SUBMISSION TO INQUIRY INTO FUTURE WATER SUPPLIES FOR AUSTRALIA'S RURAL WATER INDUSTRIES AND COMMUNITIES

EVAPORATION CONTROL SYSTEMS PTY LTD

SUMMARY

It would seem to be obvious that water supplies for the only continental nation on the planet will require a broad national policy framework, while allowing for necessary regional variation. There must be Federal Government direction and coordination in particular in those multi-state resources such as the Murray Darling system, the Great Artesian Basin and the Snowy River system. This direction could be achieved through the fiscal powers and if necessary the defence powers of the Commonwealth. Also obvious is the fact that water especially in Australia is a limited and finite resource which demands the greatest possible efficiency in its use to achieve the greatest benefit for the whole Australian community.

While this committee works under the title of Agriculture, Fisheries and Forestry, overall water policy should also be cognizant of the requirements for water for such demands as urban populations, mining, power generation, rural industry and even the major cities as these demands will often take precedence over the needs of agriculture.

Our particular concern is with the efficient use of stored surface water which may suffer enormous losses to evaporation. These losses may exceed 50 % of the water impounded in the storages. They manifest themselves in lost production, variable levels of production, and massive environmental losses as well as periodic social disruption especially to small communities, when employment is terminated or town water supplies are disrupted.

Water lost to evaporation obviously cannot be used for production whether it be:

- Broad acre cropping or pasture – dairying, rice or cotton
- Watering livestock – pastoral production of sheep or cattle
- Human consumption – in small or large communities, mining sites or defence installations
- Manufacturing – including power generation
- Mining – coal washing, mineral production and processing
- Intensive agriculture – fruit and vegetables, grapes

Broadly the economic situation for evaporation control is costly, ranging from [1]:

- Fixed covers at a cost of $93 - $172 per square metre
- Floating covers – conventional $38 - $ 49 per square metre
- Our cover – EvapCap at $6 - $8 per square metre

SOME CASE STUDIES

General Principles

- 1.0 hectare (ha) of water storage surface area equals 100 m by 100 m equals 10 000 m^2
- 1.0 megalitre (ML) of water equals 1.0 million litres
- 1.0 m^3 equals 1000 L therefore 1.0 ML equals 1000 m^3
- 1000 m^3 equals 1.0 ha by 100 mm deep
- 1.0 m depth of water over 1.0 ha equals 10 ML
- evaporation occurs due to temperature and wind; evaporation rates are taken from Queensland DPI Australian Rainman and have been supported by on-farm measurements of evaporation losses.
- In Australian irrigation areas evaporation can exceed 2.5 m per annum or 25 ML per hectare of storage.
- If water is in short supply, but cost per ML is low, and suitable land is plentiful, production tends to be unreliable and directed towards short term, lower value crops. Typically rice-growing or cotton-growing areas.
- If water is expensive but reliable and land is limited, production tends to be in much higher value crops. Typically horticulture or fruit or vine production.

1. *Small scale farm dam* where the purpose for which the water is stored is stock use. A typical surface area may be 5000 m^2 (1.25 acres or 0.5 hectares). Average depth is 5.0 metres (6-7 m excavation less 1-2 m of silt).

   Water capacity with dimensions of 100 m by 50 m would be 25 megalitres (ML) or 25 million litres. Stock use per year assume 100 head of cattle consuming 10 L per head, per day for 365 days amounts to 365 000 L per year or 0.365 ML.

   Assume no loss due to seepage – a reasonable assumption for a clay base dam with a silt cover. Assume also an evaporation rate of 2.0 m per year with an average annual rainfall of 500 mm. Therefore net average evaporation amounts to 1.5 m per year. In drought years net evaporation would be 2.0 m per year as rainfall would be lower and evaporation higher. Evaporation losses amount to 10 ML per year. These figures are not extreme in pastoral areas of Australia.

   If no stream flow occurs into storage for two years due to drought (this has happened twice in the past 20 years in the author's case), stock use equals 1.430 ML and evaporation amounts to 20 ML. A total of 21.430 ML – the dam is almost empty due mostly to evaporation losses.

   If evaporation is stopped, stock use is two years is still 1.430 ML but after two years there remains over 22.5 ML in storage, giving much greater security for the stock owner, at a capital cost of approximately $30 000 and a life expectancy exceeding 10 years.

2. *Large scale farm irrigation storage*
   An enquiry from a large agricultural enterprise in NW NSW disclosed the following situation. The main product, cotton – none grown in the current drought induced low-stream flow resulting in empty storages. Subsidiary products/citrus and grapes are highly dependent on continuous water availability. Current situation – only highly saline water available, supplemented by bore water being treated through reverse osmosis plant. Some vines have been lost. Possible solution – a dedicated deep storage with adequate water for this critical need, protected from evaporation losses by EvapCap.

If state and federal governments intend to both maximise the value of production and employment from irrigated agriculture, while at the same time providing for more "environmental water", a multi pronged approach seems to be needed.
Increased water use efficiency will allow the same production with less water thus freeing up water for environmental purposes. This may be achieved by a mix of:

- Encouragement toward higher value irrigated crops and away from low value, high water use cropping.
- Tradeable water rights to encourage water use into high value products and discourage low return use of scarce water.
- Trade off increases in water use efficiency into greater stream flows by encouraging tradeable water rights which should direct water towards higher value uses.
- Encourage and reward measures to curb evaporation losses perhaps through the taxation system in the form of increased investment allowances, accelerated depreciation rates or even through grants to irrigators undertaking these costly measures.
- Perhaps through the purchase by governments of the megalitres saved by adopting evaporation reduction measures. Evaporation control measures would include deeper storages which are covered or multi-celled storages whereby one critical cell is covered to protect a minimum survival level of water such as specifically for tree or vine crops.

Other areas of water use which would benefit from evaporation control include:

- Local water authorities eg. Goombungee and Capella in Queensland, Kalannie or Bruce Rock in WA.
- Mining for the reuse of water used in processing of minerals or coal eg. Kalgoorlie in WA, Acland Coal in Queensland.
- Power stations storage of effluent water which is held as vital backup water in power generation.
- Feedlots to protect vital water for cattle.
- Remote sites such as radar defence sites reliant on very limited artesian water.

Additional benefits of covering storages may include odour control, algal control, reduced wave action which causes erosion of banks, less salt buildup within a storage and the enhancement of anaerobic digestion.

Areas of Research Support Needed:

We are confident in the technology we have developed for cost effective evaporation control for small to medium sized storages (up to 10 ha surface area). We think we may be able to reliably stop evaporation on much larger storages but may need expensive engineering research to enable us to proceed to these much larger storages. Financial backing perhaps only in the form of a guarantee against failure of a cover as we move into this unknown area of innovation, may be of vital assistance.

If our efforts are fruitful there may well be large export opportunities opened up for this basically all-Australian initiative. There has already been interest expressed from several other countries. We would also appreciate some form of protection from potential predatory competition sourcing cheap and possibly inferior material from overseas to enable full commercialisation to proceed after such a lengthy period of research and development.

Warwick Hill
Managing Director
Evaporation Control Systems

www.evaporationcontrol.com.au
"Croydon Park"
Meandarra Q 4422
07 4665 6144

References:

(1) Membrane Liners and Floating Covers For Existing Open Water Storage Basins: Why? And How?, Paper presented by Gerrard Young, Gutteridge Haskins and Davey Pty Ltd to the 63 rd Annual Water Industry Engineers and Operators' Conference, Civic Centre – Warrnambool, 6 and 7 September, 2000.