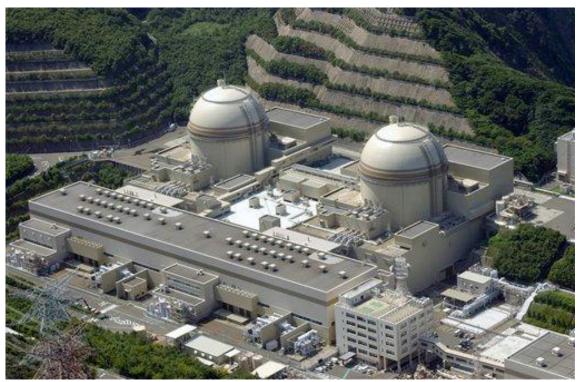
Expert Mission to Iran 8-11.Nov.2015 Local Participation and Technology Transfer

OAM 02.Nov.2015

- BASIC ELEMENTS
- LOCAL PARTICIPATION OVERVIEW & OBJECTIVES
- LOCAL PARTICIPATION MILESTONE 1
- LOCAL PARTICIPATION MILESTONE 2
- LOCAL PARTICIPATION MILESTONE 3
- LOCAL PARTICIPATION REFERENCE CASES
- LOCAL PARTICIPATION EXAMPLES
- TECHNOLOGY TRANSFER

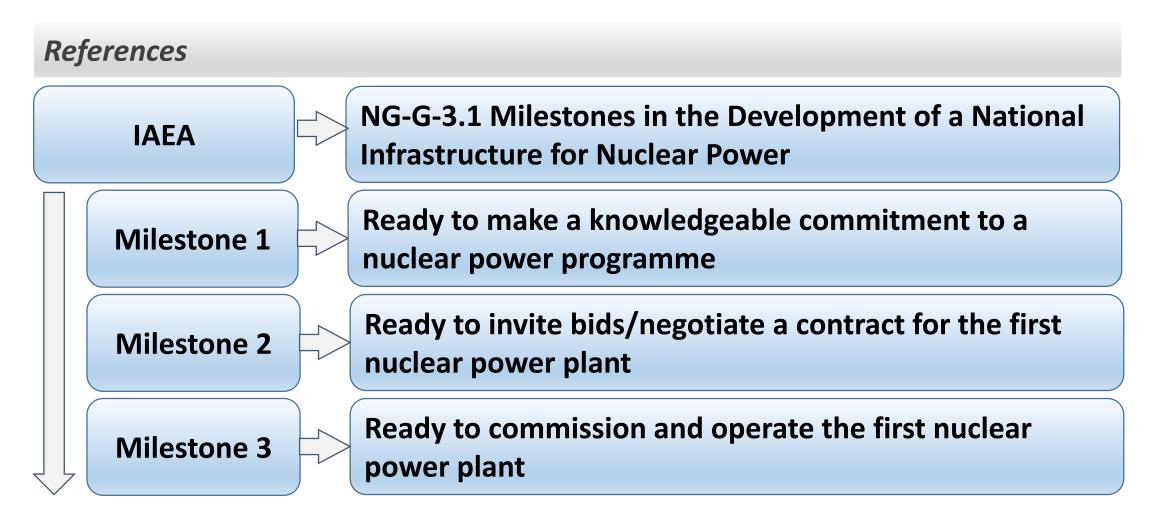




Nuclear Power Plants are very large and complex undertakings

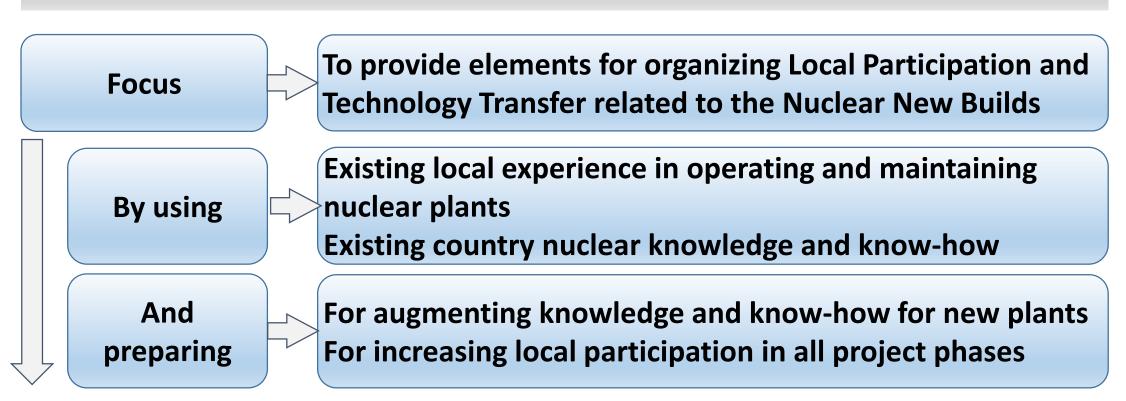
BASIC ELEMENTS

Basic Elements



Basic Elements

Focus of this Presentation



Basic Elements

Previous Plants

O&M Staff Training

Operating Plant Experience

Research / Studies by Universities

Local Industry Participation

Strategy for Industrial Development

Country Nuclear Knowledge + Know-how

Nuclear
Program of
Several NPPs

New Plants

O&M Staff Training

Technology Transfer

Research / Studies by Universities

Local Industry Involvement

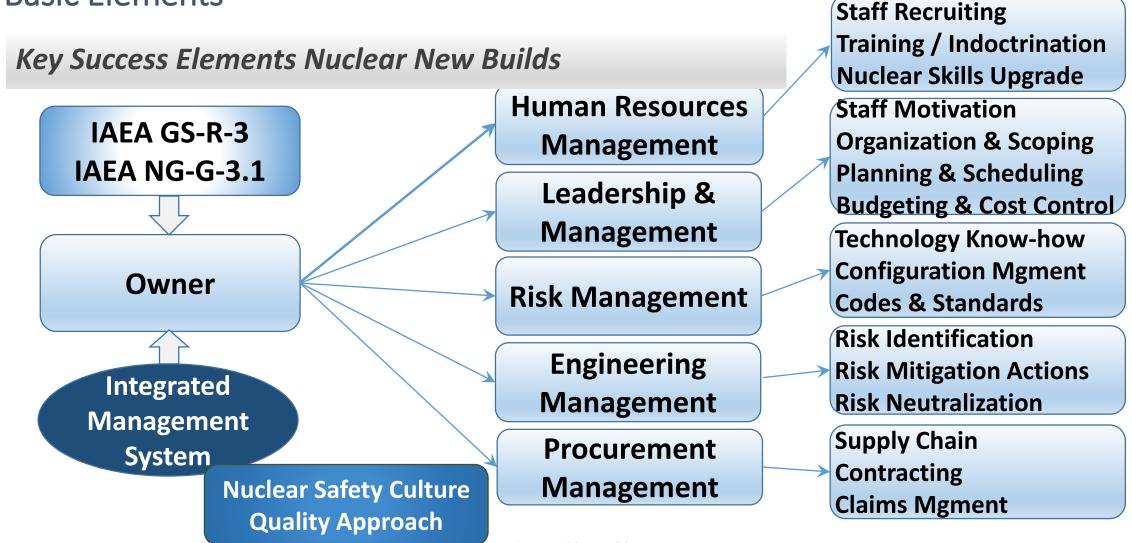
Operations
Maintenance
Technical Support

Design Engineering
Safety Analyses
Documentation

Studies & Analyses
Calculations
Laboratory Testing

Engineering
Manufacturing
Construction

Basic Elements



Oscar A. Mignone 02.Nov.2015

LOCAL PARTICIPATION OVERVIEW & OBJECTIVES

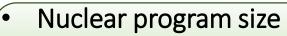
Local Participation – Overview and Objectives

Overview

Local Participation in Nuclear New Build

- Owner capabilities for operation and maintenanceOwner expectations to local participation
- Positive lists of goods and services
- Country willingness to accept different risk levels related to cost and schedule impact
- Contractor willigness to promote local participation
- Industry willigness to participate, at reasonable cost

Depends on...



- Owner business plans
- National industry technical and economic status
- Non-proliferation considerations

Local Participation – Overview and Objectives

Objectives

Objectives for Local Participation

- Create local nuclear technology and industry base for
 - Operating safely existing nuclear plants
 - Supporting nuclear operating plants
 - Engineering, Procurement and Construction of nuclear new build plants
- Understand and quantify different risk profiles to project executions (quality, cost and schedule)
- Increase employment by providing work to local staff
- Increase nuclear knowledge base to support staff training and upgrade
- Keeping a share of NPP costs in-country
 - Increasing economy level for citizens and industry
 - > Favouring the country economy and balance trade

LOCAL PARTICIPATION MILESTONE 1

Milestone 1 - Local Participation

Preparing Phase 1 Report for Local Participation

Owner

Knowledge and Know-how Technology Transfer

Ministry of Industry

Industry Plans
Promotion of Local
Industry

Commercial Chambers

Development Plans
Associations with
Int'l Chambers

Suppliers

Joint Ventures
Technology Transfer
Agreements

Produce Phase 1 Report



- Assess industrial capabilities, indicating training / development to cover gaps
- Assess industrial interest to participate in the nuclear program
- Assess level & likelihood investments required to upgrade industrial facilities
- Recommend targets and policies to reach the local participation targets

Milestone 1 - Local Participation

Defining Targets for Local Participation Owner **Participation Nuclear Target A% Plant A** Safety Ministry of **Participation** Culture **National Industry Target B% Plant B Industrial** Quality **Commercial Involvement Approach Participation Chambers Target C% Plant C** Owner must be willing to accept Local **Suppliers** Participation Risks and added Costs

LOCAL PARTICIPATION MILESTONE 2

Milestone 2 - Local Participation

Programs for Transition to Local Participation

Owner



Evaluate national capabilities for supply components and services



- Ministry of Industry
- **Commercial Chambers**

Suppliers

- On schedule
- At competitive prices
- Under strict quality assurance and controls

Positive results: Yes!

- Include in Bid Invitation Specifications
- Promote incentives for local partipation

Strong **Nuclear Safety Culture** is a must for Equipment qualification to nuclear grade

Milestone 2 - Local Participation

Programs for Transition to Local Participation

Owner



Desires for Local Participation should be



Ministry of Industry

Commercial Chambers

Suppliers

- Within reach and capabilities of local industry
- With upgrades that can be feasibly implemented

To ensure compliance with quality, schedule, and budget

Need to avoid delays that increase costs and deteriorate Project public image

Milestone 2 - Local Participation

Knowledge and Know-How

Owner Operations

Owner Maintenance

Owner Technical Support

Owner **Engineering**

Feedback from system behavior component reliability

Feedback from components performance

Feedback from technical changes problem solving

Specifications
Improvements
Lessons learned

Scope Definition – Broad Areas

National Industrial Involvement **Design Engineering**

Studies Analyses

Fuel Performance

Manufacturing

Civil Works

Installation

Commissioning

0&M

Nuclear manufacturing needs special efforts

Milestone 2 - Local Participation

Knowledge and Know-How

Preparation / Development

Operations &Maintenance

Owner **Engineering**

Previous Plant
Participating
Suppliers

Identification of SSC for Local Participation

Review Documents

Evaluate Capabilities

Gaps

Local Resolution

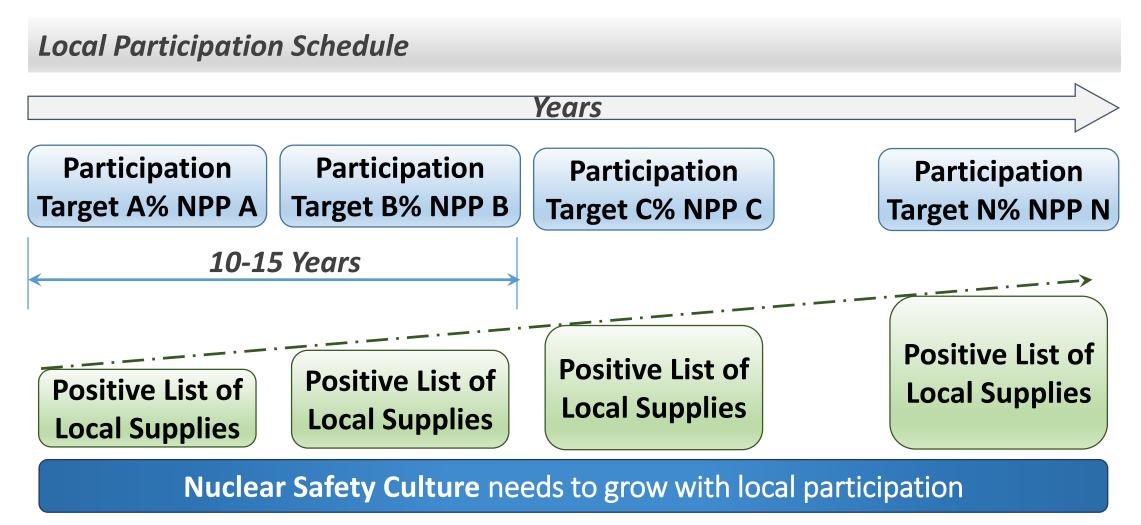
Int'l Agreements

University Support

Positive List of Local Supplies

For discussion with EPC Contractor

SSC: Structures, Systems, Components



Milestone 2 - Local Participation

Contractual Approaches in view of Local Participation

IAEA TecRep 396 describes the three main types of contractual approaches that are applied to energy and industrial projects, including nuclear plants,

Turnkey Approach

Single Contractor (or Consortium) takes all responsibility for completing project design, engineering, procurement, and construction (includes commissioning)

Split Package Approach (Islands)

Overall responsibility is divided in a small number of Contractors, each responsible for a Plant Island design, engineering, procurement, and construction

Multi - Package Approach (Components)

Overall responsibility for Plant design and construction is assumed by Plant Owner, who issues a large number of Contracts for carrying our various Plant parts

Milestone 2 - Local Participation

Contractual Approaches in view of Local Participation

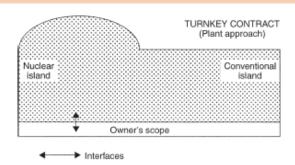
Turnkey Approach

Convenience

Project responsibilities rest on single EPC Contractor

Inconvenience

Limited Owner control over design, supply, O&M features Restricted Local Participation



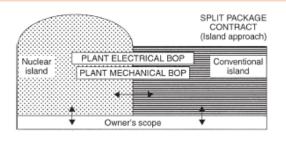
Split Package Approach (Islands)

Convenience

More favorable contract costs Better control over the plant design and O&M features

Inconvenience

Increased interface issues due to two or more EPC contracts Limited Local Participation



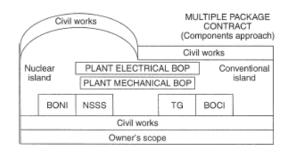
Multi - Package Approach (Components)

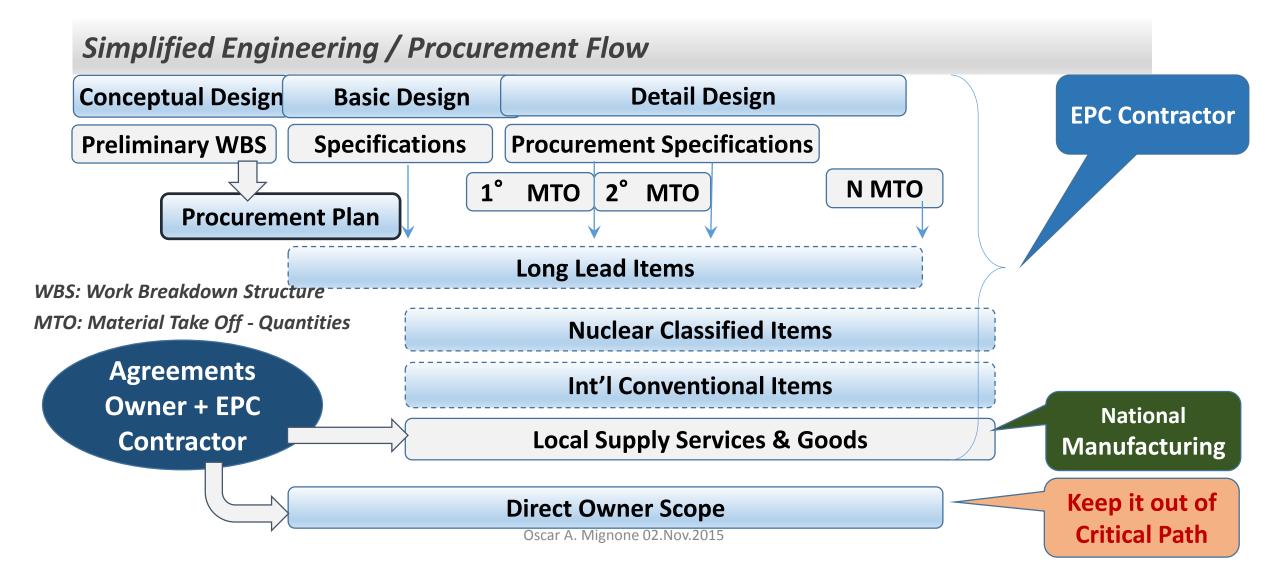
Convenience

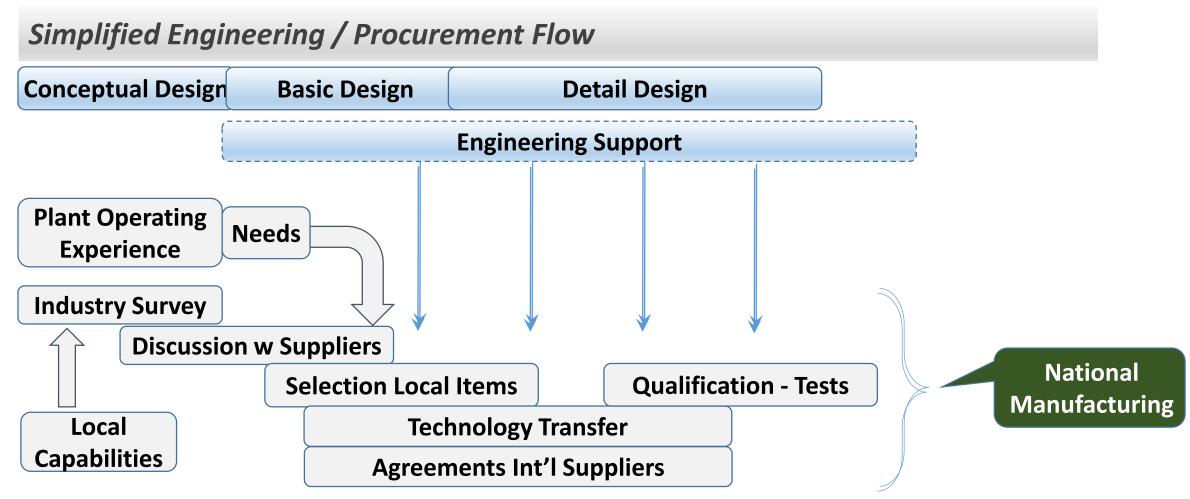
Opportunity to tailor plant design Maximum Local Participation

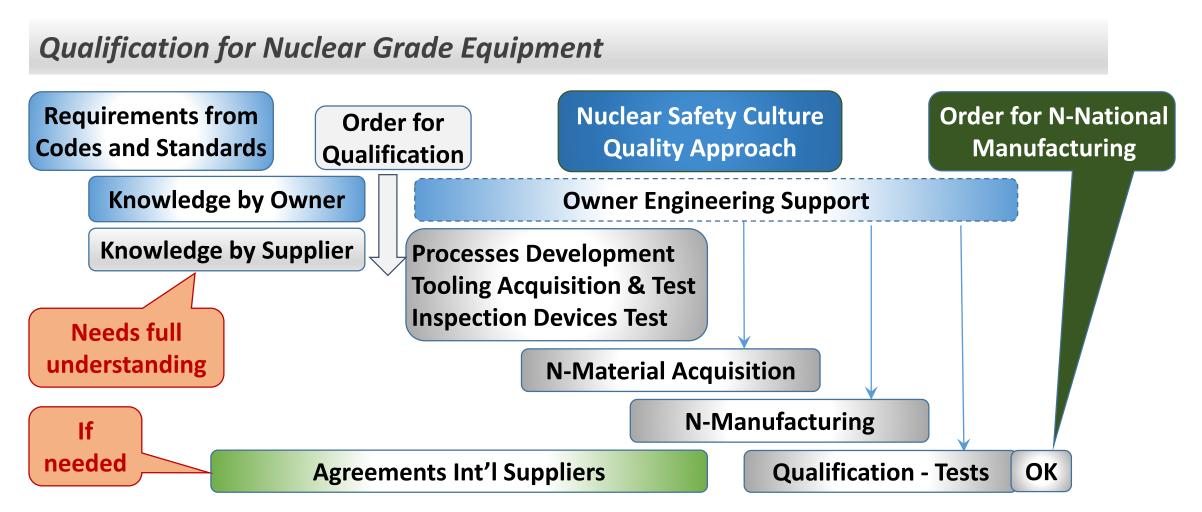
Inconvenience

Maximum Owner responsibility due to interfaces / compatibility of systems and technologies

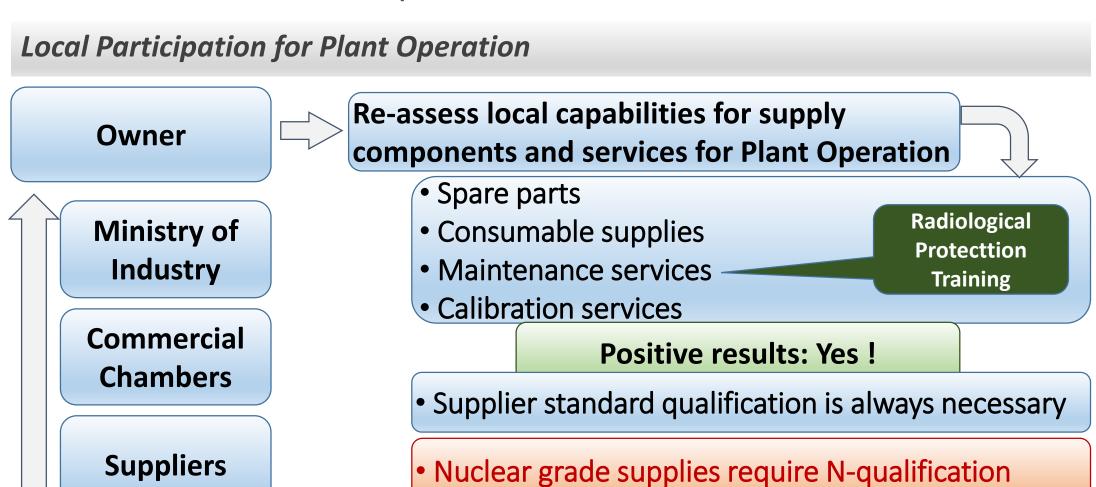








LOCAL PARTICIPATION MILESTONE 3



LOCAL PARTICIPATION – REFERENCE CASES

Local Participation – Reference Cases

Example 1 South Eastern Europe NPP

Large Experience from Operating Nuclear Plants

- Operation
- Maintenance
- Engineering
- Procurement
- Construction

O&M Staff Knowledge

Owner Engineering Knowledge

Previous Plant
Participating
Suppliers

2 x G-Watt Plants Modernization 20% Local Confirm SSC for Local Participation

SSC: Structures, Systems, Components

Local Participation – Reference Cases

Example 1 South Eastern Europe NPP (Cont'n)

Relevant
Government
Institutional
Support

Owner include List of Suppliers in BIS

Discussions with Bidders

Agreement with Selected Bidder

Target for Nuclear
New Build
30% Local
Positive
Suppliers List

Local Participation – Reference Cases

Example 1 South Eastern Europe NPP (Cont'n) Organized by **Contents: Industries** 220 Industries Name **Positive** Location **Suppliers List Principal Business** 20+ Companies **Engineering Capabilities** Number of People **R&D** Institutions 10+ Scientific / Institutes **Contents:** Name **Included in Bid** Location **Educational & 20+ Universities/Centers Specialities** Invitation **Training Facilities Specifications**

Local Participation

Example 2 South American NPP

Ministry of Industry

Ministry of Economy

Owner Knowledge

Commerce Chamber
Asociacion Tecnologia Nuclear

Research Institutions
Universities

Positive List of Local Supplies

1° NPP 25% Participation

2° NPP 51% Participation

3° NPP 54% Participation

4° NPP 70% Target

Local Participation

Example 2 South American NPP (Cont'n)

Technical Feasibility Study

Owner Engineering

Owner O&M

Participating Suppliers

R&D + Universities

Prepare Work Packages

Review Work Packages

Owner

Industry

Evaluate Feasibility

Conclusions Recommendations

Positive List of Local Supplies

Structures Spec's
System Spec's
Component Spec's
Drawings

Opinions Consultations

Few nuclear
Most conventional
All site works
System packages

Local Participation

Example 3 South West Europe NPP

Government Support

Ministry of Industry

Ministry of Economy

Utilities Partnership

Industry Chamber

Research Institutions
Universities

Aggressive
Targets set
for Local
Participation

NPP >50% Participation 2° NPP > 60 % **Participation** NPP ≈ 70% Participation NPP ≈ 75% Target

Local Participation

Example 3 South West Europe NPP (Cont'n)

Market Survey

- Local Utility
- Int'l Utility
- Knowledgeable Suppliers
- Interested Suppliers



Local Participation

Example 3 South West Europe NPP (Cont'n)

Market Survey

500+ suppliers participated

300+ registered w complete data

60 companies active in nuclear

60+ companies with dormant nuclear skills

Need of Measures

Government Incentives

Partnerships with Int'l Suppliers

National Experts Support for Industry

Local Participation

Example 3 South West Europe NPP (Cont'n)

Market Survey

- NSSS systems & components
- Turbine/Generator
- Materials, Forgings
- Steel Structures
- Systems & Packages, HVAC
- Process Equipment (Tanks, Valves, Pumps, HXs)
- Electrical + I&C equipment
- Cranes
- Other



Strenghts

- Strong industrial know-how
- Leadership in high-tech components
- Strong manufacturing skills
- Quality certification with proven results
- Commitment to investment plan

Areas for Development

- Document/configuration management
- Materials traceability
- Quality systems to nuclear grade
- Equipment qualification to nuclear grade

LOCAL PARTICIPATION – EXAMPLES FOR DISCUSSION

Areas for Local Participation - Examples

Examples for discussion

Engineering & Design

- Engineering companies to support in licensing, safety analyses, and probabilistic risk assessments
- Engineering companies for civil / stress calculations
- University Labs for thermal hydraulic / flow analyses
- Design and System/ Equipment Codes and Standards
- Local engineering validation of foreign country design
- Other ???

Areas for Local Participation - Examples

Examples for discussion

Procurement & Manufacturing

- Pressure vessels, atmospheric tanks, conventional
- Piping, conventional
- Process items, pumps, valves, HXs
- Electrical cable trays and conduits
- Electrical cables, power and control
- Instruments, pressure, temperature, flow
- Components for Heat, Ventilation, Air Conditioning
- Other ???
- Any Nuclear Grade component??
 with qualification, under technology transfer agreement

Base for nuclear

development +

transversal use

in local projects

Areas for Local Participation - Examples

- Bulk materials for civil, batch plant, laboratories
- Civil works, standard painting, decontaminable paint
- Steel structures, bulk material, prefabrication, erection
- Mechanical equipment installation,
- Piping prefabrication and erection,
- Welding School: Welders Training/Process Qualification
- Non destructive examination, NDE
- Electrical + I&C erection
- Warehousing and Material Management
- Instrument Calibration services
- Other ???



Areas for Local Participation - Examples

- Staff from Engineering Companies for
 - Commissioning procedures
 - Component check lists
 - System testing
- Staff from Suppliers for
 - Component alignment
 - Component maintenance
- Maintenance services
- Consumables supply
- Instrument Calibration services
- Other ???



Areas for Local Participation - Examples

- Electrical Substation
- Water Cooling Structures / System, conventional
- Demineralized Water Treatment Plant
- Heat, Air Conditioning, Ventilation, conventional
- Plant Gas Supply Systems
- Air Compressed Systems
- Chilled Water Systems
- Fire Protection Pump house, Fire Protection System
- Plant Security System
- Other ???



Areas for Local Participation - Examples

- Administrative Building
- Main and Secondary Gates, Reception,
- Internal Roads
- Warehouses
- Training Center
- Fire Brigade Building
- Emergency Control Center
- Site Infrastructure for Construction
 - Prefabrication Shops
 - Temporary Offices
 - Temporary Camps
- Other ??



TECHNOLOGY TRANSFER

General Overview Technology Transfer

Technology Transfer Nuclear New Build

- Owner expectations on technology transfer
- Areas of interest for know-how development
- University / Academy goals on technology knowhow
- Local engineering companies looking for upgrading skills
- Local suppliers looking for upgrading manufacturing
- Contractor willigness to support technology transfer

Depends on...



- Nuclear program size
- Owner business plans
- National industry technical and economic status
- Non-proliferation considerations

Objectives for Technology Transfer

Objectives for Technology Transfer

- Augment the nuclear knowledge and know-how for
 - > supporting nuclear operating plants
 - engineering, procurement and construction of nuclear new build plants
 - > Greater involvement in the nuclear new builds
- Support Local participation for supplying goods and services for operating plants and new build plants
- Augment work opportunities for local engineering and labor workforce, increasing employment status
- Increasing self-determination on nuclear decisions and nuclear plant implementation

Areas for Technology Transfer

Number of people, time duration

	Areas	Items	Metrics
1	NSSS Design, Specification, Performance	1.1)	
2	Core Design (physics, mechanics, thermodynamics)	2.1)	
3	Nuclear Fuel Performance and Management	3.1)	
4	Fuel Cycle Services	4.1)	SI
5	Operating events, accident and safety analysis	5.1)	5
6	Plant Transients and Dynamic Analysis	F1,200	
7	Stress Analysis of Civil & Mechanical Components	7.1)	
8	Static and Dynamic Analysis (Including Seismic)	8.1)	
9	Materials Engineering	5(1)	
10	Maintenance and Repair of Components	10.1)	

Areas for Technology Transfer

	Areas	Items	Metrics
11	Engineering / Technical Support to Plant Operations	11.1)	
12	Document and Configuration Management	12.1)	1
13	Component design and specifications	13.1)	
14	Electrical systems and equipment	14.1)	SI
15	Instrumentation and control systems	15.1)	5
16	System Packages design and specification, i.e. HVAC	79.30	
17	Commissioning	17.1)	
18	Radiological Protection	18.1	
19	Radiation Monitoring Systems	(1.1)	
20	Radio-chemistry nuclear circuits, chemistry conventional	20.1)	

Areas for Technology Transfer

	Areas	Items Metrics
21	Laboratories and Testing Facilities	21 11
22	Simulator technology and modeling tools	32.1)
23	Radiactive waste management	23.1)
24	Turbine Hall Design, Specifications, Performance	24 1)
25	Balance of Plant Design, Specifications, Performance	25.1)
26	Decommissioning	26.1)
27	Project Management during EPC	27.1) See slide below
28	Quality Assurance and Quality Control	28.1) See slide below
29	Planning and scheduling during EPC	29.1) See slide below
30	Site management during plant construction	30.1) See slide below

Notes of Caution on Technology Transfer

Technology Transfer vs Individual Growth

- Technology Transfer may be focused to the Owner staff growth on individual basis
- Many times, Owner staff is involved in assisting EPC Contractor in engineering, design, and analyses, not acquiring the overall picture
- Need to ensure that individuals feed information and knowledge to Owner organization
- Need to create a sound Knowledge Management system to receive, store, and distribute knowledge and know-how acquired by the Technology Transfer program

Notes of Caution on Technology Transfer

Technology Transfer vs Project Oversight

- Technology Transfer for Project Management, Site Management, Planning & Scheduling, Quality Assurance and Control may be counterproductive.
- EPC Contractor could train Owner staff but
 - could block visibility on project performance to Owner staff under these programs.
- Possible option would be to develop these functions as Owner representative

Thanks for your attention !!!