

**Kuwait National Nuclear Energy Committee
(KNNEC)**

**Nuclear Energy Applications in the State of
Kuwait**

**December 11-12, 2010
Tunis**



KNNEC

Goals of KNNEC

KNNEC was established by decree 43 of 2009 on March 10, 2009 (headed by HH the Prime Minister and 10 distinguished members):

1. **Develop policies for the peaceful nuclear program.**
2. **Prepare all requirements and needs for hosting peaceful nuclear program.**
3. **Collaborate with owners of well developed and safe nuclear technologies.**
4. **Cooperate with competent organizations to have access to information, studies and research facilities on nuclear energy for peaceful purposes.**
5. **Follow up latest developments and techniques in the field of nuclear energy for peaceful purposes.**
6. **Cooperate with IAEA and follow its guidelines.**



Role of KNNEC

1. Prepare national nuclear program on sound bases
2. Conduct technical studies to serve the national program
3. Build local manpower capacity in nuclear
4. Conduct studies and provide recommendations to KNNEC
5. Utilize international expertise
6. Liaison with countries and relevant organizations
7. Closely work with IAEA and follow its guidelines and milestones



Why Nuclear Energy in Kuwait? (1/2)

- High rate of electricity and water consumption (~ 5% per year).
- Rapid growth of oil/gas consumption for electricity & water production (0.3 Mbl out of 2.8 Mbl in 2008 or 11% out of total production).
- Inevitable rise of oil export prices (currently \$78/bbl)
- Lack of free gas to fuel power stations in Kuwait and reliance on limited associated gas.
- Associated gas depends on the oil production (approx. 1 Bft³/day)



Why Nuclear Energy in Kuwait? (2/2)

- Cap on Kuwait's oil production which is determined by OPEC (2.7 mbp).
- Improvement of NPP technology, safety, prices, and lifetime (60 years).
- High rate of production of greenhouse gases in Kuwait (over 25 tons CO₂ equivalent per capita per year)
- Building indigenous industries, technical services and creation of business opportunities.



KNNEC's Programs

- Consultancy Studies Program.
- Capacity-building for KKNEC Staff Program.
- Communication and Public & External Relations Program.
- Legal and Regulatory Affairs Program.
- Regulatory and Institutional Requirement Program
- Development of National Work Force Program
- National Coordination Program.
- Scientific and Technical Information of Nuclear Energy Program.



Consultancy Studies Program

- Supply/demand energy study in Kuwait.
- Preliminary feasibility study for the nuclear energy program.
- Advanced feasibility study for the nuclear energy program.
- Preliminary nuclear power plants sitting study.
- Advanced nuclear power plants sitting study.
- Energy planning, electrical load modeling and electric grid network (capacity, enforcement and enhancement) analysis studies.
- Preparation of Terms of Reference for power station.
- Review of opportunities in the operation of the station by international operators.



Legal and Regulatory Affairs Program

- Preparation of national legislations.
- Nuclear energy policy development for the country.
- Determine and identify the required international agreements.
- Review of the required agreements.
- Preparation of domestic approval agreements.
- Follow-up approved agreements
- Update the budget estimate for the program.



Regulatory and Institutional Requirement Program

- Diagnosis of organizational needs.
- Establishment of the National Atomic Energy Authority.
- Establishment of monitoring authority for the environment and health.
- Assess the security needs of a project in cooperation with the relevant authorities.



Development of National Work Force Program

- Preparation of missions for engineers and scientists in collaboration with the local University (Kuwait Univ.) and the R&D Institute (KISR).
- Planning for new university program studies in the country.
- Establish training and operational cooperation with relevant organizations.
- Developing professional collaboration with relevant institutions.
- Participate in related regional programs.



International Agreements

Kuwait's Signed International Nuclear Agreements

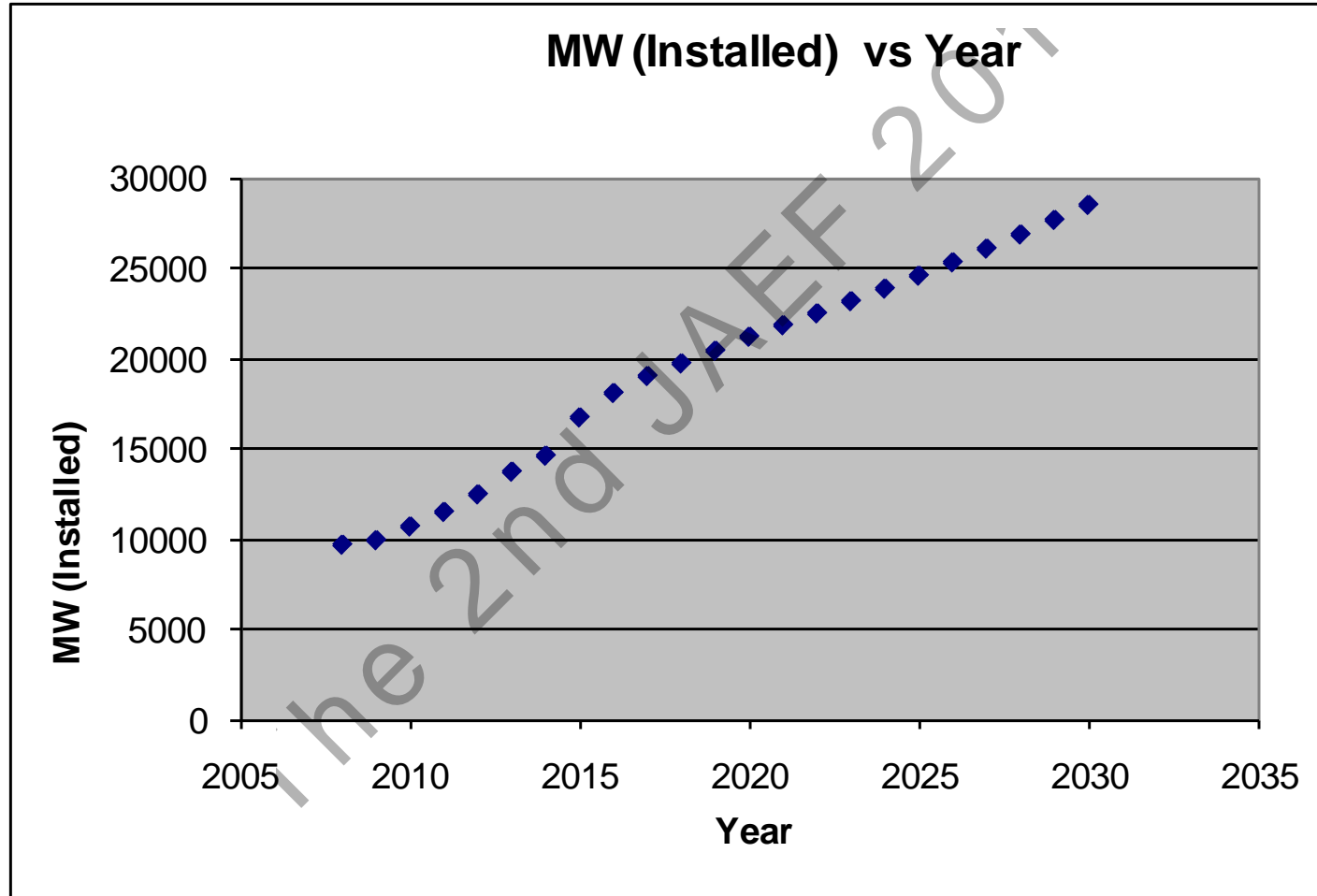
- Nuclear Cooperation Agreement (NCA) with France (Jan 2010)
- Memorandum of Cooperation (MOC) with Jordan (March 2010)
- Memorandum of Cooperation (MOC) with Department of Energy, USA (June 2010)
- Memorandum of Cooperation (MOC) with Japan (September 2010)
- Memorandum of Understanding (MOU) with Russia (September 2010)
- Memorandum of Understanding (MOU) with Korea (December 2010)

Kuwait's Proposed International Nuclear Agreements

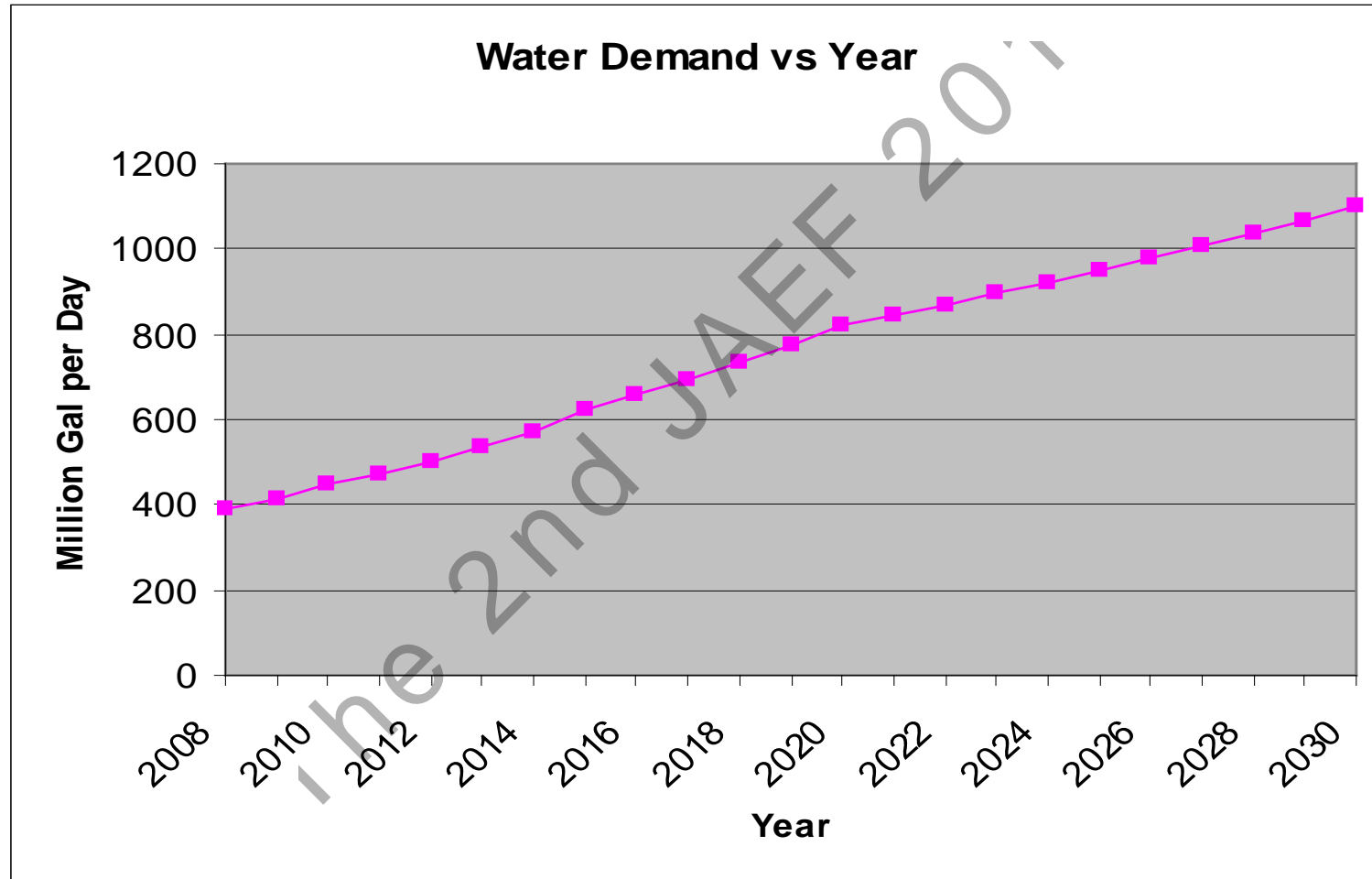
- Memorandum of Cooperation (MOU) with UAE
- Nuclear Cooperation Agreement (NCA) with Russia



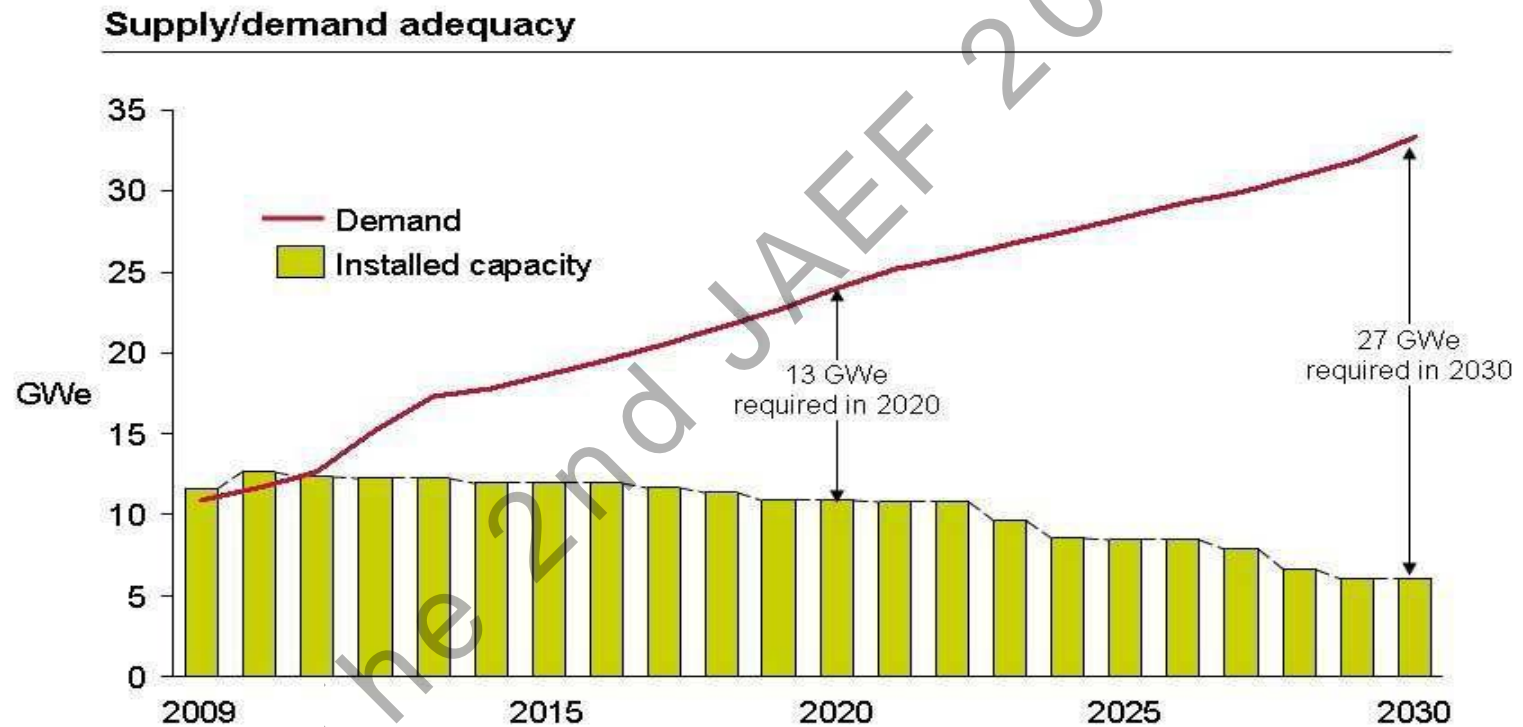
Electricity Demand in Kuwait



Water Demand in Kuwait

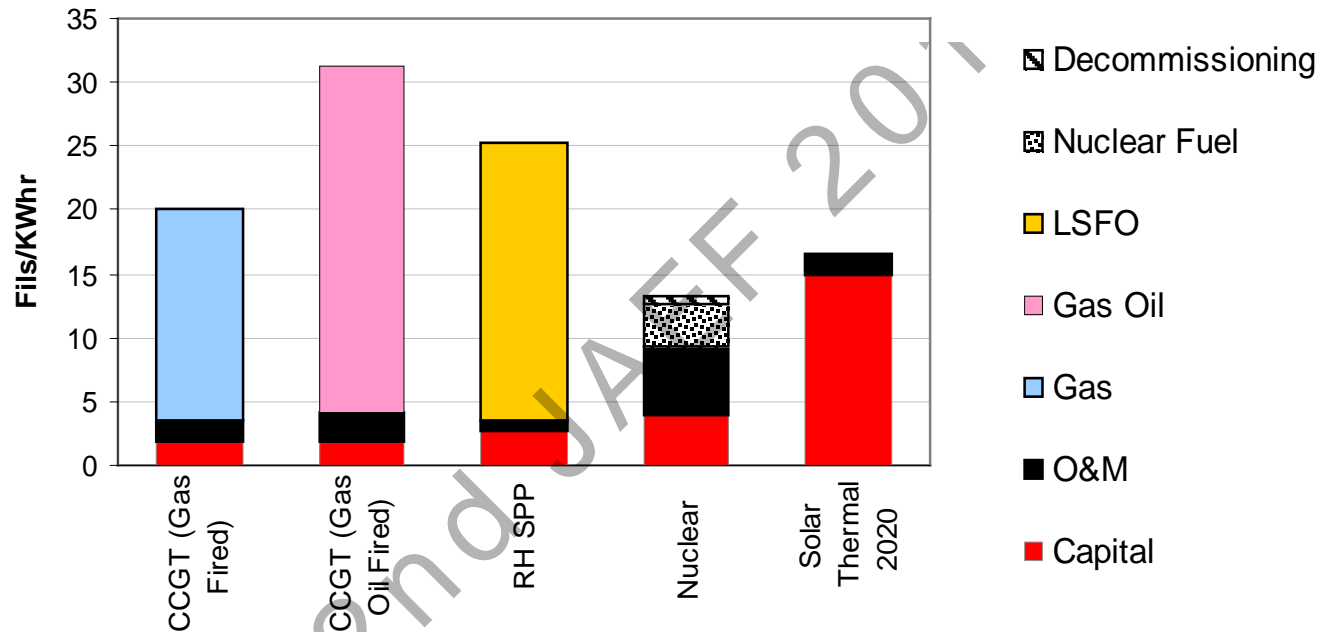


Energy Demand/Supply in Kuwait



Cost Comparison: Kuwait Case

(M Wood 2009)



	Capital KD /KW	O&M KD /KW/y	Life Years	Capacity Factor %	Heat Rate Mj/MWs	Fuel KD/Mbtu	Fils/KWhr	Decommissioning KD/KW	CO ₂ Kg /MWhr
CCGT (Gas)	320	10	25	75	1.83	2.7			350
CCGT (Gas Oil)	320	15	25	75	1.83	4.3			520
RH SPP	700	6	40	75	2.4	2.7			810
Nuclear	1500	40	50	85			3.2	250	
CSP 2020	900	4	30	23					



Consequences of Current Trends

(M Wood 2009)

Item	2010	2020	2030
Peak Load (installed kW/Kuwaiti)	3.9	5.5	4.8
Water (Gallons/Day/Kuwaiti)	210	210	195
CO2 Production (Tons/Year/Capita)*	10	14	15
Fuel Energy as % Export	12	17	20
% High Value Fuels Used	21	32	51
Electricity & Water cost as % GDP	6	9	10



Current Fuel Mix Supply For Electricity & Potable Water Production

Fuel Type	Barrel oil equivalent per day
Imported Gas	15,000
Crude	40,000
Local Gas	85,000
Crude Refined Products	200,000
Total	340,000

(MEW Statistical Year Book, 2009; and I-Tese, 2010)



Challenges of Introducing Nuclear Energy

- Nuclear waste.
- Supply of nuclear fuel.
- Flexibility of government measures.
- Selection of appropriate nuclear power plant technology.
- Development of national work force for the operation of nuclear plant.
- Security of nuclear installations.



KNNEC'S plan of work underway (through October)

Under the preparation of following studies:

- ❖ **Long Term Energy (Power) Planning (with IAEA)**
- ❖ **Preliminary Economic Feasibility of Civil Nuclear Power Plants in Kuwait (with LB &AFNI)**
- ❖ **Site Identification and Selection Study (with LB & AFNI)**
- ❖ **Preparation of Legal Framework and Draft of Comprehensive Nuclear Law (with IAEA/LO and local team from ALFATWA and WALTASHRE.)**
- ❖ **Manpower Development (first step 15 scholarships to USA)**
- ❖ **Public Information (Seminar with IAEA rescheduled to Jan 2011)**
- ❖ **International Cooperation (Bilateral MOU and NCA with France, Russia, Japan, Jordan, UAE, etc...)**
- ❖ **Assurance of Provisions for Nuclear Fuel (Support to INFB joined IFNEC (GNEP)) etc,...**



Road Map to Kuwait's Nuclear Power Program (Second Phase)

- ❑ **Anticipating a likely positive Government decision to commit to the development and introduction of nuclear power .**
- ❖ **Initiated an RFP for preparation of a Roadmap document to address all major infrastructure issues.**
- ❖ **The Roadmap is to be based on the IAEA's Milestone document, adopted to Kuwait environment.**
- ❖ **The Roadmap will spell out in sufficient details the TOR and specify the expected outcome and required deliverables for each study/activity in phase- 2.**



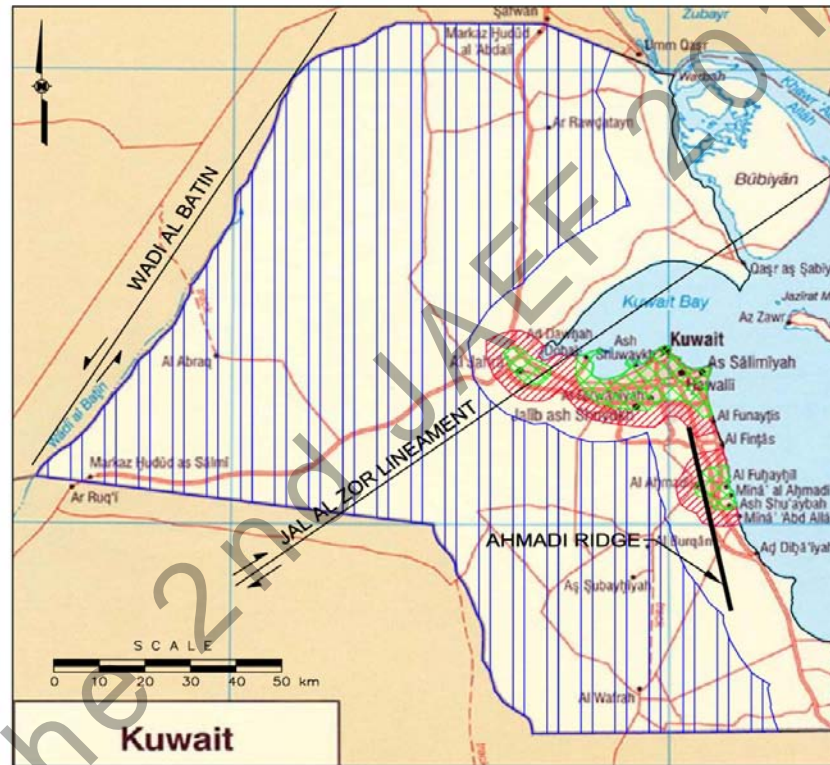
Issues to be addressed in Roadmap






❑ 19 Issues listed in IAEA Milestone document with special emphasis on:

- ❖ National position/policy and international relations and communication plan
- ❖ Nuclear safety and security
- ❖ Program and Project Management and organization (business model)
- ❖ Funding and Financing
- ❖ Legislative Framework and Nuclear Law
- ❖ Safeguards
- ❖ Waste Management
- ❖ Regulatory Framework
- ❖ Manpower development



Kuwait Coastline



-  MAJOR POPULATION CENTERS (POPULATION DISTANCE)
-  4 km BUFFER ZONE FROM MAJOR POPULATION CENTERS (POPULATION DISTANCE)
-  AREA DETERMINED TO BE MORE THAN 15 km FROM MAJOR WATER SOURCE (COOLING WATER AVAILABILITY)
-  STRIKE SLIP FAULT (PLATE BOUNDARIES AND FAULTS)
-  TREND OR ANTICLINE (PLATE BOUNDARIES AND FAULTS)

NOTE—SEISMICITY: MAXIMUM PEAK GROUND ACCELERATION FOR A 10% PROBABILITY OF EXCEEDENCE OVER A 100 YEAR PERIOD IS 0.15g IN THE STATE OF KUWAIT.

