OVERVIEW OF PROPOSAL FOR FLOODING OF LAKE EYRE

1. Background on Lake Eyre

The area around lake Eyre is up to 15 metres below sea level and was in the recent geological past a part of a shallow, fertile and productive permanent salt lake. Southern Lake Eyre is about 300 km from the northern end of the Spencer Gulf. Water from South Lake Eyre feeds into the larger and deeper North Lake Eyre through the Goyder channel. The lake is on the edge of the inland deserts with low rainfall, surrounded by fertile soils and has year round high intensity sunshine on an average of more than 300 days per year.

In 1974 Lake Eyre flooded to its maximum recorded level and had at that time a surface area of 9,649 square kilometre and a capacity of 30 cubic kilometres of water but remained 5 metres below sea level. If seawater were allowed to flow into the lake it is unlikely to reach a much higher level than this but if it flooded to sea level its area and capacity would be about double the 1974 figures. The combination of the shallow sea water body and the desert environment offers several valuable resources.

The temperature of the lake averages around 28°C. The temperature of the Spencer Gulf sea water is considerably lower. The shallow water regions of the lake reach even higher temperatures. Both the differences in temperature of the water in the lake and the Spencer Gulf and the diurnal extreme variations in temperature in the region constitute extremely large exploitable energy sources. The region also has a unique potential for solar energy projects.

2. Benefits of the Project

Clean, continuous electrical power

The temperature differences between the warm shallow water of the flooded lake and the water piped in from the Spencer Gulf can be used for developing power via the Kalina cycle water-ammonia turbine systems, the same system presently in use in Russia and several other areas. The enormous volumes of water involved mean that warm water and cool water is available at all times and power can be supplied continuously. A power plant or plants can produce megawatts, and presumably gigawatts of power, probably enough to power the city of Adelaide. This power source has as little pollution as wind power or hydro electricity and with natural sunlight producing a huge amount of thermal energy in the lake has the benefit of being able to supply base-line power. There would be considerable potential to increase the power available via local engineering and research development. Developing this type of cutting edge technology offers an opportunity to take existing technology a step further and reap economic benefit from marketing that expertise. Initial projections suggest low to very low cost per unit of power generated.

Climate: Water would enter from Spencer Gulf continuously.

When the Lake is flooded there is a very high rate of evaporation, ranging upwards of two cubic kilometres of water per year since the region has naturally low humidity and high average temperatures. The flow of water from the Gulf will maintain a high water level, sustaining increased evaporation and thus an increase in humidity in the region of the enlarged lake and a considerable increase in the humidity of air around the lake area (increasing dew and other forms of precipitation in the region) and also in the air flowing to the western side of the Eastern highlands. One prediction is for moist air over the lake to disperse during the heat of the day, and for cool desert air to flow inward toward the lake during the evening and night leading to heavy falls of dew around the lake.

To maintain a stable salinity would require either continuously removing solid salts or maintaining a steady outflow of near saturated brine from the lake. A comparatively small volume outflow of water almost on the point of saturation would maintain a viable ecology within the lake.
and prevent the massive build up of salt deposits. If it is considered desirable to harvest the dissolved salts as solids the volume of outflow could be reduced. If the saturated brine outflow from the lake had one tenth the volume of the sea water flowing in then the amounts of salt would be in balance. These flows would establish a circulation pattern within the lake which would have further benefits.

**Food production**

Extraction of the most saline, and most dense water for return to the southern coast may well provide a benefit to fish stocks off the southern coast.

In the Lake the aquatic species native to the lake are salt tolerant and capable of surviving in a sea water environment. The lake regularly contains regions of water at saturation levels for all the salts present, and huge marginal salt deposits accumulate over time with no damage to the ecology.

The shrimp and fish such as the native hardyhead in the lake provide a rapidly reproducing natural food source in times when the lake is flooded. Such a food supply could be almost immediately and continuously processed as a commercial protein food source. At present evaporation causes the salt concentration present in the lake to change from below that present in Spencer Gulf to a level in which not even brine shrimp can survive. Flooding would tend to stabilise and localise that cycle.

Inflows of fresh water from the Cooper or Diamantina would simply add to the Lake.

Growth of algae in shallow ponds could be lucrative. Fish farming at high temperatures in shallow controlled ponds should be close to ideal. Control of disease and loss to other causes could be again close to ideal. The fish farming and algal growth ponds could be set up at some point or points along the inflow channel from Port Augusta to Lake Eyre.

Available sunlight and Stirling engine, Kalina cycle engine or low pressure turbine, power generation would be set up to yield a supply of fresh clean water for intensive agriculture projects utilising local fertile areas. The highly saline outflow of such water purification can simply be added to the outflow mentioned earlier. The Kalina plants have the potential for providing cooling along with power generation. A small (somewhat isolated) community would be well served. Economically promising projects follow.

**Moving water**

The high day time temperatures and low night time temperatures and modern membrane technology offer a unique opportunity to utilise gas expansion and contraction with one way valves to create “peristalsis” pumping on a massive scale. Maintenance is pretty much the only ongoing cost of such engineering. Once water is raised to a sufficient height there is no great cost to its movement by gravity. Salt production brine harvesting and production of soda, magnesium, chlorine and other materials from the salts available in massive quantities is again a natural utilisation.