

FINEX: a New Iron-making Technology made by POSCO, S. Korea

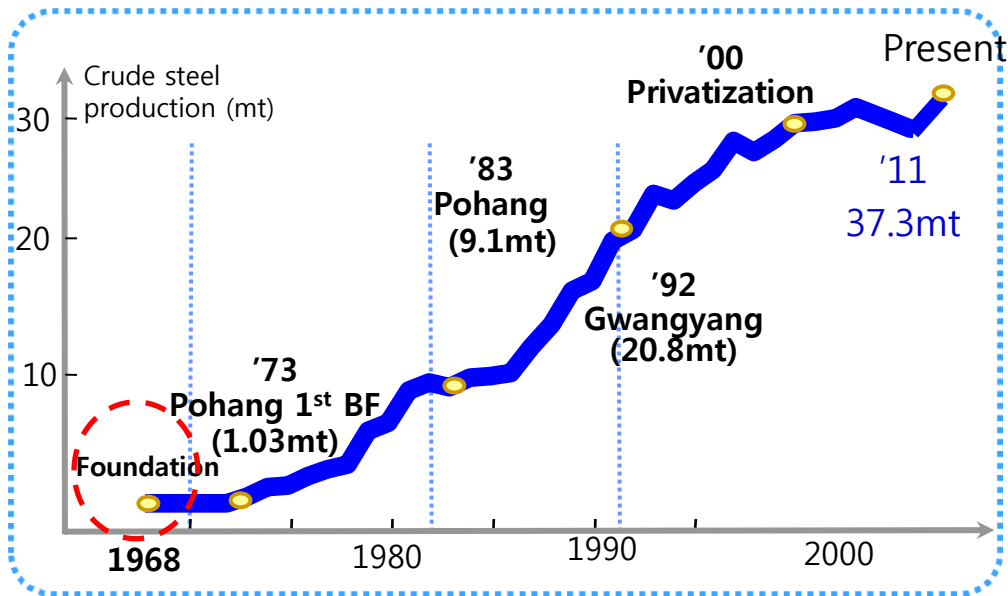
POSCO Research Institute CEO & President, Dr. Tae-Young Kang



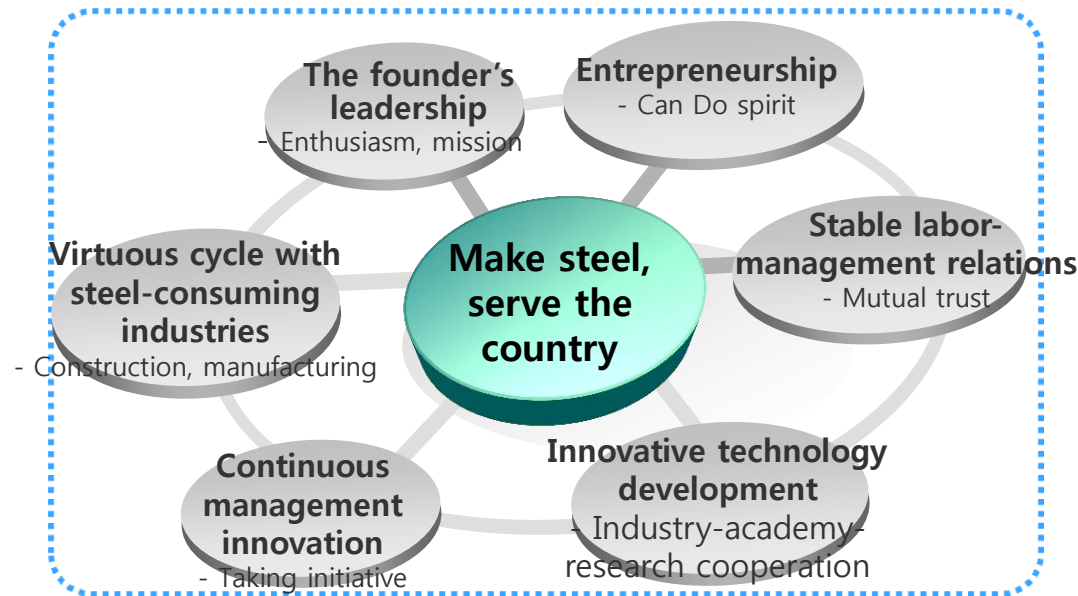
■ Present(As-Is): POSCO Built Two Integrated Sea-Borne Steel Mills from Nothing

- Among the world's top 20 steel companies, only POSCO has achieved the 30 mt steel capacity target without resources such as iron ore and coking coals

POSCO's Growth History



POSCO's Mission & KSF's



➔ POSCO, the world's most competitive steelmaker (WSD), successfully overcame the 2008 financial crisis; \$59.5 Bil. in revenue and \$4.7 Bil. in operating profit (2011)

■ Future(To-Be): Expanding Biz Portfolio & Scope Based on Knowhow in Steel

○ From steel to materials & energy, from Asia to global(UAI), from strong to smart

Expansion of biz portfolio

Materials



- Steel-based: Ferroalloy, Mg
- Energy-based: Lithium, cathode materials
- Carbon-based: needle cokes

Steel



- Resource development (iron ore & coals)
- Steel making & infra.
- Steel trading

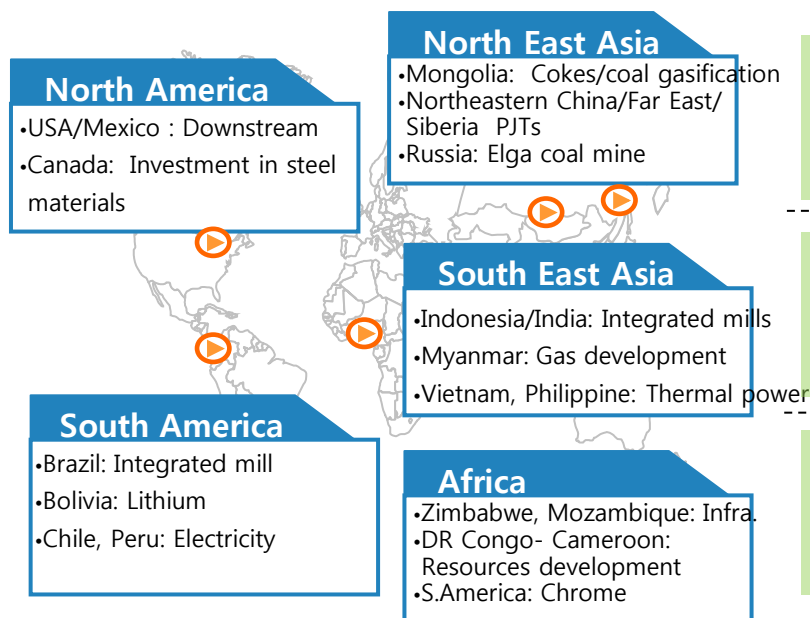
Energy



- Resource exploitation/development
- Energy infra.
- Power generation, new & renewable energy

“Building an integrated set of steel-related businesses”

Transformation into a global company



“Building a global belt connecting Asia-Americas-

Smart POSCO

Smart company

- Continuous Innovation for smart steelworks & smart workplaces

Pi (π) innovation

- Breakthrough & Destructive innovation, continuous innovation, process optimization

POSPIA 3.0

- Standardization & Optimization of global operation (ERP, MES, etc)

“Building a Global POSCO Way

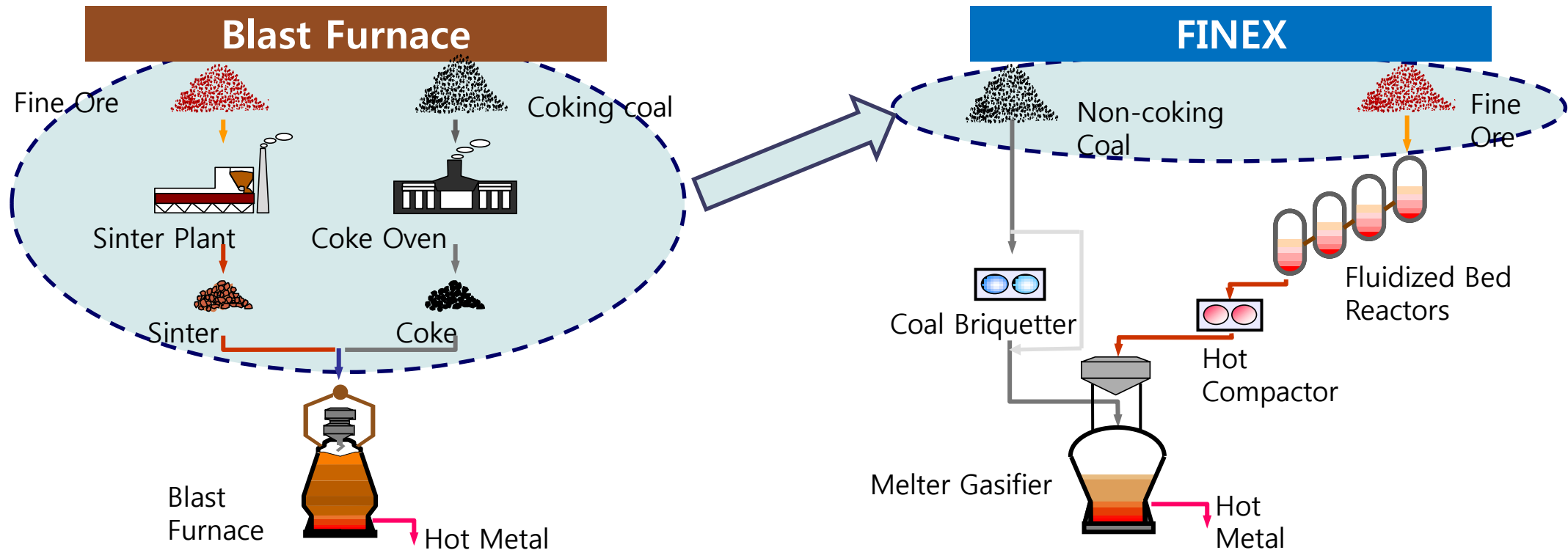
FINEX

- **FIN**e: Fine iron-ores, Fine non-coking coals
- **EX**treme: EXtreme technology



■ What is the FINEX?

- The FINEX refers to a new environmentally-friendly iron-making process which can replace the Blast Furnace (BF) technology, now dominant in the world
 - Benefits: Use of low-priced & low-quality raw materials, reduced cost of facility investments, eco-friendly iron-making process



■ Achievements of the FINEX

- FINEX can replace the blast furnace technology, the dominant steel-making process for 100 yrs

- The world's first commercialized new iron-making process

→ POSCO: the latecomer succeeded in commercializing 1mt of annual production for the first time in the world.

1 FINEX (Completed in May 2003)

-Annual production of the demo plant : 600,000 tons

2 FINEX(Completed in May 2007)

-Annual production of the commercialized plant: 1.5 million tons(mt)

3 FINEX(To be completed in 2013)

-Annual production of 2mt (under construction)

- Competitiveness over BF

Facility investment cost(per ton)	100%(BF) 80%(FINEX)
Manufacturing cost (per ton)	100% 85%
SO _x	100% 3%
NO _x	100% 1%
Dust	100% 28%

■ Birth of the FINEX

○ From imitation to creation: POSCO in need of developing its own technology

- Top management changed its strategies (after learning lessons from the fall of the American steel industry)
→ From cost competition to tech. competition (Post-Catch up strategy)

Researches on
BF replacement
technology

● **HISMELT: Joint development of Kloeckner & Rio Tinto since 1981**

● **DIOS: Joint research of 8 companies since 1988 (JISF, Japan)**

● **AISI: Research by AISI supported by US DOE since 1989**

● **COREX: Joint development of Korf & VAI since 1981**

'From COREX to FINEX'
Research on FINEX started in 1992 to overcome COREX tech.

■ Why did POSCO's Challenge for FINEX Seem Impossible

External factors

- **Advanced countries started developing various new iron-making processes in the 70s, ten to twenty years earlier than POSCO**
 - Research completed by competitors: DIOS ('96) & AISI('94) gave up commercialization
- **Substandard technologies of local partners in S. Korea**
 - Large scale tech. development projects require much cooperations with local partners

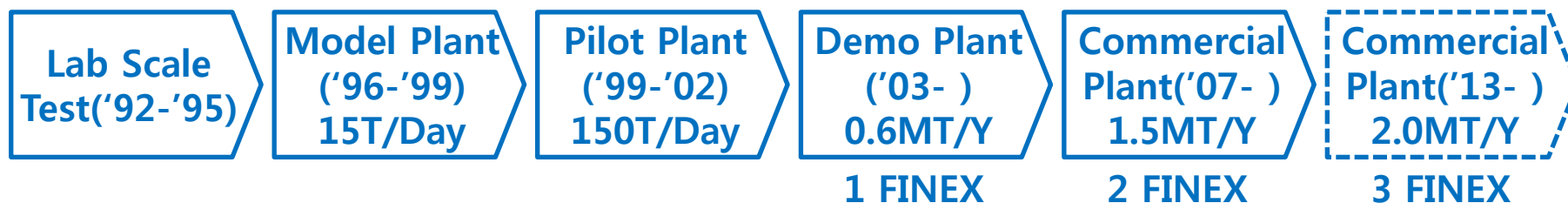
Internal factors

- **POSCO's technology was relatively inferior with a lack of experience in the large-scale technology innovation**
 - Focused on imports and improvements of advanced technologies like COREX
- **Reduced investments in tech. development during the 1987 IMF crisis**
 - Further burdensome investment in commercialization of FINEX (\$0.1 bil.)
- **A possible close-down of COREX operation**
 - If COREX stopped being operating, it was inevitable to stop research on FINEX

■ Four Key Success Factors of POSCO's FINEX

1. Top Management's direct control of the commercialization project
2. Swarm TF teams of experts in research/tech/maintenance/operation/engineering
3. Shortening of research periods by using external research outcomes and tech.
(partly open innovation) with continuously promoting internal innovations as well
4. Strategic alliance with VAI owning COREX technologies

※ FINEX Commercialization Process



○ Investments in FINEX ('92-'07)

- R&D: \$0.5 Bil.
- Plant: \$1.6 Bil.

1. Top Management Leadership

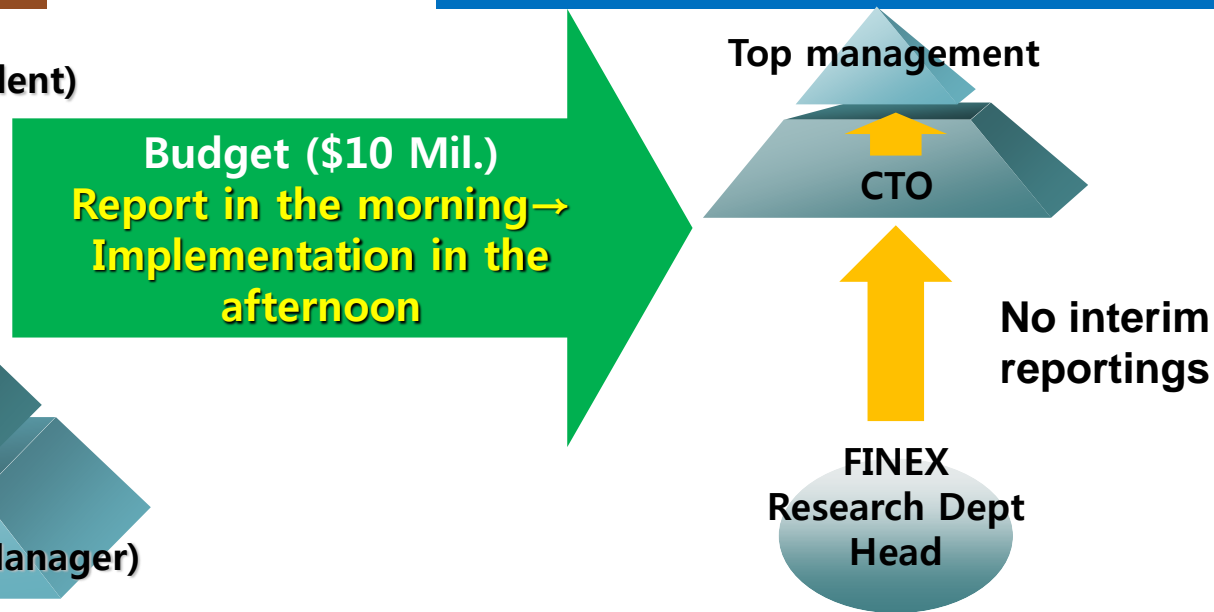
○ Direct control of the commercialization project

- CTO has all decision-making rights (presiding meetings at least once a week)
- Simplified reporting system, fast decision-making: No interim reporting (first in POSCO)
 - Consistent reporting line for 10 yrs until commercialization is completed (effective organization management)

Former decision-making process



FINEX project under the control of CTO

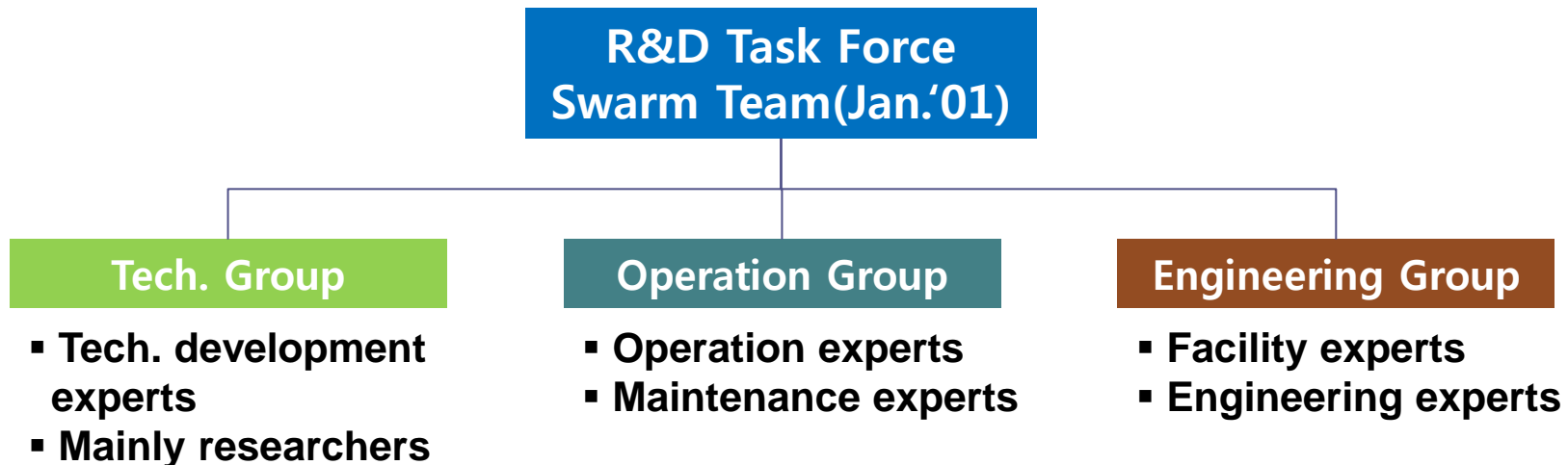


2. Cross Functional Swarm Team

○ Task force team consisting of all necessary experts in one 'swarm' team

- Concurrent engineering: Considering various alternatives concurrently to minimize errors
- Daily expert meetings : Free communication, prompt decision making process

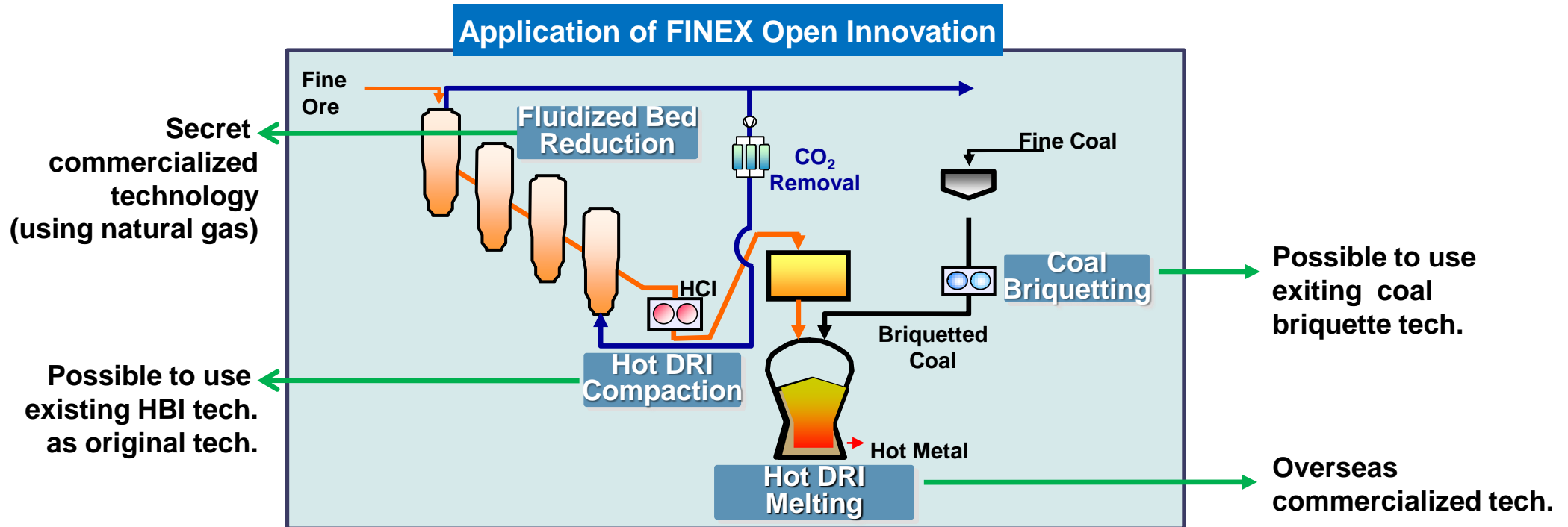
Decision-making period for new facility procurements and pricing negotiations:
from one year to just one week



3. Active Use of Open Innovation

○ Promoting tech. innovation internally by adopting external ideas and tech.

- R&D information gatherings on existing tech. related to necessary tech.
→ Active use of external tech. to shorten development periods and cut costs



4. Effective Use of Technology Partnerships

○ Strategic alliance with VAI, the COREX technology holder

- Building trust by sharing visions for success of the project and considering partners
→ POSCO's enthusiasm was highly received by VAI

POSCO

- A world class BF operation experts
- Expertise in COREX operation
- Suggestion for developing a new process based on experience in COREX operation
- Expertise in reduction tech. of smelting reduction tech.(FINEX)

VAI

- Expertise in steel facility engineering
- First commercialization in COREX
- Various auxiliary technologies
- Expertise in smelting tech. in smelting reduction tech.(FINEX)

■ Govt. Support for Development of Innovative Steel Tech.

- **Support for research on new steel-making process by establishing the association**
 - Participation by POSCO and other local steelmakers
- **Govt. support for smelting reduction process, the basic tech. for FINEX as one of the national R&D innovation projects**

[Government support for FINEX technology]

	Govt. funded research (by New Steel Technology Research Association)
Period	Nov.1990-Dec.2000
Title	Basic research on fluidization and reduction of fine iron ore
Researchers	Govt, POSCO, INI, Dongkuk Steel, Dongbu Steel
R&D cost	\$22.2 mil. out of \$58.2 mil.

■ Tech. Vision: Global Leadership in Innovative Technology

○ Innovation in high value-added products & low-cost process technologies

- FINEX: the important technology for future core operations

* CEM: Compact Endless Cast-rolling Mill

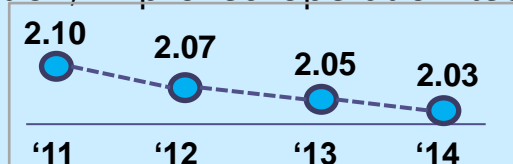
WF(world first)/WB(world best) product development

WB WF	'09	'10	'11
Sales volume('000 ton)	2,920	4,684	5,536
Share of sales(%)	10.3%	16.2%	17.8%

Innovation in low-cost process technology

- ✓ Expanded use & recycling of low-graded materials
- ✓ Development of CO₂ reduced process
- ✓ High efficient production, improved operation tech.

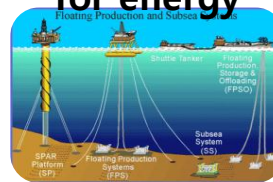
Crude steel CO₂
emission intensity
target
(tCO₂/t-Steel)



Eco-friendly free-cutting steel



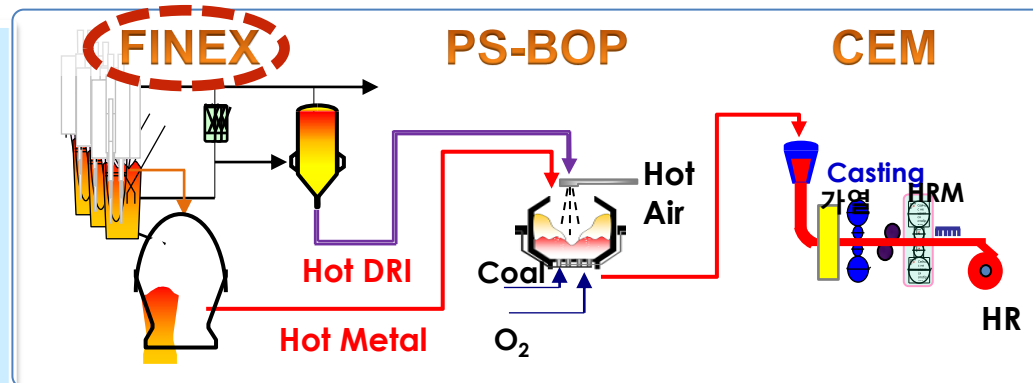
Steel materials for energy



UV-coated steel



<POIST: POSCO's signature eco-friendly steel-making process>



POIST : POSCO Innovative Steel Technology

■ Roadmap for Future Tech. Development

