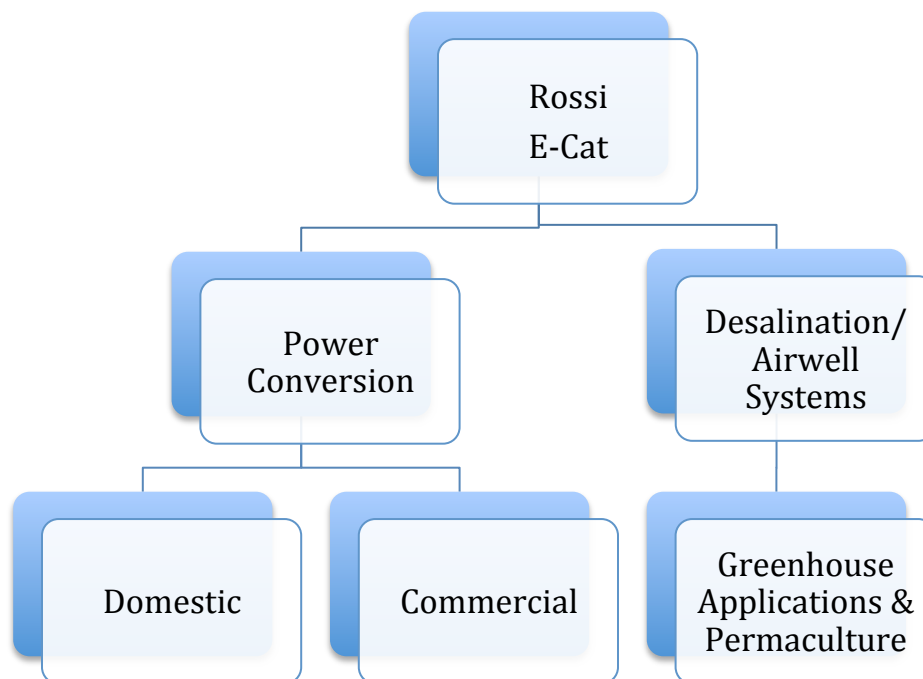




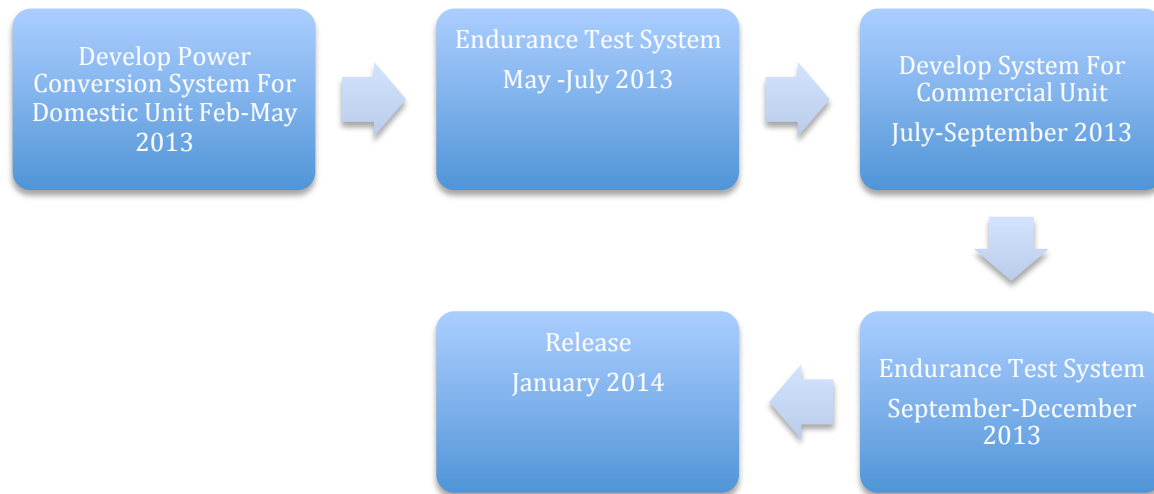
Benchmarks and Timeline for E-Cat Australia R and D



As can be seen by the graphic above, the E-Cat development will consist of two simultaneous programs:

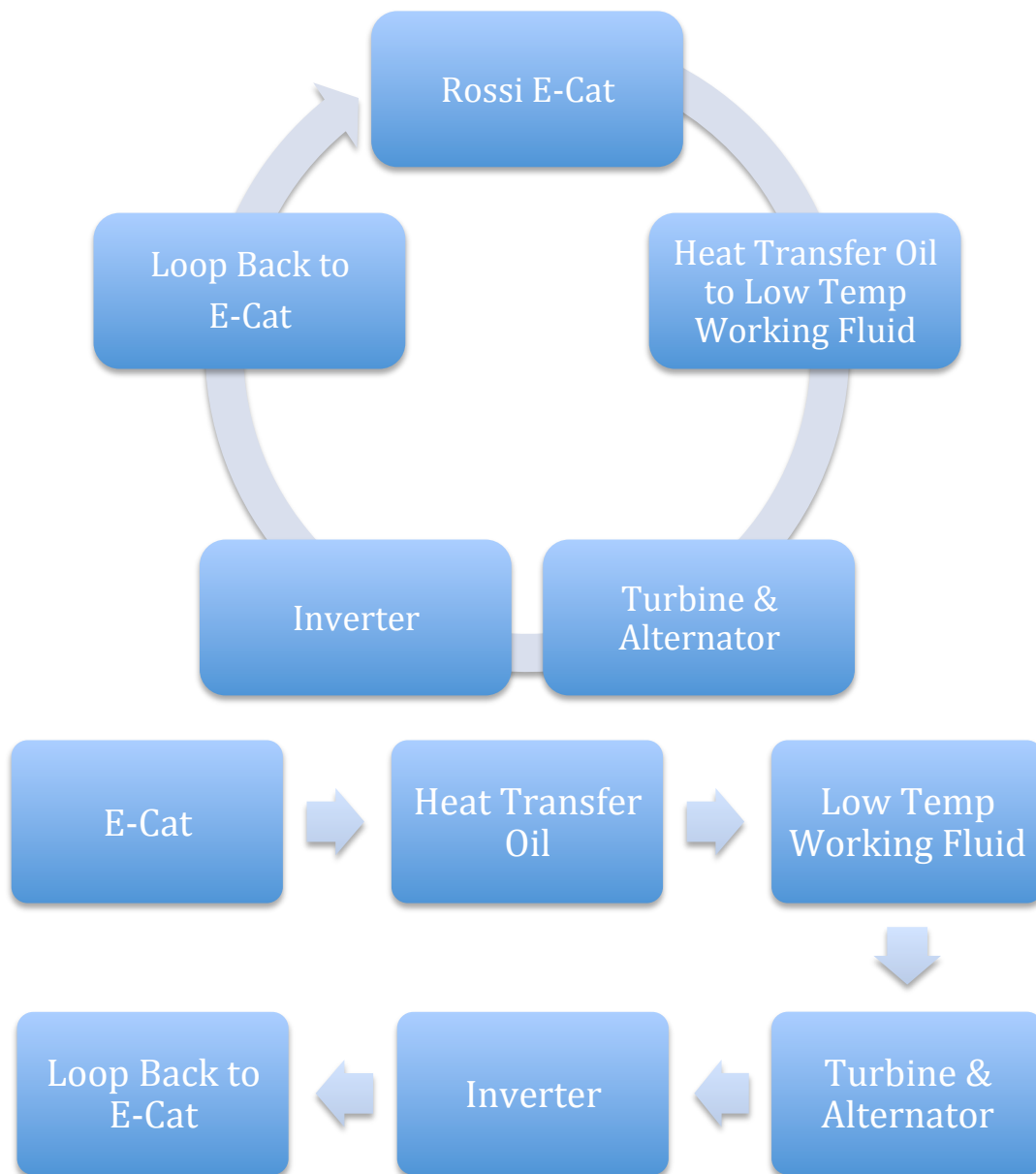
One for power conversion and another for desalination.

Benchmarks and timeline for E-cat power conversion



This graphic details the timeline for development of the Rossi E-Cat power conversion system. As seen, the first conversion proof of concept will be with the domestic unit. After this essential building block is endurance tested, this data is incorporated into the program for the commercial unit. This system is then endurance tested, and then both are scheduled for release in early 2014. The three-month blocks are minimum time frames, assuming no delays in the process. Another alternative is to have both programs operating simultaneously. However, the possibility of duplication of effort, and of cost over runs are far more likely in that scenario.

Block Diagram for Rossi Power Conversion



E-cat

Thermal to Electricity Conversion Technologies

Research and Development

Quantum Well Thermoelectric Converter (QTEG)

This system has yet to be built and tested, but both JPL and the US Department of Energy has done most of the theoretical background work necessary to the development of the unit. It is anticipated that Quantum Resonance Technologies (Roger Green) will be prototyping proprietary units that will be tested in our laboratories using this technology. We have the IP to make this technology even more efficient

In a recent report from JPL (Jet Propulsion Laboratories), the proposal was made for the construction of a quantum well thermoelectric converter with a nominal efficiency of 22%. This number is 2% above the minimum specified by Andrea Rossi

Previously, TEG devices in bulk form could only deliver an efficiency of 5%. With quantum well technology, this will push the efficiency into the 20% range, and perhaps beyond. Predicted dollars per watt at this time are quite high, but competitive with photovoltaic systems. The first proposed applications will be for space-based systems that demand high reliability, and earth based that require a rugged construction for harsh environments. One application will be for cogeneration or heat energy recovery in diesel and other internal combustion vehicles. Those systems run in the same temperature range that the E-Cat is operational, from 125-400 degrees C. The devices are usually tailored to the specific temperature regime, so when the 400 degree E-Cat becomes available, that device will be designed specifically to that blackbody temperature output. Also, from the available research, the higher efficiencies are in the high temperature regime, which means this system may need to be implemented in the 400 degree E-Cat. Work in quantum well technology is foregoing, and further developments may develop in the low to middle temperature regimes, such as the 125 degree range.

Low-Temperature Boiling Point Working Fluid

In this system, a working fluid is selected with a lower boiling point than water. Several fit the bill for this one: ethanol, and some Freon-replacement fluids. These have typical boiling points of 40-50 degrees C, far below the present E-Cat of 125 degrees. Therefore, instead of low grade steam, a medium-pressure vapor will be generated due to the phase transition that will be sent to the turbine for mechanical power conversion. Typical efficiencies that are expected will run in the 33-40

percent range, which are acceptable. This means that, for the home E-cat, a 5000 watt source of heat will produce approximately 1666 watts of electrical energy for the home, the rest being used as co-generated heat to warm household water supplies and the living space.

In the 1MW E-Cat, the net output will be 333 KW, with the rest being output as heat for either the apartment complex, swimming pool and Jacuzzi heating, or similar uses. The size of the turbines will be different for the large scale 1MW units, and are anticipated to cost approximately \$5000 per unit. Generator cost is not included. For the home scale E-Cat, The turbines can be either injection molded out of high impact plastic, or produced on a 3D printer for cost reduction, dropping the production costs to \$400-\$500. Reliability will be the same. Therefore, for the overall cost the home E-Cat will have a base price of \$1500, with a turbine cost of \$500, and an alternator for \$300, with wiring running about \$200, and heat exchangers \$300 for an overall cost of \$2800. This is somewhat cost competitive with domestic gensets, which run from \$2500-\$3000, but deliver 5000 watts instead of 1600 plus. The overall cost will either need to be decreased, or the power level increased to be more competitive.

Downsides

The working fluids of the first system would be somewhat toxic if a leak developed, and those would need to be anticipated. Freon leaks occur in air conditioning systems and are costly to replace. The ethanol is less costly, but flammable. Another alternative is liquid carbon dioxide, but that one is an oxygen displacer, and represents a health risk in that respect if a leak developed.

The Stirling Cycle Tesla Turbine Converter

This one does away with the phase change entirely, and uses a high-pressure gas to convert the heat into mechanical energy using the Stirling cycle. For example, using the case of a “perfect gas”, if the cold side were 300 degrees Kelvin (27 degrees C), and the hot side were 400 degrees Kelvin (127 degrees C), then the temperature differential would be 4/3, or 33%. If the static pressure were 30 atmospheres, then the pressure delivered to the turbine would be 10 atmospheres, or 147 psi. It is possible to go to higher pressures, and Philips of Eindhoven has run test buses on 100 atmospheres pressure in their systems. However, for safety considerations, the initial units will be “throttled back” to reduced pressures to prevent blowouts. Conversion efficiencies are anticipated to be in the 33-40% range, however we have received information that this could be substantially higher. Testing will determine the ultimate efficiency of both systems. Costs will be higher, since more material will be needed to contain the higher pressures. This will result in approximately \$200-\$300 cost increase for the home unit, and \$2000 for the commercial.

This system would most likely use either dried compressed air, or nitrogen. This one is non-toxic, and the only problem would be a catastrophic failure of one of the system components. Also, the overall efficiency may be higher, and the figures given may err on the conservative side. If the conversion efficiency were higher, it would

justify the additional cost for this system. Testing would need to be done to determine this.

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E-cat Technology and Desalination Research and Development project

Water Purification and Desalination

Introduction

One of the best investments in our developing technologies is the potential of desalination, taking free water from the ocean, removing the salt, and selling it.

Because we have technology that separates hydrogen and oxygen, it also separates impurities, creating instant desalination, at very low costs compared to other methods.

There is a rapidly dwindling fresh water supply in the world today. Roughly 1.5 billion people, more than 22% of the world's population, lack safe drinking water. According to an industry report, "the desalination market will generate expenditure in the region of \$95 billion by 2015."

Global conglomerates have quickly entered this high-profit industry. GE, Siemens and Dow Chemical each have a big stake in the business, with operating plants all over the world. Firms like T. Rowe Price, Vanguard, and Berkshire Hathaway are watching the desalination technology evolve because all of these companies use old costly methods. Current desalination can cost about three times more than traditional methods. It takes about 14 kilowatt-hours of energy to desalinate 1,000 gallons of seawater.

Project 1: Magnetic Water Treatment

This project treats the water with high strength magnetic fields, changing the structure and decreasing the surface tension. It makes the water "wetter" without the use of surfactants. Thus, the water becomes a better solvent, and nutrients as well as oxygen are more easily dissolved in it. It has yet to be determined the exact changes that are made from a quantitative standpoint, and what effect if any this has on the hydrogen bond angle. However, from an empirical perspective, it has been proven to have beneficial effects on living systems.

Project 2: Reduced Pressure Water Desalination

Currently, water is boiled at room pressure to remove salt as well as undesirable dissolved solids from the water to make it safe for human consumption. This is extremely energy intensive, as it takes a substantial amount of energy to change the

phase of water from a liquid to vapor. It has been a serious limitation to the access of clean water around the world.

This project proposes the distillation of water in a reduced pressure vessel at approximately 0.5-psi static pressure. At this amount, the water will boil at slightly higher than room temperature, which means that much less energy will be required to purify the same quantity of water. There are two methods for accomplishing this: In one method, two tanks are brought down to the required low static pressure, and a small amount of heat is placed on the evaporator tank. Optimally, there will be a differential of 10-20 degrees C between tanks. This can either be an elevated temperature on the evaporator tank, or a reduced temperature on the condenser tank. Another possibility is to place a heat exchanger between the two tanks for condensing the water vapor.

So what we need is a source of cheap, environmentally clean energy to do the desalination. One possibility is to use the Rossi E-Cat to provide the temperature differential. We do this by the use of a heat transfer oil through the reactor, routed to a heat exchange loop inside the evaporator tank. The tank is heated above the reduced boiling point by initially pumping it down with a vacuum pump so the boiling point is slightly above the ambient temperature. After vaporization, the water vapor is routed to a heat exchanger to chill it down, condensing it back into water. That water is then pumped into a holding tank. At 3.6 cents per kilowatt hour, it will cost 50.4 cents per 1000 gallons to operate, or .0126 cents per liter.

The other possibility is to use solar energy to accomplish the low-pressure distillation. Two water tanks are employed, one painted black for the evaporator side, and the other white for the condenser. The height of the tanks is variable, due to local ambient atmospheric pressure. At the top of a large mountain, for example, or high altitudes, a shorter standpipe will be required to get the correct pressure. The bottom of the tower is at atmospheric pressure, and to initially get the water up into the tower a vacuum pump is employed to raise the column to the top of the tank. The same is done for the condenser tower. Each system will work in pairs.

In operation, the black tank will be heated by solar energy, and the vapor travels through a ribbed heat exchanger, cooling it down and condensing it where it goes into the condensate or receiving tank. As long as there is enough input energy to run the evaporator, the system will continue to function.

Which system is used will depend upon availability of solar energy. In areas where sunny days are few, the E-Cat will be used out of necessity, as well as extremes of latitude. The limitation of the solar system is climate and weather. The E-Cat has no such limitation. It can also be used on board ship as well as in "closed ecologies" including many agricultural areas

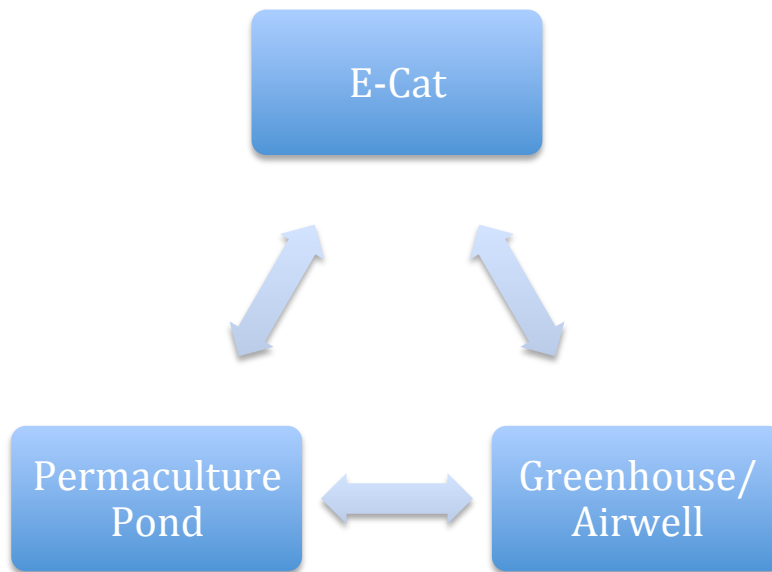
It is clear that if you can vaporize water with low energy input, you have the ultimate solution to desalination. When the water vaporizes- the salt is left behind. A low energy input solution to the world's water crisis (and a 95 Billion dollar industry)

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The desalination system can also consist of “Airwell” systems, essentially large dehumidifiers built into shipping containers. The airwells are evaporative air conditioner systems designed to wring out the water even in arid areas. The theory is that you chill down the air below its dew point, collect the water, and return the air back to its original ambient temperature minus the water. As long as the air has a dew point above 0 degrees Celsius, there is enough relative humidity to run the system.

The greenhouse application is dependent upon a source of both water as well as heat, so when the desalination regime has proved itself, then that will be incorporated into the greenhouse system. The greenhouse can either consist of hydroponic or aeroponic systems. Excess water is either recycled through the desal system, or used in several permaculture ponds to filter the water before it goes to the fish ponds. The excess ammonia from the fish pond is then cycled back into the greenhouse as bio-compatible fertilizer for the plants, completing the circle.



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