,399)	$ -	$ (9,399)	$ -	$ 3,728	$ 20,681
10	$ 165,605	$ (152,084)	$ 13,521	$ (9,399)	$ -	$ (9,399)	$ -	$ 4,122	$ 24,803
11	$ 170,573	$ (156,647)	$ 13,926	$ (9,399)	$ -	$ (9,399)	$ -	$ 4,527	$ 29,330
12	$ 175,690	$ (161,346)	$ 14,344	$ (9,399)	$ -	$ (9,399)	$ -	$ 4,945	$ 34,275
13	$ 180,961	$ (166,187)	$ 14,774	$ (9,399)	$ -	$ (9,399)	$ -	$ 5,375	$ 39,650
14	$ 186,390	$ (171,172)	$ 15,218	$ (9,399)	$ -	$ (9,399)	$ -	$ 5,818	$ 45,468
15	$ 191,982	$ (176,307)	$ 15,674	$ (9,399)	$ -	$ (9,399)	$ -	$ 6,275	$ 51,743
16	$ 197,741	$ (181,597)	$ 16,144	$ (9,399)	$ -	$ (9,399)	$ -	$ 6,745	$ 58,489
17	$ 203,673	$ (187,045)	$ 16,629	$ (9,399)	$ -	$ (9,399)	$ -	$ 7,230	$ 65,718
18	$ 209,784	$ (192,656)	$ 17,128	$ (9,399)	$ -	$ (9,399)	$ -	$ 7,728	$ 73,447
19	$ 216,077	$ (198,436)	$ 17,641	$ (9,399)	$ -	$ (9,399)	$ -	$ 8,242	$ 81,689
20	$ 222,559	$ (204,389)	$ 18,171	$ (9,399)	$ -	$ (9,399)	$ -	$ 8,772	$ 90,461

Financial Summary

Program Cost	$ 2,254,622	**Annual Interest Rate**	2.00%
Rebates/Grants/Approp.	$ (2,100,000)	**Finance Period**	20
Downpayment	$ -	**Payments per Year**	4
Amount Financed	$ 154,622	**Total Interest Payments**	$ 33,362
Ongoing Support	$ -		
		Energy Escalation	3.0%
Annual Revenue	$ 126,923	**Operational Escalation**	3.0%
Annual Operating Cost	$ (116,560)	**Service Escalation**	0.0%
Simple Payback (years)	14.9		
20 year ROI	58.5%		

Table 15.4.3: In-town, Biomass Heating Only Option – 100% Subsidy

Items	Description
Cost of Biomass Plant	$2,254,622
Financed Amount	$0
Average Cost per Green Ton of Fuel	$2.00 (Cedar Mills)
Annual Green Ton Consumption	15,000
Estimated Mega-watts of Electric Power	0
Annual Maintenance and Fuel Cost	$116,560
Annual MMBtuh Consumption	3,726
Annual Thermal Revenue	$126,923
Total Annual Revenue	**$126,923**

* The revenue provides a 10% annual reduction in utility costs for QVSD and the Quillayute Valley Recreation Center.

SIEMENS

City of Forks
Heating Only Cash Flow Analysis

YEAR	Revenue	Operating Cost	Net Cost of Operations	Principal & Interest	Ongoing Support	Program Costs	Annual Contribution	Annual Net Cashflow	Cumulative Net Cashflow
0	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
1	$ 126,923	$ (116,560)	$ 10,363	$ -	$ -	$ -	$ -	$ 10,363	$ 10,363
2	$ 130,730	$ (120,057)	$ 10,673	$ -	$ -	$ -	$ -	$ 10,673	$ 21,036
3	$ 134,652	$ (123,659)	$ 10,994	$ -	$ -	$ -	$ -	$ 10,994	$ 32,029
4	$ 138,692	$ (127,368)	$ 11,323	$ -	$ -	$ -	$ -	$ 11,323	$ 43,353
5	$ 142,852	$ (131,189)	$ 11,663	$ -	$ -	$ -	$ -	$ 11,663	$ 55,016
6	$ 147,138	$ (135,125)	$ 12,013	$ -	$ -	$ -	$ -	$ 12,013	$ 67,029
7	$ 151,552	$ (139,179)	$ 12,373	$ -	$ -	$ -	$ -	$ 12,373	$ 79,402
8	$ 156,099	$ (143,354)	$ 12,745	$ -	$ -	$ -	$ -	$ 12,745	$ 92,147
9	$ 160,782	$ (147,655)	$ 13,127	$ -	$ -	$ -	$ -	$ 13,127	$ 105,274
10	$ 165,605	$ (152,084)	$ 13,521	$ -	$ -	$ -	$ -	$ 13,521	$ 118,794
11	$ 170,573	$ (156,647)	$ 13,926	$ -	$ -	$ -	$ -	$ 13,926	$ 132,721
12	$ 175,690	$ (161,346)	$ 14,344	$ -	$ -	$ -	$ -	$ 14,344	$ 147,065
13	$ 180,961	$ (166,187)	$ 14,774	$ -	$ -	$ -	$ -	$ 14,774	$ 161,839
14	$ 186,390	$ (171,172)	$ 15,218	$ -	$ -	$ -	$ -	$ 15,218	$ 177,057
15	$ 191,982	$ (176,307)	$ 15,674	$ -	$ -	$ -	$ -	$ 15,674	$ 192,731
16	$ 197,741	$ (181,597)	$ 16,144	$ -	$ -	$ -	$ -	$ 16,144	$ 208,876
17	$ 203,673	$ (187,045)	$ 16,629	$ -	$ -	$ -	$ -	$ 16,629	$ 225,504
18	$ 209,784	$ (192,656)	$ 17,128	$ -	$ -	$ -	$ -	$ 17,128	$ 242,632
19	$ 216,077	$ (198,436)	$ 17,641	$ -	$ -	$ -	$ -	$ 17,641	$ 260,274
20	$ 222,559	$ (204,389)	$ 18,171	$ -	$ -	$ -	$ -	$ 18,171	$ 278,444

Financial Summary

Program Cost	$ 2,254,622	**Annual Interest Rate**	2.00%
Rebates/Grants/Approp.	$ (2,254,622)	**Finance Period**	20
Downpayment	$ -	**Payments per Year**	4
Amount Financed	$ -	**Total Interest Payments**	$ -
Ongoing Support	$ -		
		Energy Escalation	3.0%
Annual Revenue	$ 126,923	**Operational Escalation**	3.0%
Annual Operating Cost	$ (116,560)	**Service Escalation**	0.0%
Simple Payback (years)	0.0		
20 year ROI	#DIV/0!		

CLARIFICATIONS:

1. This is an estimated cost subject to revision.
2. Installation will occur during normal business hours, 8am-5pm Monday through Friday.
3. Development of required permit documents will be completed by Siemens in partnership with the Quillayute Valley School District and the City of Forks.
4. The City of Forks will be responsible for the negotiation and coordination of a wood chip vendor. Wood chips must be available as necessary for the start-up of the boilers.
5. The City of Forks must provide adequate material lay down areas.
6. The City of Forks will purchase boiler equipment direct from vendor.
7. The City of Forks must comply with the boiler manufacturer wood chip specification to maintain output guarantee and proper boiler operation.
8. The biomass building site will be covered with crushed rock, or an equal permeable surface.
9. Further design engineering is required prior to construction.

EXCLUSIONS:

1. A wood chip fuel supply and delivery guarantee is excluded. Siemens will not be liable for the wood chip, biomass boiler fuel supply.
2. Storm drainage.
3. Upgrades to existing Middle School and Recreation Center mechanical systems. Siemens will connect to existing piping systems in existing mechanical rooms.
4. Upgrade, repair or replacement of existing piping, electrical systems or mechanical equipment. Specific points of connection will be identified on mechanical drawings.