

# Design & Simulation of a Nuclear Power Plant (NPP) with a Pressurized Water Reactor (PWR) Using aspen HYSYS

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## Goals:



Design a 609 MW nuclear plant



Support Saudi vision 2030



Reduce fossil fuel dependence



## PWR:



Zero CO<sub>2</sub> Emissions



High energy density uranium



Proven safety and reliability



## Results:

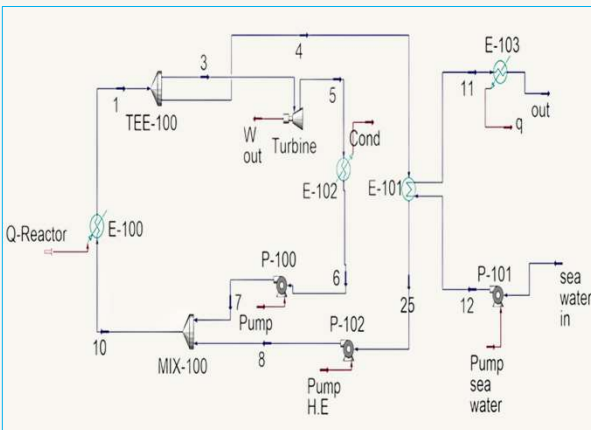


Replace 662,000 ton/year of coal

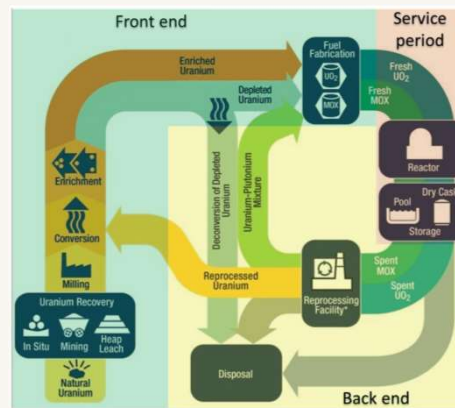


Net power output 609 MW

## Flowsheet



## Fuel Cycle of Uranium



FUEL PELLET



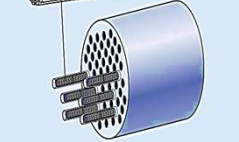
FUEL PENCIL



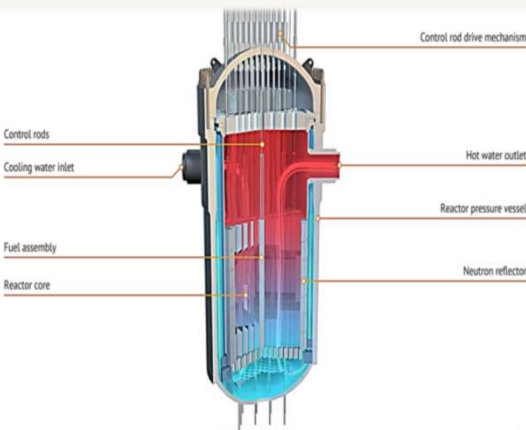
FUEL BUNDLE



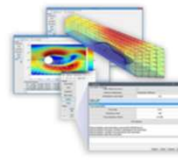
NUCLEAR REACTOR



## Core of Pressurized Water Reactor (PWR)



Process optimization



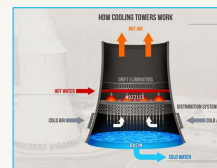
Modeling & simulation tool



**Reactor (PWR)**  
Active Length: 3.66 m  
Fuel Rods: 1,265 units

## Cooling Tower

**Cooling Tower**  
Total Height: 157 m  
Configuration: 16 Cells



**7 AFFORDABLE AND CLEAN ENERGY**



**8 DECENT WORK AND ECONOMIC GROWTH**



**9 INDUSTRIES, INNOVATION AND INFRASTRUCTURE**



**12 RESPONSIBLE CONSUMPTION AND PRODUCTION**



### TYPE OF URANIUM

Natural Uranium  
Enriched Uranium  
Recycled Uranium (MOX Fuel)

### END-USER INDUSTRY

Utility Companies  
Government and Defense  
Healthcare Sector  
Research Institutions



### APPLICATION

Nuclear Power Generation  
Research Reactors  
Medical Applications (Radioisotopes)  
Uranium Mining and Production

### FORM

Uranium Oxide (UO<sub>2</sub>)  
Uranium Hexafluoride (UF<sub>6</sub>)  
Uranium Dioxide (UO<sub>2</sub>)  
Liquid Uranium Solutions

**Levelized Cost of Uranium (U-235):**

**100-150 \$/kg**

Represent the average cost to produce 1 kg of Uranium over the project lifetime, it includes both capital and variable costs.

### Economical Analysis:

