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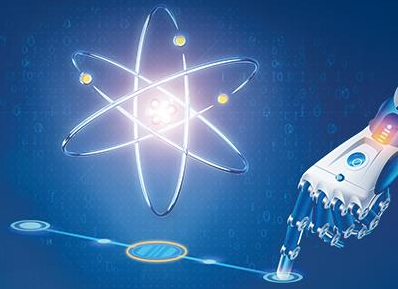

SMRs Deployment for Seawater Desalination in Jordan

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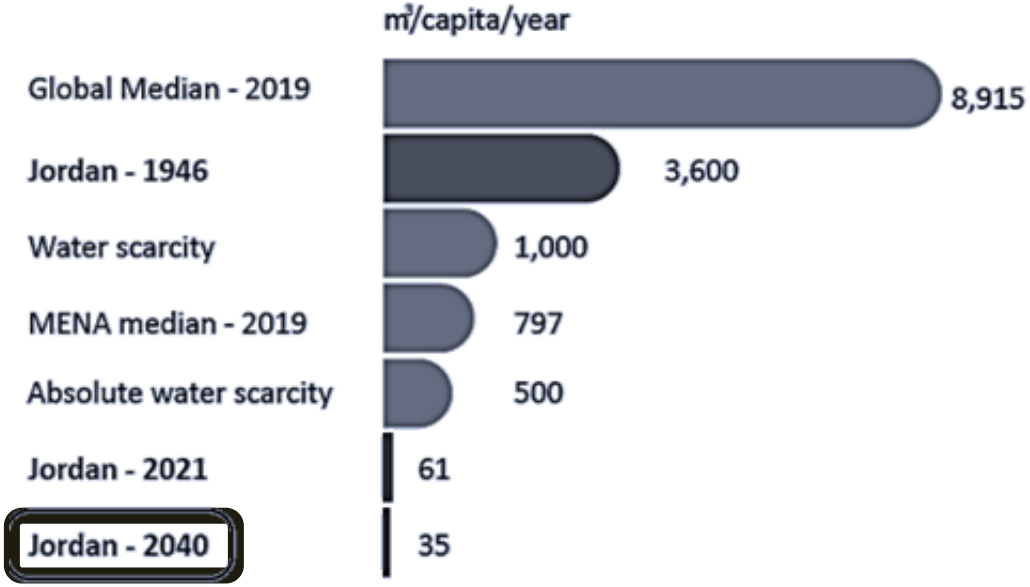
2023

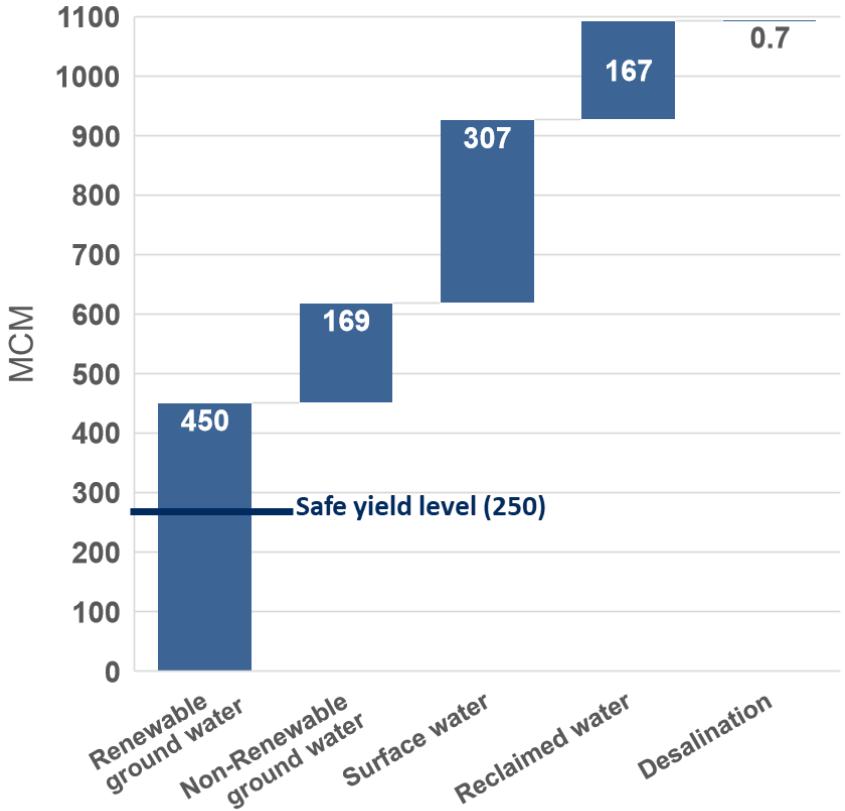
Jordan's Water Situation



Renewable Fresh Water Resources Per Capita

Jordan's population is expected to grow from 11 million in 2021 to 16.8 million by 2040

Current Water Supplies



Severe over-pumping of ground water

13 dams provide 280 MCM of the available surface water

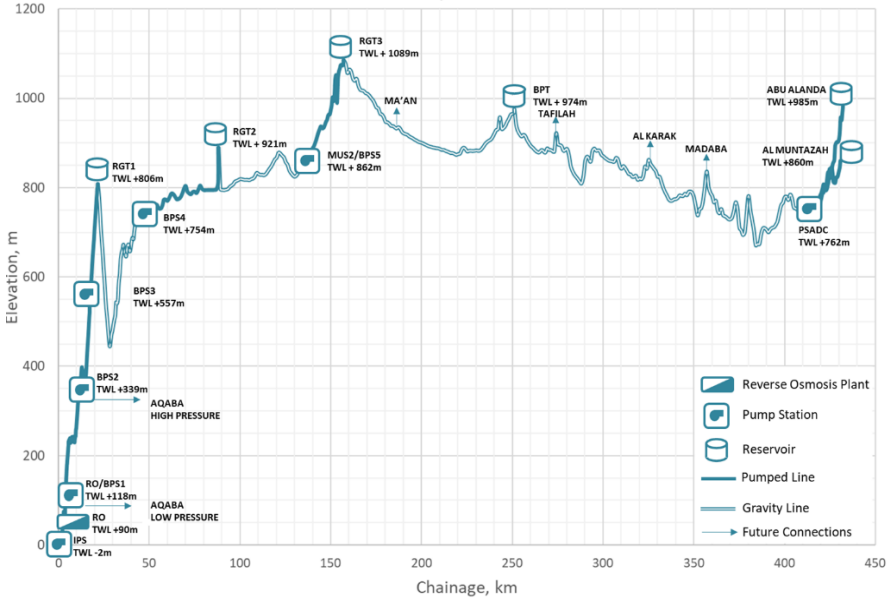
31 wastewater treatment plants

- 90% of the reclaimed water is used for **irrigation**

The most important and vital supply of renewable water will be secured through **seawater desalination.**

National Desalination and Conveyance (NDC) Project

- **300 MCM/year** will be desalinated from the Red Sea in **Aqaba** and then pumped **450 km** to **Amman** with elevation difference of over **1100 m**.
- The average power demand of the project is around **310 MWe**.



1. Electricity cost is the most dominant factor for freshwater cost pumped to Amman (**52% of the total cost**).

2. The desalination and the conveyance components of the project should operate non-stop.
   - **Intermittent energy sources will not work.**

3. Reliable, base-load, and cheap energy source is important for the success of the project and fulfilling future water demands.

Advantages of Nuclear Desalination

1

Providing base-load electricity generation

- A prerequisite for the success of the NDC Project

2

Clean and relativity cheap source of electricity

- Enhances economic feasibility of the NDC Project
- Sustainable development and de-carbonization

3

Long operational lifetime of 60+ years

- Stable electricity prices

Jordan's Requirements for NPPs

- Low capital cost and initial investment
- Low cooling water requirements
- Compatible with the small electricity grid
- Deployable post 2030:
  - Increase power demand from water desalination and conveyance
  - Decommissioning of several conventional and renewable power stations
  - Expiration of natural gas import agreements
- Scalable to match the gradual increase in electricity demand
- Transportable to inland sites
  - Heaviest component weight limitation due to seaport capacity and existing road infrastructure

Special Features of SMRs

1

Incremental Development (Scalability)

- Small size and modularity
- Continuously matches the expected increase in power demand
- Ease of managing capital investments

2

Lower Requirements for Cooling Water (~ 5 MCM/year)

- Flexibility for siting and distributed siting
- Possibility of using non-conventional water sources (treated water)

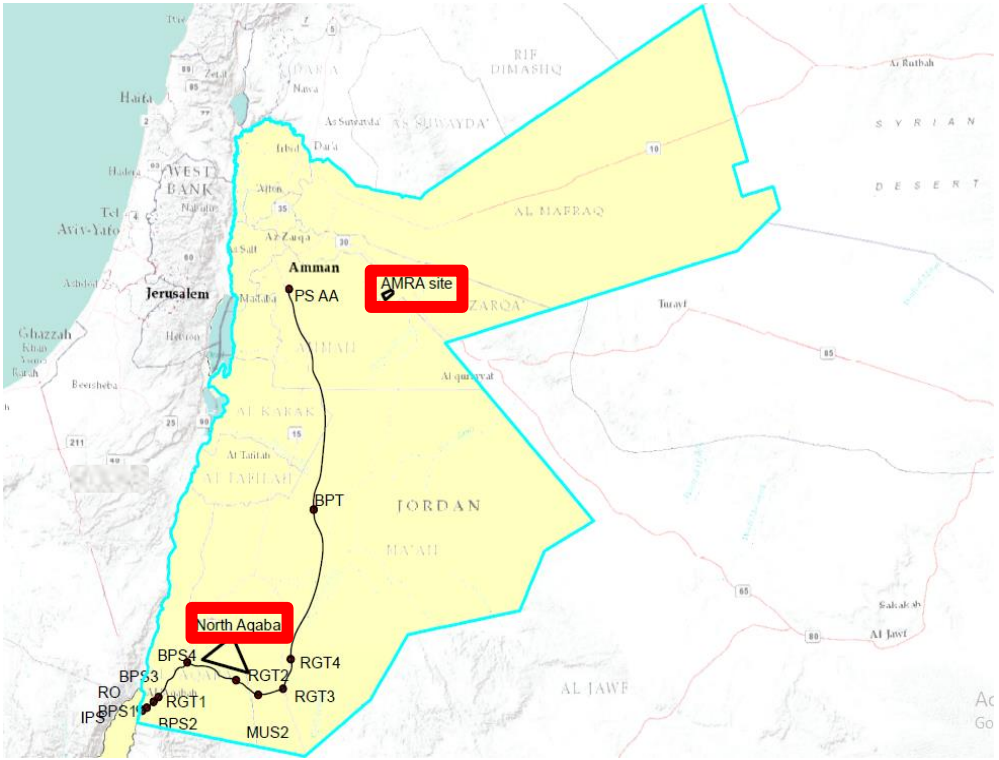
3

Increased simplicity and economies of production

- Lower capital cost and shorter construction time

Integration of SMRs with NDC Project

- **CountryWide Survey** has been performed.
- **Site selection** studies have been completed for Amra Site.
- **Water cooling** studies have been performed.



Potential Configurations of the Project

SMR location	Desalination plant location	Desalination technology
Aqaba North Site	Red Sea	Reverse Osmosis
		Thermal
Amra Site	Amra site (**underground aquifers**)	Reverse Osmosis
		Thermal

- Factors to be considered:
  - Siting limitations such as high seismicity
  - Securing water for reactor cooling
  - Electricity transmission losses

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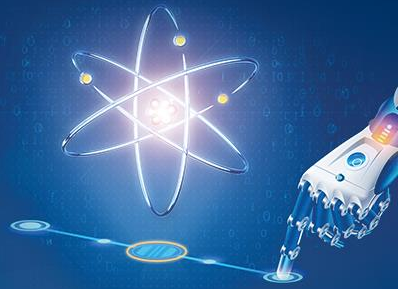

Thank you

2023