Expert Mission to Iran 8-11.Nov.2015

Local Participation and Technology Transfer

OAM 02.Nov.2015

Local Participation and Technology Transfer
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Local Participation and Technology Transfer

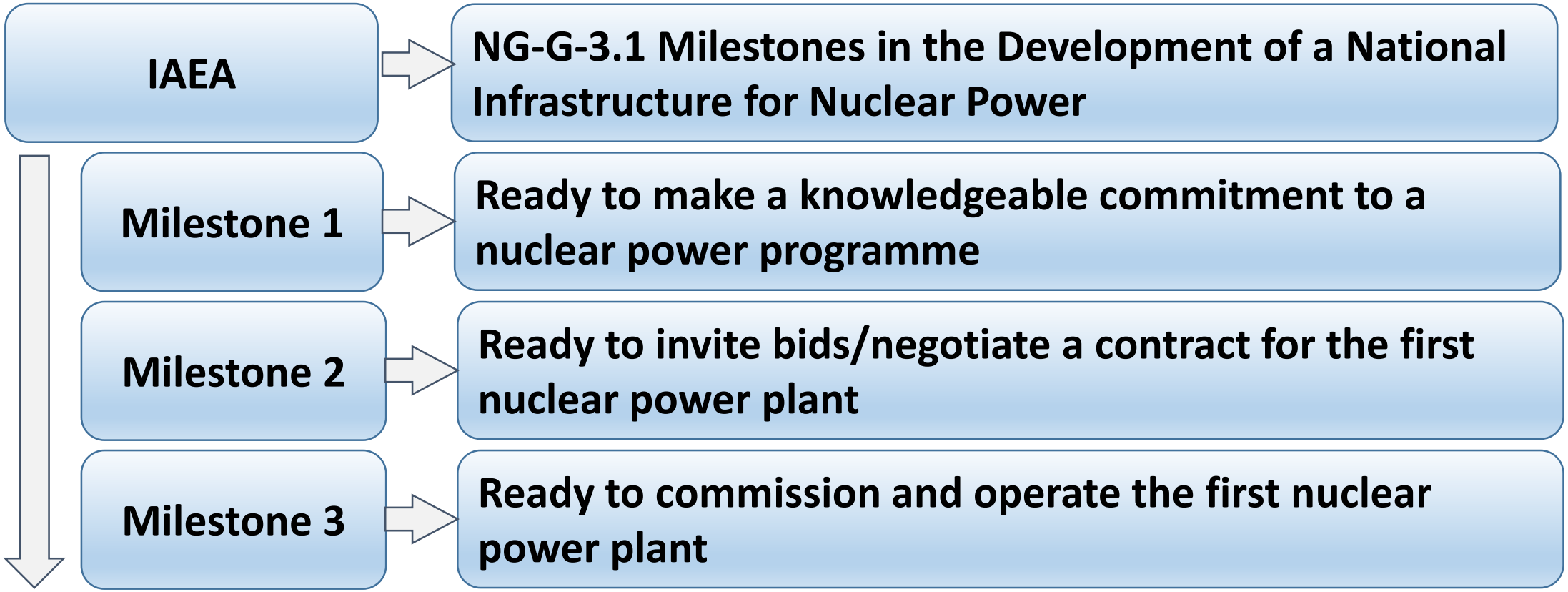
Nuclear Power Plants are very large and complex undertakings

BASIC ELEMENTS

Local Participation and Technology Transfer

Basic Elements

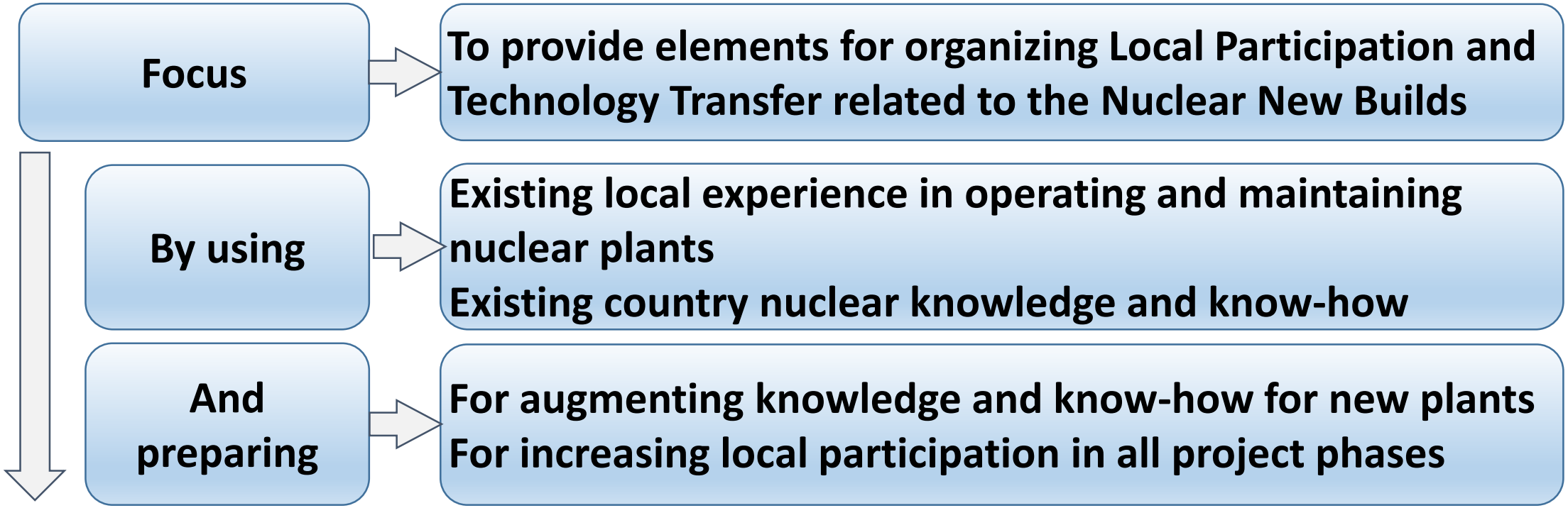
References



Local Participation and Technology Transfer

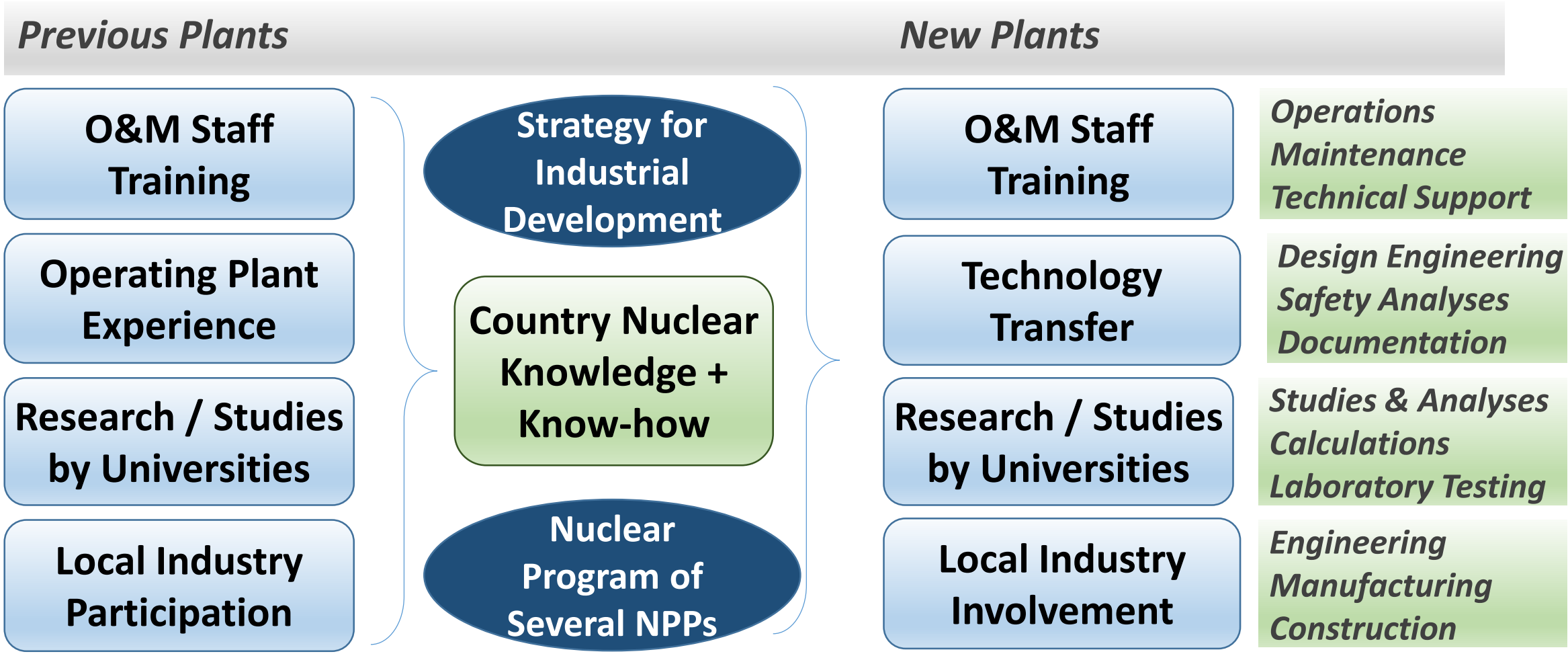
Basic Elements

Focus of this Presentation



Local Participation and Technology Transfer

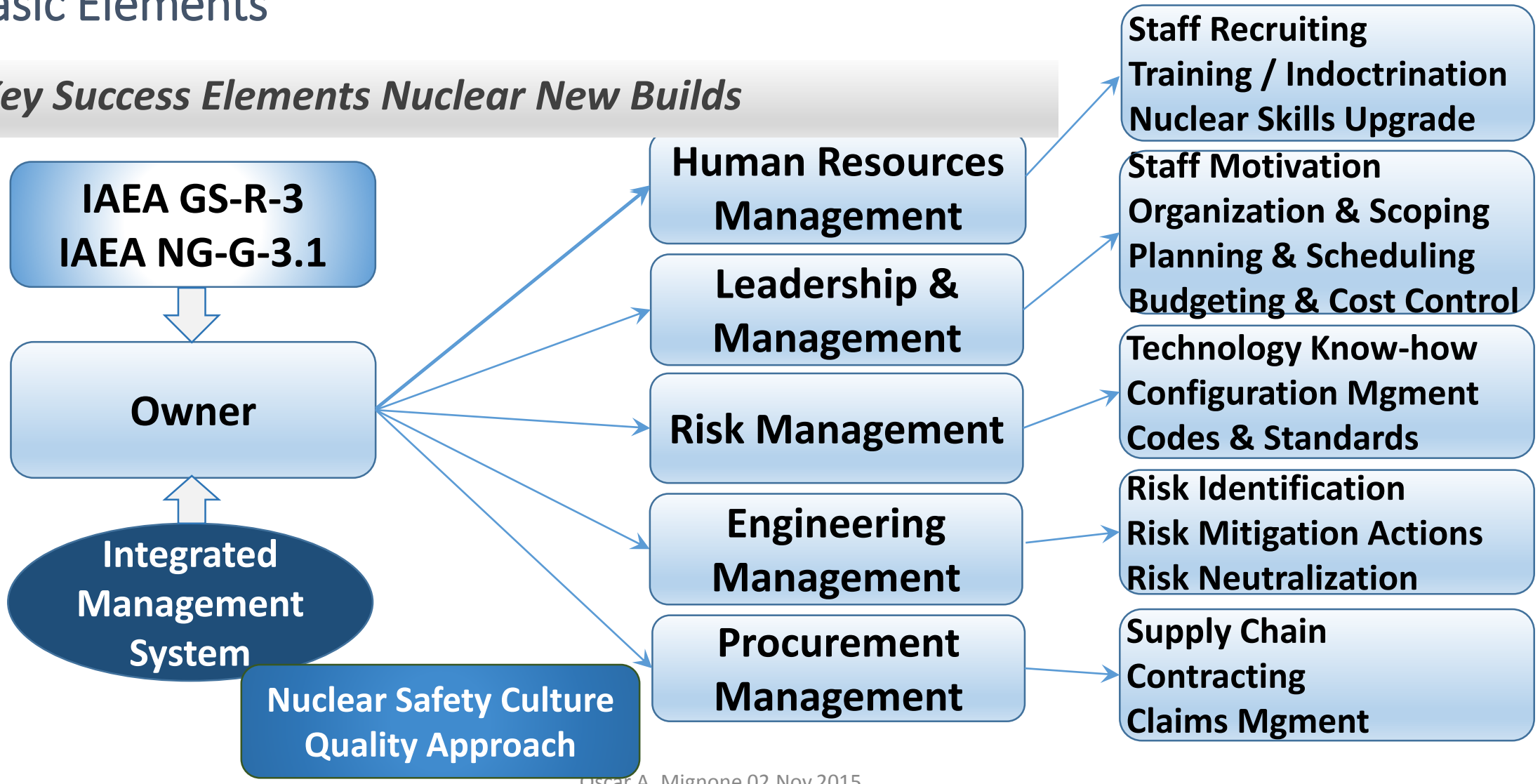
Basic Elements



Local Participation and Technology Transfer

Basic Elements

Key Success Elements Nuclear New Builds



LOCAL PARTICIPATION

OVERVIEW & OBJECTIVES

Local Participation and Technology Transfer

Local Participation – Overview and Objectives

Overview

Local Participation in Nuclear New Build

- Owner capabilities for operation and maintenance
- Owner 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…

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

Local Participation and Technology Transfer

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

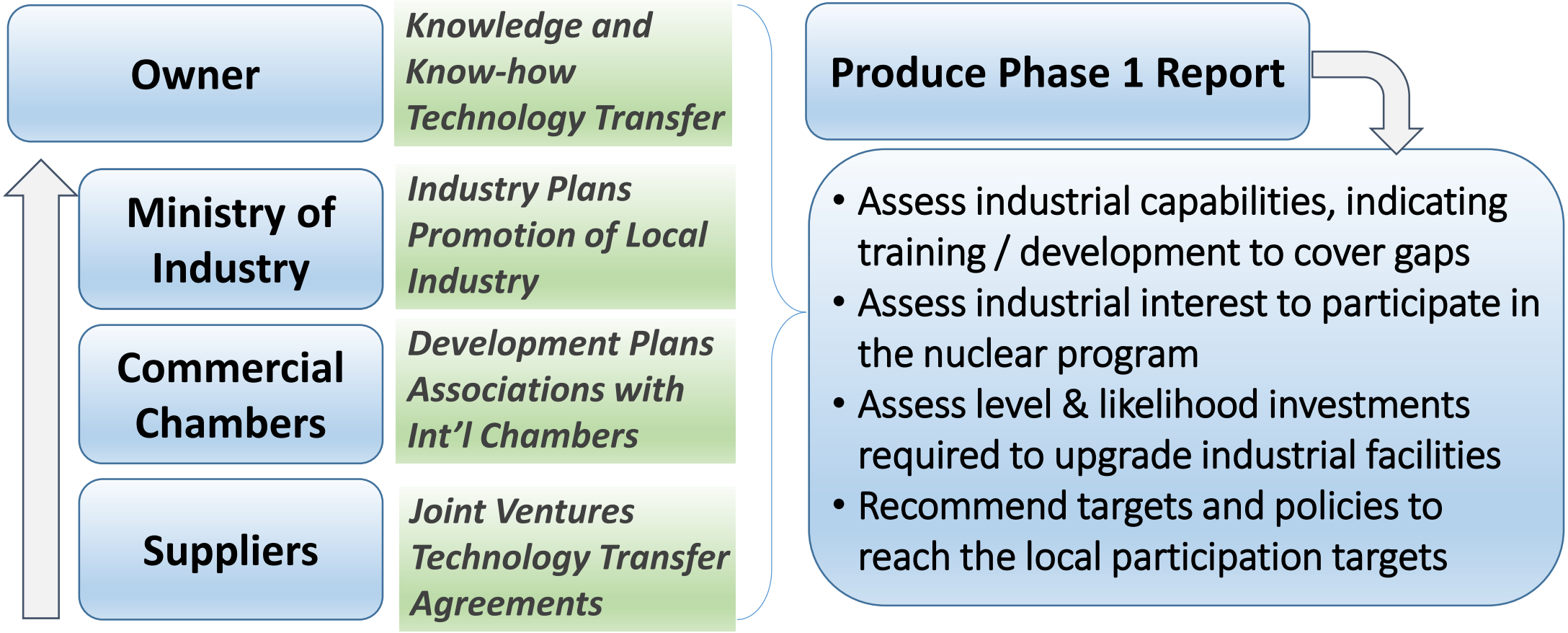
LOCAL PARTICIPATION

MILESTONE 1

Local Participation and Technology Transfer

Milestone 1 - Local Participation

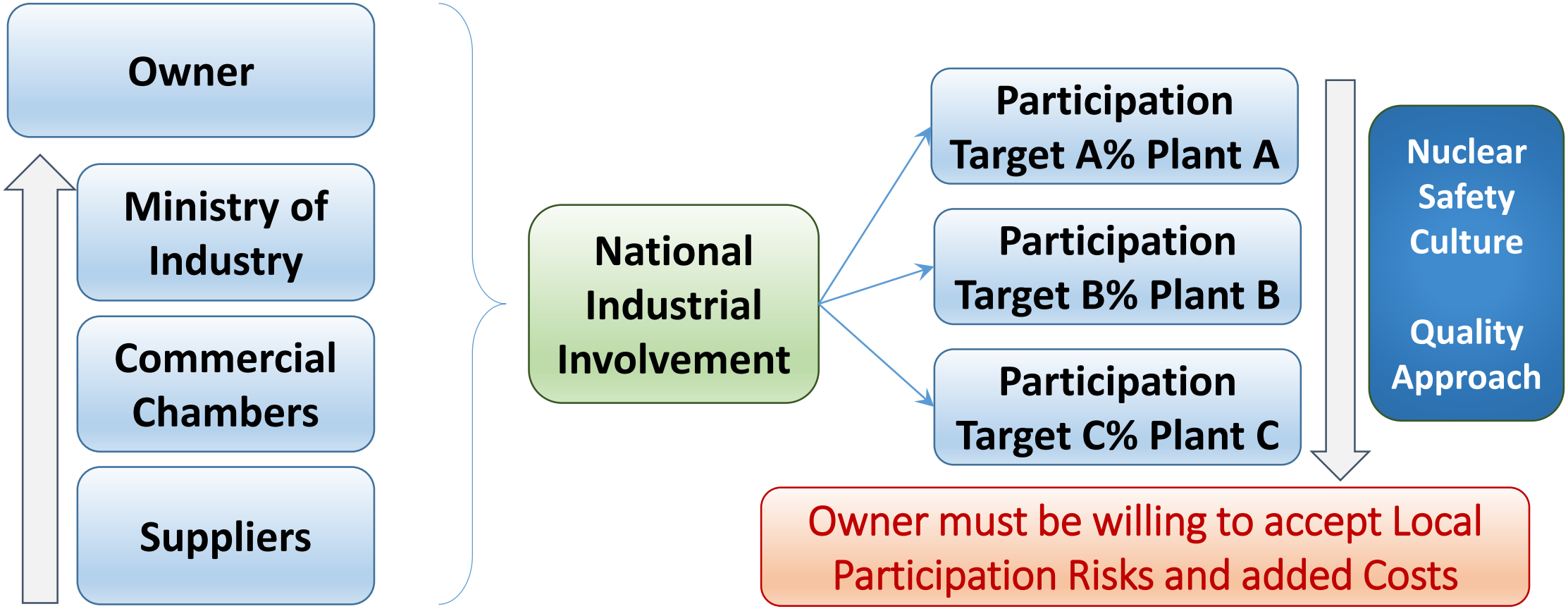
Preparing Phase 1 Report for Local Participation



Local Participation and Technology Transfer

Milestone 1 - Local Participation

Defining Targets for Local Participation

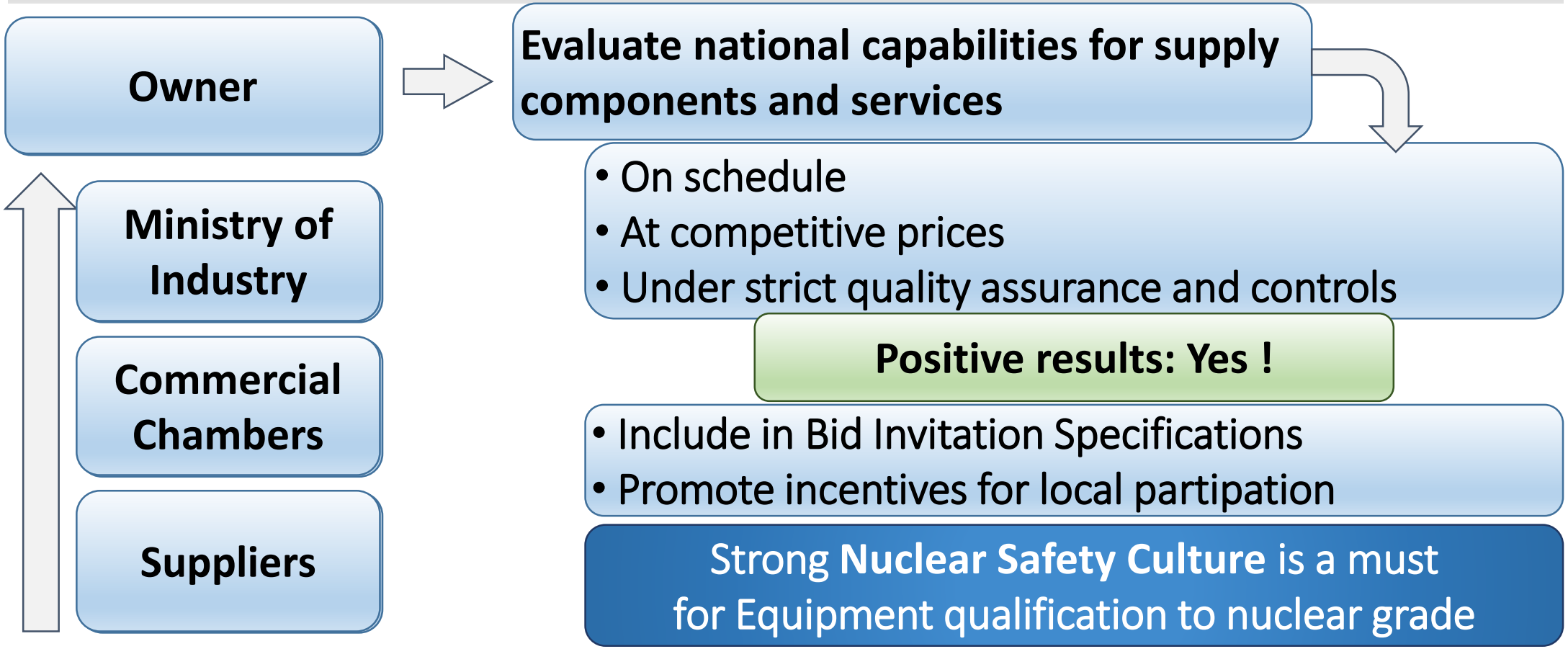


LOCAL PARTICIPATION
MILESTONE 2

Local Participation and Technology Transfer

Milestone 2 - Local Participation

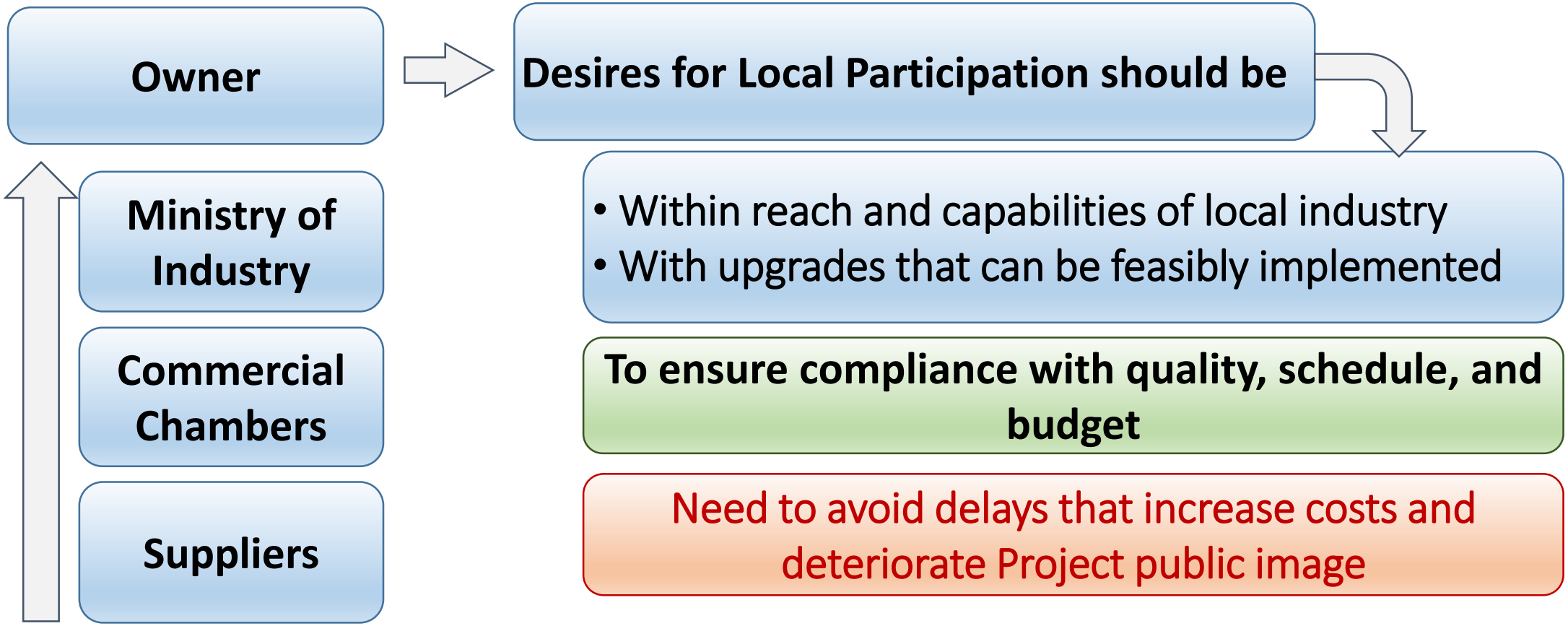
Programs for Transition to Local Participation



Local Participation and Technology Transfer

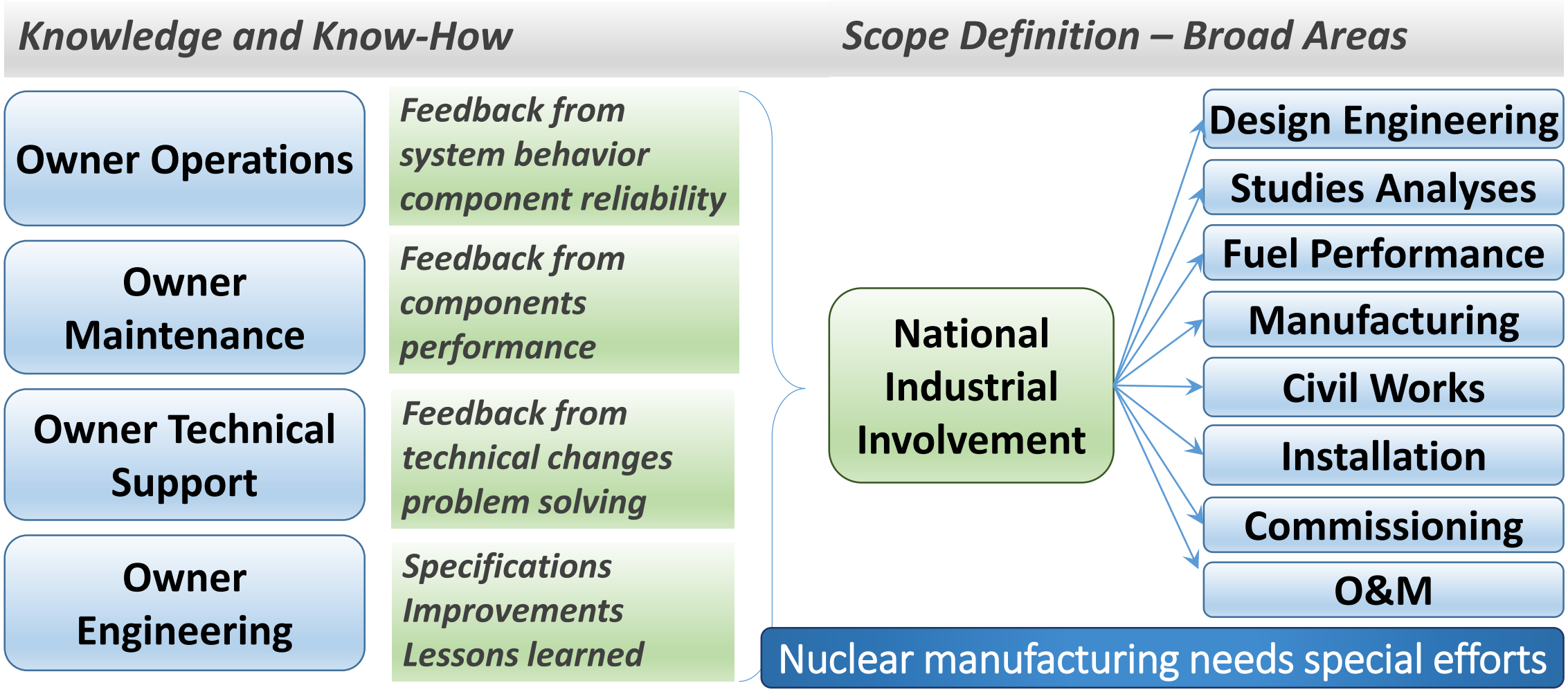
Milestone 2 - Local Participation

Programs for Transition to Local Participation



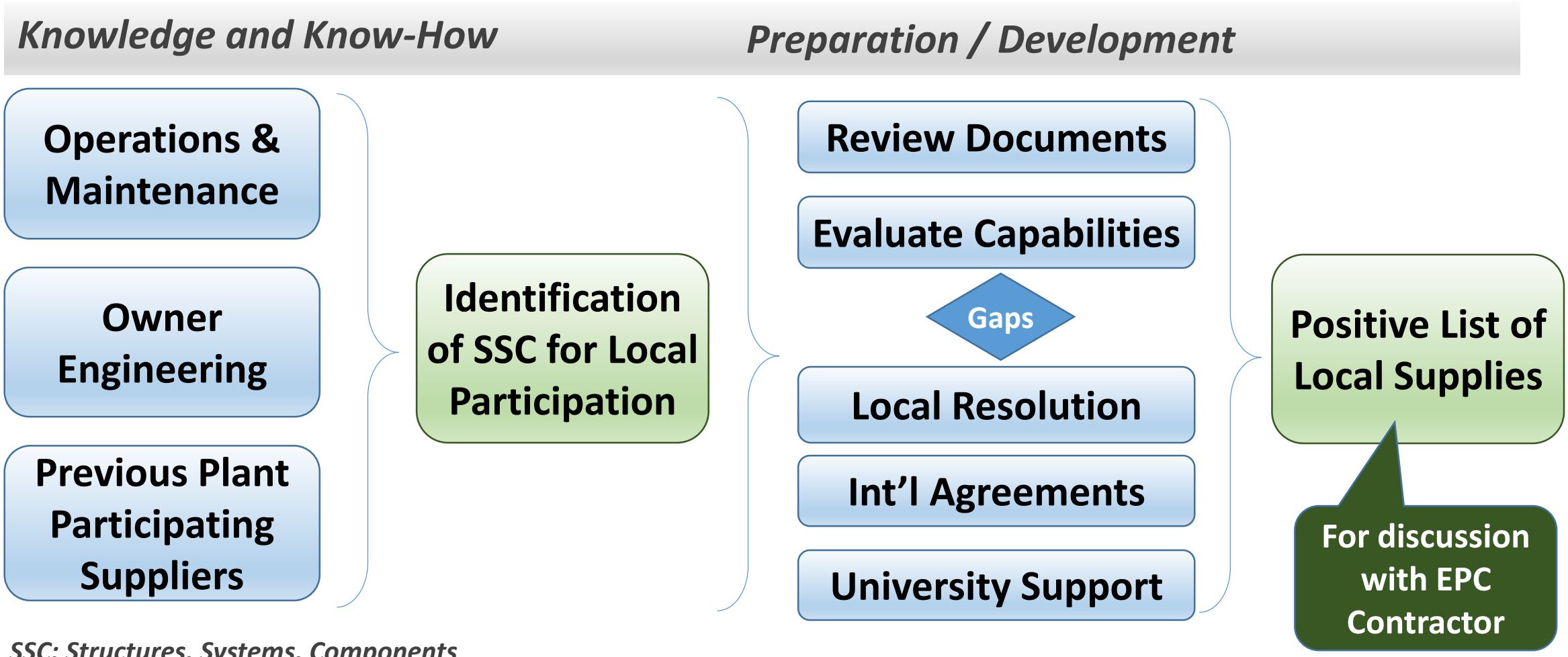
Local Participation and Technology Transfer

Milestone 2 - Local Participation



Local Participation and Technology Transfer

Milestone 2 - Local Participation

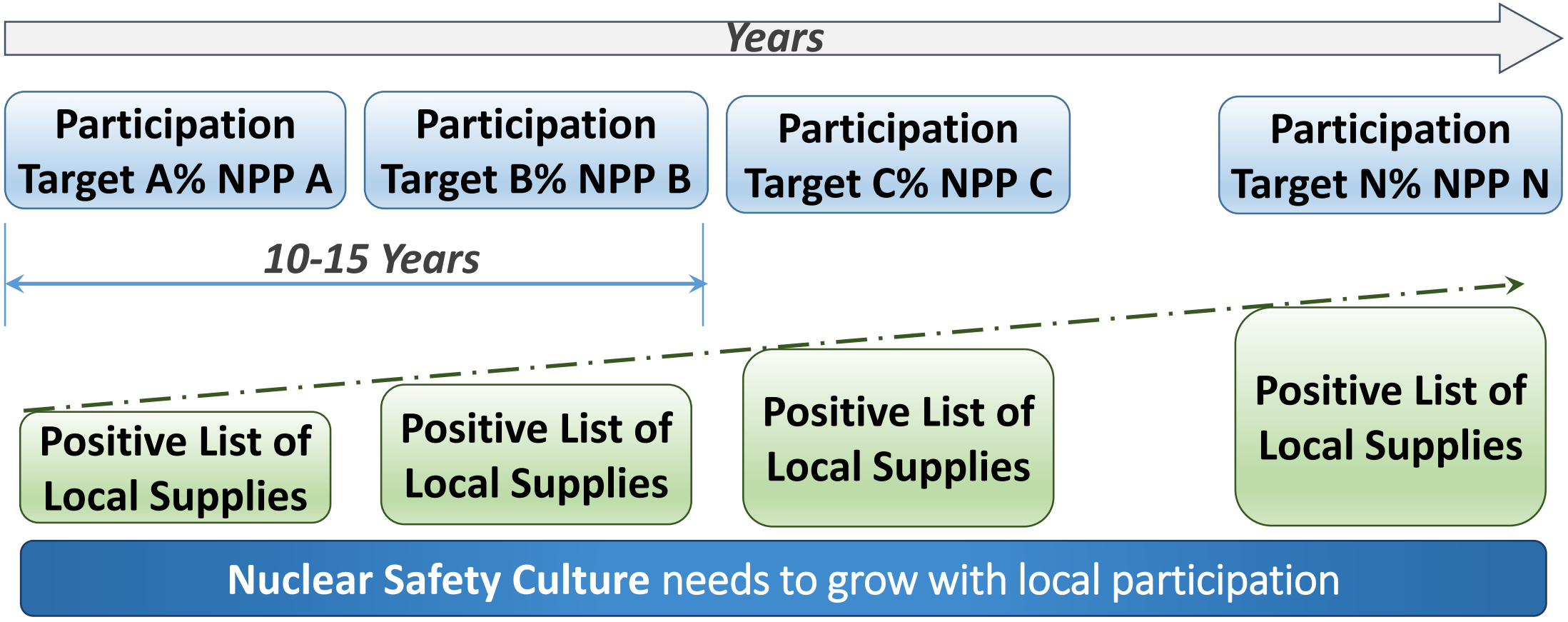


SSC: Structures, Systems, Components

Local Participation and Technology Transfer

Milestone 2 - Local Participation

Local Participation Schedule



Local Participation and Technology Transfer

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,

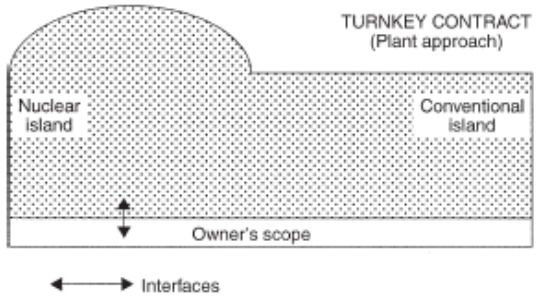
Turnkey Approach	**Single Contractor** (or Consortium) **takes all responsibility** for completing project design, engineering, procurement, and construction (includes commissioning)
Split Package Approach (Islands)	**Overall responsibility** is divided in a **small number of Contractors**, each responsible 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

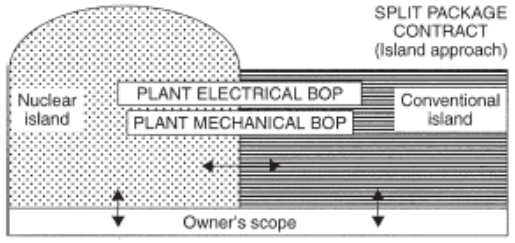
Local Participation and Technology Transfer

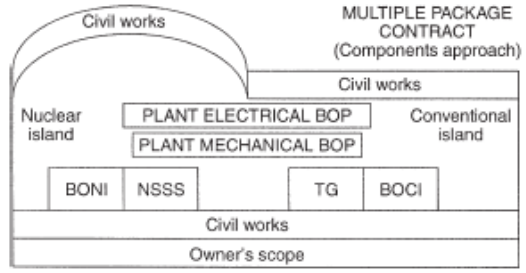
Milestone 2 - Local Participation

Contractual Approaches in view of Local Participation

Turnkey Approach	Split Package Approach (Islands)	Multi - Package Approach (Components)
Convenience Project responsibilities rest on single EPC Contractor	**Convenience** More favorable contract costs Better control over the plant design and O&M features	**Convenience** Opportunity to tailor plant design Maximum Local Participation
Inconvenience Limited Owner control over design, supply, O&M features Restricted Local Participation	**Inconvenience** Increased interface issues due to two or more EPC contracts Limited Local Participation	**Inconvenience** Maximum Owner responsibility due to interfaces / compatibility of systems and technologies

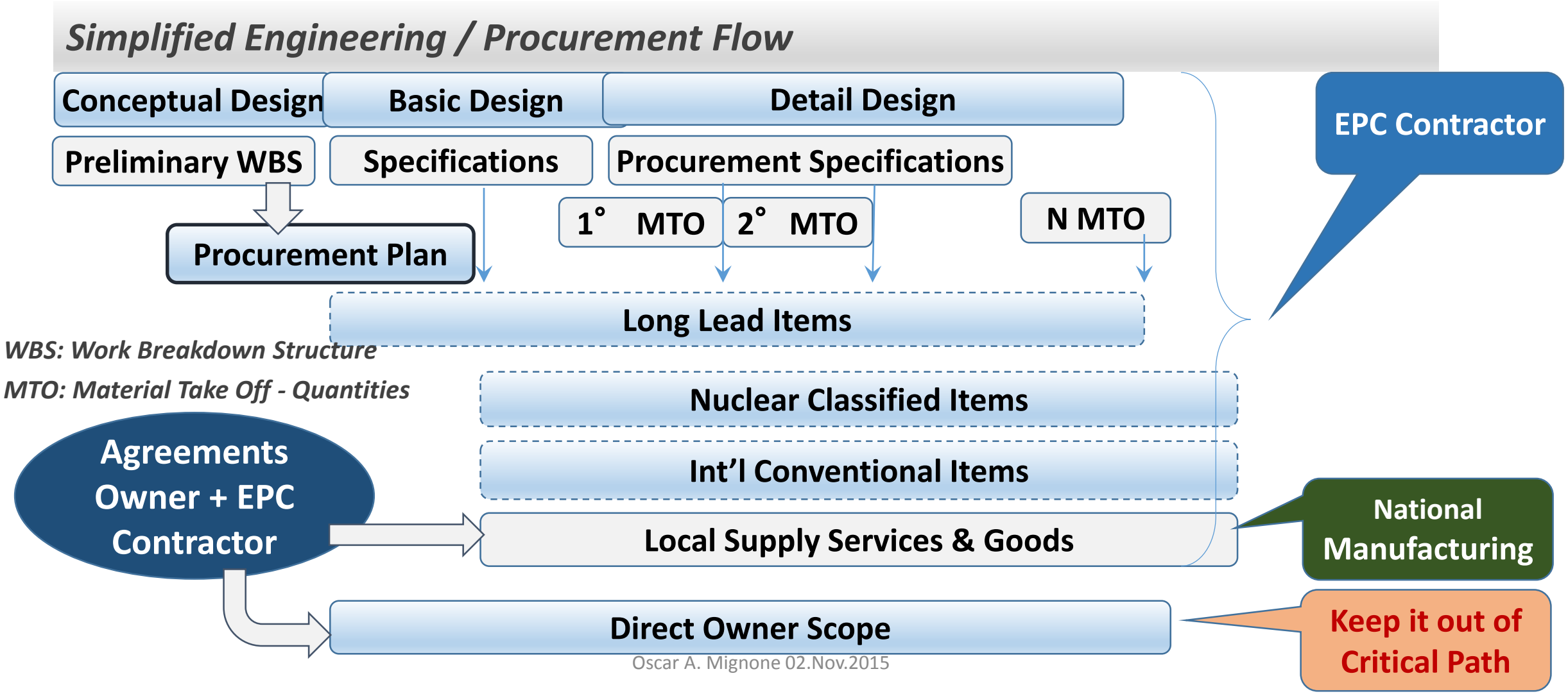






Local Participation and Technology Transfer

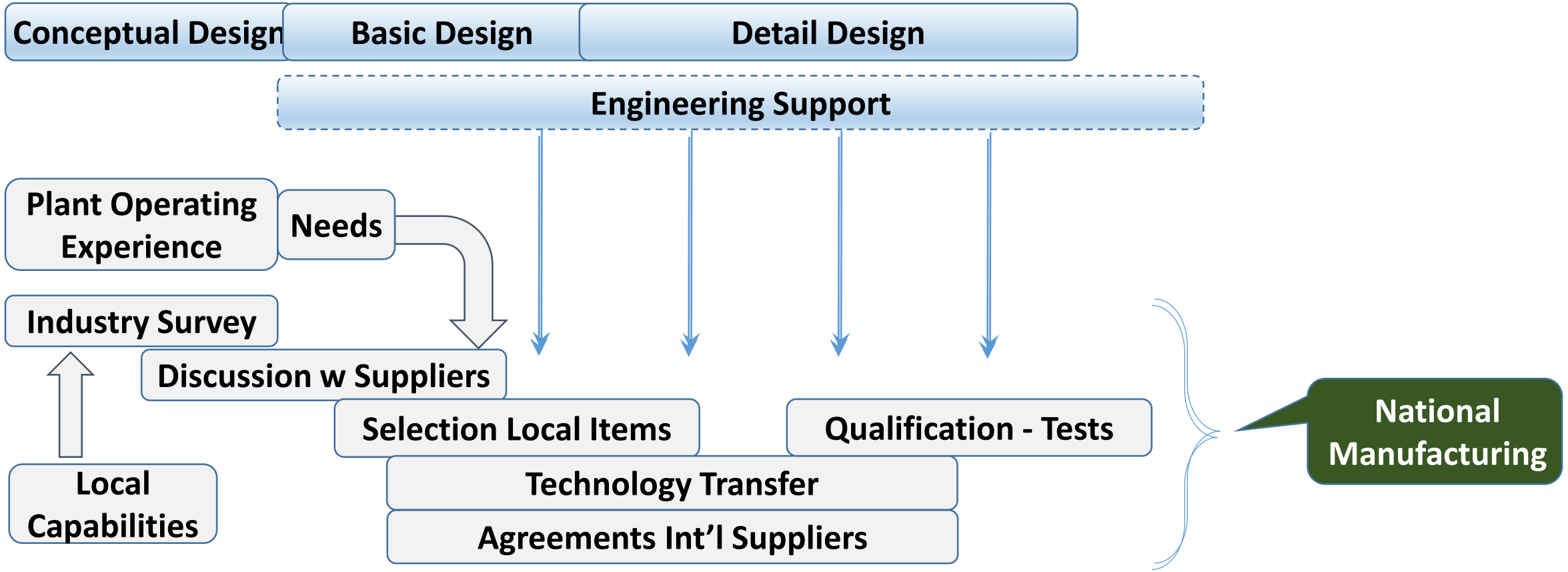
Milestone 2 - Local Participation



Local Participation and Technology Transfer

Milestone 2 - Local Participation

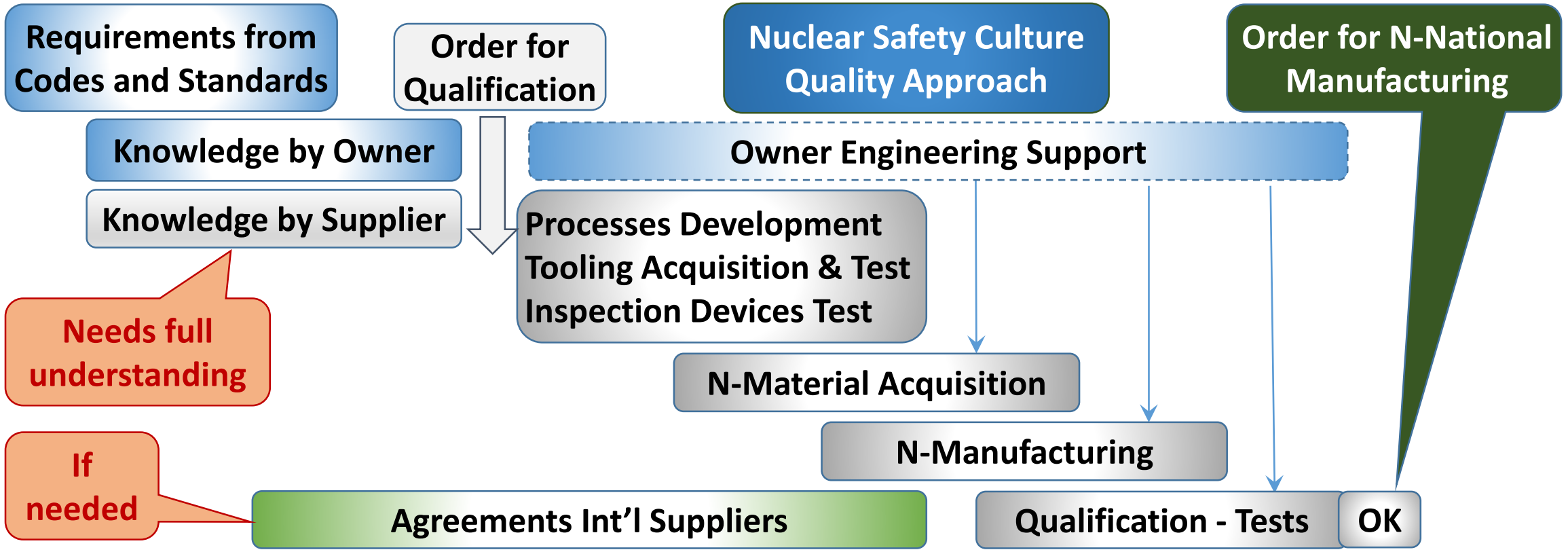
Simplified Engineering / Procurement Flow



Local Participation and Technology Transfer

Milestone 2 - Local Participation

Qualification for Nuclear Grade Equipment

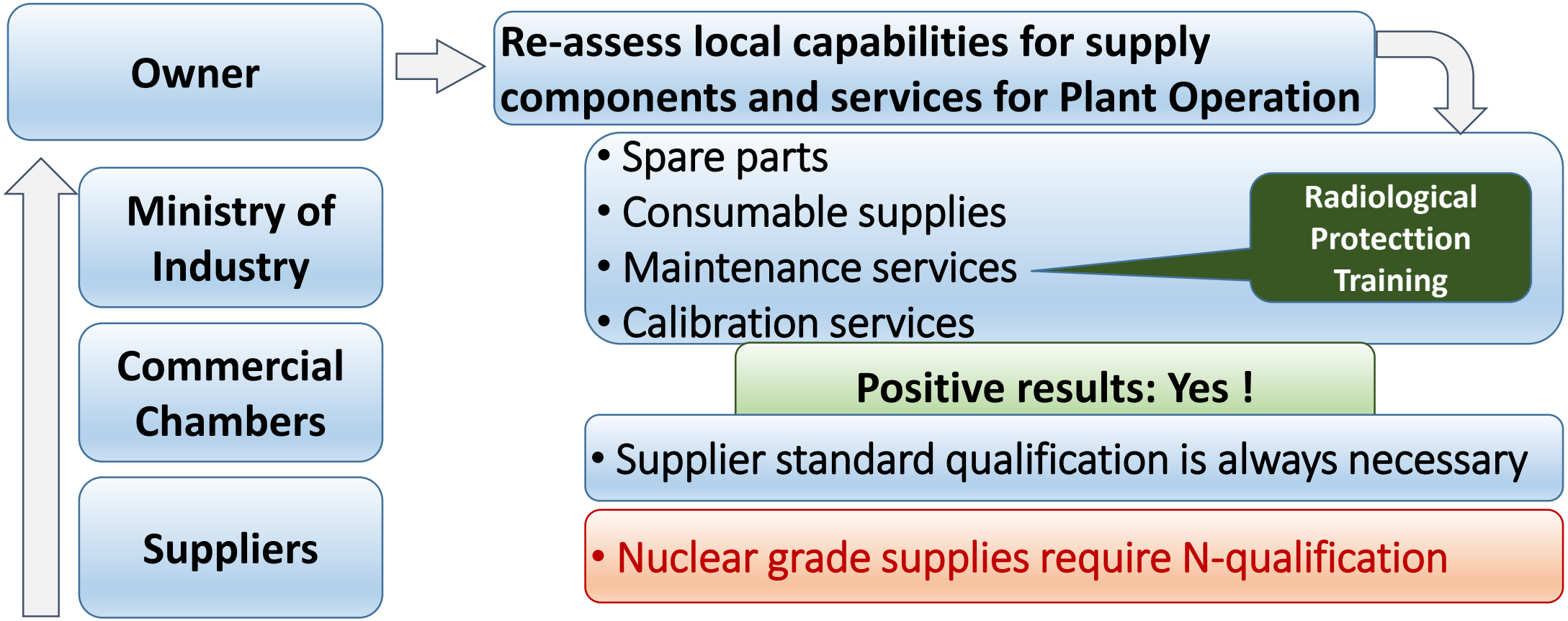


LOCAL PARTICIPATION
MILESTONE 3

Local Participation and Technology Transfer

Milestone 3 - Local Participation

Local Participation for Plant Operation



LOCAL PARTICIPATION – REFERENCE CASES

Local Participation and Technology Transfer

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

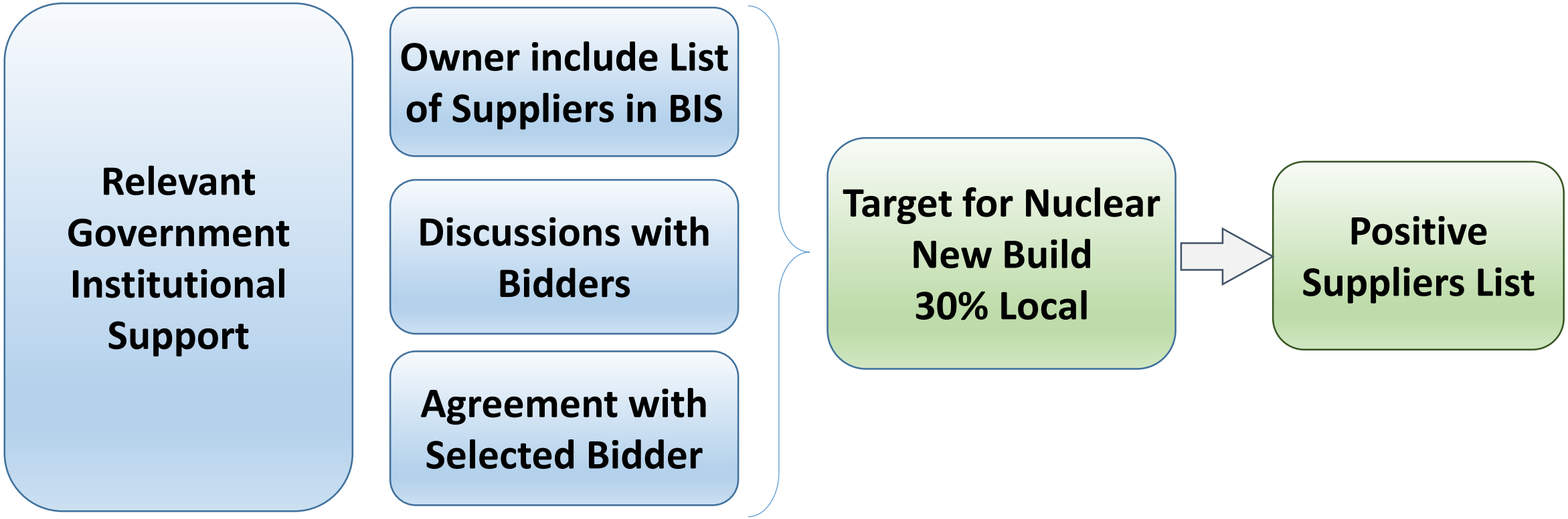
Confirm SSC for Local Participation

SSC: Structures, Systems, Components

Local Participation and Technology Transfer

Local Participation – Reference Cases

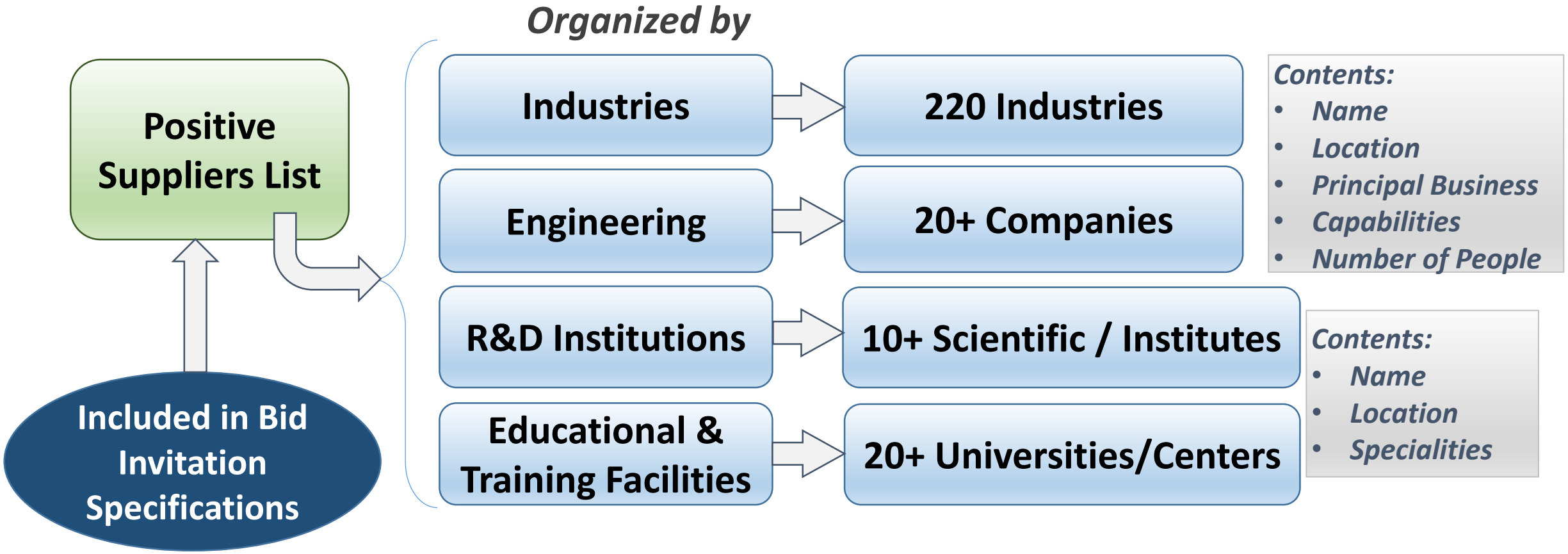
Example 1 South Eastern Europe NPP (Cont'n)



Local Participation and Technology Transfer

Local Participation – Reference Cases

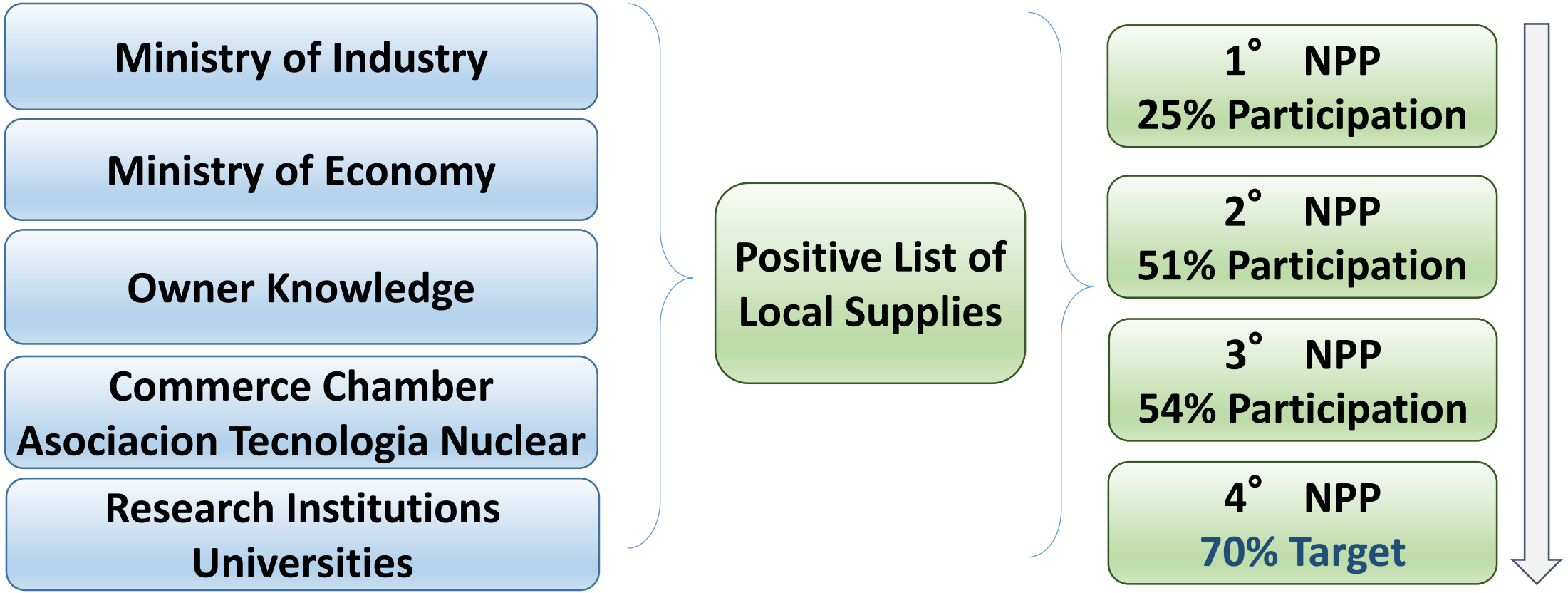
Example 1 South Eastern Europe NPP (Cont'n)



Local Participation and Technology Transfer

Local Participation

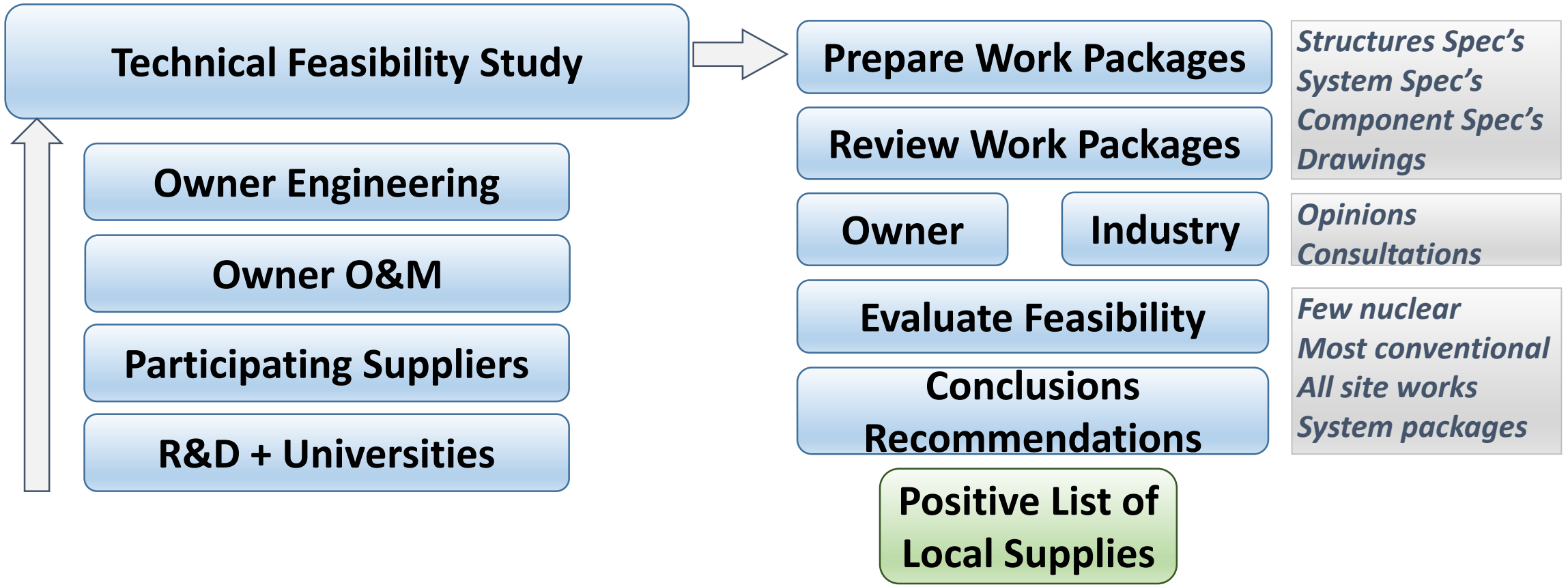
Example 2 South American NPP



Local Participation and Technology Transfer

Local Participation

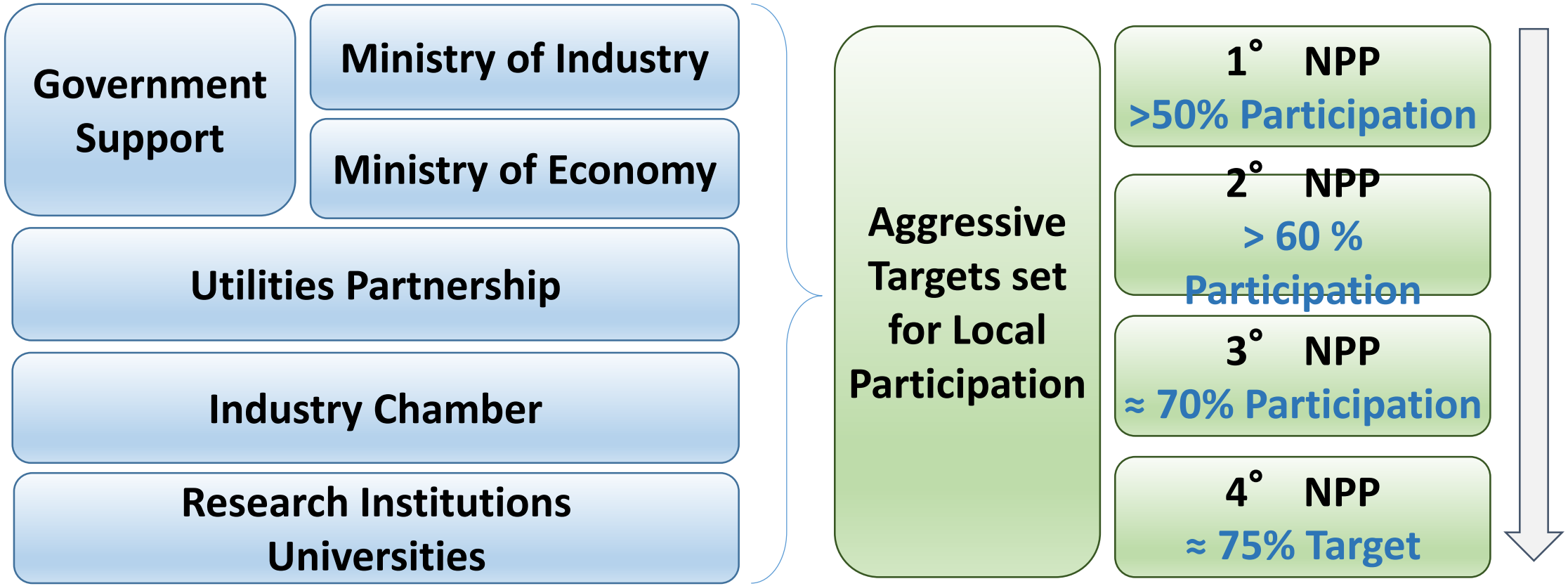
Example 2 South American NPP (Cont'n)



Local Participation and Technology Transfer

Local Participation

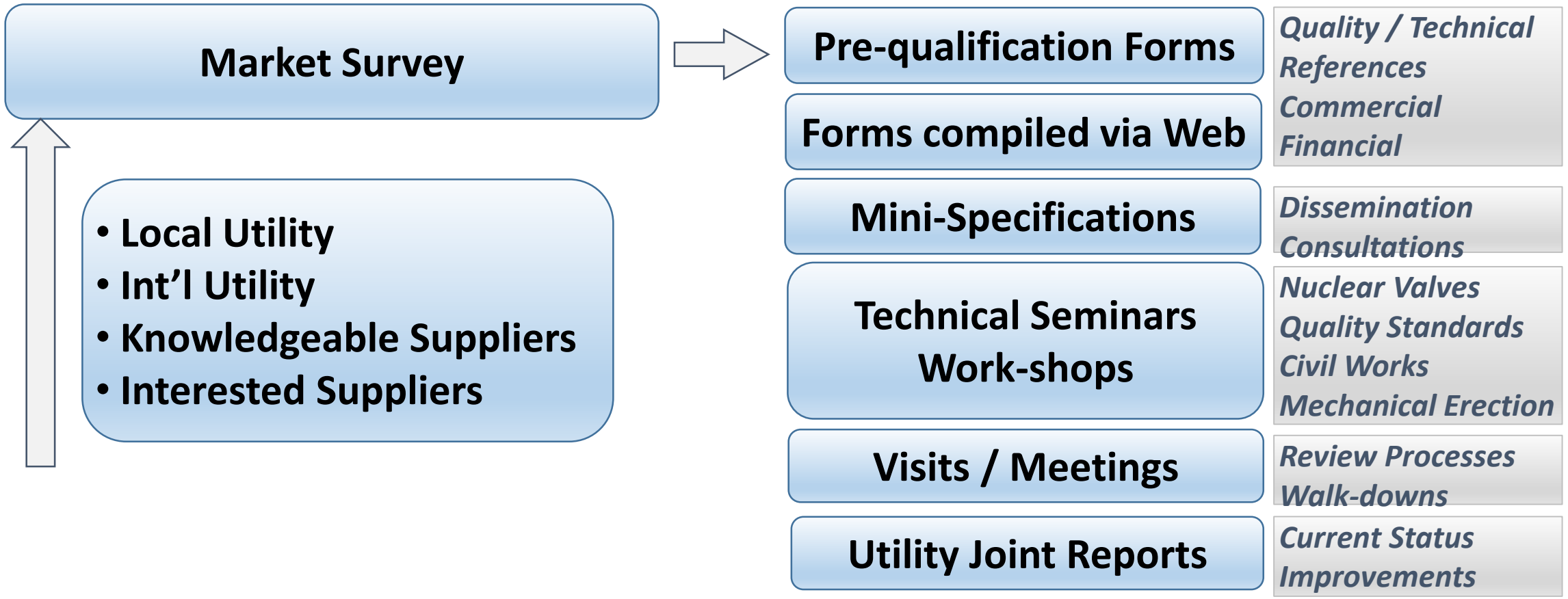
Example 3 South West Europe NPP



Local Participation and Technology Transfer

Local Participation

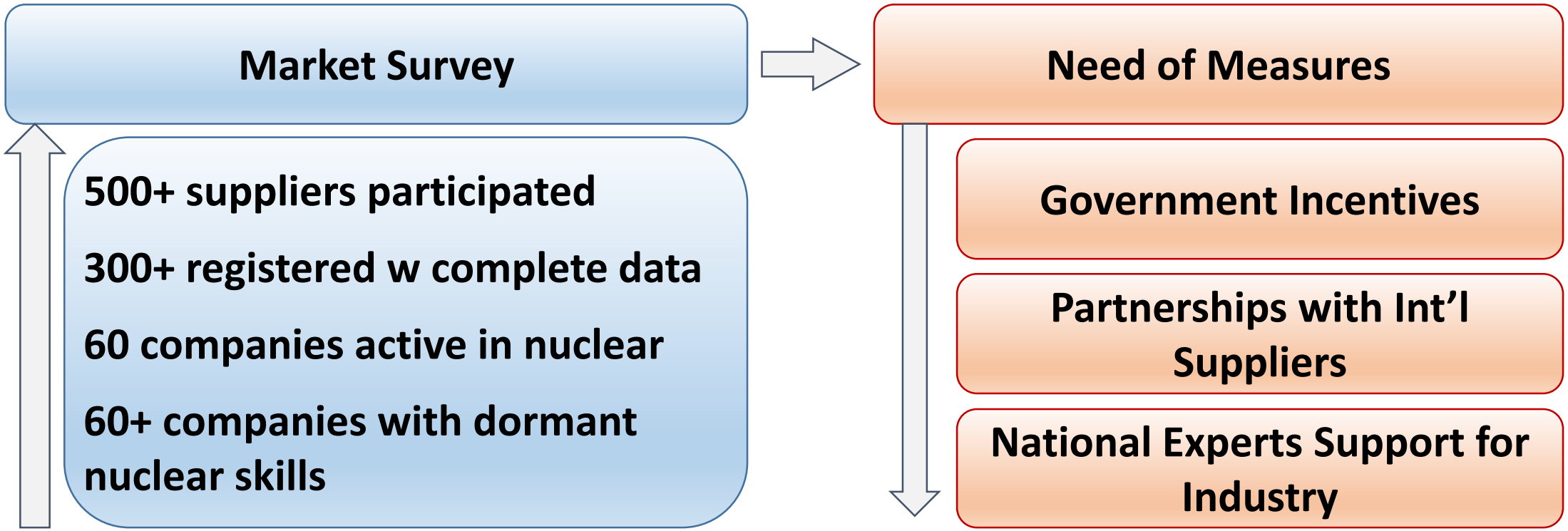
Example 3 South West Europe NPP (Cont'n)



Local Participation and Technology Transfer

Local Participation

Example 3 South West Europe NPP (Cont'n)



Local Participation and Technology Transfer

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

Local Participation and Technology Transfer

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 ???

Local Participation and Technology Transfer

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 ???

Base for nuclear development + transversal use in local projects

- Any Nuclear Grade component??
  with qualification, under technology transfer agreement

Local Participation and Technology Transfer

Areas for Local Participation - Examples

Examples for discussion

Construction

- 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 ???

Local Participation and Technology Transfer

Areas for Local Participation - Examples

Examples for discussion

Commisioning

- 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 ???

National Participation and Technology Transfer

Areas for Local Participation - Examples

Examples for discussion

System Packages

- 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 ???

National Participation and Technology Transfer

Areas for Local Participation - Examples

Buildings & Structures

Examples for discussion

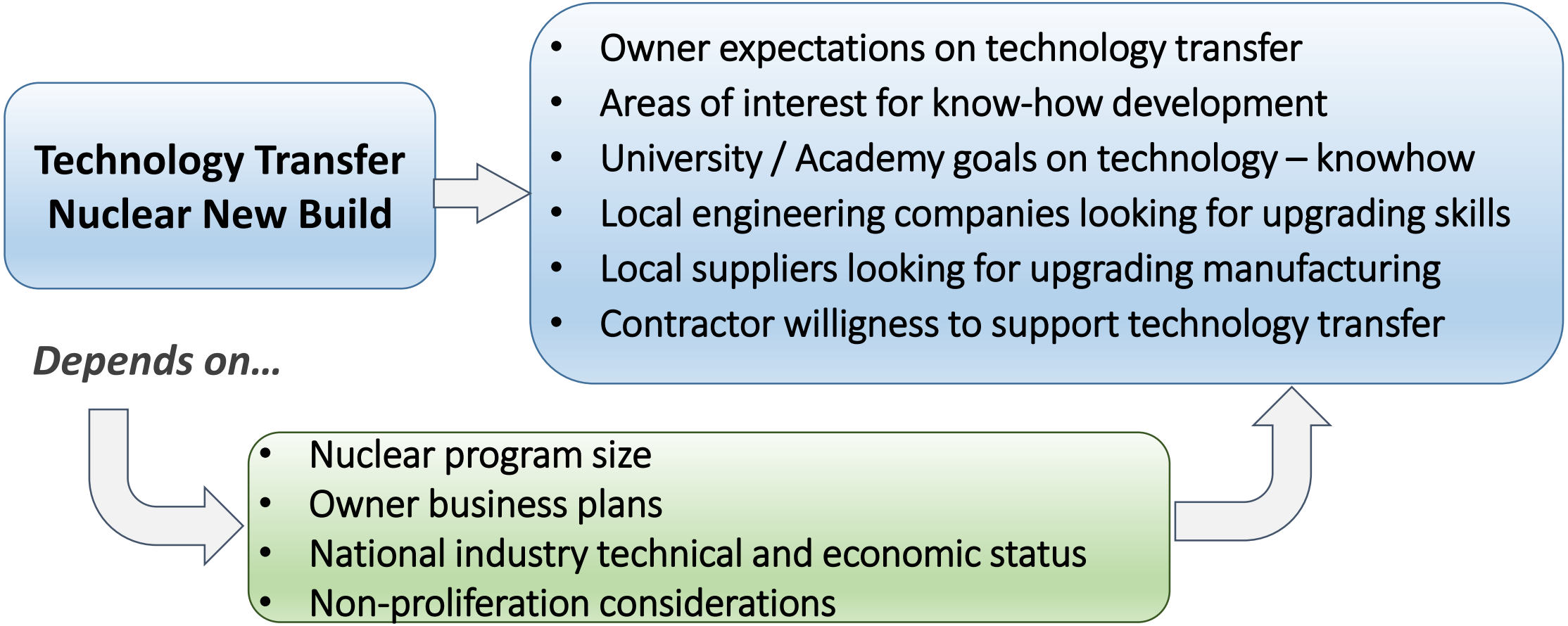
- Administrative Building
- Main and Secondary Gates, Reception,
- Internal Roads
- Warehouses
- Training Center
- Fire Brigade Building
- Emergency Control Center
- Site Infrastructure for Construction
  - Prefabrication Shops
  - Temporary Offices
  - Temporary Camps
- Other ??

Local Participation and Technology Transfer

TECHNOLOGY TRANSFER

Local Participation and Technology Transfer

General Overview Technology Transfer



Local Participation and Technology Transfer

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

Local Participation and Technology Transfer

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)	
5	Operating events, accident and safety analysis	5.1)	
6	Plant Transients and Dynamic Analysis	6.1)	
7	Stress Analysis of Civil & Mechanical Components	7.1)	
8	Static and Dynamic Analysis (Including Seismic)	8.1)	
9	Materials Engineering	9.1)	
10	Maintenance and Repair of Components	10.1)	

Local Participation and Technology Transfer

Areas for Technology Transfer

	Areas	Items	Metrics
11	Engineering / Technical Support to Plant Operations	11.1)	
12	Document and Configuration Management	12.1)	
13	Component design and specifications	13.1)	
14	Electrical systems and equipment	14.1)	
15	Instrumentation and control systems	15.1)	
16	System Packages design and specification, i.e. HVAC	16.1)	
17	Commissioning	17.1)	
18	Radiological Protection	18.1)	
19	Radiation Monitoring Systems	19.1)	
20	Radio-chemistry nuclear circuits, chemistry conventional	20.1)	

Local Participation and Technology Transfer

Areas for Technology Transfer

	Areas	Items	Metrics
21	Laboratories and Testing Facilities	21.1)	
22	Simulator technology and modeling tools	22.1)	
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	

Local Participation and Technology Transfer

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**

Local Participation and Technology Transfer

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**

Local Participation and Technology Transfer

Thanks for your attention !!!