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Seawater desalination: the strategic choice for Saudi Arabia

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Good morning ladies and gentlemen

Your excellences and distinguished guests.

It is my pleasure to be here, for the first time, attending the European Desalination Society's Conference along with this distinguished gathering of scientific and industrial community in the field of desalination.

At the same time, it is my pleasure to be here in Barcelona; the city rich in history, known for its hospitality and famous for many things; including football.

Hard luck to the Barcelona football team for the two consecutive losses. We cannot compromise on its victory in the upcoming third match!!

I also would like to express my gratitude to the organizers of this conference for inviting me to address this esteemed audience.

Ladies and gentlemen

Today marks my 135th day as the governor of the Saudi Arabia's Saline Water Conversion Corporation (SWCC).

On this occasion, I would like to assure you that the Saudi Arabia's Saline Water Conversion Corporation has been and remains keen on maintaining its active and continuous participation in such international forums.

On the first day of my appointment, my son "Mohammad", asked me: "Dad, why the government of Saudi Arabia cares about water and why had they established multiple high-level governmental agencies?" I replied: "Son, the reasons are multiple. Most people think the establishment of these agencies is solely meant to meet the water needs of the people of Saudi Arabia. The objectives, however, go beyond this. When it comes to water, our rich values and beliefs are our drivers towards a limitless journey! We all recall the well-known story from our history: the thirsty travelling man who, upon coming across a water well, descended into it, quenched his thirst and then climbed out. On his exit, the man saw a badly thirsty dog which was licking the sand from thirst. He said to himself: "This dog is suffering from the same thirst that had afflicted me. Having no means to fetch water out of the well other than his shoes, the man went down the well, filled his shoes with water and, grabbing his shoes with his teeth, climbed out of the well and placed the water before the poor dog who hastened to relieve its thirst. The morale of this story: we need to join hands to meet the needs for adequate water for, not only mankind but, all living beings on earth."

I also told my son that water is one of the earliest and most valuable making of the creator of the universe, Who made water quite stable on earth for the use of human beings. Water is the only substance that is stable in all of its triplet phases: Solid (ice), Liquid (water) and Gaseous (vapors). There are many other peculiarities of water such as its specific fusion and latent heat values, as well as the density and thermal insulation characteristic of its solid phase. Humans have utilized these unique properties of water to their advantage and turned salty unusable water into drinkable water.

Not only do human beings seek to understand the secrets of water, but they also learn about and imitate occurrences in nature to find out creative solutions for fresh water shortage. And as the late professor of desalination, Robert Silver, puts it, "Earth is the largest distillation unit." The increase in demand for fresh water have necessitated and forced all countries in the world, especially those in arid regions, to embark on

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ambitious plans, adopt and implement policies to achieve self-sufficiency in water production.

Though we live on a planet with abundant amounts of water, only a fraction of a 10,000 of these water resources is fresh water available for human consumption. Today more than 70% of the world population is without clean water. Day by day the gap between the world's demand and supply of fresh water is widening due to the increase in population and the exponential growth of industries. The efforts by the whole world notwithstanding, the gap between demand and supply of fresh water persists, a situation that castes dark shadows on the prospects of the brighter future promised by the advancement in science and technology.

The Middle East, which is mostly an arid region, is not exempt from this problem. In fact, today, more than 50% of the world's seawater desalination plants are located in the Middle East, and in particular in the Arabian Gulf. The global desalination capacity in this region grew from few thousands to more than 70 million cubic meters per day during the last five decades alone."

My son Mohammad added: "If water desalination is so vital to all of us, what have the people and the government of Saudi Arabia done for it?" I said: "Saudi Arabia's history of water desalination is very rich. It goes back to the early 1900s when a passing ship hit the coral reef of the kingdom's west coast not far away from the city of Jeddah. Guess what was salvaged from the wrecked ship? A tiny coal-fired water distillation unit of a capacity of 300 cubic meters of fresh distilled water per day! To operate and maintain the salvaged distillation unit, the people of the city of Jeddah formed an "NGO" to oversee the operation of the distillation unit. At the end of its lifetime (which lasted for 20 years), and due to the limited supply of coal fuel, the Jeddans decided to use wood as an alternative source of fuel. Unfortunately, and by dint of a tragic incident, the entire distillation unit caught fire and burned to the ground. Subsequently, our country's founder, the late King Abdulaziz, ordered the importation of two distillation plants of similar capacity in total (300 cubic meters per day) to relieve the problem of water shortage and to cater to the needs of Hajj pilgrims. Since then, much attention and efforts have been geared toward solving water shortage and fulfilling the water needs of the country's populace."

My son remarked: "I can tell that the story does not end there. I wish you would tell me more about the agency you are currently leading?" I said: "As early as 1974, a royal decree established the Saline Water Conversion Corporation (SWCC) as a governmental organization tasked with the following two major undertakings:

- Planning, constructing, operating and maintaining seawater desalination plants and delivering product water to cities, and most importantly.
- Development of seawater desalination technologies.

This necessitated SWCC to set its Vision of, "Pioneering in the Sea Water Desalination" (both production and transmission) and to set its Mission of "Meeting the Kingdom's potable water demand and contributing to the economics and social growth by effective investment in human and physical assets and resources."

To achieve these goals, SWCC executed many water desalination projects. Today, 12 dual-purpose plants and 15 single-purpose plants, are in operation, a total of 27 desalination plants utilizing thermal & membrane technologies, with a total daily production of more than 3.3 million cubic meters per day of desalinated water and over 5 GW of electric capacity. The capacity of SWCC plants is expected to rise to 5.7 million cubic meters per day by 2015. SWCC developed the desalination sector wherein its water production capacities increased by more than 1000 folds in five decades. SWCC provides more than 53% of drinking water supply and about 17% of electricity generation in the Kingdom. Today the Kingdom of Saudi Arabia leads in the production of desalinated water, claiming about 18% of world production.

And if someone asked about the future, the answer is bright and rich as well. At the city of Jeddah alone, SWCC is constructing RO plant of a capacity of 240,000 cubic meters per day. SWCC is also constructing the largest project of its kind in the world: Ras Alkhair on the north-east side of Saudi Arabia, with a production capacity of over a million cubic meters of water per day and 2.4 GW of electricity. The second project is under evaluation at Yanbu in the west coast with additional water production capacity of 550,000 cubic meters per day and 2.5 GW of electricity. The total cost of the last two projects alone amount to over $11 billion. In addition to these projects, SWCC has collaborated with Doosan Heavy Industries to build the largest MED unit in the world with a capacity of 68,130 cubic meters per day. Moreover, SWCC has executed 14 water transmission systems of more than 4,400 km of pipelines of diameters ranging from 300 to 2000 mm allowing the transmission of desalinated water from the production sites to the interiors of the country."

Ladies and gentlemen

Here I would like to highlight further future steps taken by SWCC, focusing on the main features of the

distinguished role SWCC is playing in developing and localizing desalination technologies.

SWCC believes in the importance of scientific research as the basis of industrial development in all industries. Therefore, SWCC established a specialized research institute: the Saline Water Desalination Research Institute, to conduct research studies in different fields of desalination, and works toward developing and nationalizing desalination techniques. The institute also provides its research services to companies, organizations and desalination plants at the national and international levels.

The Saline Water Desalination Research Institute participates effectively in the development of desalination technologies worldwide. It's invention of a new approach to pre-treat seawater using nano-filtration (NF) prior to being pumped to conventional desalination plants, by way of both thermal and/or reverse osmosis, is an example of the work our institute is doing.

Extensive studies to explore the possibilities of the application of Nano-filtration pretreatment to MSF processes on both di-hybrid NF/MSF and tri-hybrid NF/RO/MSF desalination configurations were carried out.

With regard to the application of NF pretreatment to MED, SWCC built an MED pilot plant in the Saline Water Desalination Research Institute, to operate the top brine temperature up to 125˚C, instead of the 65˚C currently in use in commercial MED desalination plants. Extensive tests were carried out in the pilot plant within the context of a research agreement signed between SWCC, Water Reuse Promotion Center of Japan and SASAKURA Engineering Co. With the grace of Allah, the MED pilot plant successfully operated up to top brine temperature of 125˚C without scale formation or experiencing any other operational problems.

Ladies and gentlemen

The research partnership between SWCC's R&D institute and the National and International Scientific Organizations focuses on developing advancement in desalination technologies and reducing water production cost. During the last couple of years, SWCC signed a number of research agreements and memorandum of scientific understanding with a number of national and international organizations.

Esteemed audience

The innovative research carried out by SWCC's R&D institute led to the registration of many patents and the winning of several international and national awards in the field of seawater desalination.

Ladies and gentlemen

We are all aware that the progress in desalination industry is inevitably bound to generate collateral harm to the environment. This awareness should prompt us to do all that is in our power to preserve our environment. We should see to it that while solving our problems, we must not create other ones. From the outset, SWCC has paid significant attention to the environment. The desalination plants were designed in such a way that they take care of environmental issues. A number of research projects carried out by SWCC's R&D institute reflect this environmental awareness and concern. The projects addressed the various environmental issues such as sea and air pollution, brine discharge and minimization of chemicals use, apart from assurance that product water quality conforms to national and international standards.

To tap the resources of renewable energy in desalination is another goal to which SWCC is committed. Recently, SWCC has partnered with Hitachi Zosen to couple Solar Energy (CSP) with MED unit with the ultimate aim of commercializing this technology. In addition, SWCC is actively cooperating with King Abdulaziz City for Science and Technology (KACST) in Saudi Arabia to construct an RO plant, operated by a 10 MW PV solar system, to produce 30,000 cubic meters of fresh water per day.

On the local front, SWCC also established a training center to develop human resources locally. This training center has all the necessary facilities to train personnel in all technical fields such as operation, instrumentation, electrical and mechanical maintenance, etc. Since its inception, the training center has trained more than 8,500 SWCC personnel in the technical, engineering and IT fields. Training programs are being conducted in collaboration with universities, training institutes and specialized organizations at various venues both inside and outside the Kingdom to improve the employees' skills and capabilities. A large number of youngsters have been recruited and given adequate training to qualify them for sophisticated job requirements.

Before wrapping up the draft of this speech, my son Mohammad glanced over the draft, and asked: "Dad, you have briefed the audience on the achievements of your predecessors. Given your background in R&D, renewable energy, energy conservation, and environmental protection, what will your inputs be as the new governor of SWCC?" This question from my son reminded me of the huge, multiple challenges I will have to deal with as the governor of SWCC! My answer to the question is: together with our team in SWCC, we will continue the leading work of SWCC. Specifically, we will stretch our R&D capacities. We

will support the efforts being made to find alternative fuel sources. We will conserve our energies through the enhancement of our plants' conversion efficiency. We will continue to preserve our environment. We will empower our human resources. And last but not least, we will enhance our capacity in technology transfer and sharing, through the establishment of the framework of a Learning Organization.

Ladies and gentlemen

What I have mentioned to you so far, were not goals to be executed at a later stage. Instead, they are action plans which we have started executing from day one of my duty as the governor of SWCC. Today, we were able to optimize the efficiency of our Yanbu plant under evaluation from 29% of conversion efficiency to 35%, a measure that is expected to generate savings of more than U$2 billion throughout the lifetime of the project."

Respected audience

Before I leave, allow me to say the following.

The world continues to face water shortage, and desalination is the strategic solution to the world's problem of water shortage. Therefore, all of the International Organizations and Institutions, including all the desalination industrialists, technologists and scientists, should join hands to make desalinated water available at an affordable cost. It is through the true and sincere collaboration and cooperation between us, that new heights in the field of desalination can be conquered, so that clean and safe water will be available throughout the world for human consumption.

I personally believe that we as scientists are able to find a common ground when it comes to water.

I personally believe also, that scientific and technological advances in the field of desalination should place equal weight on the development of the already established processes as well as on the development of new promising systems and processes for the future. This two-way approach could bring quick solutions and improve the established processes, and the promising system development could possibly make break-through, in the longer term, achieve milestones in the desalination industry.

Finally, I believe that this forum, which brings together a group of highly competent delegates from all over the world, will witness active, profound deliberations and exchange of ideas, which will hopefully take water & desalination industry many steps ahead, thus providing relief, by way of affordable and environmentally friendly solutions, to water-starved nations and bringing the desalination industry closer to achieving its set goals.

Once again I would like to thank you for your attention. I also would like to re-express my deep appreciation of the sincere efforts of the organizers of this conference. I should also not forget to extend my best wishes for the Barcelona football team.

I wish this conference a great success.

I also hope that my son, Mohammad, who has joined me to this conference, will witness a glorious and a bright future for our desalination industries.

Thank you.