

DISTRICT ENERGY ASSUMPTIONS

1. BACKGROUND:

The customer and BC Hydro are evaluating the feasibility of implementing district energy solutions which may lead to reductions in energy consumption and greenhouse gas emissions. The process of assessing the feasibility of district energy includes the preparation of Pre-Feasibility and Feasibility studies.

The purpose of this document is to state the assumptions that are to be utilized in the preparation of studies and reports related to district energy to ensure consistent treatment of input data and the integrity of report outcomes from different sources. This document shall be used in conjunction with the Energy Forecast spreadsheet.

The study proponent may challenge any assumptions it does not agree with. The study shall clearly state assumptions that are at variance with the assumptions below, as well as any other assumptions that are not included herein.

These assumptions may be revised from time to time and will be reviewed and agreed with the customer prior to commencing work.

2. ASSUMPTIONS

A. Technical / Engineering:

i. Energy Use Intensity:

The table below lists thermal energy performance for the archetypical, multi-unit residential building (MURB) for the business as usual (BAU) case. Annual baseline EUIs of space and water heating thermal loads are (LOAD = net energy required; METERED = LOAD / Fuel Efficiency):

MURB Archetype	Description	Details for Average Archetype	Baseboard Electrical Thermal Energy kWh_e/m²	MUA Natural Gas Thermal Energy kWh_e/m²	DHW Natural Gas Thermal Energy kWh_e/m²	Total Thermal Energy kWh_e/m²/year
High Rise	Typical concrete high-rise MURB over 6 stories with electric space heating; assume 60% glazing and brick construction to satisfy envelope compliance.	150 suites Total floor area = 143,000 ft ² Total common area = 24,300 ft ² (17% of total) Average suite size = 791 ft ²	LOAD 32.4 METERED (Eff @ 100%) 32.4	LOAD 22.7 METERED (Eff @ 78%) 29.1	LOAD 24.2 METERED (Eff @ 69%) 35.1	LOAD 79.3 METERED 96.6

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Low Rise	Typical wood-frame low-rise MURB under 7 stories with electric space heating.	114 suites Total floor area = 154,000 ft ² Total common area = 15,400 ft ² (10% of total) Average suite size is 1216 ft ²	LOAD 17.1 METERED (Eff @ 100%) 17.1	LOAD 26.8 METERED (Eff @ 78%) 34.4	LOAD 18.4 METERED (Eff @ 69%) 26.7	LOAD 62.3 METERED 78.2

[Based upon work by EnerSys Analytics for a code-compliant ASHRAE 90.1-2004 building (envelope trade-off method) in BC Lower Mainland.]

The study proponent is advised to consider these energy use intensities to establish thermal energy loads for all energy studies. Any deviations from this data should be separately stated and supported with details.

Estimate large amenity loads separately (from pools etc.) and include for each building.

ii. System efficiencies:

Load diversification and seasonal, combustion and thermodynamic system efficiencies and losses shall be stated in the study. Reference actual performance data where available and account for life cycle performance deterioration.

iii. System redundancy:

Design the DE system to have at least the same level of redundancy as the BAU.

B. Financial / Economic:

i. Rate of Inflation: 2.1%

ii. Amortization and Depreciation (for accounting):

- a) Generation Plant: 25 years
- b) Distribution Plant: 25 years for Pre-Feasibility; 50 years for Feasibility.
- c) Energy Transfer Station: 25 years

iii. Amortization and Depreciation (for tax):

- a) If classified as renewable generation: 85% of the assets qualify for Class 43.1 (50% declining balance) and 15% of the assets qualify for Class 1 (4% declining balance).
 - b) If not classified as renewable generation: 85% of the assets qualify for Class xx (i.e. a blend of various classes, 8% declining balance) and 15% of the assets qualify for Class 1 (4% declining balance).
- iv. Natural gas costs:
- a) Commodity: Refer to Fuel Price Forecast for Natural Gas in DE Commodity Assumptions spreadsheet. Assume Base Case scenario. For Sensitivity Analysis assume High Case scenario.
 - b) Delivery: Refer to Delivery Cost of Natural Gas in DE Commodity Assumptions spreadsheet.
- The natural gas tariff for each year shall be stated in the study.
- v. GHG Offsets
The GHG Offset Price is assumed to be \$25 per tonne in F2011 and increasing to \$30 per tonne in F2012+. The GHG Offset value for each year shall be stated in the study.
- vi. Electricity Prices
Refer to Customer Energy Rate Schedule Forecasts in DE Commodity Assumptions spreadsheet for residential and commercial rate classes. Assume Projected Average rates for each rate class.
- vii. District Energy rates:
State proposed district energy rates (\$/MWh) and estimate as a percent of BAU. Include any discounts/rate subsidies provided by the developer or others. Also provide rate for heat sales.
- viii. Corporate tax rates:
Refer to Canada Revenue Agency. Assume federal (including surtax) and provincial tax payable on corporate earnings:
2011 – 26.5%
2012 and beyond – 25%
- ix. Property Tax rates:
For utility tax rates refer to Ministry of Community and Rural Development website:

www.cd.gov.bc.ca/lgd/infra/statistics_index.htm.

- a) Generation Plant: For property tax purposes estimate value of land and buildings only excluding equipment.
- b) Distribution Plant: Assume 3% franchise fee on gross revenue in lieu of property taxes.

x. Discount rate: 6% real (8.1% nominal).

xi. Capitalization and Discounting:

a) Capital Structure:

Municipality: 100% debt.

Regulated Utility: 60% debt / 40% equity.

b) Interest on Debt:

Municipality: 3.15% real (5.25% nominal)

Regulated Utility: 3.9% real (6% nominal)

c) Return on Equity (ROE):

Municipality: n.a.

Regulated Utility: 9.67% (2009) or the Return on Common Equity for a Low-Risk Benchmark Utility as set by the British Columbia Utilities Commissions from time to time plus 100 basis points.

d) Weighted Average Cost of Capital (WACC):

Municipality: 5.25%

Regulated Utility: 7.47% (after tax)

WACC to be assessed separately for all other capital structures.

xii. Estimate Variance & Contingencies:

a) Class B estimate (Substantive): -5%, +10%

b) Class C estimate (Feasibility): -15%, +25%

c) Class D estimate (Pre-Feasibility): -25%, +50%

Contingency for all studies to be 10%.

xiii. O & M Costs (annual):

a) Pre-Feasibility Study:

Distribution plant = .5% of Capital

Generation Plant (biomass) = 3% of Capital

Generation Plant (other) = 2% of Capital

b) Feasibility Study:

Project specific estimate required.

Assume operating engineer = \$100K per person-year including payroll burden.

Management and administration costs to be estimated separately.

xiv. Construction Costs

To be developed at unit rates and reported in sufficient detail to support the permitted estimate variance (see Note 2 Bxii).

C. Environmental

i. Greenhouse Gas Emissions (direct):

a) Natural gas combustion: 48.6 kg/GJ (CO₂e)

b) Electrical generation: 0

Refer to the BC Energy Plan – all new electricity generation to have zero GHG emissions.

Assume indirect (upstream and downstream) GHG emissions equals zero, unless noted otherwise.

ii. Air Contaminant Damage Values:

For Metro Vancouver only refer to Richmond / Airport _ Vancouver Rapid Transit Project – Part 3. Air Emission Valuation Table: Pollutant Damage Costs for the Lower Fraser Valley (units in 1993C\$):

a) NO_x: \$2,000/tonne

b) SO₂: \$5,750/tonne

c) PM₁₀: \$45,000/tonne

d) VOC: \$2,000/tonne

D. Social

i. Employment:

a) Construction: 40% of capital cost is site labour; assume tradesman = \$100K per year including payroll burden.

b) Operations: refer to Part 2 Bxiii.