Main Infrastructure Preparation and Local Human Resource Development for the First Nuclear Plant Construction

February, 2010

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Hitachi –GE Nuclear Energy Uninterrupted Construction Experience

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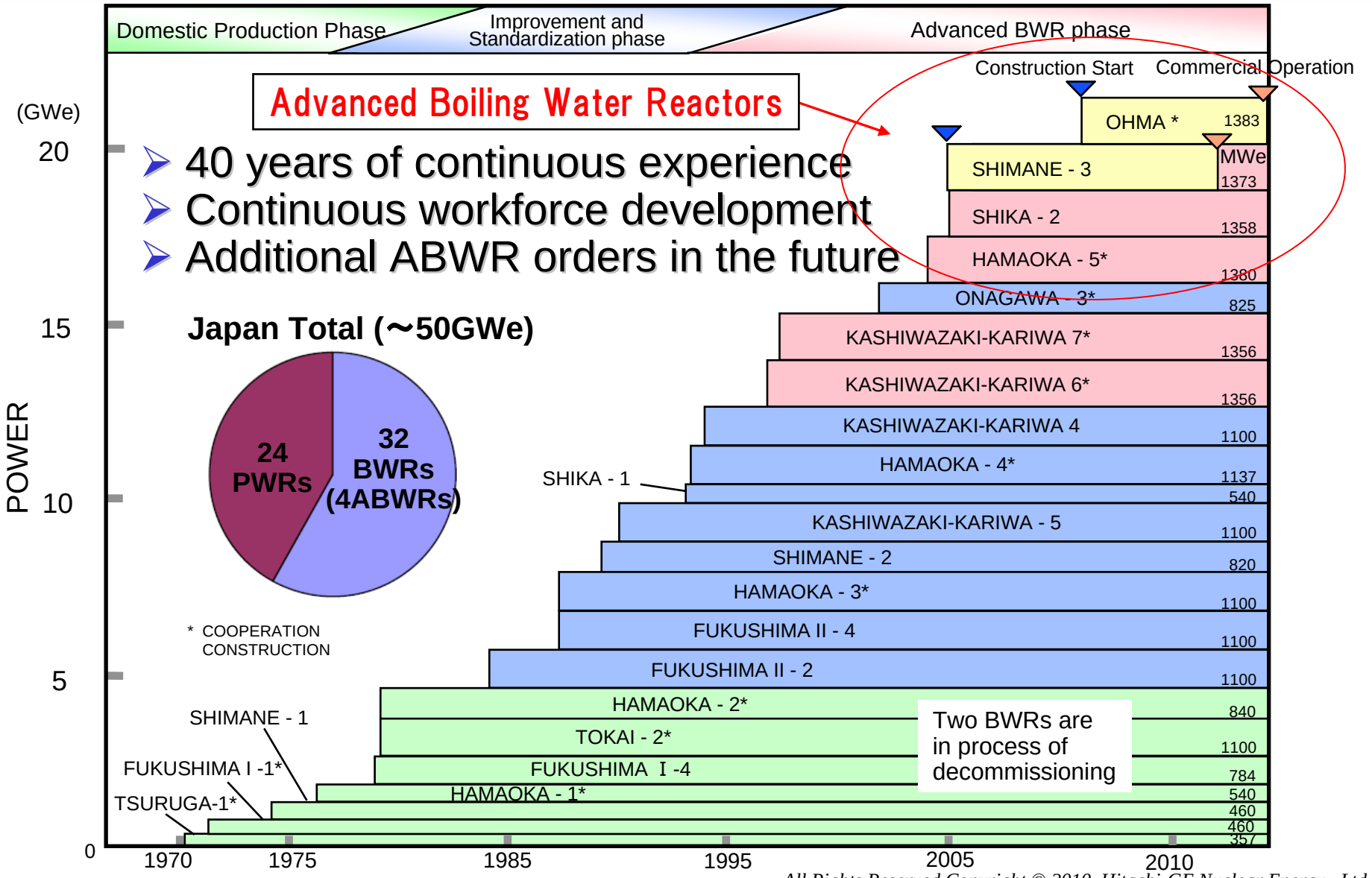

1-2 ABWR has adopted Proven Technologies in Japan

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1980 1990 2000 2010 2020

BWR

Operating Plant

ABWR

Utility Requirement

First of a kind development by manufacturer

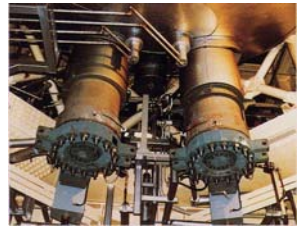
Utility acceptance

Retrofit

Verification Tests

-New Pumps
-Seismic Tests
-Safety Systems
-Containment Vessel
-Reactor Internals
etc.

Containment Vessel Seismic Verification



New Pump Verification

Evaluation by Advisory Gr. (Government level)

Adoption

Construction/Operation

1-3 ABWR has Approved by Japanese Licensing Process

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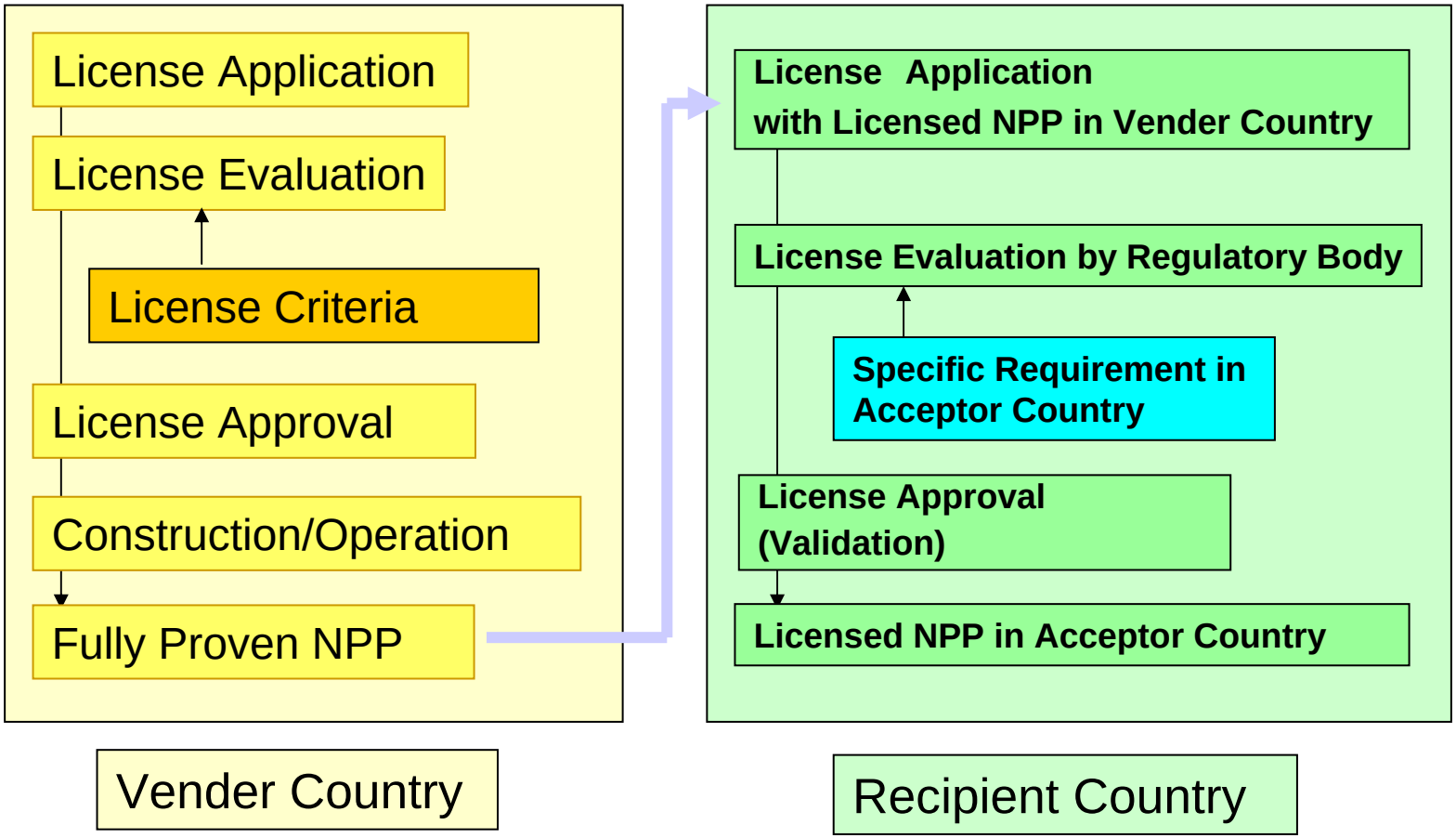
- Under the Support or Accreditation of IAEA,
- Adoption of Similar Licensing Concepts to Those in Vender Country
- Validation by Specific Requirement in Acceptor Country



1-4 ABWR Technology was Fully Established through Construction

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With Modularization Method

Milestones: S/C — R/I — F/C — M/C — O/C — P/S — RPV H/T — F/L — C/O

Construction Period = 38M (actual First ABWR)

Excavation

R/B Building Work

MMR

Base Mat

RCCV Installation

Roof Frame Work

Commissioning

Mat Module

Lower

Upper Liner

Top Slab

RCCV Liner Blocks

EOTC

ECCS/CRD Pre-Operation

RPV ON

Upper Drywell

RIN Installation

Mechanical & Electrical Work In R/B

Base Mat (460tons)

Mechanical module

Upper Drywell (650tons)

S/C: Start Construction
R/I: Rock Inspection
F/C: First Concrete
M/C: Mat Completion
O/C: Operating Floor Completion
P/S: Power Supply
RPV P/T: RPV Hydro Test Completion
F/L: Fuel Loading
C/O: Commercial Operation
EOTC: Electric Overhead Traveling Crane

Critical Module

RCCV Lower Liner (630t, Composite

Displayed Weight shows approximate value

Mechanical module

HCU Module (270t, Composite)

Mechanical module

CUW HX (40tons)

Mechanical module

Off Gas (27tons)

ABWR have been Improved Plant by Plant

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～The only plant of third generation in operation in the world～

- **Provided full-plant or major equipments in all 4 completed ABWR projects**

Tokyo Electric Power CO.
Kashiwazaki-Kariwa-6/7 (1996/1997)
(H/G/T Joint Venture)

Chubu Electric Power CO.
Hamaoka-5 (2005)
(BOP)

Hokuriku Electric Power CO.
Shika-2 (2006)
(NSSS and BOP)

- **Continue to provide series of ABWR projects:**

Chugoku Electric Power CO.
Shimane-3 (Under construction)
(NSSS and BOP)

Electric Power Development CO.
Ohma
(Under construction)
(NSSS (Full MOX ABWR))

Tokyo Electric Power CO.
Higashidori-1 (Under Licensing Review)
(H//T Consortium)

1-6 ABWR will be Constructed Continuously and Improved More in Japan

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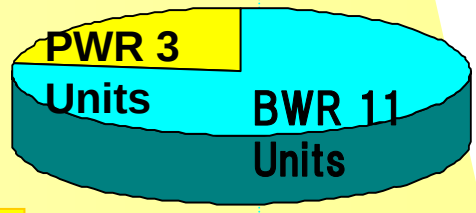
Based on Power Supply Plan
2009 Japan FY by METI

Under Construction

- Shimane-3
- Ohma
- Kaminoseki-1
- Tsuruga-3
- Tsuruga-4
- Higashidori-1(TEPCO)
- Fukushima I-7
- Fukushima I-8
- Sendai-3
- Higashidori-2(TEPCO)
- Kaminoseki-2
- Hamaoka-6
- Namie-Odaka
- Higashidori-2(TOHOKU)



Technology Development
by
Continuous Construction

2005 2010 2015 2020 FY

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2-1 Steps for Site Construction

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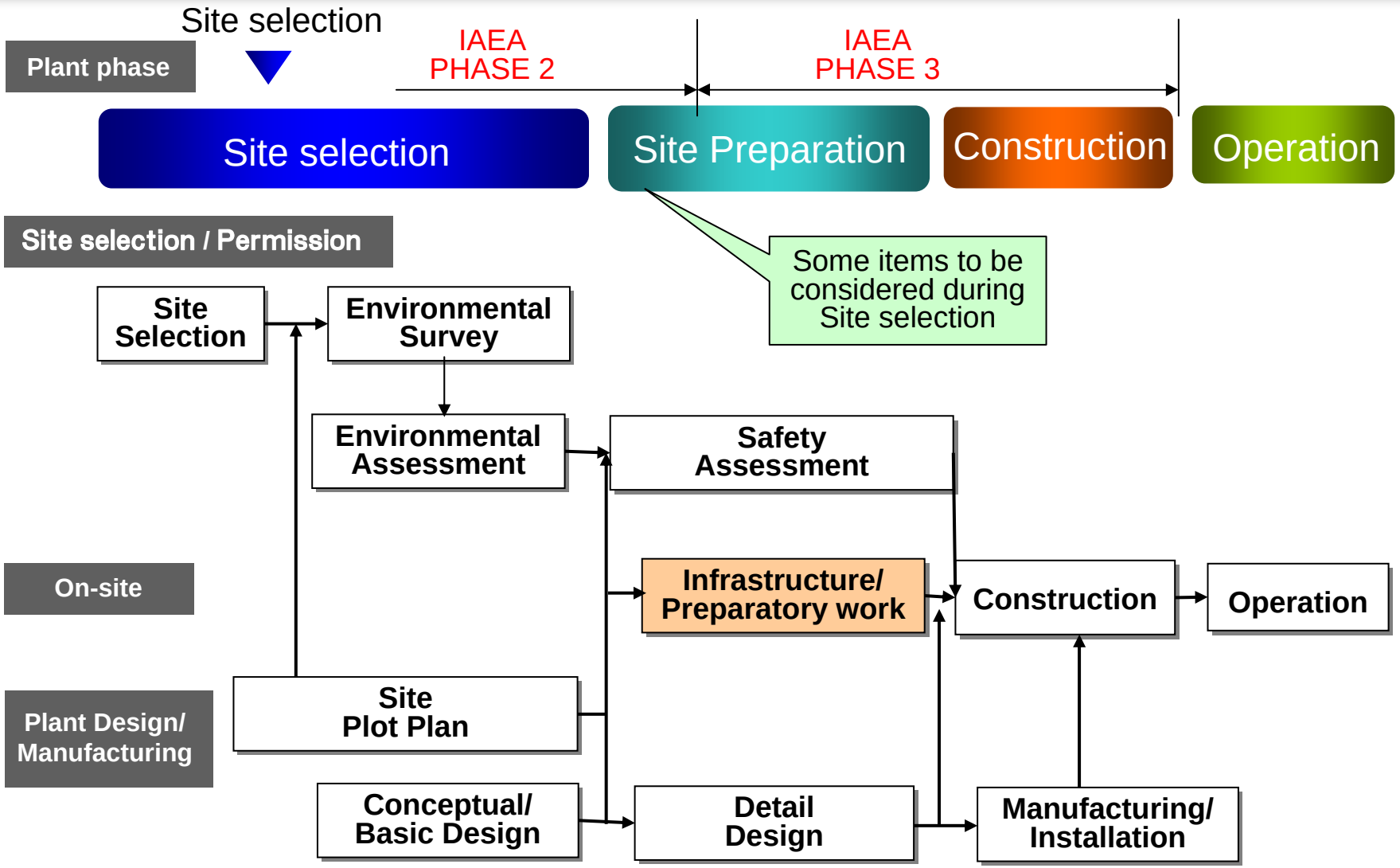

2-2 Key Issues for Site Construction

Establish Energy Policy

Create a Legal Framework

Technology Introduction & Development

Public Acceptance

Site Selection & Infrastructure

Human Resource Development

Systematic and Scheduled Approach

is necessary to achieve NPP introduction

Site Selection & Infrastructure

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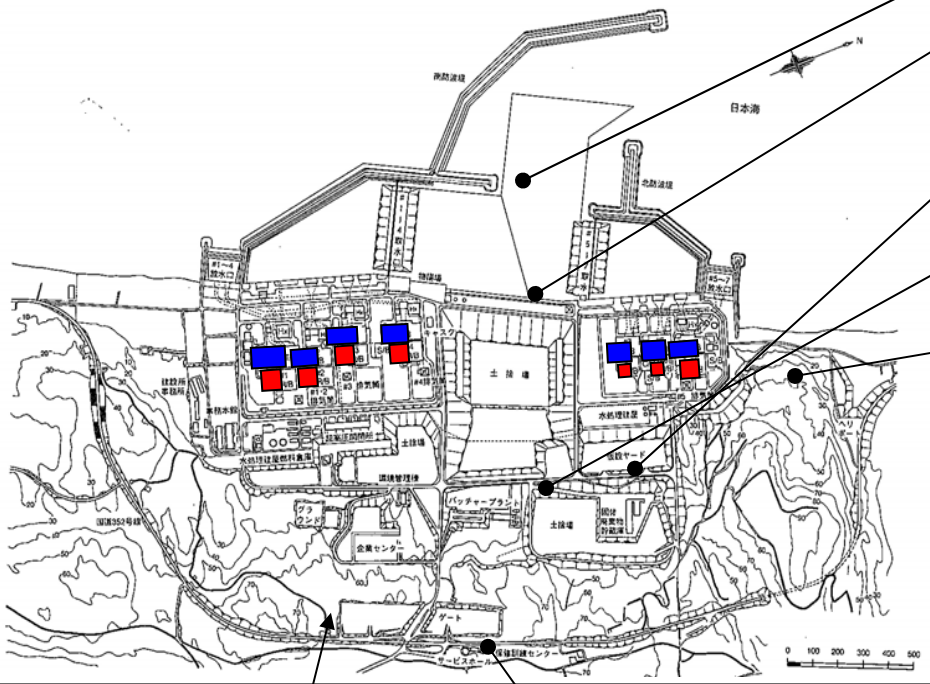
Site Plan of a Nuclear Power Plant



Harbor Facilities
Quarry
Yard and Parking Lot
On-site access road
Land acquisition
Excavation/grading
Water/Electricity supply for construction
Concrete batcher plant

On-site

Off-site

Electrical gridlines
Off-site access road
Off-site temporary construction yard
Village

This figure is extracted from「火力原子力発電所土木構造物の設計」

3-3 Life Related Facilities

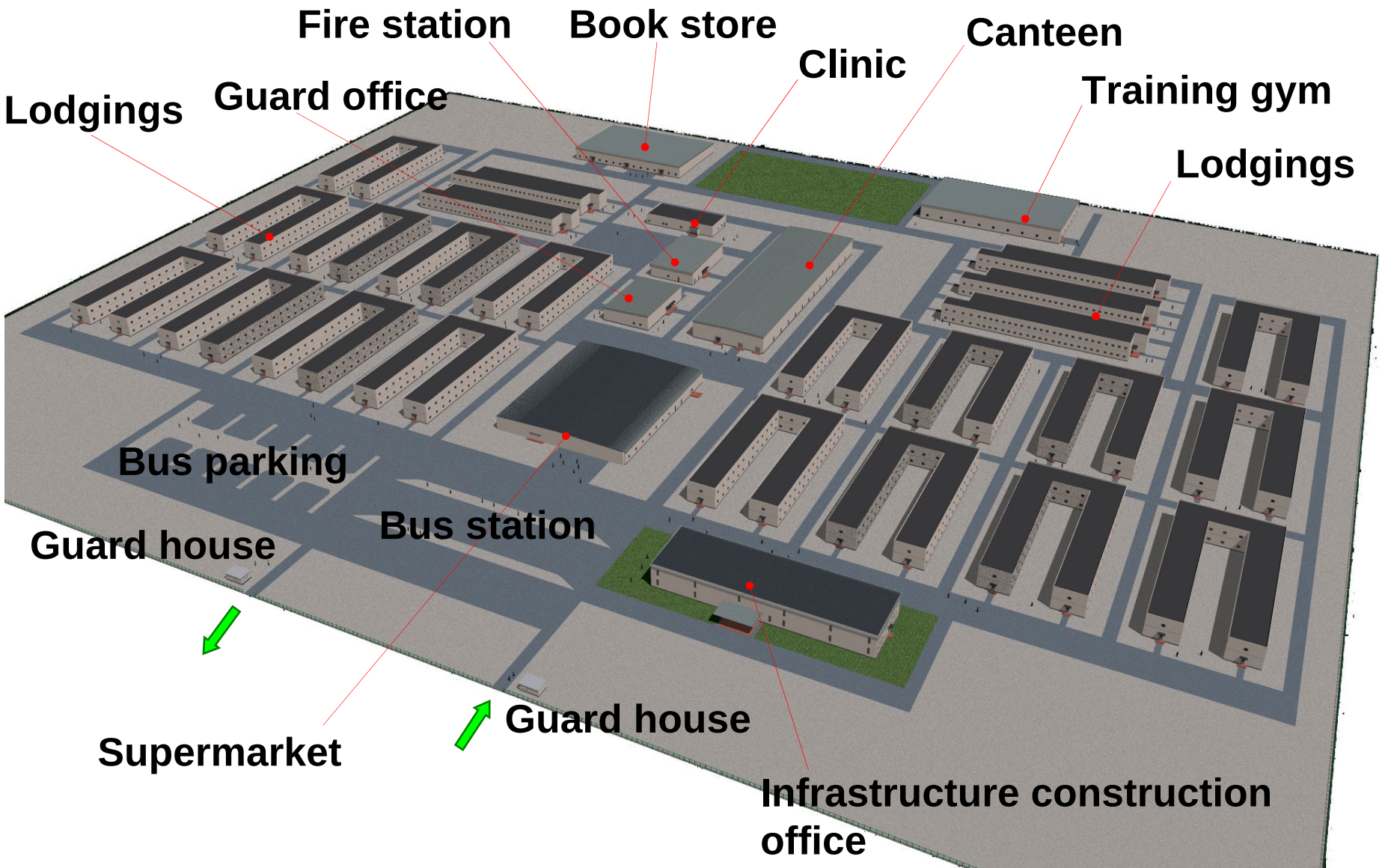
Village (for const.)

- Lodgings
- Fire Station
- Clinic
- Religion Institution
- Amusement Facility
- Supermarket
- Laundry Facility

Nearest Town

- Police Station
- Hospital
- Fire Department
- Bank
- Post Office
- Fuel Supply Vender
- Gas Supply Vender (O_2, N_2, Ar)

Village for NPP Construction (Sample Image)



Human Resource Development Program

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Establish Energy Policy

Create a Legal Framework

Technology Introduction & Development

Public Acceptance

Site Selection & Infrastructure

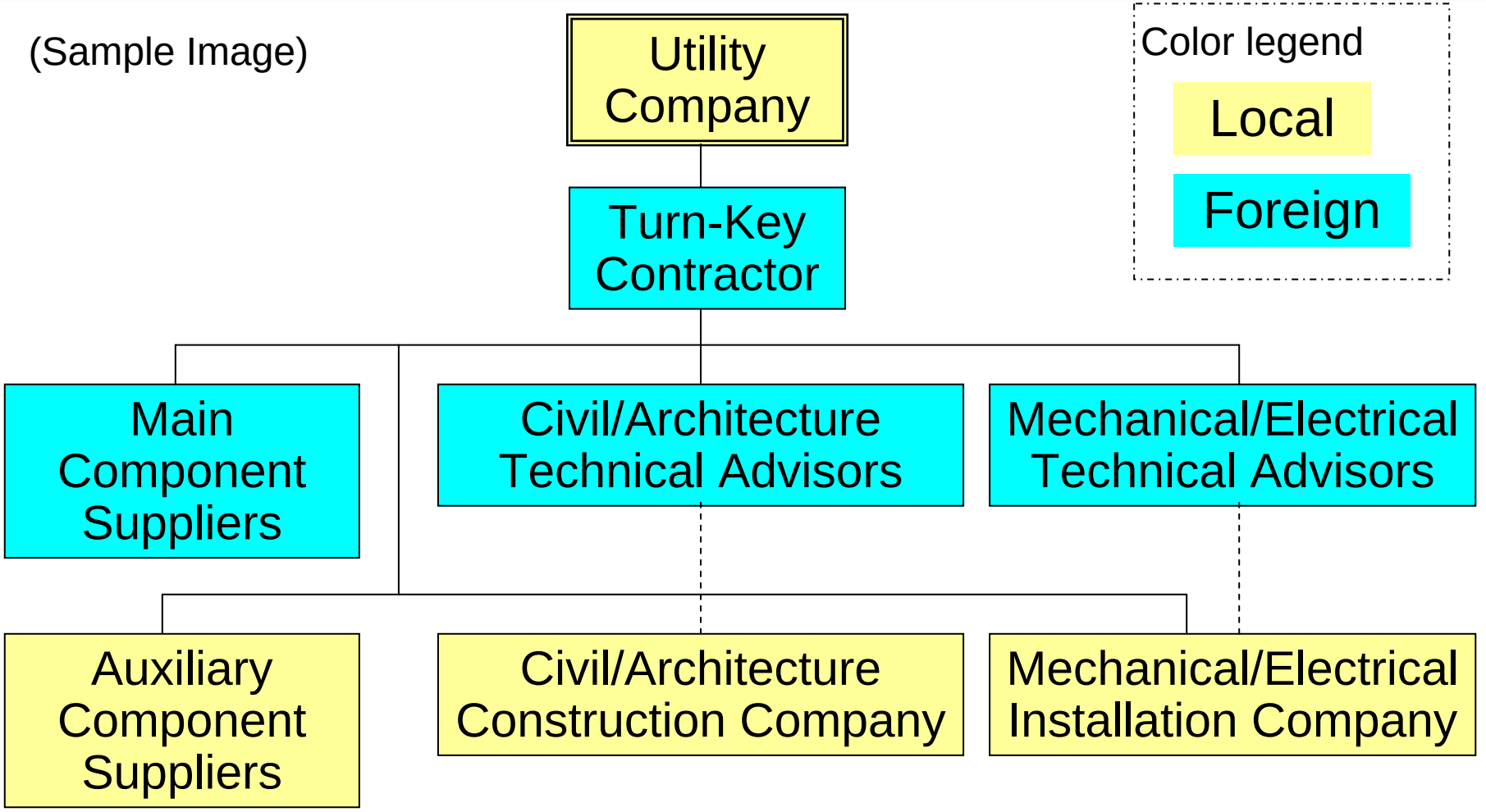
Human Resource Development

Systematic and Scheduled Approach

is necessary to achieve NPP introduction

4-1 Construction Scheme for first NPP

(Sample Image)



Construction/Installation work and some auxiliary components need to be acquired locally

4-2 Human Resource Development (HRD) at Construction & Installation Phase

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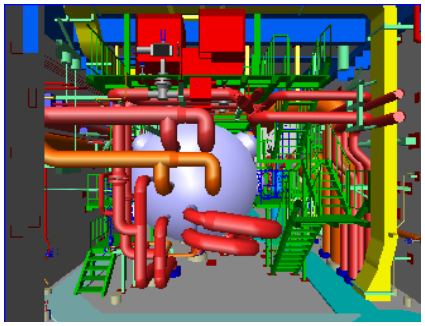
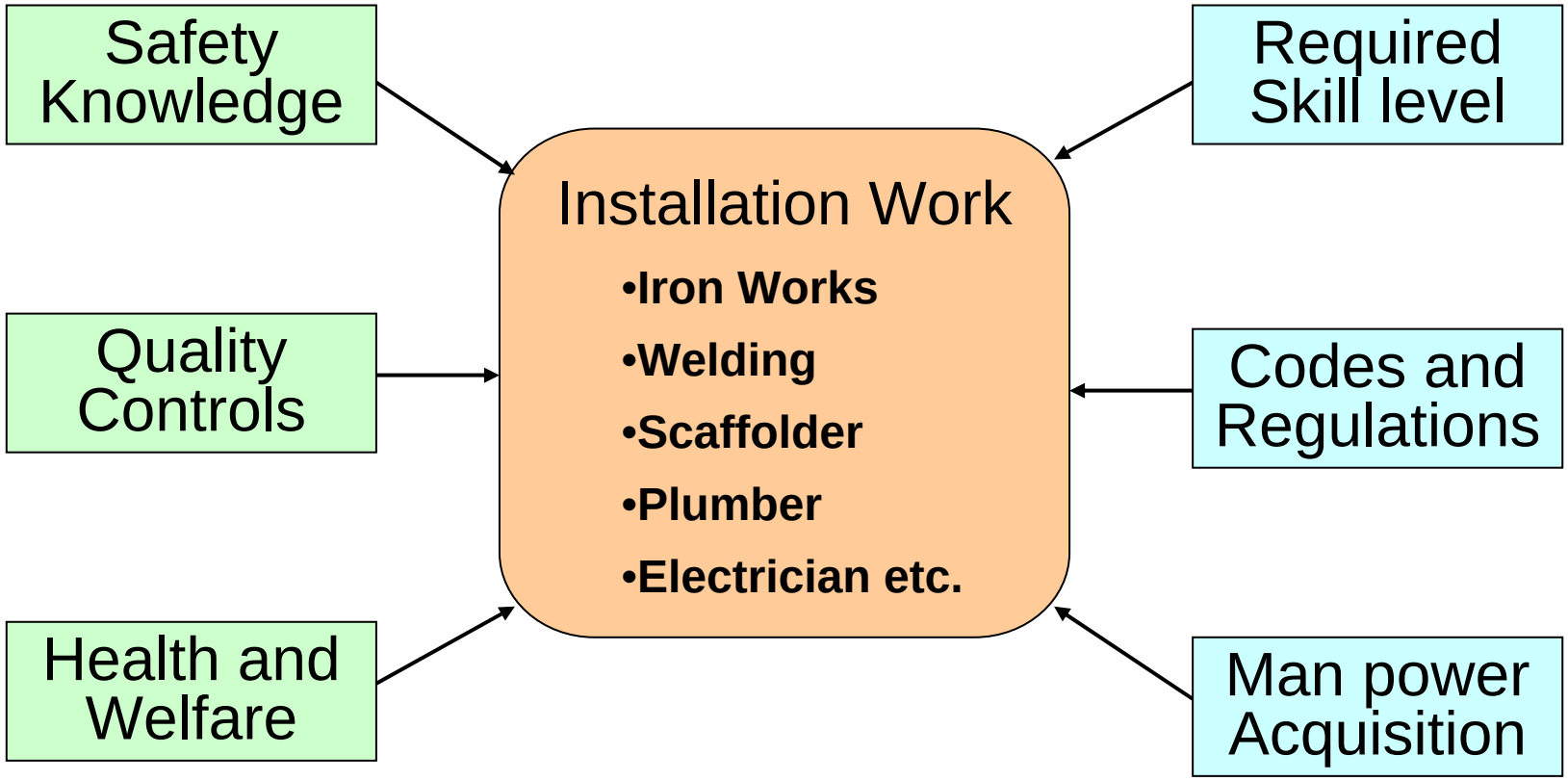
Design Planning → Manufacturing Procurement → **Construction Installation** → Operation Maintenance



- Identify which process should become locally necessary
- What kind of HRD should be done to achieve the planning above
- When and How the HRD should be performed and maintained
- TT and PDCA cycle of further HRD for successive Nuclear Plants

What is required for Installation work?



4-4 Job Classification (Mechanical/Electrical)

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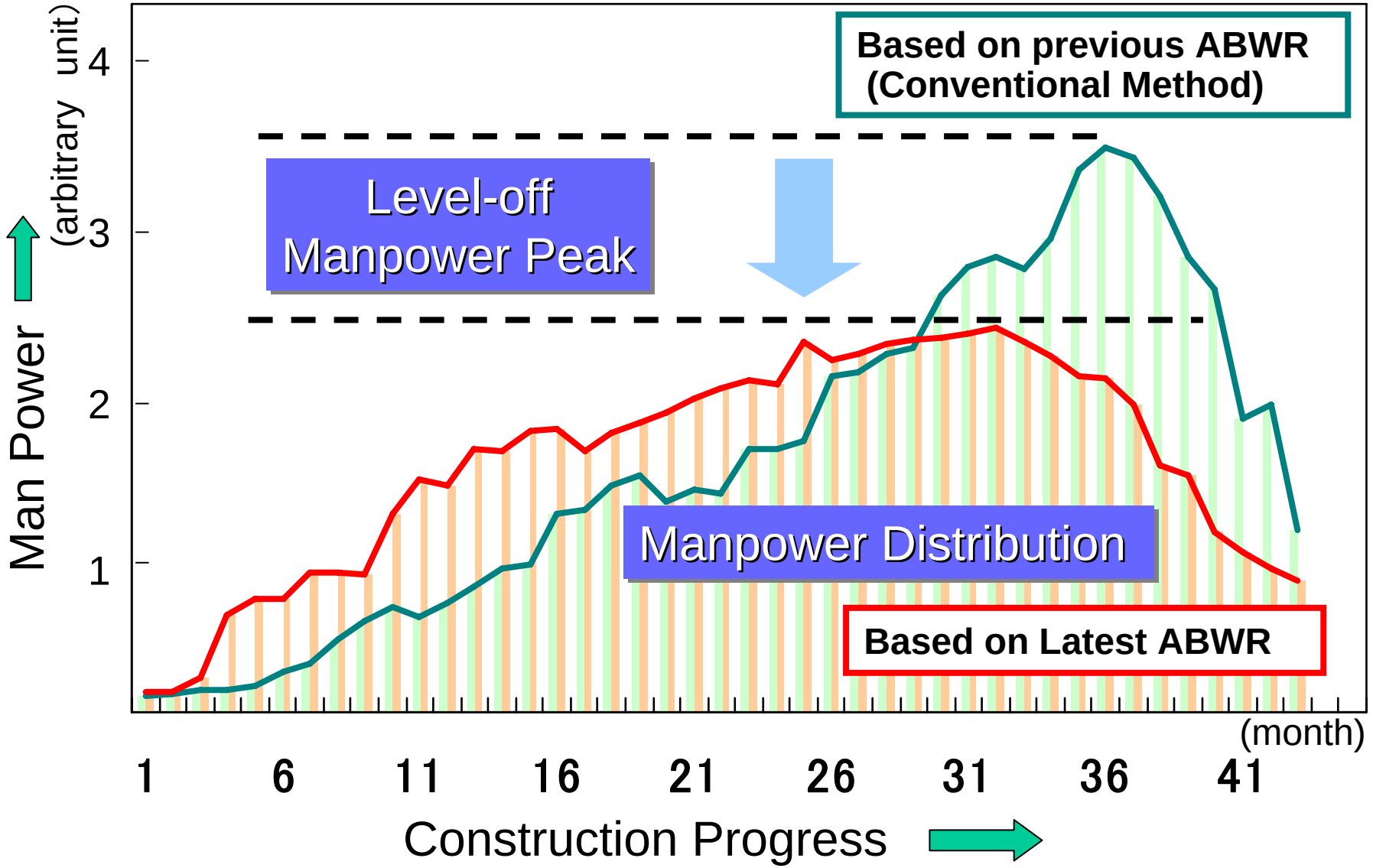
Item	Ratio	Foreman	Worker	Helper
Boiler Maker, Iron Worker	8%	20%	70%	10%
Millwright	7%			
Pipe Fitter, Plumber	13%			
Welder	25%			
Scaffolder, Carpenter	14%			
Sheet Metal Worker	5%			
Electrician	13%			
Instrument Worker	3%			
Insulation Worker	2%			
Painter	3%			
Cement Finisher	1%			
Others	6%			
Total	100%			

Manpower Curve and Peak Reduction Effort



4-6 Education and Training System

Basic Education (All New Members)	Rules & Regulations, Safety, Quality Assurance&Control, etc.
Basic Technical and Work Skill Training	Piping, Welding, Scaffolding, Lifting, Electric Work, etc.
Advanced Skill Up Training	Millwright Course, Welder Course, Electrician Course, etc.
Safety Skill Up Training	Training for the prevision of danger, Lessons learned
Quality Skill Up Training	Search for Failure in Mock-up Facilities, Lessons learned etc.

Technology Introduction & Development

Establish Energy Policy

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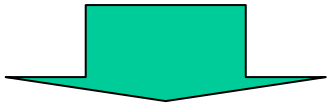
Systematic and Scheduled Approach

is necessary to achieve NPP introduction

Technology Introduction & Development

The following factors should be taken into account of, when localizing NPP

1. Scope (Engineering, Manufacturing, Operation etc.)
2. Level (Classification of equipment by importance/safety etc.)
3. Progress (First NPP, Second NPP and succeeding NPPS)



- Strategic Planning for Localization matched with HRD Planning
- Strong Government support for fostering local industries
- Support by IAEA or Cooperation with other Nuclear advanced countries

5-3 Step by Step Localization along with Industry Development

- Step-by-Step Localization based on Industry Technical Level of Acceptor Country
- Engineering Localization as well as Equipment to be Considered

	Category		1st Stage	2nd Stage	3rd Stage
1	Main Equipment	A			
		B	Foreign		
		C			Local
2	Pumps, Piping, Valves	A			
		B			
		C			
3	Module work	A			
		B			
4	Installation work	A			
		B			
Industry Development in Recipient Country					

1,2: A: Important to Safety and Performance, B: Dedicated Skill, C: Others (Image Picture)

3,4: A: Dedicated Skill, B: Others

5-4 An Example of Localization

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- 1997/5 Hitachi Established Joint Mechanical Company in Dalian in China

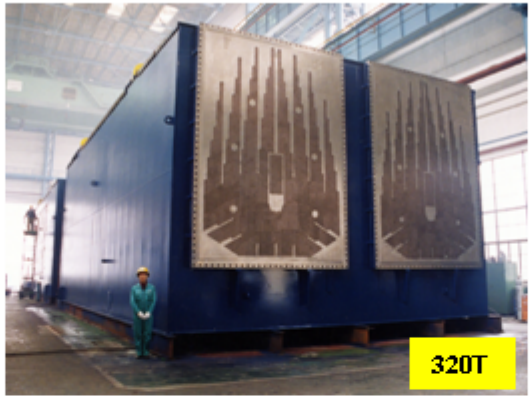
- 1999/5 Shipped Power System Equipment to Qinshan-Phase III in China

- Now Continuing of Manufacturing Equipment of Power, Chemical and other System

An Example of Localization
based on Local Industry Ability

Power System Equipment

Containment Hatch



Condenser

Deaerator

MSR

HP-HTR

LP-HTR

6 Conclusions

- **Introduction of Fully Proven Technology based on long experience is vitally important to new-comer country on short schedule and on budget construction with optimum infrastructure**

- **Site Infrastructure preparation should be well considered during site selection stage and be performed before main Construction starts**

- **Human Resource Development at construction & installation phase is vitally necessary as well as design & planning, Commissioning or O&M phase**

- **Strategic Planning for Technology introduction & development including localization policy is required with strong government support and local industry ability**

Thank you for your attention!

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