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Siting of Nuclear Power Plant

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The article is devotedthe things to consider when choosing a nuclear power plant construction site for clean electricity generation and how we can make the nuclear power plant more safe than earlier.
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World Energy Needs and Nuclear Power

- The world will need greatly increased energy supply in the future, especially cleanly-generated electricity.
- Electricity demand is increasing twice as fast as overall energy use and is likely to rise by more than two-thirds 2011 to 2035. In 2012, 42% of primary energy used was converted into electricity.
- Nuclear power provides about 11% of the world's electricity, and 21% of electricity in OECD countries.
- All major international reports on energy future suggest an increasing role for nuclear power as an environmentally benign way of producing electricity on a large scale.
- Renewable energy sources such as solar and wind are costly per unit of output and are intermittent but can be helpful at the margin in providing clean power.
- Future applications of Nuclear Power are in the works for off world ventures.

Primary energy and electricity outlook

With the United Nations predicting world population growth from 7.7 billion in 2019 to 8.7 billion by 2035 (Chart.1), demand for energy must increase substantially over that period. Both population growth and increasing standards of living for many people in developing countries will cause strong growth in energy demand, as outlined above. Over 70% of the increased energy demand is from developing countries, led by China and India – China overtook the USA as top CO2 emitter in 2007. Superimposed on this, the UN Population Division projects an ongoing trend of urbanization, from 52% in 2011 to 62% in 2035 and reaching 70% worldwide by 2050, enabling world population to stabilize at about 9 billion with better food supply, clean water, sanitation, health, education and communication facilities.

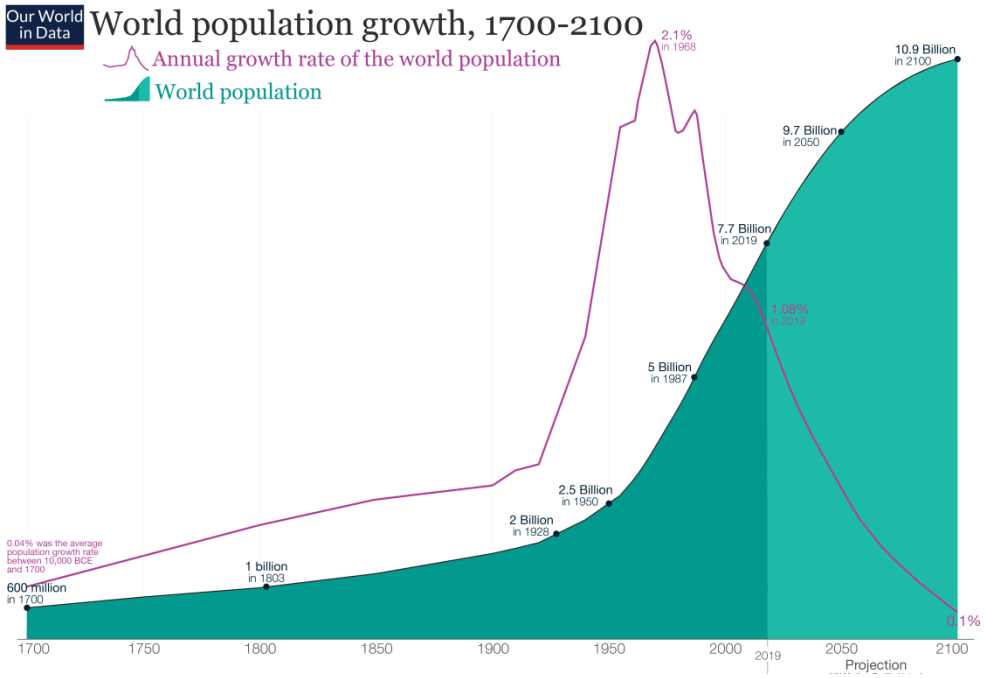

Chart.1. World population growth

Coal is not limited globally, but large amounts need to be moved from where it is plentiful to where it is needed, mainly for power generation. This has both economic and carbon emission implications (apart from actually burning it). Natural gas is abundant and increasingly traded over long distances, with supplies in several countries increasing due to technology enabling access to gas in shale beds. Oil is more limited, in 2012 global production increased to almost 76 million barrels per day (27 billion barrels/yr), and known reserves increased 8% to 1600 billion barrels (Chart.2).

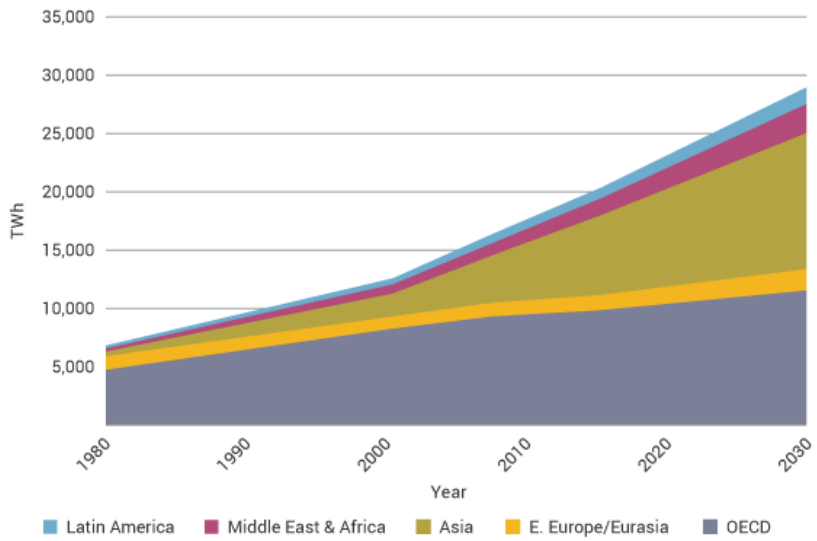

Chart.2. World Electricity consumption by region

Nuclear Power for electricity in published scenarios

Nuclear power generation is an established part of the world's electricity mix providing in 2012 some 11% of world electricity of 22,752 TWh (cf. coal 40.3%, oil 5%, natural gas 22.4%, hydro 16.5% and other 5%). It is especially suitable for large-scale, continuous electricity demand which requires reliability (i.e. base-load), and hence ideally matched to increasing urbanization worldwide.

So we will get acquainted with the first step in the journey of building the nuclear power plant, which is choosing the place

Simply, Nuclear power plants can be built essentially anywhere they can access the large amounts of water needed for cooling; anywhere from 95,000 to 227,000 liters per MWh of power generated. This could be from a river, a lake, or along the coastline.

Siting

Siting is the term used to describe the process to select where a nuclear installation is built and whether the decided location is suitable for it. Siting is one of the important decisions in the early stage of a planned nuclear energy project.

The selection and evaluation of a site suitable for a nuclear installation are crucial processes. They can significantly affect the costs, public acceptance and safety of the installation. Poor planning and lack of knowledge can lead to faulty decision-making and can cause major delays of the project. Siting is a multifaceted process, involving many types of site characteristics. Those characteristics can affect the safety of a nuclear installation over the whole period during which it is planned, situated and operated.

Site characteristics that can affect safety include earthquakes, geotechnical phenomena, volcanism, flooding, meteorological events, human-induced events, dispersion of radioactivity and feasibility of emergency plans. These are also called safety-related characteristics. There are also non-safety-related factors: nuclear security considerations, technology, economics, topography, availability of cooling water, availability of transport and access to the electricity grid.

Investigating site characteristics to ensure safety

The safety of nuclear installations against the characteristics of a site is derived through careful investigation. Basic information on site characteristics is necessary when screening less preferred sites and selecting the most appropriate site. Site investigation activities must start well before such a decision is taken.

A selected site needs to also undergo an in-depth investigation, which is called site evaluation. This is necessary to ultimately confirm that the site is suitable and to define the design basis of external hazards. For every external event, parameters are chosen so they can be used easily in the nuclear installation's design and its safety assessment.

Example of a choosing for location to build a nuclear power plant

El-Dabaa Nuclear Power Plant in Egypt

El Dabaa nuclear power plant site is in close proximity to rail, road and transmission interconnections. It has low regional seismic activity and sufficient cooling water supply (Fig.1).

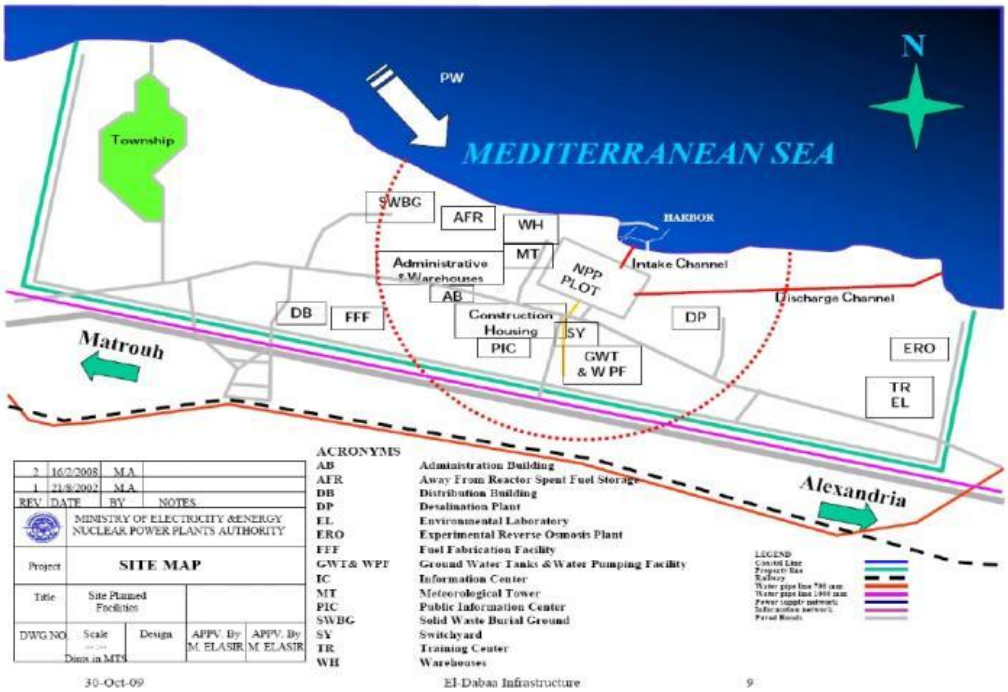

Fig.1. DNPP location

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