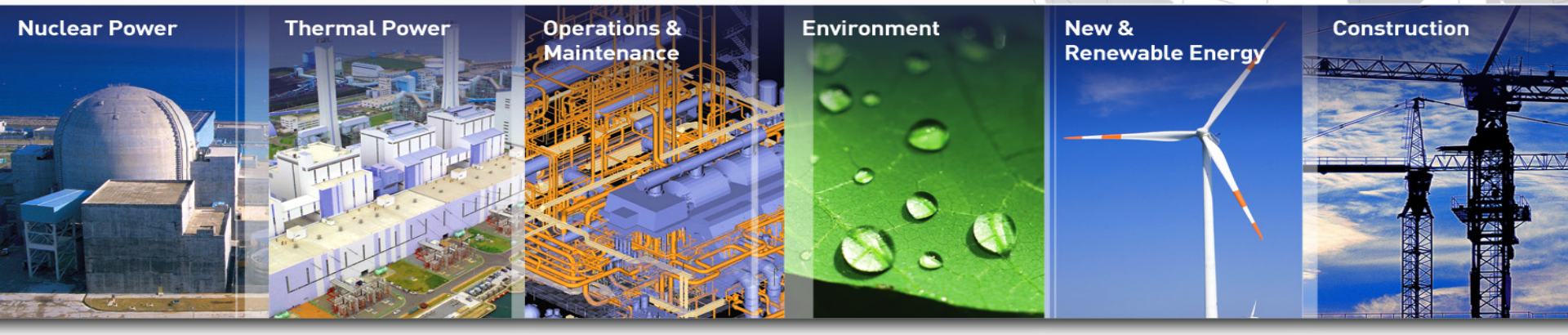
KEPCO E&C

Global Power EPC Company



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1 _ Company Information

2 _ Business Area

2-1. Nuclear Power
2-2. Thermal Power
2-3. O&M/Environment/PM•CM

3 _ Our Performance

KEPCO ENGINEERING & CONSTRUCTION COMPANY, INC.

Company Overview

Korea's Leading Power Plant Engineering Company

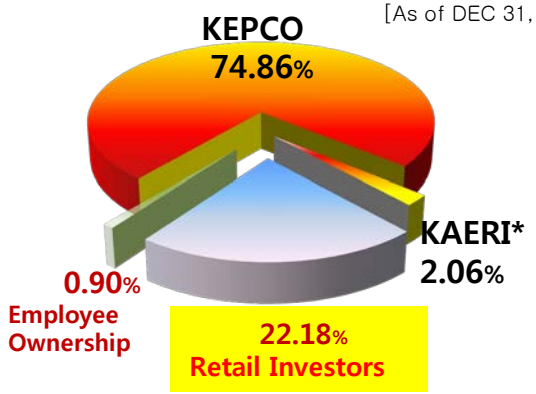
- Korea's leading provider of design and engineering for nuclear, thermal and hydro-electric plants with over 35 years of experience
- Current 100% market share in nuclear power plant design in Korea
- The world's most competitive engineering company specialized in the two sectors: A/E and NSSS
- Expanding its business to Thermal EPC, energy-related business, environment-friendly business, etc.

Corporate Information

CEO & President	An, Seung Kyoo (Former Vice Chairman, Hyundai Engineering)
Foundation Date	October 1, 1975
Employees	2,337 (As of JAN 1, 2013)
Business Area	Power plant design & engineering, etc.

Ownership

[As of DEC 31, 2012]



* KAERI - Korea Atomic Energy Research Institute

IPO Information

Shares Outstanding (Common shares 100%)	38,220,000
Listing Date	December 14, 2009
Offered Securities	7,644,000

Year	2009	2010	2011	2012
Dividend Propensity*	50%	50%	70%	55%

* Dividend Propensity – Dividend/Net Income *100

Business Overview

Business Areas

• Design & Engineering

- Nuclear Power Plant
- Thermal Power Plant
- Combined Cycle Power Plant
- Cogeneration Power Plant

• O&M (Operations & Maintenance)

- Technology & Engineering Support for Operating Power Plants

• Environmentally-friendly Biz.

- FGD System / DeNOx System
- ESCO, Renewable Energy
- Water Pollution Control
- Wastewater Treatment Facilities

• PM/CM

- SOC
- Private SOC
- Power Plants
- International Plants

Business Area – Design & Engineering

All of the local nuclear power plants have been independently designed by KEPCO E&C since 1993, Ulchin Unit 3.

Major Project Experience

• Projects in Progress

Reactor	Project	Project Period	Client
APR 1400	UAE #1,2,3,4	Jan '10 ~ May '20	KEPCO
	Shin-Ulchin #1,2	Dec '07 ~ Dec `16	KHNP
	Shin-Kori #3,4	Aug '06 ~ Sep '14	KHNP
OPR 1000+	Shin-Wolsung #2	Aug '02 ~ Jan '13	KHNP
	APR1400 US NRC DC design/licensing support	Mar '11 ~ Jul '13	KEPCO
	APR+ design Development – stage 2	Aug '10 ~ Dec '12	KHNP

• Projects Completed

Reactor	Project	First Power	Design
OPR 1000+	Shin-Wolsung #1	2012	KEPCOE&C
	Shin-Kori #1,2	2011 / 2012	KEPCOE&C
OPR 1000	Ulchin #5,6	2004 / 2005	KEPCOE&C
	Yonggwang #5,6	2002 / 2002	KEPCOE&C
	Ulchin #3,4	1998 / 1999	KEPCOE&C
	Yonggwang #3,4	1995 / 1996	KEPCOE&C-WEC
CANDU PHWR	Wolsung #3,4	1998 / 1999	AECL-KEPCOE&C
	Wolsung #2	1997	AECL-KEPCOE&C
	Wolsung #1	1983	AECL-CANATOM

*KHNP – Korea Hydro & Nuclear Power co. LTD. (The sole nuclear power plant operator in Korea)
*WEC – WestingHouse Electric.
*AECL – Atomic Energy of Canada Limited

*CANDU PHWR – CANada Deuterium Uranium Pressurised Heavy Water Reactor

Technology – Nuclear Power Plant

Korean Nuclear Power Plant Design Development

1990s - GEN. Ⅲ

OPR 1000
Optimized Power Reactor

- Improved Safety
- Improved Operability, Maintainability and Accessibility

- Yonggwang Units 5,6
  Ulchin Units 3~6

OPR+
Improved OPR

- Optimization of plant arrangement
- Optimization of system design and Equipment capacity

- Shin-Wolsong Units 1,2
  Shin-Kori Units 1,2

2010s - GEN. Ⅲ+

APR 1400
Advanced Power Reactor

- 1,400MW Class large capacity
- A Korean nuclear power reactor improved economic factor

- Shin-Kori Units 3,4
  Shin-Ulchin Units 1,2
  BNPP(UAE) Units 1~4

2020s - GEN. IV

- **Under Development**

APR 1400
(For Europe)

APR+
Improved APR

- 1,500MW
- New light water nuclear reactor

APR 1400
(US NRC DC*)

SMART
System-integrated Modular Advanced Reactor

- 90MW
- Reactor, steam generator, pressurizer & coolant pumps integrated in one vessel

VHTR
Very High Temperature Reactor

SFR
Sodium Cooled Fast Reactor

- **The Competing Reactors**

France	USA	Japan	Russia
AREVA	WH-Toshiba	Mitsubishi	ASE
EPR1600	AP1000	APWR+	VVER-1500

※ All of the reactors in this box are PWR type reactors.

* US NRC DC: United States Nuclear Regulatory Commission Design Certification

Strength of Korean Nuclear Power Plants

APR1400 - The best reliability, economic efficiency and operability

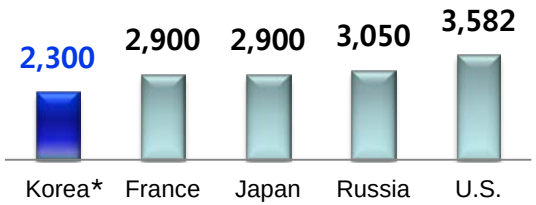
APR 1400 in Detail

<Source : www.apr1400.co.kr ; Comparison with other reactors>

	OPR 1000	APR 1400	EPR 1600
Capacity (MWe)	1000	1,400	1,600~1700
Design Life Time	40	60	60
Seismic Design Basis	0.2g	0.3g	0.25g
Refueling Interval (month)	12~18	18	18
Construction Period (month)	Over 60	54	57
Construction cost ($/Kw)	-	2,300	2,900

- **The World's Most Economical and the Safest Reactor**

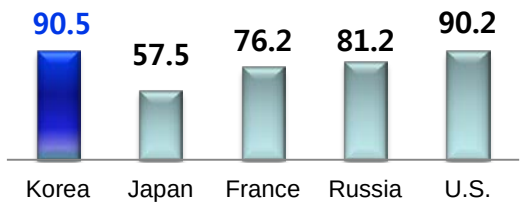
Cost of Building Nuclear Power Plant ($/Kw)



*APR1400

※World Nuclear News
(World Nuclear Association, 2008)

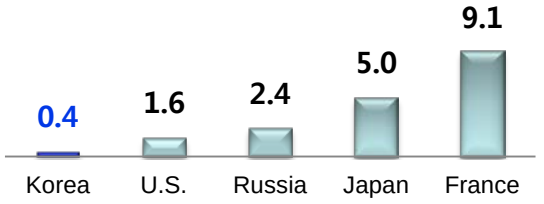
Energy Availability Factor(%)



▪ EAF = (REG-PEL-UEL-XEL)/REG x100
▫ REG : Reference Energy Generation ▫ PEL : Planned Energy Loss ▫ UEL : Unplanned Energy Loss ▫ XEL : External Energy Loss

※ IAEA PRIS (Power Reactor Information System), A three-year average (2009~2011)

Unplanned Capacity Loss Factor (%)



- **Exporting technology to the world** (Below is recent overseas projects)
  - ITER Electrical Installation Support (Client : ITER)
  - AP1000 COL Demonstration & Design Finalization (Client : WEC)
  - Technical Support for Bechtel (Client : Bechtel)

Market Opportunities

Focus on New Opportunities at Home & Abroad

Growth of Nuclear Power

• Domestic

*Timeline for Completion of Nuclear power plant construction (`13~`24)

Year	Project [capacity (MW)]
2013	Shin-Kori #3 [1400]
2014	Shin-Kori #4 [1400]
2016	Shin-Ulchin #1 [1400]
2017	Shin-Ulchin #2 [1400]
2018	**Shin-Kori #5 [1400]**
2019	**Shin-Kori #6 [1400]**
2020	**Shin-Ulchin #3 [1400]**
2021	**Shin-Ulchin #4 [1400]**
2022	**Shin-Kori #7 [1500]**
2023	**Shin-Kori #8 [1500]**

*This timeline was based on "The 5th Basic Plan of Long-term Electricity Supply" of The Ministry of Knowledge Economy(2010.12.28)
*The changed schedule and a new national energy plan will be announced by the Korean government in Aug 2013.

• Overseas

*Projected Growth for World Nuclear Power

Year 2011 → 2030

435 reactors (369 GWe)

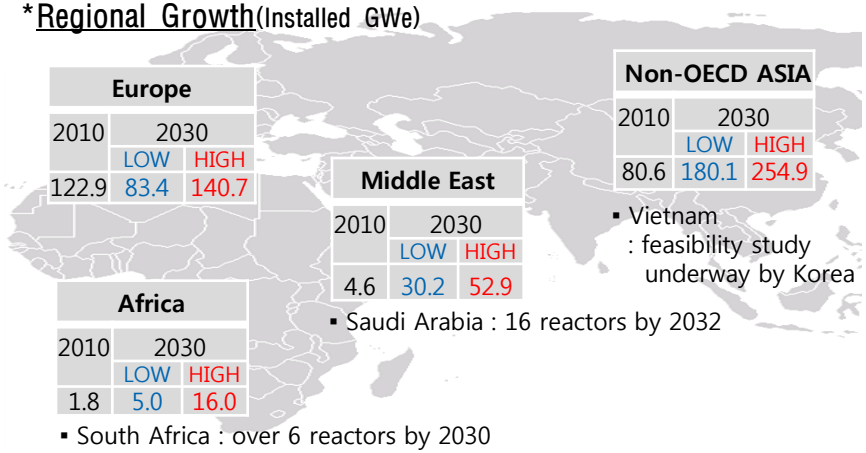
90↑ Low projection

High projection 350↑

525 reactors (501 Gwe)

785 reactors (746 GWe)

*Regional Growth(Installed GWe)



▪ Vietnam : feasibility study underway by Korea

▪ Saudi Arabia : 16 reactors by 2032

▪ South Africa : over 6 reactors by 2030

(Source ▫ IAEA Nuclear Technology Review 2012 ▫ World Nuclear Association country briefings)

Business Area – Design & Engineering

Experiences of
Coal fired/ CFBC Coal fired/ Combined Cycle/ Cogeneration Design

Major Project Experience

• Projects in Progress

Capacity (MW)	Project	Project Period	Client
340	Ghana Takoradi T2 EPC	Dec '11 ~ Oct '14	Takoradi Int'l Company
1000x2	Taean #9,10	Jun '11 ~ Mar '17	Korea Western Power
150 x3	Turkey Turfanbeyli (Including Procurement)	Apr '11 ~ Feb '15	SK E&C
1000x2	Shin-Boryeong #1,2	Jan '11 ~ Sep '17	Korea Midland Power
350 x2	Morocco Jorf Lasfar	Jun '10 ~ Apr '14	Daewoo E&C
1000x2	Dangjin #9,10	Oct '07 ~ Sep '16	Korea East-West Power
1000x2	Samchok #1,2	Sep '09 ~ Mar '16	Korea Southern Power
300	Taean *IGCC Pilot Plant	Apr '11 ~ Jul '16	Korea Western Power

• Projects Completed

Coal Fired Power Plant
- 500MW 34 Units
- 800MW 4 Units

Large Scale *CFB Coal Fired Power Plant
- 200MW 2 Units
- 340MW 1 Unit

Combined Cycle /Cogeneration
- 38 Units

* IGCC - Integrated Gasification Combined Cycle
(Producing electricity by burning coal gas regarded as clean as natural gas)
* CFB - Circulating Fluidized Bed Combustion Boiler

Technology – Thermal Power Plant

Coal-Fired Power Plant Design Development

Standard Coal Fire Power Plant (1000MW)
- Ultra-supercritical, highly efficient
- 1,000MW class large capacity

→ Dangjin 9,10; Shin-Boryeong 1,2; Taean 9,10

Standard Coal Fire Power Plant (800MW)
- Improved heat efficiency through the increase of steam temperature
- 3D CAD model design

→ Yeonghung 1~4

Standard Coal Fire Power Plant (500MW)
- Use of supercritical pressure steam, highly efficient operation
- Environment-friendly design

→ Boryeong 3~8; Taean 1~8; Dangjin 1~8

Standard Coal Fire Power Plant (200MW)
- Circulating fluidized bed boiler
- High compatibility of fuels

→ Tonghae 1,2; Yongwol 3

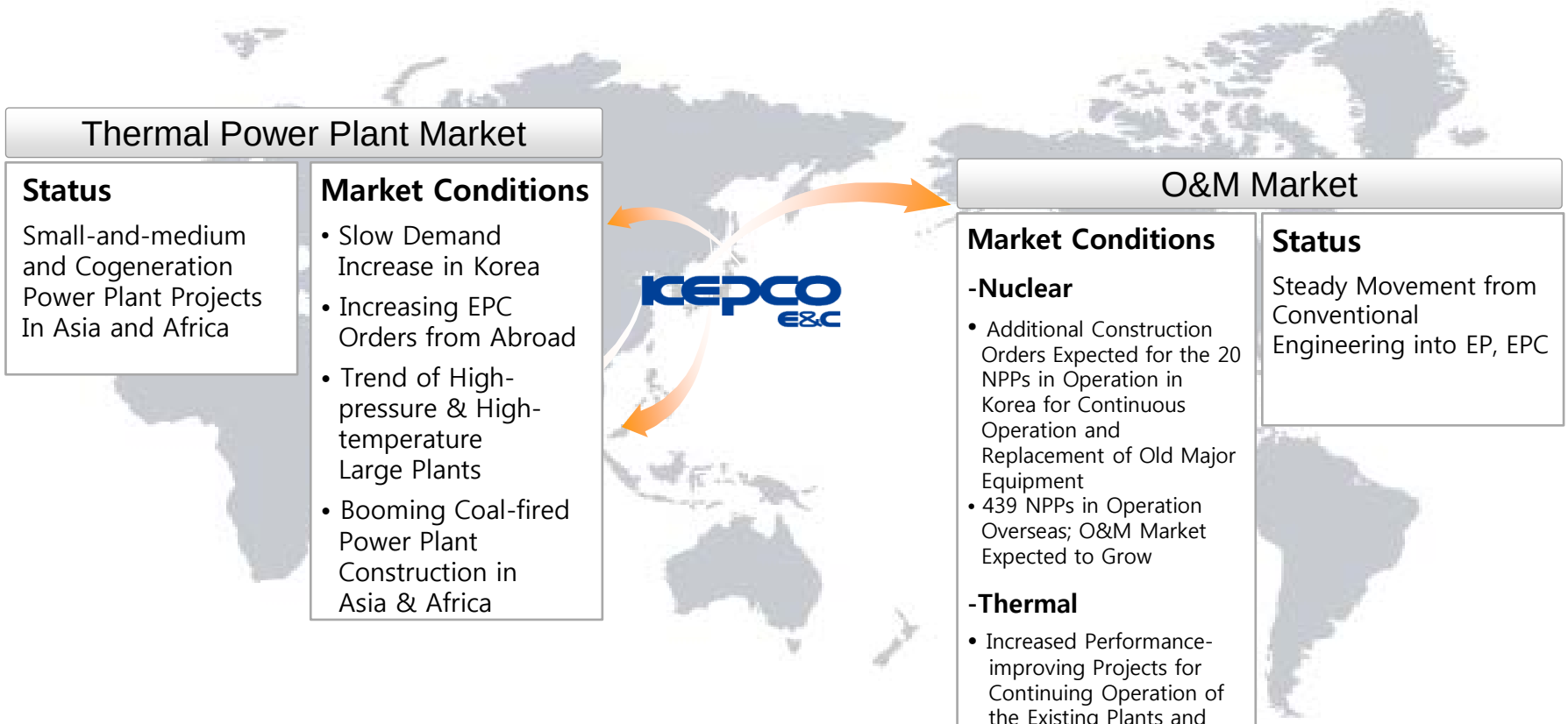
• **Dangjin #1~4- World Best Project Awarded**
<US, Power Engineering, 2001>

• **Boryeong #3,4 – World Best Project Awarded**
<US, Electric Power International,1996>

EPC Business Expansion

Developing Overseas EPC Projects toward Global Top 5 Power EPC Leader

EPC Strategy



Thermal Power Plant Market

Status

Small-and-medium and Cogeneration Power Plant Projects In Asia and Africa

Market Conditions

- Slow Demand Increase in Korea
- Increasing EPC Orders from Abroad
- Trend of High-pressure & High-temperature Large Plants
- Booming Coal-fired Power Plant Construction in Asia & Africa

KEPCO E&C

O&M Market

Market Conditions

-Nuclear

- Additional Construction Orders Expected for the 20 NPPs in Operation in Korea for Continuous Operation and Replacement of Old Major Equipment
- 439 NPPs in Operation Overseas; O&M Market Expected to Grow

-Thermal

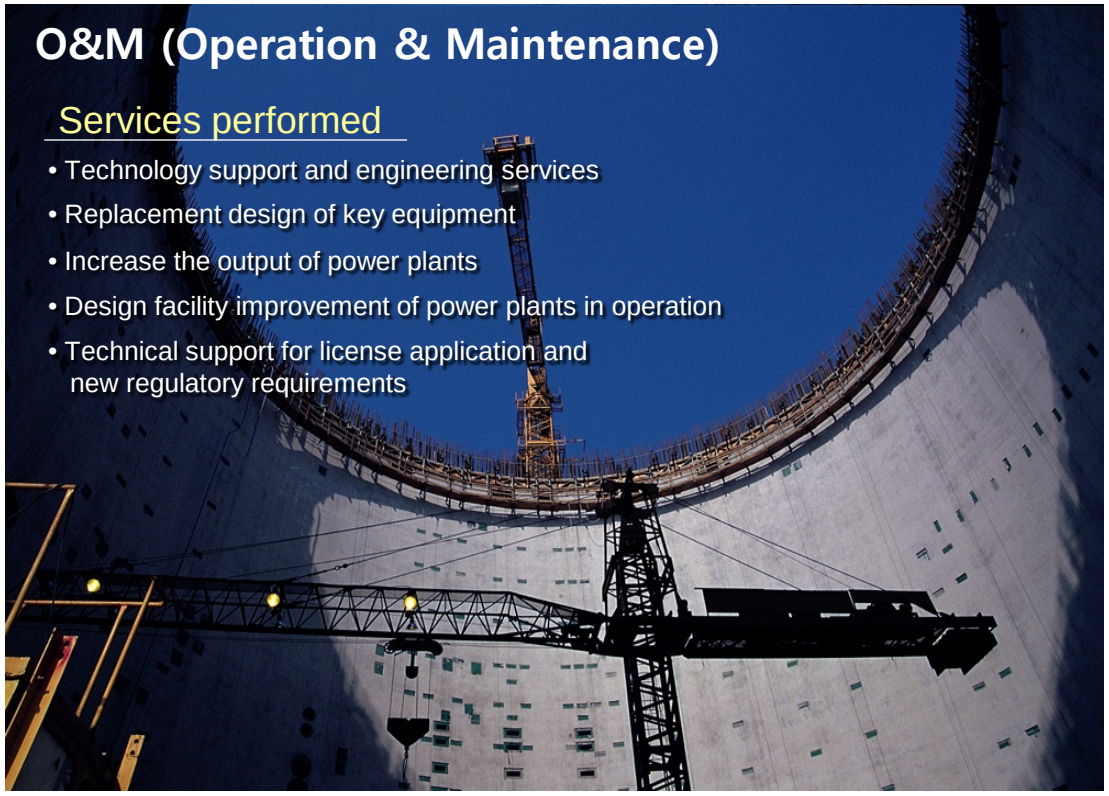
- Increased Performance-improving Projects for Continuing Operation of the Existing Plants and Reducing the Cost
- Increasing Old Plant Facilities outside Korea

Status

Steady Movement from Conventional Engineering into EP, EPC

Business Area – O&M

Contribution to the Improvement of the Operating Power Plants' Operability, Efficiency and Safety



Major Project Experience

- **Recent Projects**
  - Technical support for license application to replace the steam generator for Unchin #1,2
  - Technical consulting for license application to increase the output for Ulchin #1,2
  - Improvement of facilities at Yeosu #2
  - hundreds of small projects are in progress

Business Area – O&M

The O&M market is growing due to the old operating nuclear power plants.

• Domestic Operating Nuclear Power Plants (23 units)

Plant		Capacity (MW)	Commercial Date	NSSS Supplier	Plant A/E	Model
Kori	#1,2	587/650	Apr `78/ Jul `83	WEC	Gilbert	PWR
	#3,4	950	Sep `85 / Apr `85	WEC	Bechtel/KEPCO E&C	
Wolsung	#1,2	679 /700	Apr `83 / Jul `98	AECL/	AECL	PHWR
	#3,4	700	Jul `98 / Oct `99	AECL/DOOSAN	AECL/KEPCO E&C	
Yonggwang	#1,2	950	Aug `86 / Jun `87	WEC	Bechtel/KEPCO E&C	PWR
	#3,4	1,000	Mar `95 / Jan `96	DOOSAN	KEPCO E&C	PWR (OPR1000)
	#5,6	1,000	May `02 / Dec `02	DOOSAN	KEPCO E&C	
Ulchin	#1,2	950	Sep `89 / Sep `88	Framatome	Framatome	PWR
	#3,4	1,000	Aug `98 / Dec `99	DOOSAN	KEPCO E&C	PWR (OPR1000)
	#5,6	1,000	Jul `04 / Apr `05	DOOSAN	KEPCO E&C	
Shin-Kori	#1,2	1,000	Feb `11 / Jul `12	DOOSAN	KEPCO E&C	PWR (OPR1000+)
Shin-Wolsung	#1	1,000	Jul `12	DOOSAN	KEPCO E&C	

• Developing Canada PHWR O&M Market

- MOU with SNC-Lavalin Nuclear (Mar `12)
- MOU with CANDU Energy (May `12)
- Established the Office in Toronto, Canada (Dec `12)

* CANDU Energy
  - created in 2011 when parent company SNC-Lavalin purchased the commercial reactor division of AECL(Atomic Energy of Canada Limited), along with CANDU reactor technology
* CANDU reactor
  - CANada Deuterium Uranium PHWR(Pressurised Heavy Water Reactor)

Business Area – Environmentally-friendly Biz.

• Environmental Business

Advanced air pollution prevention facilities
- Flue gas desulfurization system
- Flue gas denitrification(DeNOx) system

Site selection and environmental assessment

Water quality pollution prevention facilities
- Wastewater treatment facilities
- Sewage, manure, and livestock wastewater treatment facilities

Greenhouse gas reduction systems
- Development of technologies for capturing carbon dioxide
- CDM(Clean Development Mechanism) projects

• New and Renewable Energy

ESCO(Energy Service Company)

- Improvement of output of power plants
- Installation of energy-saving facilities
- Improvement of productivity of manufacturing industries

11 Projects ESCO projects performed by KEPCO E&C

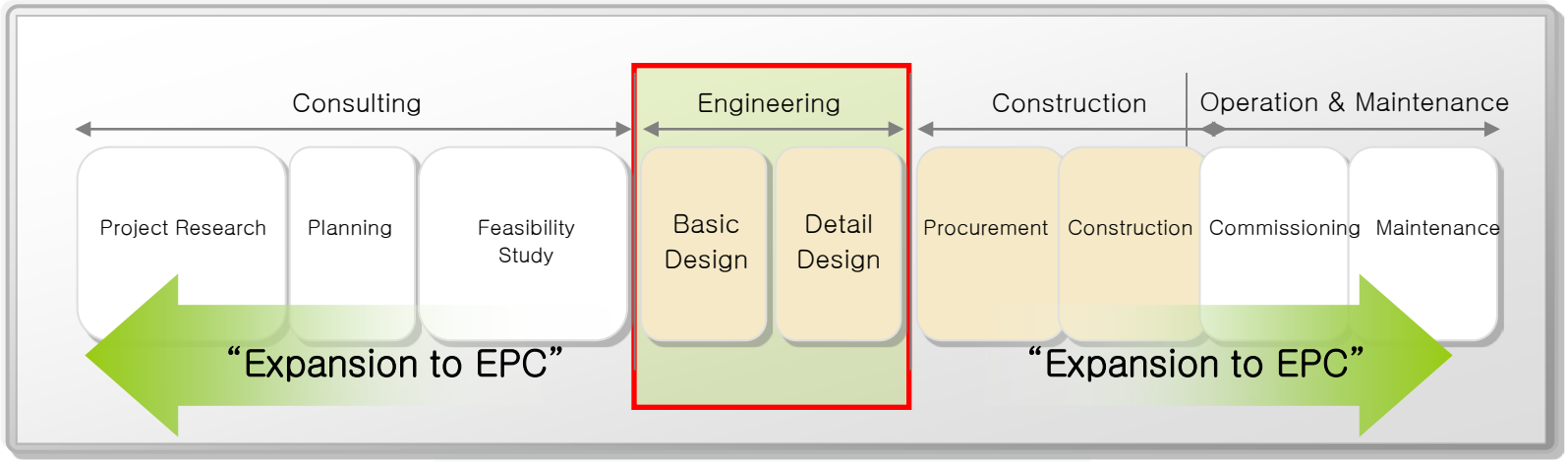
117,369 TOE Annual energy saving by ESCO projects

321,899 t Annual CO_2 reduction by ESCO projects

63,165,560 US$ Annual energy saving value by ESCO projects

Business Area – PM/CM

Management of the Entire or Parts of a Construction Project (Consulting, Engineering, Construction, O&M , etc.)



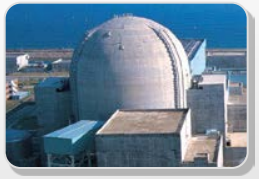
- **Involved Projects**

SOC

KTX Project

Incheon Int'l Airport

POWER PLANTS


Nuclear

Thermal

PRIVATE SOC

Incheon Int'l Airport Rail

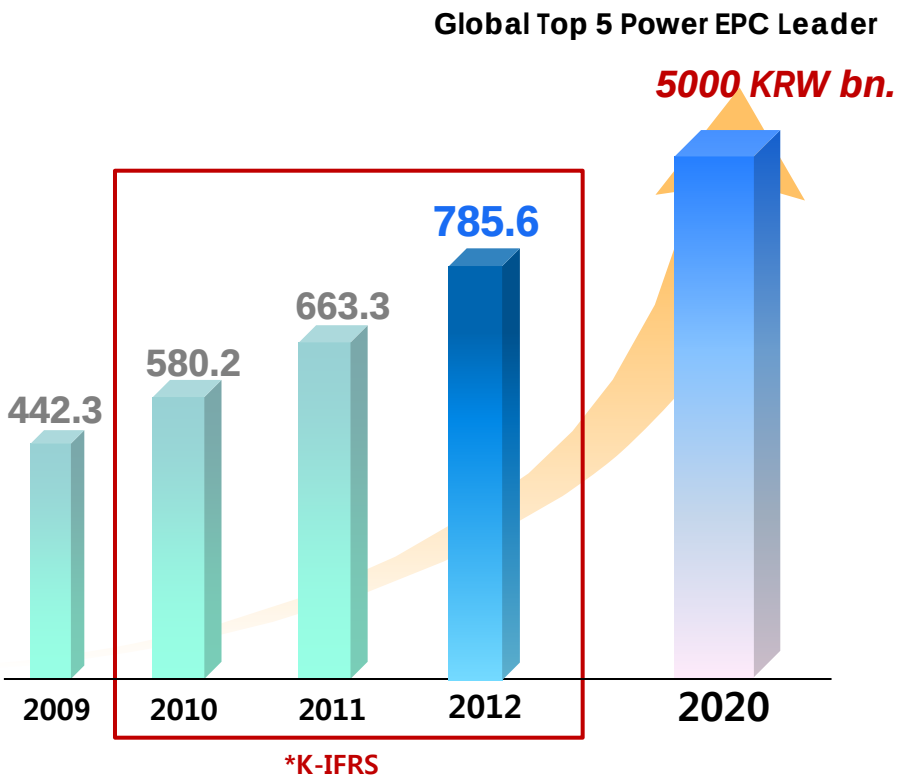
Bridge of Busan-Gejei

Financials

2012 Revenue

• Revenue

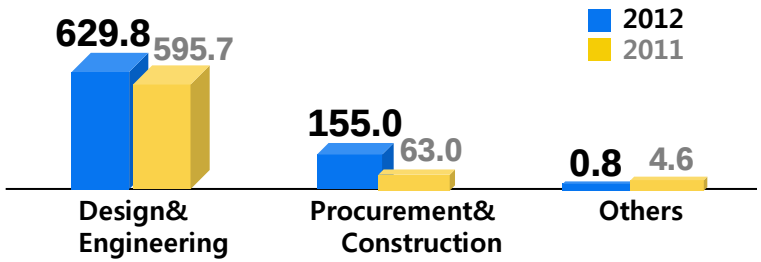
[Unit: KRW bn.]



• Revenue Breakdown

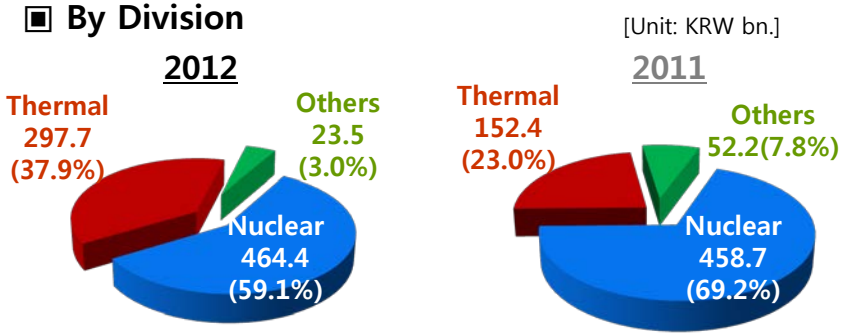
▣ By Business Area

[Unit: KRW bn.]



▣ By Division

[Unit: KRW bn.]



▣ By Region

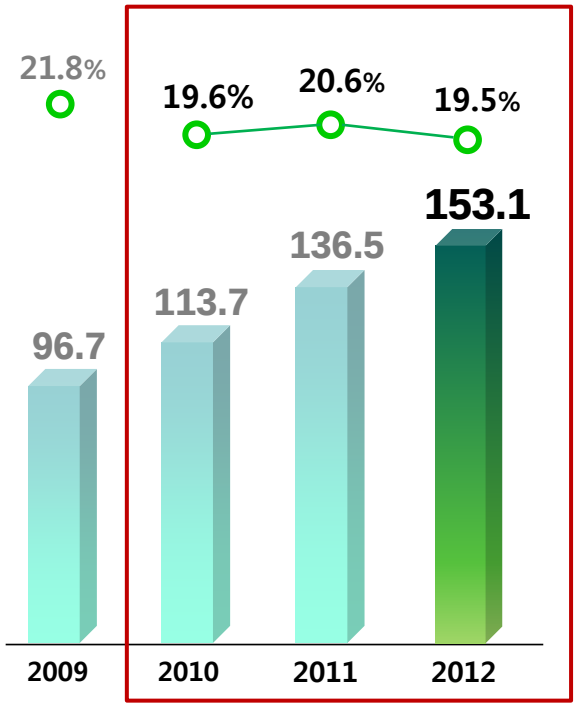
* KEPCO E&C has adopted K-IFRS(Korean International Financial Reporting Standards) from FY `11 in line with the national policy.
(FY `10 financial statements is also converted to "K-IFRS" for comparison with FY `11.

Financials

2012 Financial Highlights

• Operating Income /Margin

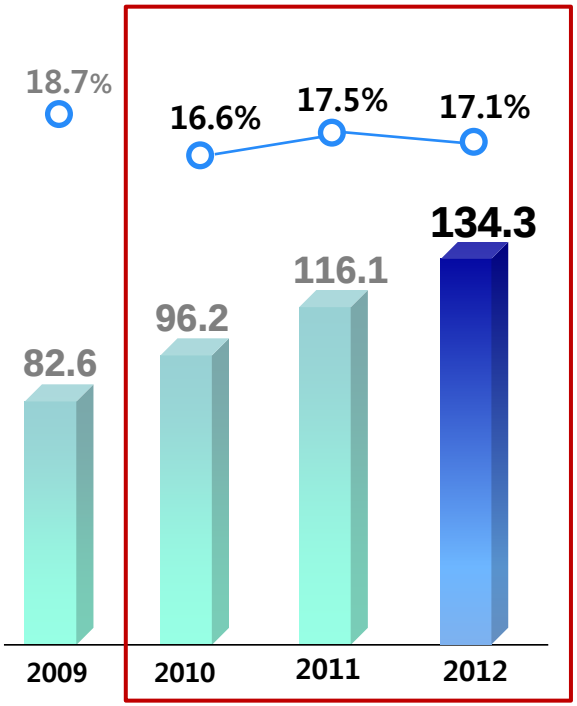
[Unit : KRW bn.]



*K-IFRS

• Net Income /Margin

[Unit : KRW bn.]



* K-IFRS

• 2012 4Q Overview

[Unit : KRW bn.]

	2012 4Q	2012 3Q	2011 4Q
Revenue	**263.1**	185.9	202.8
Operating Income	**46.9**	32.3	20.3
Net Income	**40.9**	28.9	25.6

* KEPCO E&C has adopted K-IFRS(Korean International Financial Reporting Standards) from FY `11 in line with the national policy.
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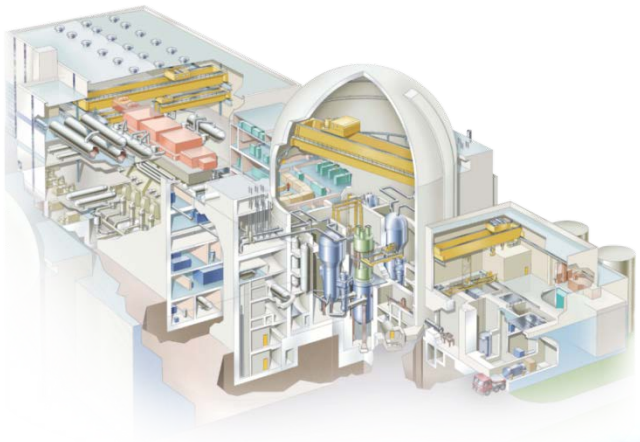
Vision 2020 – Global TOP 5 Power EPC Leader



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KEPCO E&C