

<b>Webinar Q&amp;A The salt of the earth</b>		
<b>Question #</b>	<b>Question</b>	<b>Answer(s)</b>
1	What are the environmental risks involved in desalination processes if any?	The brine is discharged via jet diffusers into the sea, which ensures the mixing is fast. Often, increased coral growth is apparent in the mixing zone. I'm not aware of sound evidence of environmental damage or risk from brine discharge into the sea. This is scrutinized heavily but the risk is minimal.
2	All of the six plants can discharge saline waste to the sea. I am working inland where these disposal options are not available. Can we discharge down into highly saline groundwater?	This is sometimes practiced but depends on jurisdiction - I understand it is more common in the USA. The alternative to high recovery RO inland is most commonly evaporation lagoons. Groundwater composition is more variable than seawater, so there may be risks depending on the brine content.
3	What are the water quality parameters in brine samples that have harmful effects on marine ecosystems?	The brine is effectively twice the salinity of sea water and twice the concentration in individual ions, and the same pH. The cleaning solutions used in the process raise concern, but are of minimal volume and diluted in the discharge to the point of not being detected.
4	Is there consideration by water authorities to use floating evaporation mitigation devices on dam storages to improve water security?	live answered
5	Is it environmentally responsible to facilitate population growth with energy hungry desalination?	The presenters have mentioned cases of plants powered entirely by green energy. Seawater desalination is energy hungry in comparison to lower salinity alternatives. Desalination plants therefore appear in water stressed areas where other options are limited. However, energy efficiency of desalination has improved enormously over the last 60 years both through membrane and energy recovery device technology.
6	How far does the effect of brine on seawater extend? (distance from outfall of brine)	live answered
7	Energy consumption for Desalination are usually cited as the major barrier to *Sorry pressed enter early. Energy consumption for desal is usually cited as a major barrier for their application. As renewables and decarbonisation practices becomes more common, is this barrier being reduced?	Absolutely, desalination membranes have become more permeable so the pressure required from pumps is lower, and energy recovery devices have achieved the same. Further improves continue to be developed.
8	How well does desalination technology adjust to time varying water quality?	Water quality variance is easy to detect with the standard instruments used in desal plants and plant operation can be modified accordingly. Seawater plants, outside of algal blooms in certain locations, generally experience a steady water quality. Adaptive desalination plants are becoming more common in brackish water/industrial applications with varying water quality
9	What is the design life of desal plants and what are the costs in maintenance? How are the costs of desal operation and setup passed on?	Typically time to replacement or refurbishment: electrical and instrumentation 10 years, mechanical equipment 25 years and civil structures 60 years.

		<ul style="list-style-type: none"> <li>•Civil assets : 100 years</li> <li>•Mechanical assets : 25 years</li> <li>•Electrical assets : 25 years</li> <li>•Instrumentation / control assets : 15 years</li> <li>•SCADA assets : 15 years</li> <li>•Pipelines and tunnels 100 years</li> </ul> <p>Rules of thumb: Capex 50%, O&amp;M 25%, Energy 25%. So if water unit cost is \$2/m3, the \$1.0/m3 Capex, \$0.50/m3 Opex, Energy \$0.50/m3 (Specific Energy Consumption 3.2 to 4.2kWh/m3)</p> <p>Water Utilities have a mix of water sources, so utilities balance the water price according to the mix, with a basic return on Capex, Opex (variable and fixed) to cover costs.</p>
10	What is the current application for decentralised desalination on a small scale (an analogy could be roof top solar). Is application of small scale desal possible for emergency response or development cooperation in emerging communities/countries?	There are many thousands of small desal plants around the world in regional and remote areas. RO plants with capacity as low as 6 kL/d are readily available. Smaller units (undersink and boating) are also readily available. Mobile containerised desal plants are regularly deployed for emergency water supplies - a recent example was from South Australia to provide water for communities in Turkey ravaged by earthquake in February 2023.
11	Are there ambitions to use the discharge brine for salt production and subsequently decommission some salt mines? This may improve the overall environmental footprint. Is there a correlation between desalination and the energy mix associated with the blue economy energy option?	Yes - new technologies have been introduced for this. 'Brine mining' looks at extraction of valuable minerals from sea water brine where they are more concentrated, namely, rubidium, magnesium, lithium salts.
12	With the operation of desalination plants - is the preference continuous or only when needed when dams lower/groundwater	Desalination plants are most economical operating continuously providing base load water supply with dams and groundwater for peak and emergency supplies.
13	Do we have a simple estimate of the unit cost of future supply using desal and will this cost reduce over time?	World best practice is in the Middle East where long term (25 years typically) water supply agreements are almost always used for seawater desalination, with the utilities buying water rather than buying and operating desalination plants. Actual contracted price for water (including plant finance, construction, operation and maintenance) is generally in the range \$US 0.40 - 0.50 per kL. A common "rule of thumb" used is \$US1 per kL for brackish water and \$US2 per kL for seawater RO.
14	Are any of the current or proposed plants coupled with clean energy generation?	All of the Australian plants are operated by water utilities that purchase renewable energy equivalent to the energy used in desalination. The new 260 MLD Northern Water Supply seawater desalination plant in South Australia will be entirely run with renewable energy (wind/solar/hydrogen)
15	are the technologies utilised in UAE (mainly Dubai) are very different since they have a high reliability on desalination ? or could there be feasible alternatives for places like that which do not have access to water bodies	The technologies are pretty much standard: ultrafiltration pretreatment and reverse osmosis. Where there are places with no water bodies, there are some people working towards extraction of moisture from air, but no large scale developments.
16	For inland sites, desalination produces brine which is difficult and expensive to deal with. Is there innovation in disposing of brine with less cost and less environmental impacts?	Reinjection is normally the cheapest, but subject to intense regulation. New generation high recovery brackish water RO plants (eg batch RO plants) can operate at much higher recovery (ie 95% instead of 70%) reducing the size and cost of lined evaporation lagoons.

17	Treat part seawater and part wastewater from cities. What proportions could they be in real scenes?	Treated wastewater is usually available at the coast. If a seawater desalination plant were located at the same place, it could blend seawater and treated wastewater for lower cost desalination with the possibility (with suitable additional treatment) for potable use. However, the treated water quality would be subject to intense monitoring and reporting for public health, and still subject to the "yuck factor" requiring much public consultation usually over a number of years to gain acceptance.
18	Is there any significant difference in the technology to treat saline groundwater compared to treating sea water?	The same desalination membranes are used, however the process design is different as it depends on the (significantly different) water quality. Brackish water plants typically achieve higher recovery water and produce less brine.
19	is there a correlation between desalination and the energy mix associated with the blue economy energy option?	A recent innovation (at present untested at pilot scale) is to use SWRO brine to sequester CO2 and fix it as bicarbonate before return to sea, providing a potential to increase seawater pH.
20	Any advances in development of high salinity wetlands for treating brine from borewater extraction?	This is usually limited by land availability and need for protection of groundwater. There have been some developments in Western Australia in growing specialist food crops (eg samphire) on saline groundwater and RO concentrate.
21	Do you guys know which of water reuse and seawater desalination cost more? Sorry for the mistake: water reuse	Recent work in Western Australia indicates similarity in order of costs and overall energy intensity between SWRO and indirect potable reuse based on pumping to uplands reservoirs. The equation changes to favour direct potable reuse, but while the technology is there, public perception is not there yet.
22	George: it was noted a increase in marine biology within the discharge area, has there been investigation into the water quality / polutant processing of the increased marine biology?  Sandra: has there been consideration to the extraction of the minerals from the water and solidifying the minerals as opposed to reinjecting into the groundwater. As there is no perfect science about geological recharge and prevention of water table polution.	live answered
23	what are the policy options available for desalination plant effluent discharge into the environment?	Return to sea through carefully designed diffusers. There is just too much of it to feasible do anything else. The Saudis in NEOM are exploring ZLD for major SWRO but its not easy.
24	Would you be able to share your thoguhts on performance bwtween High pH RO and sea water RO in terms of higher recovery rate?	
25	These scenarios are with infinite population growth. A limit should not be considered in water balances?	Great question - probably should be the subject of a separate webinar.
26	Thanks George GHGs need to be discussed	