

## **What they are saying in the desalination industry...** January-03

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### **“DESAL WORLD WILL NEVER BE THE SAME...”**

“DESAL WORLD WILL NEVER BE THE SAME NOW ENERGY RECOVERY INC. third generation SWRO energy recovery device is running successfully since November 2002 in 3,900 m<sup>3</sup>/day plant in St. Maarten, Netherlands Antilles.”

“BIG SAVINGS. Willem Chr. Barendsen, SWRO supplier/developer and former President Vivendi Enerserve, said, “Vivendi has been adopting PX technology since March 2000 to lower operating costs. The use of PX technology in their BOOT operation is saving Vivendi over \$1.2 million per year in power and maintenance costs.”

“Before I retired as President of Enerserve, we decided to buy the first set of the larger PX units coming out of the ERI production line in California. Best CAPEX decision I ever made. These large PX units were installed at the St. Maarten (GEBE) plant. I will tell you that the units started up without any problems in mid November and have been operating flawlessly ever since.”

“CYPRUS. “We are currently installing Phase II of Dhekelia (Cyprus) with this new device. With the Series 65 we can do a 10,000 m<sup>3</sup>/day control block with 10 rotors. The same train in Dhekelia Phase I took 40 rotors.

“Simpler is better. This technology is making possible for small and large co.’s to desalinate seawater to make and sell potable water for less than \$0.50/m<sup>3</sup>. This cheap water is opening up new markets in resort areas and for irrigation.”

Water Desalination Report, Vol 39, No. 4, January 23, 2003

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### **“RO Plant Expansion Allows Energy-Savings in Antigua”**

“...installation of PX Pressure Exchangers as part of a plant expansion in Antigua’s SWRO plant brought annual savings of nearly \$200,000, according to the author. Payback time for the capitol cost was 1.8 years.”

“...together with Enerserve’s year-long experience with a PX-60 device in a hotel plant in Curacao (2.8 kWh/m<sup>3</sup> product water for a two-pass 250 m<sup>3</sup>/day SWRO, plant product quality 100 ppm or less) encouraged Enerserve management and technical staff to install the larger PX-120’s in Antigua. Five PX-120 Pressure Exchangers were installed in one production unit and due to the excellent performance results, eight months later the second production unit was also equipped with the same devices. Also, in the Enerserve St. Maarten SWRO plants (total production capacity 14,000 m<sup>3</sup>/day), one production train was equipped with four PX-120 Pressure Exchangers.

At this moment in St. Maarten, work is in progress to replace two Wheatley plunger pumps with one Duechting multi-stage centrifugal pump and at the same time install four of the latest 6.5 inch Model PX-220 Pressure Exchangers as energy-savings devices. Although Enerserve does not have experience with every energy-recovery device available on the market, the simplicity and the reliability of the Pressure Exchanger made the decision to choose it an easy one.”

“The PX is practically maintenance-free as long as the directions for installation and controlling the flow per unit, are followed.”

“After the installation of the PX units the capacity of the plant increased by 26% (from initially 2,270 m<sup>3</sup>/day to 2860 m<sup>3</sup>/day) without having installed one more electricity-consuming device.”

“After successful start-up of the expanded plant the overall kWh consumption per m<sup>3</sup> of product water amounted to 3.18, which is a reduction of 1.22 kWh/m<sup>3</sup>.”

Nov/Dec 2002 D&WR, RO Plant Expansion Allows Energy-Savings in Antigua, by Willem Chr. Barendsen, Retired President, Enerserve Group of Companies.

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**“Pressure exchanger technologies now give RO designers several new degrees of freedom, which have previously been the design barriers for the older centrifugal energy recovery devices...This now allows for the possibility for lower flux design that have significantly lower power consumption profiles while still producing high quality permeate and systems that are easier to operate and maintain.”**

Energy Recovery Technology Opens Doors to New SWRO Plant Designs, John P. MacHarg, American Water Works Association Conference, Reno, October-02

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**“...it is time for our water experts and other government officials to reconsider its (SWRO) feasibility in the United States and elsewhere.”**

“Beginning in the mid 1990’s a new generation of seawater reverse osmosis (SWRO) energy recovery devices became commercially available, which has drastically changed the economics of desalination. This new type of device uses positive displacement technology to transfer the high-pressure brine energy directly onto the incoming seawater...In some cases, these ultra high efficient devices make it possible to desalinate seawater for less than half the energy that was required using the earlier turbine technology.”

“These new devices are being used in desalination plants such as Ashkelon, Israel, a 95,000 acre-ft/year facility, to drive down the cost to produce fresh water from seawater to levels approaching other traditional methods of water treatment. The contract price to produce water for this project is approximately US\$ 600/acre-ft...Singapore is a similar

example where the winning bid is offering water for sale at approximately US\$ 500/acre-ft.”

“In Mazarron, Spain there is an SWRO plant that produces approximately 12,000 acre-ft/year of fresh water solely for agricultural use. When seawater desalination is being used to grow Europe’s tomatoes, cucumbers and other winter export crops it is time for our water experts and other government officials to reconsider its feasibility in the United States and elsewhere.”

The Pipeline, Volume 2, Issue 2, September-02, A quarterly publication of the National Urban Agriculture Council, by John P. MacHarg, General Manager Energy Recovery, Inc.

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**ERI announces new management and changes to handle rapid company growth.**

ERI announces new management and changes to handle rapid company growth. GG Pique has taken over as company President with 20 plus years industry experience in all aspects of management and sales of water treatment equipment. C. Peter Darby has been elected to The Chairman of the Board to bring his proven leadership record, as founder of Codeline Pressure Vessels, to help steer ERI through a rapid and challenging growth cycle. And John MacHarg has moved into the General Management position focusing on operations, engineering and product development.

ERI News, September-02

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**“...you will never have any operational problems and the most energy savings you can ever imagine.”**

“Our largest two operations, St. Maarten, 15,000 m<sup>3</sup>/day and Antigua, 10,000 m<sup>3</sup>/day have the PX units operating in parallel. We have five and six units in parallel. As long as you follow the instructions with respect to, more or less, equal flow over each PX unit you will never have any operational problems and the most energy savings you can ever imagine. We also have smaller plants operating with the PX unit for over two years now and are very content with the performance and the savings. We recently ordered two PX units of the latest, largest flow, design for St. Maarten.”

Willem Chr. Barendsen, Vivendi Enerserve, August 16, 2002

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**“...2.08 kW-hr/m<sup>3</sup>...”**

“...The plant is a 150,000 GPD (568 m<sup>3</sup>/day), with two PX-90’s, and a Wheatley T100-4 positive displacement high pressure pump.”

“...We did a factory test of the unit here, and the energy consumption was verified at 7.9 kWh/Kgal (2.08 kWh/m<sup>3</sup>) on 51,000 micro-mho simulated seawater. This was a no-BS number based on measurement of the amps drawn and voltage on the HP pump and boost pump. No estimates, assumptions, adjustments, etc. (supply pump is not included in the measurements).”

David Keever, Matrix Desalination, August 15, 2002

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**“Breakthrough Allows Seawater Desalination for Less Than \$0.50/m<sup>3</sup>”**

“In fact, the cost of desalinated water has been dropping dramatically over the last 20 years to the point that it is now less than half of what people are paying in some major urban areas...such as Liverpool (UK) and Mexico City.”

“Most industry engineers agree that by far the most important breakthrough in desalination in the last 10 years is the commercialization of advanced energy recovery devices developed specifically for seawater RO plants.”

“Commercial isobaric chamber devices have been rapidly accepted by the market making possible the desalination of seawater for less than half the energy of what was possible 5 years ago. Commercial devices include the DWEER (Double Work Exchanger Energy Recovery) developed by Desalco and the Pressure Exchanger developed by Energy Recovery, Inc.”

“...you will see why Ashkelon can make and sell desalinated water at a profit for less than \$0.53/m<sup>3</sup> and the Singapore BOOT bidders came in below \$0.50/m<sup>3</sup>...This low cost for desalinated water is opening a large market for irrigation with desalted seawater. Desalinated water is now inexpensive enough that the Mazarron and Cuevas de Manzora SWRO plants in Murcia, Spain and others in Gran Canary use RO permeate to water tomatoes, cucumbers, beans and other winter export crops.”

European Desalination Society New Letter, June-02, by GG Pique, Executive Vice President, Energy Recovery, Inc.

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**“The pressure exchanger technologies are shattering SWRO design barriers ...”**

“The pressure exchanger technologies are shattering SWRO design barriers and yielding seawater power consumption figures that were previously unthinkable. The combination of designing at lower flux and conversion rates and using high flow, higher efficient main high pressure pumps makes it possible today to produce fresh water from sea at around 1.7 kWh/m<sup>3</sup>. This represents a 15% reduction from just one year ago, when ERI published for the first time that water could be produced for 2.0 kWh/m<sup>3</sup>...”

SWRO Energy Recovery Technology Shatters Design Barriers, John P. MacHarg,  
American Membrane Technology Conference, Tampa, June-02

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**“With the assistance of Energy Recovery, Inc., plant output recently increased 60%, from 100,000 gpd to 160,000 gpd, to better serve the island.”**

“Seven Seas Water has completed the upgrade of a mobile SWRO plant at Cruz Bay, St. John, U.S. Virgin Island. With the assistance of Energy Recovery, Inc., plant output recently increased 60%, from 100,000 gpd to 160,000 gpd, to better serve the island.

Seven Seas director of engineering Kent Nielson worked with John MacHarg of ERI to increase SWRO capacity by installing ERI Pressure Exchangers and decreasing energy consumption from 19.7 kWh/1000 gal to 12.7 kWh/1000 gal.

“Upgrade is designed to incorporate a second pressure exchanger to further incase the production to 250,000 gpd, with a corresponding decrease in energy consumption to 7.9 kWh/1000 gal,” said Fredrick Hung, Seven Seas Vice President from their offices in St. Thomas, USVI, last week...”

Water Desalination Report, Vol 38, No. 20, May 16, 2002

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**“Medanich headed strategy, management and sales teams quadrupling PX sales in less than 20 months”**

“Pete Darby returns to desalting industry, joining Energy Recovery, Inc. board of directors to achieve some goals mentioned above...”

Darby founded Advanced Structures in 1976 to develop, manufacture and market RO membrane pressure vessels. Built to ASME standards, Darby and Codeline became RO industry housing leader...Codeline was acquired in 1998 by group that later became part of Pentair...

ERI announced James Medanich, its President and CEO since February 2000, also joined board...Medanich headed strategy, management and sales teams quadrupling PX sales in less than 20 months...”

Water Desalination Report, Vol 38, No. 13, March 28, 2000

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**“What Seawater Energy Recovery System Should I use?”**

“What Seawater Energy Recovery System Should I use? – A Modern Comparative Study was asked and addressed by Irving Moch, Jr. of I. Moch & Associates and Chip Harris of Advanced Membrane Systems at the IDA World Congress in Bahrain this week. On equivalent basis, they matched Pelton Wheel (Calder Pressure Systems), turbocharger (Fluid Equipment Development Co. and Pump Engineering), Francis turbine, Pressure Exchanger (Energy Recovery, Inc.) and work exchanger (Desalco) in 6 typical plants that might be globally installed, with outputs of 300 m<sup>3</sup>/day, 1000 m<sup>3</sup>/day, and 6000 m<sup>3</sup>/day...

Case	1	2	3	4	5	6
Production, m <sup>3</sup> /train	300	300	1000	1000	6000	6000
Recovery, %	45	35	45	35	45	35
Fedco turbocharger, kWh/m <sup>3</sup>	3.25	3.92	3.57	4.29	XXX	XXX
Francis turbine, Kwh/m <sup>3</sup>	XXX	XXX	4.30	4.73	3.22	3.59
Calder Pelton Wheel, kWh/m <sup>3</sup>	2.97	3.35	3.68	4.26	3.04	3.34
ERI PX, kWh/m <sup>3</sup>	2.51	2.67	2.44	2.59	2.61	2.74
Pump Eng. Turbo, kWh/m <sup>3</sup>	3.44	4.43	3.76	4.55	3.11	3.69
Desalco work exchanger, kWh/m <sup>3</sup>	XXX	XXX	2.53	2.70	2.60	2.70

Moch and Harris found from the information in the table above that the ERI PX and Desalco DWEER work exchanger use less energy than other devices, stemming from the differences in the amount of fluid pressurized. Exchanger systems pressurize only the amount of permeate produced, where other devices pressurize the total feed water delivered to the RO membranes, permeate plus brine...

Today, the energy recovery technology edge generally favors the low flow exchangers.”

(1) What Seawater Energy Recovery System Should I Use? – A Modern Comparative Study by Irving Moch, Jr. of I. Moch and Associates and Chip Harris of Advanced Membrane Systems, IDA World Congress in Bahrain 2002.

(2) Water Desalination Report, Vol 38, No. 11, March 14, 2002

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**“Energy Recovery, Inc. Pressure Exchangers are helping new BOO...”**

“Energy Recovery, Inc. Pressure Exchangers are helping new BOO desalting Plant for Coraya Beach Resort in Marsa Lam, Egypt produce quality drinking water at a minimum cost...

“Thanks to Waterworks’ use of the Pressure Exchanger in their desalination system, their plant consumes only 2.9 kWh/m<sup>3</sup> of permeate,” Cameron said. Waterworks Vice President of Marketing, Swami Tanjore also said company’s plant is first of its kind in Egypt, stimulating “significant interest and attention in the Pressure Exchanger technology...”

For more info from Tanjore Tel: 403-289-3147, e-mail: [waterworks@waterworks.ca](mailto:waterworks@waterworks.ca).”

Water Desalination Report, Vol. 38, No. 8, February 21, 2002

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**“And that is fantastic,” said Bill Blansett, President of BVB.**

“Yet another retrofit of SWRO system with Energy Recovery, Inc. Pressure Exchangers. This time it’s BVB Corporation using PX technology to replace original Pelton device increasing system capacity at undisclosed Caribbean location from 275 m<sup>3</sup>/day to 790 m<sup>3</sup>/day...”

“And that is fantastic,” said Bill Blansett, President of BVB.

Onsite for start-up, ERI Executive Vice President G.G. Pique said after only half-day of testing and final adjustments in January that the plant was operating at peak performance. This shows how easy the PX is to operate, ERI said, while applauding designers, operators and crew of BVB and their customer for completing the project.”

Water Desalination Report, Vol 38, No. 9, February 28, 2002

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**“Class I devices (pressure exchangers) are more efficient and yield significantly lower SWRO systems power consumption figures”**

Nov/Dec 2001 D&WR, The Evolution of SWRO Energy Recovery Systems by John MacHarg

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**“...plant in Xiao Qingdao, China, has been producing water below 2.2 kWh/m<sup>3</sup>...”**

“One of the benefits of the new PX technology is that the main high-pressure pump flow is approximately equal to the product water flow... The result is that smaller systems can be as much as 25% more efficient than even the largest plants.

Or as company Executive VP G.G. Pique says, “The PX makes SWRO democratic because with the PX a small farmer using the PX and a PD pump can desalinate water more efficiently than the biggest government desalination facility.”

Water Desalination Report, Vol 37, No. 47, November 29, 2001

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**“That is a savings of over 62% from the best we could do in the RO plant with turbo technology...”**

“...Martin Estevez, Club Lanzarote RO plant manager, was of same mind. “We have operated the original Energy Recovery PX units for over 25,500 hrs with little maintenance. Having the benefit of this experience, we retrofitted our old plants with these devices. Two months ago, we needed two pumps and motors consuming 100 amps to produce 250 m<sup>3</sup>/day. Now with the PX we can produce 510 m<sup>3</sup>/day with a single pump drawing 78 amps. That is a savings of over 62% from the best we could do in the RO plant with turbo technology and a power reduction of over 61% from the original design, including the beach well pumps. By eliminating one high pressure pump we also expect our pump maintenance to be reduced by at least half.”

Water Desalination Report, Vol 37, No. 40, October 11, 2001

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**“The plant is the new benchmark. This is probably the desalination plant with the lowest energy consumption in all of Spain, said Domingo Ponce...”**

“Covering 16 year historical progression, Club Lanzarote SWRO plant at Playa Blanca, Canary Islands, had remarkable retrofit with Energy Recovery, Inc. Pressure Exchanger device reducing energy consumption from 6.7 kWh/m<sup>3</sup> to 2.64 kWh/m<sup>3</sup>....

Club Lanzarote in 1997 installed container-mounted plant including first commercial application of PX Pressure Exchanger...

Encouraged by reliability of the Pressure Exchanger and low energy usage, Club Lanzarote in February 2001 contracted with DPG Canarias to do an expansion retrofit...with new PX technology...

Upgraded plant started up in July and has over 890 hrs...and total energy consumption including beach well pumps of less than 2.64 kWh/m<sup>3</sup> product...

“The plant is the new benchmark. This is probably the desalination plant with the lowest energy consumption in all of Spain,” said Domingo Ponce, General Manager, impressed with smooth startup and PX requiring no maintenance...

Water Desalination Report, Vol. 37, No. 40, October 11, 2001

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**“Energy Recovery, Inc. is shipping Pressure Exchangers to sizable SWRO...”**

“Energy Recovery, Inc. is shipping Pressure Exchangers to sizable SWRO existing systems, including 10,000 m<sup>3</sup>/day train at Cyprus Dhekelia plant, 3000 m<sup>3</sup>/day train at

Malta Lapsi plant and similar size train for Vivendi Enerserve in St. Maarten, Netherlands Antilles.”

Confirming shipment this month, GG Pique, veteran membrane desalting engineer now with ERI said, “these applications may help dispel belief that energy savings PX device is limited to smaller facilities. Up to now, the industry had a general perception that the PX is a great energy saving device but applicable mainly to small SWRO plants. These large PX installations are rapidly changing this perception.”

...”At the recent desalination conference in Zaragoza, Spain, the general buzz was that with PX making possible seawater desalination for less than 2.5 kWh/m<sup>3</sup>, the wide spread use of desalinated seawater for irrigation is now economically feasible. Some of us remember how in the age of cellulose acetate and 8-9 membranes driven by Sunflo pumps, you were lucky to desalt brackish water for less than 2.5 kWh/m<sup>3</sup>,” Pique said.”

Water Desalination Report, Vol. 37, No. 26, June 28, 2001

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### **“Breaking barrier”**

“Earlier this year, wanting to show what was possible with new PX technology, ERI...broke the 2.0 kWh/m<sup>3</sup> barrier...”

“We are entering the age when \$1/m<sup>3</sup> desalinated seawater can be a reality in most places. This price level is what people in many places (Cancun, Acapulco, Liverpool) are already paying municipalities for conventionally filtered river water,” said Pique.”

Water Desalination Report, Vol. 37, No. 26, June 28, 2001

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### **“Israel Raises Its Glass to Desalination”**

“But continuing technological innovation has now pushed the price of desalted seawater down to \$2 for a thousand gallons, compared with \$6 a decade ago, with experts forecasting further reductions. Urban consumers in Israel already pay about \$4 per thousand gallons.”

New York Times, Business Section, William A. Orme Jr., June 22, 2001.

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### **“Contracting Deals Now Driving Technology”**

“ A good example of such a technology – which received many compliments at the IDA Singapore conference – is **Energy Recovery Inc’s PX exchanger**. The PX unit uses the principle of positive displacement to transfer the energy in the reject stream

directly to the feed stream. Using this in a test desalination plant, **ERI** has achieved the remarkably low energy consumption of 2.0 kWh/m<sup>3</sup> (7.6kWh/1000 gal).”

“Such is the success of ERI’s technology that the question arises as to whether it is worth devoting any more research time to recovering energy even further.”

May/June 2001 D&WR Editor Robin Wiseman.

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### **“China’s largest SWRO plant commissioned”**

“According to Jianfei Zhang, director of the DCWTT control center, the plant consumes only 2.8kWh/m<sup>3</sup> of electricity through use of a Pressure Exchanger supplied by Energy Recovery Inc.”

May/June 2001 D&WR Industry News

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### **“Future bright for desalination”**

“Speaking at the international Desalination Association conference in Singapore in March, Leon Awerbuch, the conference chairman, said that a figure of \$ 0.5/m<sup>3</sup> for desalinated water in five years time was not very challenging. The current issue of D&WR (May/June 2001) shows that energy costs can be reduced below 2 kWh/m<sup>3</sup> already.” Leon Awerbuch was referring to an article in the issue written by ERI Vice President John MacHarg.

Desalination 2001 Sources Directory D&WR Editor Robin Wiseman

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### **“Challenges in the future”**

“To meet the world wide challenges in water supply, Dawn Kristof, president of the Water & Wastewater Equipment Manufacturers Association in the US, predicts that the winning players in this millennium are likely to be large conglomerates that can supply a equipment and finance packages or small specialized firms with protected technology serving niche markets.”

“The author takes issue with that prediction for several reasons. There are always avenues for highly motivated, smaller organizations to compete with the large conglomerates, by simply doing the job better.”

Desalination 2001 Sources Directory D&WR introduction by Gordon Leitner, Leitner & Associates Inc.

“Either way, ERI has it covered.” – Jim Medanich, President Energy Recovery Inc.

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**“ERI’s PX technology is at least 15% better than any Pelton Wheel system, and 25%to 60% more energy efficient than most SWRO plants operating worldwide.”**

ERI’s GG Pique.

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**“Energy savings in seawater desalination in Malta”**

“Accordingly, a request for information – RFI – was published in the international press in March 2000 explaining the application, the existing plant in Malta, the objectives and the desired results.”

“Four different technologies were on offer a) Pelton wheel b) Pressure Exchangers Type 1 (rotating cylinder) c) Pressure Exchangers Type 2 (moving piston) d) Turbo Chargers.”

“The Turbo charger offered only minor improvement. It was not considered further.”

“Options (b) and (c) operate generally on the same principle. Option (b) however was considered much more advanced and state-of-the-art for the size of plant being considered, and held promise for the future. Option (c) incorporates an elaborate hydraulic control system, which was considered to be superceded by the advanced rotating cylinder technology. Option (b) in particular was very attractive and was marked for adoption. This was thus an ideal situation for application of the new pressure exchanger.”

“Overall results: The environmental benefits of this project are obviously very favorable. The retrofitting of the new technology energy recovery devices will once completed and at full stream, reduce the total energy used for desalination by some 23.2% (excluding product transfer).”

Antoine Riolo, Chief Executive Officer, Water Services Corporation, Malta

European Desalination Newsletter, Welcome to Cyprus, European Conference on Desalination and The Environment: Water Shortage May 28-31.