**Salt Spring Island** **CAEE Gold Project**

# Policy Options to Reduce Energy Consumption and Greenhouse Gas Emissions in New Residential Buildings

## Summary Report

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## Context and Project Scope

The Pembina Institute and Deborah Curran and Company were contracted to analyze a series of policy options that are intended to help Salt Spring Island to meet their targets to reduce energy consumption in new residential buildings, and provide recommendations on which policy options should be considered for implementation.

The objective of this project is to facilitate the timely adoption of environmental policies appropriate for Salt Spring Island by the Islands Trust and Capital Regional District (CRD). The scope of the project was on energy efficiency in new residential buildings, plus changes to carbon storage in forests and soils on residential sites where new homes are being built. This project excludes energy efficiency improvements in existing buildings, new commercial buildings, transportation and food/other industrial production on the island.

The policy analysis for this project consisted of two parts – (1) analysis of the physical change (for example, how much energy is saved by increasing insulation in a single house? How much energy is saved if all new house meet higher insulation standards?) and (2) analysis of the policy choices that would lead the physical changes (what policies will lead to more houses using increased insulation? Are the Islands Trust/Capital Regional District able to implement the policy?). Both of these elements (policy choice and estimated impact) need to be considered in order to evaluate which environmental policies are appropriate for Salt Spring Island.

Two supporting reports were completed to meet the above objectives. *Energy and Greenhouse Gas Emissions for New Residential Buildings* includes estimates of how much Salt Spring Island can reduce greenhouse gas emissions through physical changes to new residential buildings and sites. *Density Bonus and Other Policy Options for Energy Efficiency* evaluates the ability to enact policies that will encourage these physical changes, given legal jurisdiction and the administrative capacity of the Islands Trust, CRD, and the rural land use context of the Salt Spring Island community.

## Energy and Greenhouse Gas Emissions for New Residential Buildings

*Energy and Greenhouse Gas Emissions for New Residential Buildings* provides an assessment of the potential costs and benefits, energy savings and greenhouse gas reductions resulting from physical changes to new homes on Salt Spring Island. Energy consumption in new homes can be reduced through changes in insulation levels and windows, changes in the energy efficiency of heating systems, and building attached rather than detached homes. This report also estimated the greenhouse gas emissions associated with disturbances of trees, grasses and soils on residential sites.

To estimate the energy savings and cost implications for the entire Salt Spring Island community, five scenarios were developed that represent potential future development of new residential buildings. Each scenario considers the impacts across all new homes, summing up changes to individual homes across all homes that would be affected. Each scenario assumes the same growth in number of housing units (70 housing units per year) but differs in the energy

performance of new buildings or the type of new buildings (single detached vs. 5-unit attached row houses). The assumed size of the new homes is based on information provided by building permits on Salt Spring Island for 2006 and 2007, which indicated the size of the average new detached house was 2,515 square feet.

The scenarios were designed to approximate the policy options being considered by the Islands Trust and CRD, as reported in Table 1. Note that this report focused on the impacts (energy, cost, and greenhouse gas emission savings) of theoretical policies. See the next section for a summary of the description of the policy options and recommendations given the administrative and rural land use context of Salt Spring Island.

**Table 1. Linkages between Scenarios and Policy Options**

| Scenario | Type of Policy Option that would be needed to achieve change modeled in Scenario |
|---|---|
| **Performance Requirement for E80** [EnerGuide for New Houses rating of 80, uses approximately 7% less electricity than home meeting BC Green Building Code] | Both of these scenarios assume that all new residential buildings will meet higher energy performance than is currently in the BC Building Code. The only policy option that would achieve this level of change (affect 100% of new homes) is regulating energy efficiency standards for new buildings. |
| **Requirement for Air Source Heat Pumps** [or equivalent energy savings from building design, envelope and heating system, uses approximately 24% less electricity than a home meeting BC Green Building Code] | |
| **Information / checklists / incentives (moderate)** | These two scenarios illustrate the potential impacts on energy, emissions and costs from using a mix of information (such as a sustainability checklist for guidance, rather than compliance) and incentives. Possible incentives include density bonuses or tailored development cost charges or building permit fees. |
| **Information / checklists / incentives (strong)** | |
| **More attached homes** | This scenario could be achieved by incentives focused on encouraging the development and purchase of town/row houses rather than detached homes. Policy options for consideration include tailored building permit fees for attached, relative to detached homes. Other potential policy options could include density bonus and other zoning changes. |

Note: The policy options in Table 1 refer to theoretical policies; the next section of this report discusses the potential for each policy option to be implemented in the Salt Spring Island context.

The quantitative results are summarized in Table 2, showing the expected energy savings and other results covering all new homes built on Salt Spring Island from 2009 to 2020. In other words, the values are the sum of impacts on all new homes for each scenario – in order to show the overall cumulative impact on the community energy needs.

Table 2 also provides additional information on energy bill savings and reductions in greenhouse gas (GHG) emissions for the community. The GHG savings due to changes in new home energy performance are relatively low. One of the main reasons for this is that electricity use on Salt Spring Island generates only a small amount of greenhouse gas emissions due to the fact that so much of BC Hydro's supply comes from hydro-electricity. The values in Table 2 represent average emissions from BC Hydro. Note that British Columbia is part of an integrated electricity system that includes Alberta and the United States. It is possible that reduced electricity use on Salt Spring Island could lead to less imported electricity and thus less coal generation in Alberta. In that case, much larger GHG reductions would occur. The complexity of the electric systems makes such calculations uncertain, so the results here reflect the simple, though possibly conservative, approach of considering only BC Hydro generation.

However, energy conservation in new homes provides benefits to homeowners in addition to reducing GHG emissions. Other advantages include reducing the other environmental impacts of energy supply (such as water use and land development), increased personal comfort from well-insulated, non-drafty homes, plus protection against future escalation in energy prices. Looking at the larger picture, energy conservation helps Salt Spring Island contribute to meeting provincial goals. British Columbia is committed to achieving specific energy conservation targets and to providing electricity with zero GHG emissions. Energy conservation in new homes contributes directly to the first goal and helps avoid development of some new hydro-electric or other renewable plants.

**Table 2 Summary of Total Energy Savings, Costs and Greenhouse gas reductions for Salt Spring Island in 2020 (cumulative, covering all new homes built on the Island from 2009 on), various scenarios**

| Scenario | Fraction of New Houses Affected by Policy | Energy Savings per Year (MWh): | Incremental Costs, annualized, per Year (thousand $) | Energy Bill Savings per Year (thousand $) | Reductions in GHG emissions per year (tonnes) |
|---|---|---|---|---|---|
| Performance requirement E80 | 90% | 1,262 | $144 | $122 | 30 |
| Performance requirement Air Source Heat Pump | 100% | 4,522 | $554 | $436 | 108 |
| Information / checklists / incentives (moderate) | 5% | 226 | $28 | $22 | 5 |
| Information / checklists / incentives (strong) | 10% | 380 | $46 | $37 | 9 |
| More attached homes | 10% | 798 | net savings | $77 | 19 |

Note 1 – Greenhouse gas (GHG) emissions for Salt Spring Island from energy consumption in buildings are estimated at 2,945 tonnes currently.

Comparing the scenario results with each other yields the following observations

- The two policies with performance requirements (requiring all new homes to meet energy performance standards) will lead to greater energy savings than the policies that provide incentives and information but do not require compliance.
- The incremental costs of construction and equipment for more energy efficient homes is greater than the expected energy cost savings, over a twenty five year period. Over longer periods and for some houses, the energy cost savings may exceed the cost of construction and equipment. Also, if future energy costs increase faster than estimated for this analysis, or if costs of equipment (for example, heat recovery ventilators and air source heat pumps) decrease as they become more mainstream, the energy efficiency improvements could pay off sooner than estimated here.
- Increasing the fraction of attached homes leads to significant cost savings, since both construction and energy costs are lower, plus reduces energy use and greenhouse gas emissions.

The *Energy and Greenhouse Gas Emissions for New Residential Buildings* report also provided rough estimates of the carbon that would be released from a simple disturbance (i.e. residential development) on a site that could be avoided by alternative development strategies. For example, home builders or developers can limit the amount of land that is used for roads and driveways by placing homes side by side within a site or sharing road requirements between several sites.

The report considered four species of trees and plants, Douglas-fir (*Pseudotsuga menziesii),* Western Hemlock (T*suga Heterophylla)*, Red Alder, and natural grassland. These are fairly representative of the growth on the island. For each species, information was gathered on the amount of carbon stored in biomass and soils. Policies that encourage tree retention and limit the amount of land that is permanently changed from natural conditions, will help avoid the loss of stored carbon.

Table 3 depicts the carbon storage based on the age of the stand, species, and quality of site. The values in the table represent the amount of carbon stored in the biomass on a 100 $m^2$ plot. As an example, a homeowner planning to install a driveway that is 50 metres long and 2 metres wide (100 $m^2$) on land that contains a medium quality stand of red alder that is 20 years old on average, would expect to lose about 1.28 tonnes of $CO_2e$, based on the values in Table 3. Siting a home closer to the main roadway, leading to a shorter driveway, decreases the loss of carbon.

**Table 3 Carbon Storage in Non-soil sources (Live Standing Trees, Dead Standing Trees, Understory, Down Dead Wood, Forest Floor) (tonnes $CO_2e$ / 100 $m^2$)**

| **Age (years) →** | **10** | **20** | **40** | **80** |
|---|---|---|---|---|
| **Species and site quality ↓** | | | | |
| **Douglas-fir – good quality** | 3.30 | 3.70 | 6.84 | 11.45 |
| **Douglas-fir – medium quality** | 1.34 | 1.50 | 2.77 | 4.64 |
| **Western Hemlock – good quality** | 3.24 | 3.33 | 6.36 | 12.37 |
| **Western Hemlock – medium quality** | 0.91 | 0.93 | 1.78 | 3.46 |
| **Red Alder – good quality** | 2.74 | 3.12 | 4.66 | 5.97 |
| **Red Alder – medium quality** | 1.13 | 1.28 | 1.92 | 2.46 |
| **No trees / grasslands** | Relatively low amounts in non-soil sources | | | |

A large amount of carbon is also stored in the soil; for example up to 25 tonnes CO2e per 100m2 is stored in soils at depths of over 1 metre.

Further research would be needed to refine the above estimates to be more reflective of specific conditions on Salt Spring Island. These refinements would include a more accurate assessment of the biomass and growing conditions on the island and also an assessment of the potential risk of carbon loss due to human and natural disturbances.

*CAUTION Comparing greenhouse gas emission reductions from energy efficiency improvements with carbon storage in biomass on residential sites.* Readers need to be cautious in comparing the values in Tables 1 and 2, especially in terms of evaluating which policy options to pursue. The carbon storage values are provided for a single patch of land, while the energy efficiency estimates are based on changes throughout the community. Also the greenhouse gas reductions from energy efficiency values refer to annual estimates (these values could be summed over the lifetimes of the new homes), while the carbon storage values refer to a single point in time but the carbon has been stored over years. However homeowners and policy-makers on Salt Spring Island are not forced to make this tradeoff. Both opportunities (increasing energy efficiency and conserving biomass) can be pursued simultaneously.

## Density Bonus and Other Policy Options for Energy Efficiency

The *Density Bonus and Other Policy Options for Energy Efficiency* report describes the density bonus provisions of the *Local Government Act* and other policy options, discusses their implications for energy efficiency, and includes recommendations for their application given the administrative capacity of the Islands Trust and the Capital Regional District, and the rural land use context of the Salt Spring Island community.

This report covers key legal aspects relating to possible policy options for residential buildings. It sets out the jurisdiction of the Islands Trust and the Capital Regional District as it applies to a rural landscape, and how changes in regulation affect existing uses of land and buildings. It then describes the density bonus policy option in detail and also explains other policy options for taking action on energy efficiency available to the Islands Trust and Capital Regional District. The other policy options considered are official community plans, energy efficiency standards for buildings, development permit areas, development cost charges, reduced permit fees and fast tracking applications, parking in lieu fees, limiting impervious surfaces, and regulating tree cutting. The report includes recommendations for the implementation of each policy option. The issue of local government liability for taking action on energy efficiency and the ability to require the use of sustainability checklists for land and building development is also covered.

A summary of the recommendations from the report, and their benefits and drawbacks are include below:

1. *Include greenhouse gas emission reduction targets and actions in the Salt Spring Island official community plan*. Local governments are now required by law to include targets for reductions of greenhouse gas emissions and actions and policies to achieve those targets. The

recently adopted OCP contains some actions to reduce emissions but the Islands Trust should consider including specific targets (including reduction targets post-2012) and more focused actions in the next OCP review;

2. *In discussion with the provincial government on further provincial action, and other local governments on their approach, work with the capital regional district to evaluate the feasibility of enacting energy efficiency standards for new buildings*. The most simple way to achieve blanket improvements in energy efficiency is to regulate. However, local governments currently do not have this ability without permission from the provincial government or under an agreement or regulation. While timelines and success are uncertain, the Islands Trust and CRD can collaborate with other local governments and the province to establish either province-wide standards or local standards;
3. *Expand existing development permit areas for the objective of reducing greenhouse gases with particular focus on guidelines relating to tree retention.* This would involve expanding the geographic scope of development permit areas (DPAs). The Islands Trust has experience with using DPAs to shape development and this approach includes any land clearing or changes to land. The main drawback of using DPAs is that they are difficult to enforce.
4. *Evaluate the use of development cost charges as part of a comprehensive growth management and development financing review, not solely to promote green building.* Development cost charges (DCCs) are payments from development applicants to local governments for the additional cost of infrastructure services that new development causes. DCCs apply to roads, sewers, water, and park infrastructure, and thus may be most appropriate in the Ganges area. Many local governments tailor their DCCs depending on the location and type of development. They are a fiscal mechanism to assist in reflecting the true cost of new development in a community, but are challenging to calculate.
5. *Create a tailored building permit fee for energy efficient buildings.* The CRD provides the service of building permits. Different permit fees may be charged for different classes of property, activities or factors. Energy efficiency may be a different factor in providing the building permit service, for which lower fees could be charged. This is a small incentive for development applicants to increase energy efficiency.
6. *Evaluate whether there are sufficient applications for development that involve parking spaces per year or per five years that would warrant using parking-in-lieu fees for alternative transportation infrastructure.* New legislation allows local governments to accept parking-in-lieu fees rather than require development applicants to build new parking spaces. These fees can be put towards cycling, pedestrian, and other alternative transportation infrastructure. This is a simple funding mechanism, however there may not be enough parking spaces created on Salt Spring Island to warrant this approach.
7. *Explore the potential for a density bonus in the form of a floor space increase to improve the energy efficiency of new buildings without compromising the community's goals for obtaining other amenities*. Density bonus allows development applicants to voluntarily provide an amenity in exchange for increased density. Energy efficiency, particularly in single detached homes, can be seen as an amenity. Some new home builders may opt for an increase in home size (density) in exchange for better energy efficiency. This approach is voluntary and may detract from the ability of new development to provide other community amenities.

8. *Have the CRD consider adopting a tree cutting bylaw on hazard lands in, for example, development permit area 6 and all lands over a specified slope gradient to bolster enforcement opportunities.* This would enable more simple enforcement of tree cutting restrictions, rather than having to enforce development permit conditions through the courts. However, it relies on an ability to enforce and evaluate activities on the landscape.

## Recommended Next Steps

The results of the analysis in the two reports lead to the following recommendations of next steps for the Islands Trust and the Capital Regional District . The priority assigned to each recommendation is based on the combination of potential to reduce emission (including estimate of net costs), the ability for the policy to be implemented on Salt Spring Island, and any external timing constraints or opportunities.

The next steps for the Islands Trust and the Capital Regional District in terms of policy options for new buildings to reduce climate change impacts should be, in priority order:

1. *Work with other local governments and the provincial government to evaluate the feasibility of enacting higher energy efficiency standards for new buildings.* Of the energy efficiency options considered in this analysis, enacting energy efficiency standards for new buildings on Salt Spring Island leads to the largest reductions in GHG emissions from new buildings. However, the CRD/Islands Trust cannot enact regulations for higher energy efficiency standards without consent of the province. Collaboration with the province is essential and collaboration with other local governments will likely increase the probability of success. This is the top priority due to potentially large emission reductions plus timing constraints. The province will be considering updates to the Building Code for 2010. Thus it will be ideal for the CRD/Islands Trust to start collaborations with the province and other municipalities now, with objectives of submitting recommendations to the province in 2009.
2. *Expand existing development permit areas (DPA) for the objective of reducing greenhouse gases with particular focus on guidelines relating to tree retention*. The GHG analysis indicates that retaining trees is important for avoiding loss of stored carbon on Salt Spring Island, based on common species and vegetation. The Islands Trust is already using DPAs to shape development. Thus, the second recommendation is for the Islands Trust to expand the geographical scope of development permit areas and to focus on tree retention, based on overall benefits in addition to GHG emissions. The Islands Trust should also consider adding resources to ensure enforcement of all development permit area requirements. Note that a full analysis of carbon storage across the land that is likely to be developed was not been completed as part of this project. This full analysis could also be considered as a next step in order to estimate overall impact on GHG emissions and provide a comparison with the energy efficiency policy options.
3. *Develop focused and co-ordinated program of information and incentives.* An information and incentives programs for green buildings would have several objectives, including a) building support for, and experience in, developing buildings that meet the proposed energy performance standards in step 1, above and b) encouraging builders to design and construct buildings with very high energy performance standards (i.e. well in excess of standards that are likely to be required in the near term through regulations).

The Islands Trust and Capital Regional District should link together both targeted information (such as the specific energy efficiency components of the sustainability checklist that is under development) and incentives (such as the opportunity for reduced building permit fees). The synergy helps home-builders see the immediate importance of the information and increase awareness of the incentives.

4. *Approve and Implement a Salt Spring Island Sustainability Checklist for New Developments and Renovations to Existing Buildings*. A Sustainability Checklist could be the integral part of the information and incentives package. Sustainability checklists allow the Islands Trust, CRD, homebuyers and developers to compare and rate new buildings and renovations of existing buildings based on an established set of sustainability criteria. The sustainability checklist can be used to provide information to home buyers and developers, as a link to financial incentives offered by the province, and to gather information on the sustainability attributes of new buildings and renovations.

Salt Spring Island has key opportunities to show leadership and contribute to meeting British Columbia's energy and greenhouse gas reduction targets through policies aimed at new residential developments. The above four steps are intended as recommendations for the Islands Trust and CRD to embark on in the near term. Other actions (see recommendations in previous section) will also need to be considered and implemented. Finally, with technologies, practices and policies for new residential buildings continuing to evolve, the Islands Trust and CRD are encouraged to review and update this type of analysis in the future to ensure that new opportunities are evaluated and acted upon.

Regardless of which opportunities are pursued, the Islands Trust and CRD should immediately implement information systems to monitor and report on the effectiveness of the chosen policies. Policies may need periodic strengthening to account for new technologies, practices, and costs, or the policies may need to be revised if expected results are not achieved due to limited uptake or enforcement.

## Recommended Energy Strategy Updates

Pending acceptance of above Next Steps, the Salt Spring Island Energy Strategy should be revised to include the following under the recommendations section for Housing (2.4).

2.4.1 Work with the Capital Regional District, other local governments and the province to evaluate the feasibility of requirements for higher energy performance standards, at a minimum requiring EnerGuide for Houses 80 standard for new housing.

2.4.2 Promote the LiveSmart BC incentive program for existing houses to island homeowners, the renovation industry, and the real estate industry.

2.4.3 Promote energy-efficient wood stoves and launch a wood stove change-out program.

2.4.4 Create a communications process based on a sustainability checklist for islanders and potential islanders to encourage energy and water conservation, clean wood-burning practices, and other attributes that enhance sustainability through building design, construction and use.

2.4.5 Promote tree retention on sites undergoing development or renovations, through development permit area and information.