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Challenges Faced by Developing Countries in Nuclear Power Deployment: UAE Approach

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Introduction

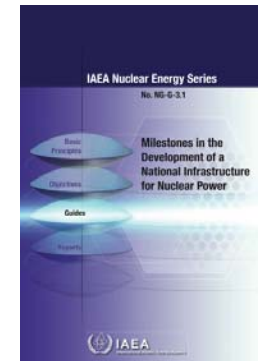
- High interest for the introduction of nuclear power
- Most developing countries lack critical infrastructure required to support nuclear power program deployment.
- The common challenges for the introduction of nuclear are mostly associated with the nature of nuclear energy and its development requirements :
 - Major planning efforts
 - Large capital investment
 - Importance of long term sustainability for safety and commercial considerations
 - High level political decisions and international framework
 - long term commitment
- UAE has adopted and implemented an approach for the evaluation and implementation of peaceful nuclear energy program based on UAE needs, IAEA recommendations and guidance, and international support for the program

IAEA Guidance on infrastructure Requirements

- IAEA “*Milestones in the Development of a National Infrastructure for Nuclear Power*” addresses infrastructure requirements in a phased approach for the introduction of nuclear power.

- National position
- Nuclear safety
- Management
- Legislative framework
- Regulatory framework
- Financing
- Human Resource Development
- Safeguards
- Security and physical protection
- Emergency planning
- Radiation protection
- Nuclear Fuel cycle
- Nuclear waste
- Environmental protection
- Site and supporting facilities
- Industrial involvement
- Procurement
- Electric grid
- Stakeholder involvement

The *Milestones* document identifies “end state” requirements for each phase





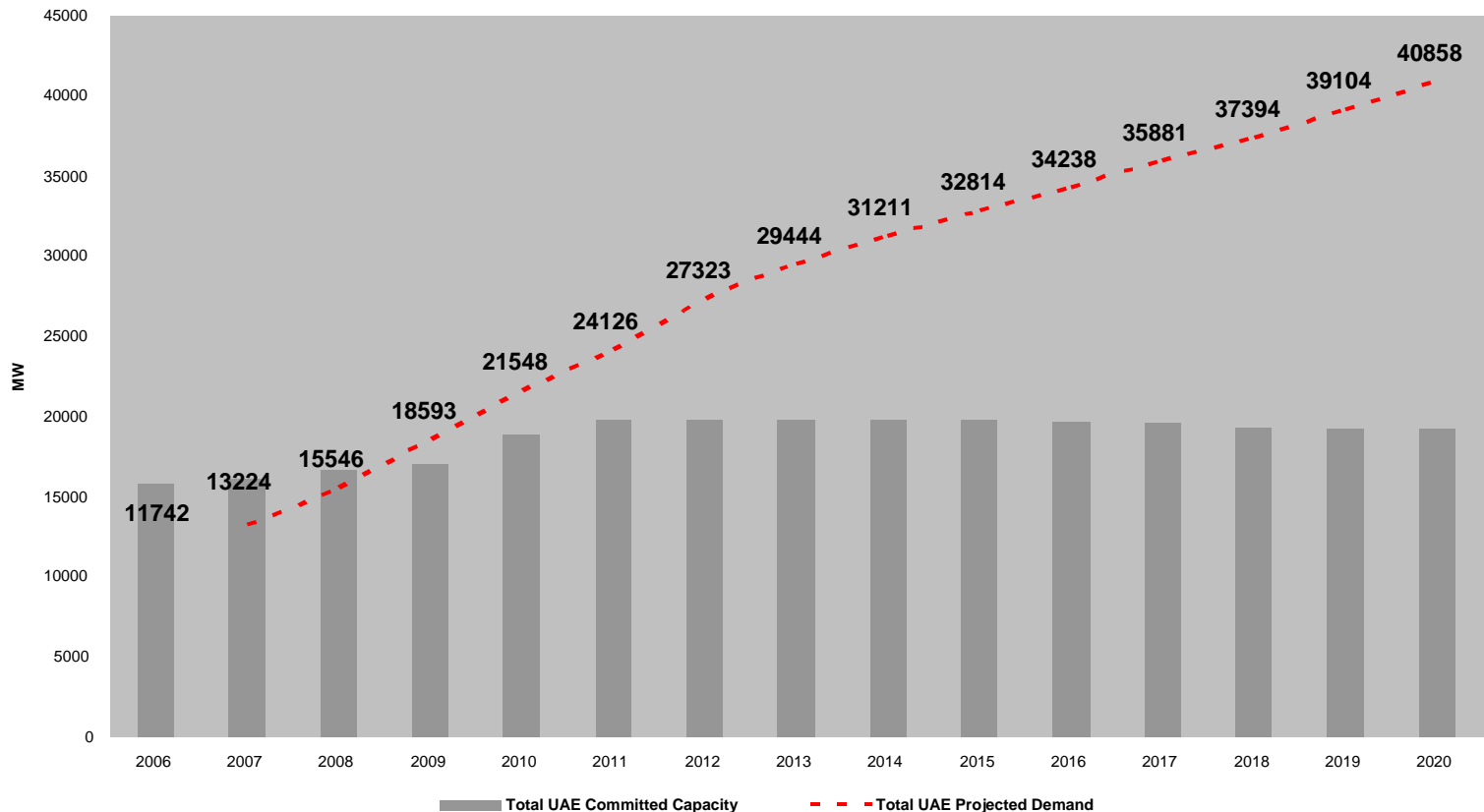
Developing a National Position

- Developing a positive national position introduce nuclear energy program is challenging process in most states :
 - Nuclear Power is a sensitive subject politically
 - Decision making process differs from country to country, a challenging process in most countries.
 - The decision is not a pure political decision ,many factors are involved
 - Availability of advanced energy planning and technical capabilities is essential to develop the national position
- National position :
 - Demonstrates Government support and commitment
 - Safety, security and non-proliferation needs
 - Defines a national strategy and the implementing organization(s)



Developing a National Position : UAE Approach

- Interagency Energy planning committee
- Energy planning studies to determine electricity and water demand , available options and fuel for each option.
- Tremendous projected growth by the year 2020





Developing a National Position : UAE Approach

Energy Demand and Supply Study Results

- Available natural gas volumes will be insufficient to meet future demand
- Reliance on burning liquids will have high economic costs and poor environmental performance
- Utilizing traditional coal-fired plants will negatively affect the environment and the security of supply of the UAE's electricity sector
- Renewable technologies, even if aggressively developed, will meet only a small portion of future demand
- Nuclear power is a proven, environmentally attractive and cost-competitive electricity-generation option which could contribute significantly to a diversified and secure basket of future electricity-generating assets

Developing a National Position : UAE Approach

Formulating UAE Policy

1. Determination that peaceful nuclear energy represents a potentially valuable option for the UAE
 2. Development of guiding principles by UAE Government →
 3. In-depth study of international best practices
 4. Wide consultation process
 5. Formally endorse final policy
- Complete operational transparency
 - Highest standards of non-proliferation
 - Highest standards of safety and security
 - Close cooperation with the IAEA
 - Partnership with governments and firms of responsible nations
 - Long-term sustainability





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Developing National Infrastructure

The long-term objective of the UAE nuclear program is the construction and operation of commercial nuclear power plants performing to world-class safety standards while producing operating results that rival or exceed the best of other worldwide nuclear programs.

Energy
Planning
Study



Nuclear
Policy



Infrastructure
Development



First unit
followed by
sustainable
program



Developing National Infrastructure Plan: UAE Approach

- A *Roadmap* document was designed to translate the milestones of a successful nuclear power program (as identified by the IAEA) into an implementation plan customized to meet the needs of the UAE
 - Evaluate the current infrastructure and capabilities within the UAE
 - Make recommendations to improve and develop new elements where required
 - Evaluate different industrial strategies and report their feasibilities
 - Outline a schedule and set feasible milestones for the UAE program
 - Identify crucial path tasks to be started on an urgent basis
 - Match responsibilities for specific infrastructure requirements to appropriate domestic organizations



Defining a national strategy

- National strategy was defined based on extensive planning and involved all stakeholders addressing the following topics:
 - Defining and Managing the Overall Requirements for a Successful Commercial Nuclear Program
 - Program Schedule
 - Risk and Resources
 - Implementing an Effective Program Organizational Structure
 - Implementing a Comprehensive Network of International Agreements;
 - Implementing a National Legal Framework to Support Nuclear Power;
 - Developing an Effective Nuclear Safety Regulatory Agency
 - Effective Communication
 - Implementing a Rapid and Effective Procurement Strategy
 - Building a National Infrastructure to Support Nuclear Power
 - Selecting the Appropriate Site;
 - Technology Selection
 - Developing the Nuclear Fuel Cycle and Waste Management Strategy.



Developing nuclear safety infrastructure

- Competent Nuclear Safety infrastructure is the corner stone for the successful implementation of nuclear program.
- Challenges include:
 - establishing the appropriate legislation
 - Some difficulties may arise in passing legislations , and associated timeline differs from country to country
 - Ensuring the independence of regulatory entity from implementing entities is challenging process in some countries.
 - A challenge is how to “upgrade” or “replace” the existing safety and regulation framework where exists
- UAE Approach :
 - Amended previous concerned legislations, establish a new law for the applications of peaceful nuclear energy
 - Establish a new nuclear regulatory body and merge previous responsible entities.
 - Safety Regulator is given the power and protection to independently regulate the sector safely.
 - Law defined high level responsibilities of operators , the regulator and other stakeholders.



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Developing Management infrastructure

- Management structure of the program continues to change as the program expands and stakeholder number increases
 - Ex: Moving from NEPIO to fully functioning regulator and implementing organization
- Challenges include:
 - Ensuring all stakeholders plans and progress are aligned throughout all phases of the program ,
 - Defining responsibilities among stakeholders
 - Evaluating unique state ownership options
 - Availability of resources and capabilities to manage large projects
 - Lack of expertise and capabilities in managing large projects and specifically nuclear power plants constructions.
 - Contracting strategy should be defined to meet the requirement, the timeline and states policies.



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Developing Management infrastructure: UAE Approach

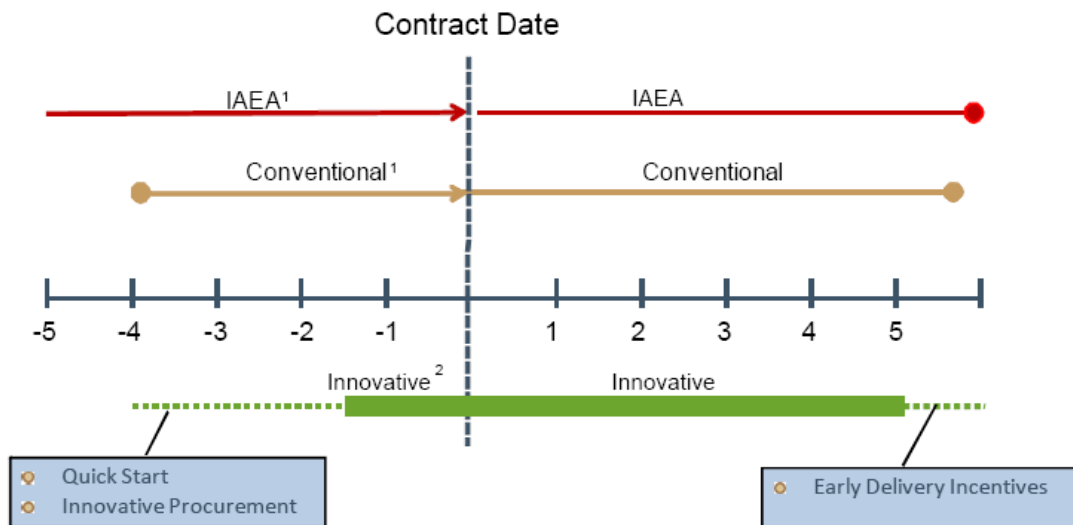
- Based on IAEA guidance and best international practices gleaned from consultations and cooperation programs with established nuclear states:
 - **Nuclear Regulatory Authority**
 - Regulations, licensing, inspections, accounting and control of nuclear material
 - **ENEC**
 - Promotion and development of required infrastructure for nuclear power program in UAE
 - Finance and hold government's equity and operator interests in future nuclear power plants and related facilities in the UAE
 - Innovative contracting strategy
 - Tender is in process for the design, construction and operation of fleet of nuclear power plants.
 - **Other entities are assigned with specific responsibilities(CNIA, Khalifa University)**



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Developing a Procurement Strategy

- Challenge : Procurement strategy to meet state requirements and timeline and viable from vendors point of view.
- UAE Approach: Innovative Procurement strategy to cut conventional procurement time.



- Program objective to safely deploy first plant by 2017
- This implies a first concrete in 2012
- Would represent one of the fastest deployment schedules

¹ Assumes the existence of a competent nuclear procurement organization.

² Assumes the creation of the Intelligent Customer.



Funding and Financing

- Lack of funding and financing options have put major projects on hold in the past.
- Nuclear programs are capital intensive and would require strong Government backing.
- Vendor countries may be interested to support funding nuclear plant constructions in developing countries.
- Available funding from Governments is essential for long term sustainability of the program
- Strategies should be aligned to ensure long term funding for the goal of sustainability of the program
- UAE Approach
 - Government will fully fund development of required infrastructure.
 - Strategies for long term sustainability of the program
 - Opportunities of equity share and foreign participation
 - Decommissioning fund



Site Selection

- UAE Approach:
 - General survey of potential sites has been conducted.
 - Detailed site characterization is underway.
 - A conceptual master plan for infrastructure at candidate sites have been completed
 - Interfaces are established with various UAE agencies and authorities for power, water, roads, ports and the establishment of the construction camps.
 - Plans and drawings are being produced by the agencies along with the detailed engineering for the necessary infrastructure to support construction



Human Resources development

- Availability of sufficient qualified manpower throughout all phases of the program constitutes a major challenge.
- UAE Approach :
 - Personnel with previous skills and experience are being placed in the program
 - Appointment of a Managing Agent
 - Developed staffing plans, relationships with universities world-wide have been, and are continuing to be developed.
 - Nuclear operations staffing model was developed to calculate staffing needs from 2009 until 2022 for the UAE program
 - A plan to develop and maintain the human resources base in organizations for Phase 3 and the operational phase is developed.
 - Plan implementation included establishment of scholar programs and arrangements with universities outside the UAE
 - Vendors are required to participate in implementing training programs as part of contracted scope of work.
 - Initial talent from this strategy will begin entering the resource pipeline in 2012 and increase with time



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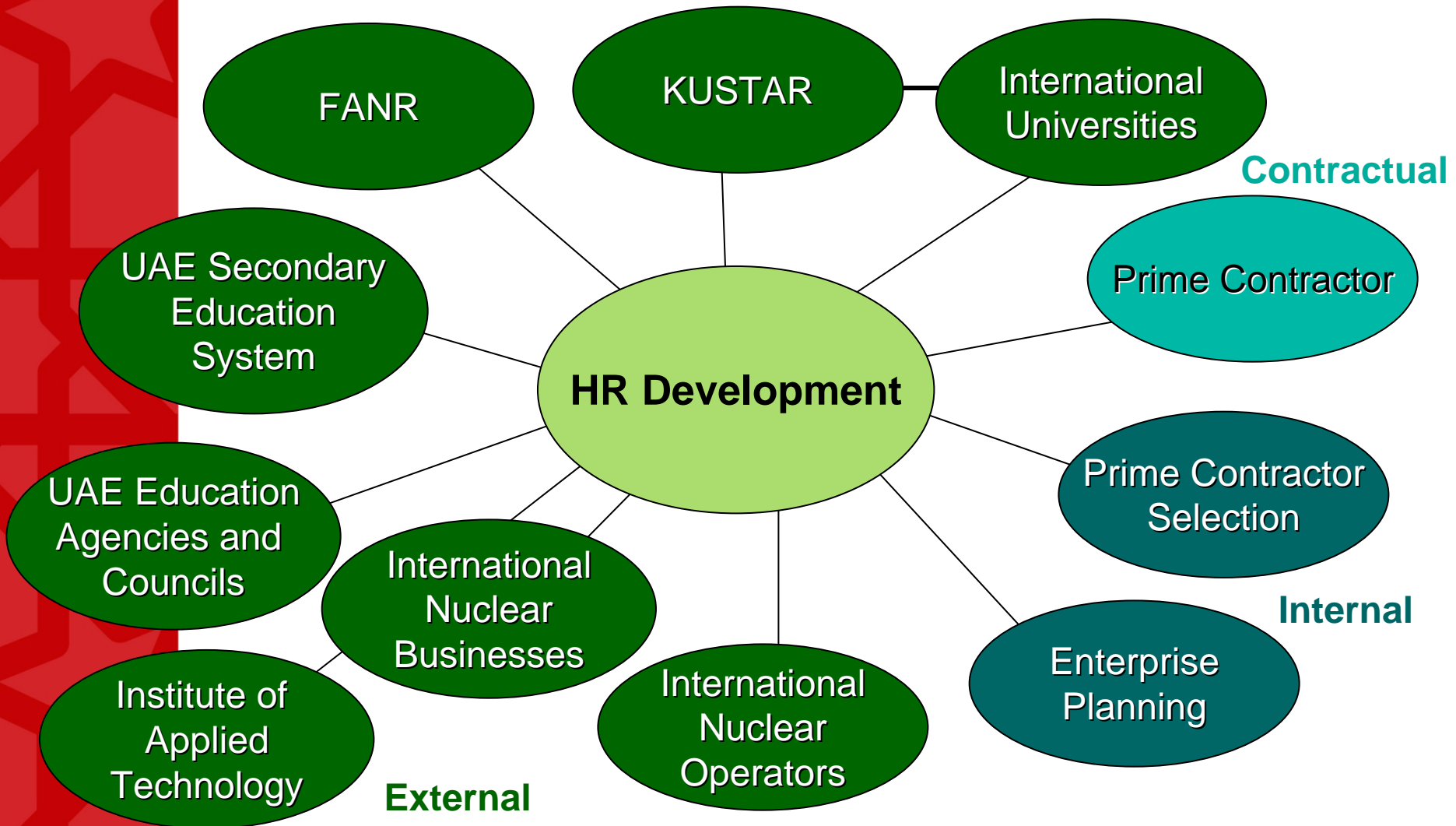
Human Resources Development UAE Approach: Roles & Responsibilities

Organization	Roles and Responsibilities
ENEC Program Office	<ul style="list-style-type: none">▪ Development and implementation all aspects of the Human Resource Development Strategy▪ Implement the recruiting, staffing and talent pipeline aspects of the Human Resource Development Strategy and ensure execution
Abu Dhabi Education Council	<ul style="list-style-type: none">▪ Provide analysis and support to identify UAE educational system capabilities relative to the future human resource requirements
Khalifa University of Science Technology and Research (KUSTAR)	<ul style="list-style-type: none">▪ Sponsor scholarship students and assist with candidate identification and selection▪ Implement agreed upon plans for institutions in the UAE to support the talent pipeline requirements▪ Engage in partnerships with international universities to support the talent pipeline requirements
Institute of Applied Technology (IAT)	<ul style="list-style-type: none">▪ Implement agreed upon plans to support the talent pipeline requirements▪ Provide skilled trade workers, technicians , and BS degree candidates to support the talent pipeline requirements
UAE Education System	<ul style="list-style-type: none">▪ Implement developed programs designed to interest students (primary, preparatory, and secondary) in a career in civil nuclear power



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Human Resources Development UAE Approach: Roles and Responsibilities

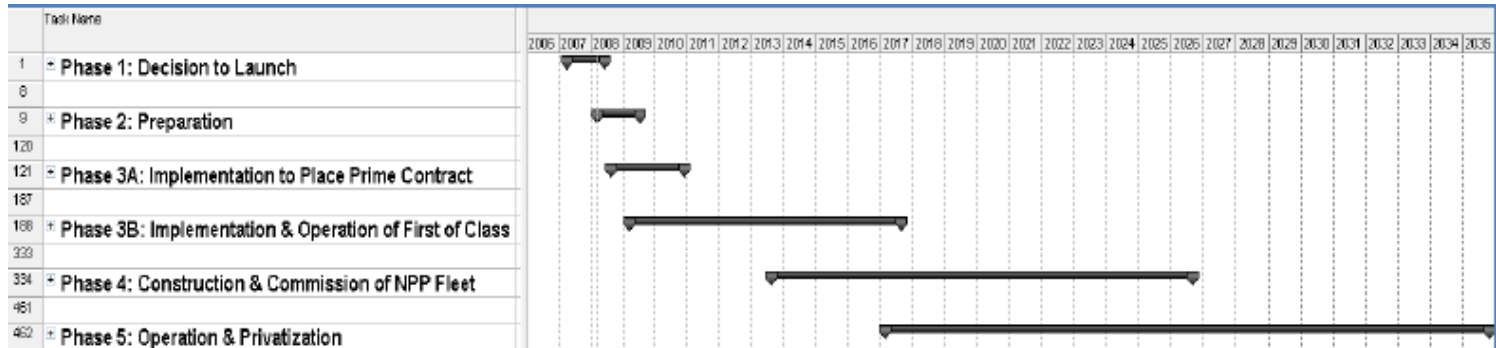




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UAE Overall Program Phases

1. Decision to Launch: Feasibility Study, prepare Roadmap
2. Preparatory phase: program planning, mobilization of organizations and national infrastructure.
- 3A. Implementation: Define project scope, negotiate and place prime contract
- 3B. Construction and Commissioning
4. Operation
5. Decommissioning





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Thank You.