This submission is made in reference to the consultation for the SA Water Regulatory Determination 2016.

Firstly I need to establish the credentials of the author of this submission. I am one of the founders and the Managing Director of Osmoflo, Australia's largest desalination company. We established in 1991 and I have been in the industry for about 30 years. I have a BE (Chem) from Adelaide University and a MCOMM (Marketing) from UNSW, am a Fellow of the Institute of Chemical Engineers and a member of the International Desalination Association and the Australian Water Association. Osmoflo has an internationally respected reputation in desalination systems, with an installed base of 450 plants, with the largest 56,000 m3/day sea water desalination in Barka, Oman.

I am a fervent supporter of desalination technology around the world and am a supporter of the Adelaide Desal Plant. If the desal plant is required to supplement flows that are established to be low then I have no objections. However I am not supportive of the proposal of a "Hot Standby" that I believe does not represent best value for money for the state. My view is that, based on the basic information provided, that a more appropriate solution is to shut the plant down in a safe and effective manner as described variously below. This would result in significant cost savings.

My submission will be based on the information provided in the following documents, and will be in the form of a reply to some of the statements made in these reports.

- SA Water's business plan (http://www.sawater.com.au/__data/assets/pdf_file/0020/26921/RBP-2016.pdf)
- Aurecon's report on the use of the ADP (http://www.sawater.com.au/__data/assets/pdf_file/0008/26927/Attachment-J.pdf)

With regards,

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SA Water's Business Plan

6.4.2.1 Why we propose minimum production mode

The incremental average annual operating cost of minimum production rather than zero production for the second regulatory period is estimated at $5.7 million (Figure 6.4). Notably, a zero production regime still incurs significant annual fixed operating costs fom contractual obligations.

Response: Whether a significant fixed cost exists is not relevant, the issue is additional cost above the minimum contractual position. $5.7 million is still a lot of money. On top of the stated $47 million annual fixed operating cost it is only an additional 10-15% however my

view is that this is unnecessary expenditure and there are other simpler desal industry standard ways of shutting the plant down that would result in significant cost savings. If extended periods of shutdown were anticipated I would recommend to review the contract and investigate early termination.

Operating the ADP in minimum production mode rather than at zero production mode over the second regulatory period provides both financial and non-financial benefits customers. Financially, that mode provides best value to customers over the longer term because it:

• Maximises the life of the plant, so defers future capital expenditure to replace or renew elements of the plant

Response: This is not supported by evidence or sound advice of the membrane experts. Seawater desalination plants age as all materials do, with time and the manner in which they are operated and maintained. Putting membranes into storage is a well-known known method around the world to preserve the life of the elements, a fact that is supported by all the major membrane companies around the world. For comparison the total replacement of the RO membranes would be in the order of $10M, considerably less than the 5 year proposal of $25-30 million additional cost for having membranes in Hot Standby.

• Avoids, or defers $5-6 million per year in capital expenditure in other parts of the water treatment and supply network, because the plant provides an alternative to those water supply sources.

Response: This statement appears to be making the argument that going into Hot Standby is a zero sum game. Without details of the capex deferrals it is not possible to validate this statement.

From a non-financial perspective, minimum production mode:

• Generally improves drinking water quality (salinity) in metropolitan Adelaide

Response: Correct and I support this, however Adelaide previously had and continues to have raw water sources that, following correct treatment, met Australian Drinking Water Guidelines for many decades.

• Improves the security of supply to customers who rely on the Happy Valley water treatment plant as their sole source of supply, in the event of a loss of distribution at the plant (such as a power failure)

Response: Correct and I support this, however Adelaide previously had and continues to have raw water sources that supplied the city with potable water for many decades.

• Enables us to rapidly address disruption in the supply sources (such as deterioration of water quality due to algal blooms in the reservoirs poor quality inflow fom catchments, and elevated salinity from the River Murray)

Response: Correct and I support this, however Adelaide previously had and continues to have raw water sources and treatment systems that supplied the city with potable grade water. The supply source changes do not generally occur rapidly. As I recall the primary need for the ADP was the extraordinarily low flows into the catchment system, which occurred over many years.

• Avoids the operational difficulties and costs of re-commissioning the plant after an extended shutdown. Interstate and overseas utilities have experienced

Response: A correctly shut down plant, with appropriate maintenance procedures, will result in reasonable costs to recommission the plant, a fraction of the cost of holding the plant in Hot Standby. This is the experience I have observed of many sites around the world over many years, as have other membrane plant practitioners. The Australian plants have been operating for a very short time and do not have any long term relevant experience as yet.

10issues with desalination plants that were shut down for extended periods. Recent documentation supports that it is difficult to bring complex facilities (such as desalination plants) back online after shutdown mode, regardless of the maintenance during the

shutdown. The Santa Barbara Desalination Plant in the United States lost 80% of its original asset value as a result of being in full shutdown for more than 20 years
Response: Response: A correctly shut down plant, with appropriate maintenance procedures, will result in reasonable costs to recommission the plant. It is incorrect that complex facilities cannot be brought back on line regardless of maintenance procedures. The original asset value of the Santa Barbara plant was about US$30 million and it was constructed in about 1985 when seawater desalination was in its infancy so there was not the same knowledge as today of materials, design and operations and maintenance techniques. Any suggestion that the ADP would lose 80% of its value (over A$960 million based on media reports of the project cost) over 20 years by being in cold standby is gross exaggeration and simply not credible.
• Leverages staff experience and our investment in training by keeping a skilled workforce to operate and oversee a complex plant, thereby reducing future risk
Response: Osmoflo generally agrees and has much experience of this, as a number of the skilled workforce at ADP came from Osmoflo where they had significant training and experience in desalination. These resources will not be lost and there is an opportunity to redeploy them in Australia, we can confirm this as these skills are becoming increasingly in demand.

Aurecon's report on the use of the ADP

Standby Modes Considered:
The two specific ADP standby modes considered in the study are:

- Cold Standby which has zero production
- Hot Standby which operates in a pattern of minimum production.

Cold Standby is defined as the plant operational mode under which the ADP is not producing and delivering any potable water to the drinking water distribution system for a period of one year or longer.
Response: There are many ways of achieving a standby of a desalination plant, so it is not clear exactly what this term "Cold Standby" is referring to. One configuration is to completely remove membranes from their housings, store them under vacuum sealed conditions, flush and drain all pipework, disconnect all motor/pump couplings and then performing routine maintenance of the equipment in a controlled manner. Another configuration is to keep all the membranes in their housings under preservative and monitor the conditions carefully and replace the preservative on a periodic basis to maintain optimum storage conditions for the membrane elements.
Hot Standby is the plant mode of operation where the ADP plant runs at 30ML/d for 9 months and then zero production for 3 months, cycling across both production facilities at the plant.

SA Water risks
The main benefit experienced by other reference plants using Cold Standby, is that this mode of operation allows the achievement of a significant reduction in the plant's annual O&M costs, as compared to continuous plant operation and Hot Standby. The key risks associated with this Cold Standby mode of operation for SA Water to consider are:

- The notably longer time period needed to return the plant to 100% production capacity

Response: This depends on the configuration of “Cold Standby” adopted. With the membranes totally removed from their housings it would naturally take longer to restart the plant than if the membranes were retained in their housings. In both cases the startup is perfectly achievable with reasonable timeframes for planning purposes, and at a far lower cost than maintaining the plant in Hot Standby.

- Intake structures may be exposed to higher rates of deterioration and biological growth when the intake is idle. Capping of the intake pipe usually does not prevent the intake structure from accumulating heavy growth and structural damage

Response: Intake structures can have maintenance procedures applied during shutdown as they do during operation. In both cases there is likely to be some chemical treatment in addition to physical maintenance actions. Capping the intake pipe and introducing a biostatic environment is just one simple way to minimise any regrowth.

- The pre-treatment and RO membrane ageing process is accelerated when these membranes are kept in preserving solution for a long time (typically more than 1 year)

Response: The correct storage of RO membranes as recommended by all major membrane manufacturers is in appropriate preservative solutions, whether short or long term. If the membranes are to be removed from their housings they are preferably stored in preservative solution in a vacuum sealed bag. Under these conditions RO membranes are expected to last many years (>3) with no deterioration to performance. If the RO membranes are to be stored in their housings the preservative solution then care needs to be taken to avoid air ingress which degrades the preservative solution and this is what can cause long term damage. This is common industry knowledge and was recently confirmed by one of the technical experts of a major membrane company (Hydranautics). Hence simple attention to maintenance of preservation of RO membranes results in long term storage with little or no deterioration to the membranes. This is not an opinion it is a statement of fact that is widely known in the industry.

- When restarted after long periods of preservation (usually more than 1 year), pre-treatment and RO membranes can exhibit a loss of permeability and lower efficiency in salt rejection and fresh water production. This may be higher than that of membranes that are operated continuously under the proposed Hot Standby regime or kept in preserving solution for less than 6 months and operated intermittently

Response: See response immediately above. This statement perhaps is based upon experience from operations where there has been incorrect preservation and storage or the membranes, or incorrect cleaning of the membrane prior to preservation. It is not in accordance with good engineering practise within the membrane industry for appropriately stored and preserved RO membranes.

- RO and UF membrane guarantees may be lost if the membranes are kept continuously in preserving solution for over 2 years

Response: See response above. Membrane manufacturers are the ones who advise these storage and preservation conditions so any warranty issues should be dealt with in this context.

Response:

- Plant reliability may be negatively impacted because motorised equipment (such as valves, pumps and motors) left idle over long periods of time may develop permanent loss of efficiency and may be more prone to failures (i.e. less reliable). These items are not in contact with water, which is favourable from a durability perspective.

Response: This depends totally on the preservation and maintenance schedules and procedures utilised. This is not difficult and the vendor should have provided full details with their original documentation. As described above it is common practise to flush and drain all pipework and rotating items, disconnect all motor/pump couplings and then performing routine maintenance of the equipment in a controlled manner, eg routine turning on of motors and manual turning of pumps to ensure bearings and seals remain in reasonable condition. The environment in Adelaide is not humid so this means preservation of motors and other electrical items is not as complex as in other parts of the world where this might be more of a challenge.

In summary, Cold Standby decreases O&M costs in the short term, but if extended for more than two years, is likely to cause accelerated loss of plant asset value for key components, such as the plant intake, pre-treatment and RO membranes, as well as pumps, valves, mixers and other motorised equipment.

Response: Refer to responses above, this statement is not in accordance with good engineering practice and standard industry norms.

The key benefit of Hot Standby is that it allows some reduction in plant O&M costs, while still maintaining the plant in complete readiness to produce between 0 and 100% of its design capacity at very short notice. In addition, under this mode of operation the plant maintains its reliability, equipment and membrane guarantees at levels that are comparable to continuous plant operation. The hot standby mode of operation is also expected to enhance the useful life of the UF and RO elements by 10% to 20% and reduce their replacement rate.

Response: The last statement about extending membrane life by operating in Hot Standby mode is not credible. Operating membranes over an extended period means that they will be replaced sooner than if they were removed and preserved/stored correctly.