# Nanaimo Regional General Hospital Thermal Energy Plant Project Business Case


Architectural rendering

**Submitted to Ministry of Health**
**January 30, 2018**

island health

# Part A: Planning Future Service Delivery

## Introduction and Background

The energy plant as well as a portion of the distribution system at Nanaimo Regional General Hospital (NRGH) have been operating since the early 1960s.

Although the system has been well maintained, and adequately meets the redundancy requirements, and has undergone many upgrades over the years, the plant is at the end of its useful life.

In October 2013, VIHA retained a consultant to complete a Energy Plant Risk Assessment Report which reported that "Continuing to operate the plant over the next few years without replacement exposes NRGH to an unacceptable level of risk, meaning unplanned hospital closure is likely to occur, and/or patient and staff lives will likely be placed at risk, and corrective action is necessary."

The Report also stated that "Repairs or replacement of plant components will not practically eliminate the unacceptable risks. A new plant is the only practical course of action."

## Service Need

NRGH requires thermal energy to:

- heat the hospital buildings
- heat the domestic hot water
- provide humidification in the air
- provide steam in the kitchen
- provide steam sterilization in the Medical Device Reprocessing Department (MDRD)

As the hospital campus grows, the need for thermal energy will also grow.

## Strategic Alignment

One of Island Health's key strategic mandates is to ensure patient and staff safety, and to mitigate any/all risks to healthcare.

This project will significantly reduce the risk at NRGH of boiler failure, hospital closure and patient and staff injury.

NRGH's current facility condition index (FCI) is .52.

This project will address some of the items noted in NRGH's FCI requirements list, however because the majority of the work is isolated to just the boilers (and does not include

replacement of the hot water piping distribution system as well), the reduction to the FCI is marginal (reducing from approximately 0.524 to 0.517).

## Part B: Service Delivery Options Analysis

## Project Objectives and Scope

### *Objectives*

- reduce the risk of boiler failure to an acceptable level
- eliminate many other identified risks and condition issues of the existing plant
- significantly increase the overall system reliability
- moderately reduce maintenance costs
- eliminate much of the remaining asbestos in the impacted mechanical rooms
- present the opportunity to increase energy efficiency
- achieve CSA boiler redundancy requirements
- reduce the risk of steam leaks
- relocate the boiler plant from the current third floor location to a safer, ground level, location
- eliminate the risk of flooding and possible shutdown of the clinical floors below the boiler plant due to a breach of water/steam lines or tanks
- allow for the option to convert some of the system in the future from steam to more energy-efficient hot water

### *Scope*

- new 630m$^2$ standalone single storey post disaster building
- multiple duel fuel (gas/oil) steam boilers
- support spaces for chief engineer's office, control room, washroom, and workshop
- connection to existing hospital steam piping/distribution system
- decomissioning of the old energy plant
- boiler redundancy
- plant configuration allows for moderate expansion of additional boilers in the future

### *Risks*

The usual risks apply to this project:

- risk of project "scope creep"
- risk of exceeding the project budget, including risk of inflation/escalation
- risk of the project taking longer to complete than scheduled

To mitigate these risks, the established VIHA project management/approval processes and controls will be implemented:

- project scope/budget/schedule review conducted at various key project milestones (schematic design, design development, pre-tender)

- user groups consulted throughout design development
- construction contract documents based on industry-accepted templates
- regular project status reports issued to the VIHA executive and Board
- an inflation/escalation allowance has been included in the project budget

## Service Delivery Options Considered, Analysis and Recommendation

### *Option 1: New Thermal Energy Plant/Building (with biomass capability)*

- **Description:**
  - combination of a biomass steam boiler, and duel fuel gas/oil steam boilers
  - a biomass boiler is fueled by organic matter (e.g. woodchips) which is less expensive and greener (emits less carbon) than gas/oil
  - new standalone single storey post disaster building
  - support spaces for chief engineer's office, control room, washroom, and workshop
  - connection to existing hospital steam piping/distribution system
  - decomissioning of the old energy plant
  - designed to include redundancy
  - designed to allow for moderate expansion of additional boilers in the future

- **Assumptions:** Uninterrupted supply of wood chips. Gas/oil prices increase long term to justify savings from converting to wood chips.
- **Context and Rationale:** This option would signficantly reduce Island Health's carbon footprint and would contribute significantly towards Island Health's ability to meet their carbon reduction targets. There are also significant fuel cost savings in converting from steam to biomass.
- **Cost Estimate:** $23.55 million
- **Specific Issues:** The Nanaimo Regional Hospital District (NRHD) will not cost-share in the biomass cost component of the project.
- **Option Implications:** None identified

### *Recommended Option:*

### *Option 2: New Thermal Energy Plant/Building (without biomass capability)*

- **Description:**
  - no biomass steam boiler
  - duel fuel gas/oil steam boilers only
  - new standalone single storey post disaster building
  - support spaces for chief engineer's office, control room, washroom, and workshop
  - connection to existing hospital steam piping/distribution system
  - decomissioning of the old energy plant

- designed to include redundancy
- designed to allow for moderate expansion of additional boilers in the future

- **Assumptions:** Eventual conversion of some of the boilers from steam to hot water in order to generate more energy cost savings.
- **Context and Rationale:** More conventional option. Gas and oil is a more reliable fuel source. Less risk and fewer unknowns overall.
- **Cost Estimate:** $18.39 million
- **Specific Issues:** This option does not take advantage of the opportunity to signficantly reduce Island Health's carbon footprint and meet Island Health's carbon reduction targets.
- **Option Implications:** None identified

## Part C: Procurement Options Analysis

### Procurement Objectives, Options, Analysis, Recommendation and Implementation Plan

After reviewing the pros/cons of the three project delivery models, VIHA has chosen design-bid-build:

Design-Bid-Build

Pros:
- provides a complete set of construction drawings/specifications and a complete understanding of the project scope and cost prior to committing to the tender and construction phases of the project
- involves a direct contractual relationship with both the design consultants and the contractor which allows for more VIHA involvement through-out the design and construction
- creates a fair and competitive process, which results in the best value to Island Health, and is well received by the construction industry and the public
- a fast project schedule is not the priority for this project, so the slower design-bid-build process is not an issue

Cons:
- the design-bid-build model creates the potential for a more adversarial relationship between the owner and the contractor
- contractor inclined to construct as cheaply as possible in order to maximize their profit on the fixed price contract


Design-Build

Pros:

- the design and construction are done by the contractor in parallel which allows construction to begin earlier and often produces a shorter project schedule overall
- parallel design and construction allows the design consultants and the builder to work together on the design, and on the construction methods which can help mitigate the number of change orders and additional costs during construction
- the project may benefit from the contractor's expertise in methods of construction, and pricing experience

Cons:

- because of the boiler complexities of this project, VIHA involvement is important through-out the design process which the design-build option does not accommodate
- the design consultants work for the contractor, not the owner
- because there is no direct contractual relationship between the owner and the consultants, there is no obligation for the consultants to represent the owner's best interests

Construction Management

Pros:

- the construction manager (CM) works with the owner, and provides their advice/expertise on the project scope, schedule and budget through-out all phases of the project from design, to tender, to construction, to commissioning and occupancy
- the construction management model creates a less adversarial relationship between the owner and the contractor
- sub-trade work and change orders are not marked up by the CM
- any savings from the original cost estimate (i.e. guaranteed maximum price) revert back to the owner

Cons:

- the CM model excludes general contractors from the tendering process which may be perceived by the construction industry and the public as a less open and fair process, and not the best value to VIHA
- since project knowledge and expertise is already available in-house by VIHA, the cost of the advice and expertise of the CM is not required

Because this project has specific and complex mechanical requirements, there will likely be a pre-qualification phase first, following by a tendering phase with the qualified contractors which will be based solely on price.

Since the boilers are a significant portion of the total project cost, and to ensure the most appropriate boiler is chosen at the lowest price, the boilers will likely be tendered separately.

## Part D: Funding Analysis and Implementation Plan

### Funding Analysis

#### *Capital Expenditure*

The total capital project cost (for recommended option 2) is $18.39 million.

| **Capital Funding Sources** ($millions) | **17/18** | **18/19** | **19/20** | **20/21** | **Total** | |
|---|---|---|---|---|---|---|
| Province | 0.24 | 2.52 | 5.15 | 3.12 | 11.03 | 60% |
| NRHD | 0.16 | 1.68 | 3.44 | 2.08 | 7.36 | 40% |
| **Total Capital Costs** | **$0.40** | **$4.20** | **$8.59** | **$5.20** | **$18.39** | 100% |

Island Health is working with the NRHD on finalizing their 40% cost-share approval.

#### *Operating Expenditure*

The estimated net annual increase in operating expenditures (for recommended option 2) is $9,330.

Any operating expenditure increases will be absorbed within Island Health's existing operating budget.

| **Operating Expenditure** | **Annually** |
|---|---|
| Cost increase – O&M costs on 630 s.m. building addition | $55,730 |
| Cost increase – electrical load increase | $1,300 |
| Cost decrease – gas savings | $47,700 |
| **Total Operating Expenditure** | **$9,330** |

### *Preliminary Implementation Schedule*

| Event | Approximate Date |
|---|---|
| Design Consultants Retained | July 1, 2017 |
| Schematic Design Report Complete | September 29, 2017 |
| Approval to Proceed (MoH and RHD) | March 31, 2018 (estimate) |
| Working Drawings Complete | August 31, 2018 |
| Tender Award | October 31, 2018 |
| Construction Start | November 30, 2018 |
| Construction Complete | May 31, 2020 |
| Commissioning Complete | June 30, 2020 |
| New Thermal Energy Plant Operational | July 31, 2020 |
| Decommission the old thermal energy plant | January 31, 2021 |

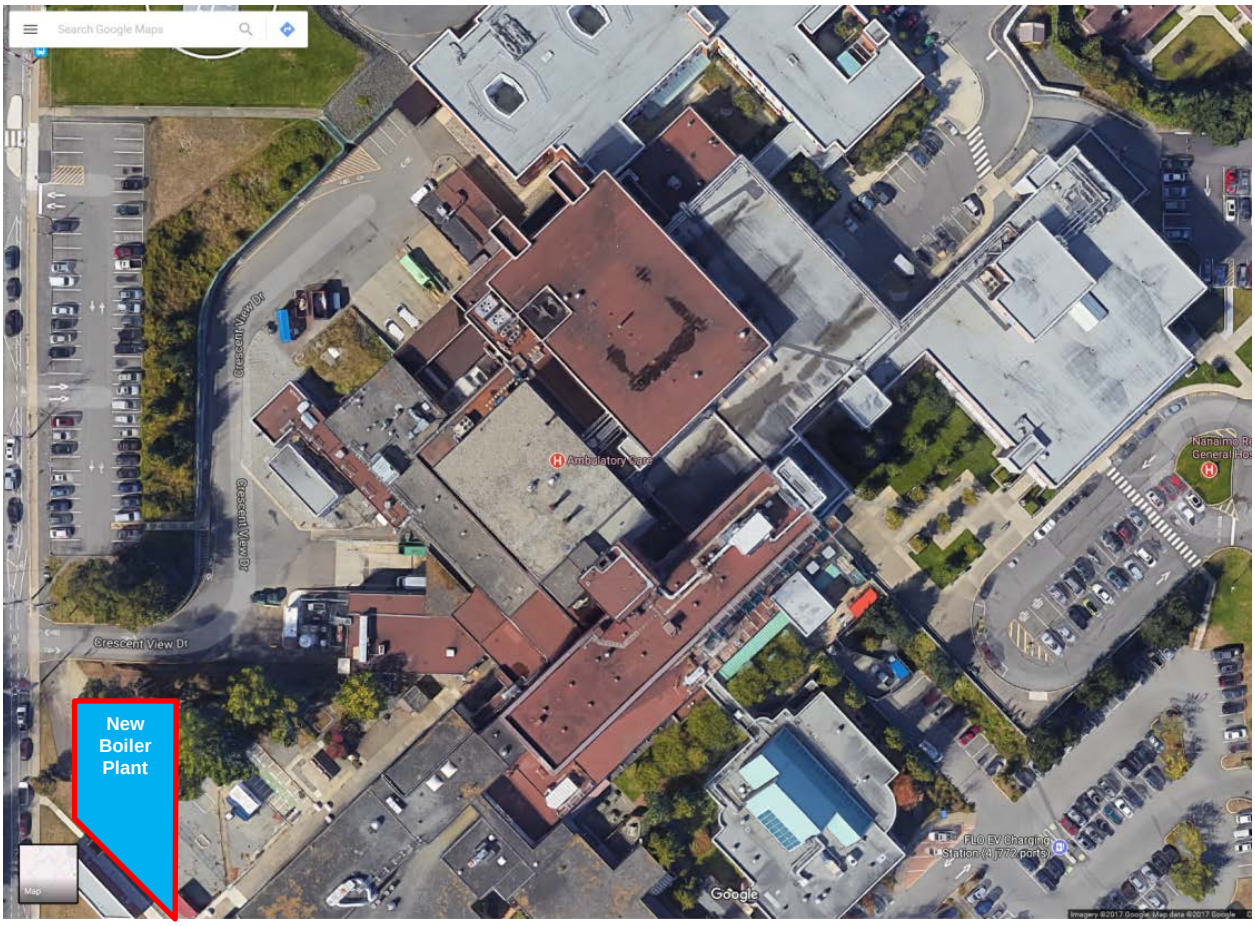
Implementation of this schedule is dependent on final approvals from the Ministry of Health and the NRHD.

## Part E: Communications and Public Consultation

VIHA Communications has been, and will continue to be in contact with the City of Nanaimo throughout the project process.

The City of Nanaimo, in turn, has been arranging public consultation meetings which include the involvement of the local Hospital Area Neighbourhood Association.

## Appendix A: Site Plan



## Appendix B: Picture of Boilers

The NRGH boilers will be similar to these recently installed RJH boilers.