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The purpose of this report is to discuss current energy conservation policies adopted by the Council and to examine possible enhancements to such policies as they relate to the Council's environmental policies and Council-owned buildings.

#### INTRODUCTION

Over the last three years, in accordance with the Council's energy conservation policies adopted in 1996 and 1997, every major project with a substantial energy content has been subjected, at its concept design phase, to a comprehensive Energy Efficiency and Sustainability Assessment. This has resulted in the adoption of sound energy efficient solutions for these projects, a guarantee that the new facilities' energy consumption meet good/best practice targets and in on-going savings of energy and costs. The standard compulsory procedure of Energy Efficiency and Sustainability Assessment includes considering different fuels and choosing the most effective, sustainable and environmentally acceptable energy source or a combination of energy sources for a particular project. It has to be noted that a universal "best" energy source does not exist for all situations and each time a decision has to be made based on an individual energy consumption situation.

Although the current energy policies and the Energy Strategy 2020 (an internal management document) provide a good guidance in the selection of energy sources, in practice, in a number of cases economic factors may prevail as environmental factors can not be easily quantified and compared with actual monetary savings. This is usually the case with renewable energy sources such as solar energy. For example, LPG has some environmental advantages over diesel oil but the latter can be more cost-effective.

#### CURRENTLY ADOPTED POLICIES

The Council has already adopted the following energy policies.

*Conservation of Energy. The Council will follow energy strategies, which minimise energy consumption, select sustainable energy supplies and minimise impacts on the environment. [Council, 26 November 1997]*

*The Council is committed, in its operations, to the efficient use of energy and energy conservation. [Council, 27 November 1996]*

*For new projects and major retrofits with a significant energy component an Energy Efficiency and Sustainability Assessment must be carried out. [Council, 27 November 1996]*

## POTENTIAL ALTERNATIVE ENERGY SOURCES

Commercially available sources of energy for heating in Christchurch are electricity, electric heat pumps, coal, LPG, oil, firewood and pellet fuel.

Renewable energy sources include hydroelectricity, geothermal energy, solar, biofuels (energy crops and woody biomass), and energy recovery from wastes (such as biogas from the wastewater treatment plant or landfill gas) wind, wave/tidal currents. The underlying sources of most renewable energy are the sun, the action of gravity, the earth's rotational forces and internal temperature, contemporary biomass or plant materials and animal and human wastes. Not all renewable energy sources are necessarily environmentally friendly and pollution-free. For example, burning such a renewable fuel as firewood may result in excessive emission of PM<sub>10</sub> particulate that causes the smog problem in Christchurch. Geothermal energy is associated with substantial emissions of a greenhouse gas CO<sub>2</sub>; the geothermal fluid may also contain harmful substances such as arsenic, mercury, and boron. Hydroelectricity is also not an environmentally friendly source of energy: in particular, flooding of large areas containing organic material and periodic changes of water level in hydro lakes cause emission of a greenhouse gas methane.

The energy sources differ in terms of their impacts on the environment with regard to air discharges. There are two aspects of their environmental impact:

- their contribution to Global Climate Warming through Greenhouse Gas emissions;
- their contribution to local air pollution in Christchurch.

In terms of the Greenhouse Gas emissions, energy sources such as wood, solar, combustible wastes, biogas, wind and wave/tidal energy are greenhouse gas neutral. An extract from the Christchurch City Council Energy Strategy 2020 document is attached which contains information on other fuels emissions of CO<sub>2</sub> (see Attachment A). It should be noted that electricity, contrary to a common misconception, is associated with substantial emissions of greenhouse gases. Even such a renewable source as hydropower is responsible for emissions of a greenhouse gas methane that is many fold more harmful for the environment than CO<sub>2</sub>.

It has to be noted that the issue of greenhouse gas emissions is a global concern and is dealt with on an international level. Measures for mitigation of CO<sub>2</sub> emissions are usually financed by either international organisations (such as the European Commission) or national/state governments through the introduction of "carbon taxes", etc, but not at the level of local authorities.

In terms of local air pollution, different fuels at their combustion emit different quantities of suspended particulate, sulphur oxides, nitrogen oxides and other polluting substances. Such renewable energy sources as solar, wave/tidal energy do not produce local air pollutants. Wind energy can be associated with noise pollution, radio communications interference and visual effects on the landscape.

The "fuel cell" technology is an emerging technology that promises to become commercially available in the very near future and would provide non-polluting combustion processes for either stationary heating plant or vehicles.

#### **EVALUATION OF IMPACTS ON THE ENVIRONMENT**

When different energy sources are compared, it is important to be able to evaluate, side-by-side with capital and operating costs, a difference in their impact on the environment.

The environmental impact is being carefully considered by the Council's environmental specialists and consultants engaged in each particular project, as part of the Energy Efficiency and Sustainability Assessment of each particular project.

Experience over the past three years has shown that these assessments could be enhanced by introducing a scoring system that would include the "financial implications" of controlling air pollution (in their estimated dollar values or in merit points). Such a system, if developed, would also take into account the significance of different air pollutant emissions in Christchurch.

#### **ENERGY EFFICIENCY AND SUSTAINABILITY ASSESSMENTS FOR COUNCIL'S HOUSING**

Over the last three years the Council has been making substantial energy efficiency improvements to its Elderly Persons' Housing and Public Rental Housing units. Energy efficiency measures (such as ceiling and underfloor insulation, hot water cylinder wraps, draft stopping, energy saving lights) have been implemented in about 1,500 of the existing 2,528 housing units. For the implementation of the project, the Council has received grants totalling \$372,000 from the Energy Saver Fund administered by the Energy Efficiency and Conservation Authority (EECA).

Improved energy efficiency results in creating substantially healthier and more comfortable living conditions for the Council's tenants and in tangible energy cost savings by the tenants.

When new housing complexes are being designed and built, energy efficiency issues are considered by the designers and reviewed by the Council's Energy Manager. However, technically the current energy policies can not fully apply to the housing units because their energy consumption and costs are outside of the Council's operations. An Energy Efficiency and Sustainability Assessment for a new housing project (or a retrofitting project) can not be formally requested and carried out because the housing units are too small to qualify for "a significant energy component". They do not individually have a significant energy component, which is defined by the Energy Strategy 2020 document, as energy expenditure of greater than \$10,000 per annum, and the energy cost is not that of the Council but the private tenants in the housing.

In new housing projects, as well as in retrofitting the existing units, the extent of energy efficiency can vary significantly. Compliance with Section H1 "Energy Efficiency" of the New Zealand Building Code, that stipulates only very minimum requirements and refers to an old NZ Standard of 1977, may not necessarily define "good practice". The newer New Zealand Standard 4218: 1996 "Energy Efficiency - Housing and Small Building Envelope", sets higher standards and recognises colder weather conditions in Christchurch. This Standard could be used as a "good practice" benchmark but the Standard is still not part of the national Building Code and therefore compliance with it is voluntary.

If the Council had a formal policy of compliance with NZS 4218:1996, for its own housing unit designs, this would set a good example to other landlords, developers and the general public.

**It is recommended that the Council's standard procedure of Energy Efficiency and Sustainability Assessment be now extended to cover the design of new Council's housing units, and that it include a check for compliance with NZS 4218:1996.**

It is, however, important that the Council continues to ensure that possible increases in capital costs by selecting this option do not go towards making affordable housing "non-affordable". This will be able to be done by careful design in most cases.

#### **CONCLUSION**

The energy policy currently in place, in general, provides a suitable method of checking the energy efficiency of new building projects of the Council. It could be improved for rental housing units, by the inclusion of consideration of passive solar design and solar water heating in the assessment procedure, and the adoption of the requirements of NZS 4218: 1996 as a benchmark for both new and retrofitting rental housing units.

To take the air pollution potential comparison into account during this process could provide assistance, on a rational basis, in the decision process apart from direct energy comparisons and give a clearer indication of overall environmental impacts.

- Recommendation:**
1. That the scope of current Council's energy policies be expanded to include rental housing units.
  2. That a specific requirements to consider passive solar design and solar water heating be included in the Council's Energy Efficiency and Sustainability Assessment procedure.
  3. That requirements of NZS 4218: 1996 "Energy Efficiency - Housing and Small Building Envelope" be applied as a minimum energy efficiency benchmark for the design of new Council's rental housing units and retrofitting existing units.
  4. That the Principal Environmental Officer, in co-operation with the Energy Manager, be asked to develop a scoring system for assessment that gives greater emphasis to the environmental impacts of different fuels.