



APACHE & PS3


for TaeAn Fossil Power Plant

KEPRI
Power Generation Laboratory
Automation Technology Group

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Contents

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- Project Objective**
 - Company overview - KEPRI, KWP, AID**
 - APACHE System**
 - PS3 System**
 - Conclusion**



Project Objective

Rapid Reaction

To react promptly when some problems are occurred on normal or abnormal operation conditions.

Prevent Mistake

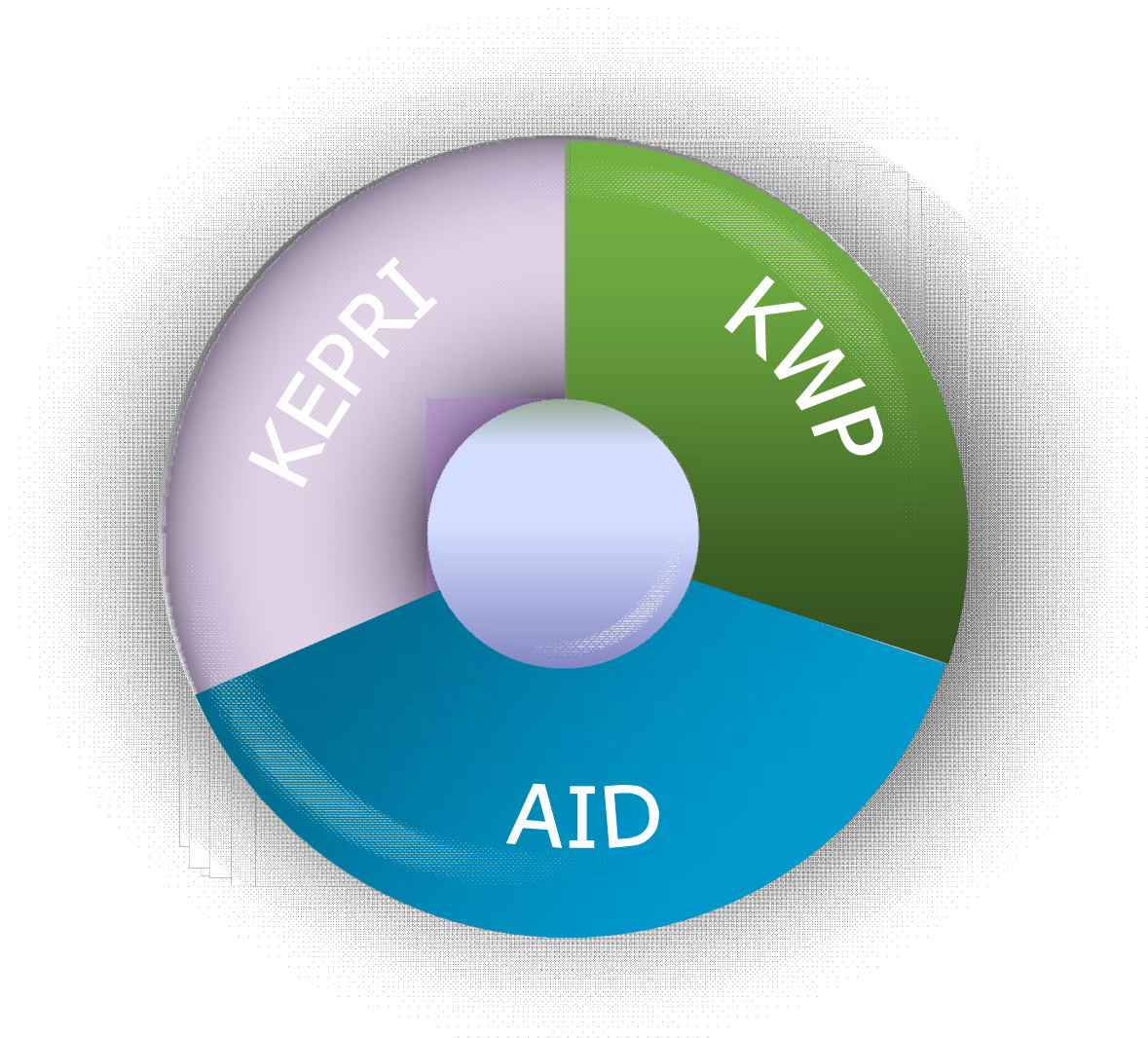
To prevent mistakes of operator, this system will provide appropriate operation guide and real-time data.

Improve Reliability

To improve reliability for operation and management of power plants.



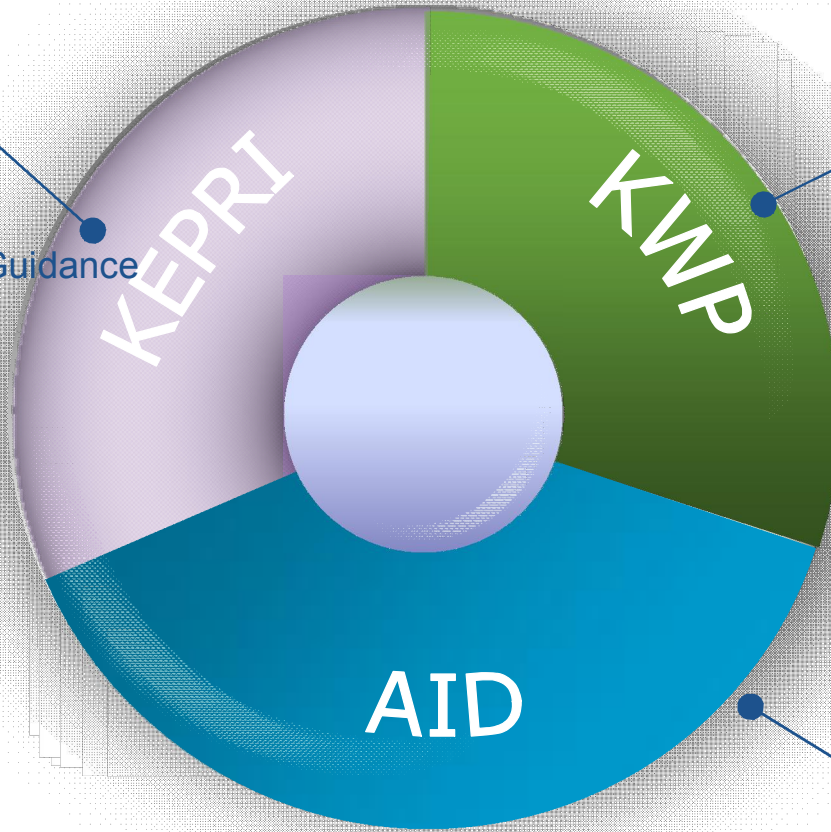
Introduce Project Team





Project Team Roles

- Issue this project
- Structuring systems
- Review the Operation Guidance
- Structuring the system

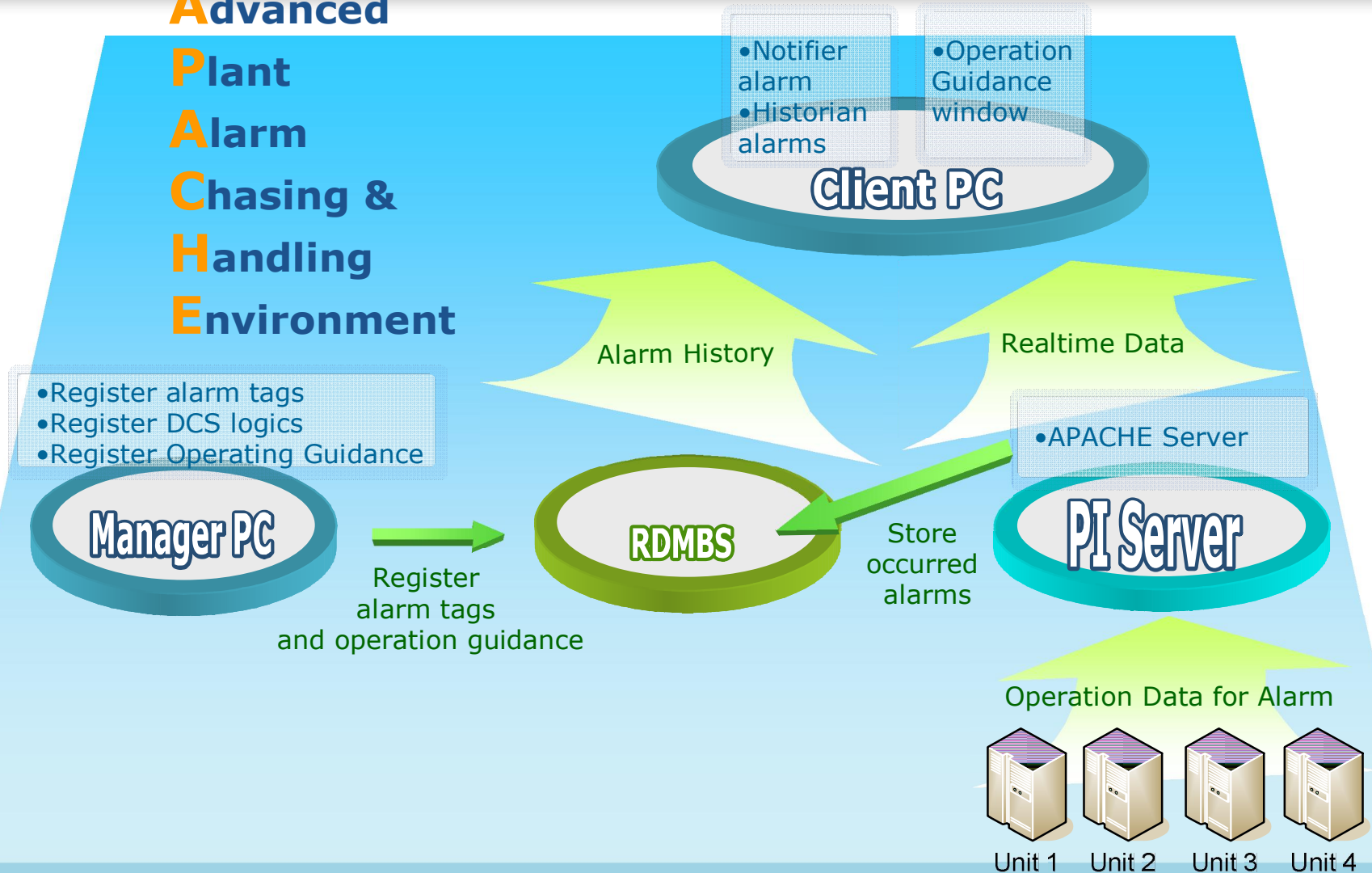


- Funding this project
- Provide alarm tags
- Provide procedure of plant start-up/stop
- Provide their knowledge for the Operation Guidance
- Filed Test

- Developing systems
- Install systems on TaeAn TPP
- Monitoring systems as running online



Advanced Plant Alarm Chasing & Handling Environment





APACHE - Server

환경설정

PI Server 설정

PI 서버: PIHome
사용자: piadmin
비밀번호:

Database 설정

DB 이름: OASIS
사용자: sa
비밀번호: *****

Interface 설정

검색 주기: 1000

저장 취소

APACHE

전력연구원

PI - SERVER : 208.239.91.29
감시 태그 수 : 336
상 태 : 정상

환경설정 숨기기

Status of Server

정상
PI 이상
DB 이상



Change the tray icon's color as status of server





APACHE – Client Config

The screenshot shows the 'APACHE 설정' (APACHE Settings) window. It is divided into three main sections. The top section, '알림 창 설정' (Alarm Window Setting), includes checkboxes for '호기' (Alarm) levels 1 through 4, all of which are checked, and a '중요도' (Priority) dropdown set to 5. The middle section, '목록 색상' (List Color), shows color selection boxes for '발생' (Occurrence) in pink and '해제' (Release) in green. The bottom section, also labeled '알림 창 설정', includes a '사운드 파일' (Sound File) field with a browse button, a '창 대기 시간' (Window Wait Time) of 3 seconds, and an '알림 창 모드' (Alarm Window Mode) dropdown set to '알림창 보이기' (Show Alarm Window). At the bottom are 'OK' and 'Cancel' buttons.

APACHE 설정

알림 창 설정

호 기 : ☒ 1호기
☒ 2호기
☒ 3호기
☒ 4호기

중요도 : 5

목록 색상

발 생 :

해 제 :

알림 창 설정

사운드 파일 : C:\Program Files\AP ...

창 대기 시간 : 3 초

알림 창 모드 : 알림창 보이기

OK Cancel

To choose units and priority of alarm tags for pop-up window as user's work.

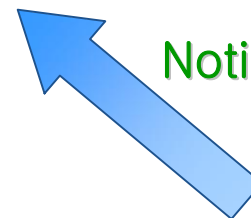
To change colors for alarm-on and alarm-off on Alarm History window.

To play sound when pop-up window.

To run Operation Guidance window directly without pop-up window



APACHE - Clients



Notification as pop-up window
when an alarm is occurred





APACHE - Clients

APACHE

호기 : 전체 중요도 : 5

실시간 조회 기간 : 2007-04-03 ~ 2007-04-04 조회

시간	Unit	태그 이름	Description	중요도
2007-04-04 14:31:...	1호기	1CA_11EA122_BXU03	PULV A TRIP	1
2007-04-04 14:28:...	1호기	1CA_11EA122_BXU03	PULV A TRIP	1
2007-04-04 14:26:...	1호기	1CA_11EA122_BXU03	PULV A TRIP	1

Alarm History window
when tray icon is double clicked





APACHE - Operation Guidance

PI ProcessBook - [Display1.PDI+]

File Edit View Insert Tools Draw Arrange Window Help

100%

Explorer

전력연구원 경보/원인 추적시스템 발전운전지원시스템

조회 유형 : 과거 조회 Depth : 3

2007-02-23 16:34:54 조 회

☐ 경보가 발생한 항목만

처음으로 맨위로 올리기

(K) 1CS_FDR_A__AXU11(FDR A OFF OR TROUBLE[ON])

UND

1CS_FDR_A__AXB00.XB02(FEEDER MTR START ELEV A[CS CLOSE])

DOO

(K) 1CS_FDR_A__CXG63(FEEDER MTR START ELEV A[LS OFF])

1CA_XADS01_CXH11(PULV A BOWL DP[>HIGH])

1CA_XAWT001_CXH11(PULV-A MTR WATTAGE[>HIGH])

(K) 1CS_FDR_A__AXU07(FDR OFF AND NO CMD ON[ON])

UND

(K) 1CS_FDR_A__AXU13(FEEDER MTR START ELEV A[ON])

1CS_FDR_A__AXU03(FEEDER[NOT ON])

(K) 1CA_11EA122_BXU15(CMD RUN FDR A TO MIN[ON])

1WU_10DZ001_DXU04(MAXIMUM DEV LIMIT[>MAX])

1CS_CFM001A_CXG11(COAL FLOW MONITOR A[ON])

1CS_TS_03A_CXG11(FEEDER A TEMP HIGH[ON])

1CS_LSF001A_CXG11(FEEDER A PLUGGED SW[ON])

FDR A OFF OR TROUBLE

1. 원 인

가. 5초 이상 FDR Not On
나. FDR Suction VV Close로 Coal On Belt Not On
다. HPU SYS 오동작
라. PULV 내부 이물질 유입
마. FDR DISCH Plugged
바. FDR 내부 화재 및 Sensor 오동작으로 TEMP High
사. Silo Out Plugging으로 Flow Monitor On
아. Bowl DP > HI or Wattage > HI
자. Clean Out Belt 파손

2. 결 과

가. FDR Trouble Alarm 발생
나. Bowl DP > HI or Wattage > HI 신호가 5초간 지속시 Run FDR To Minimum

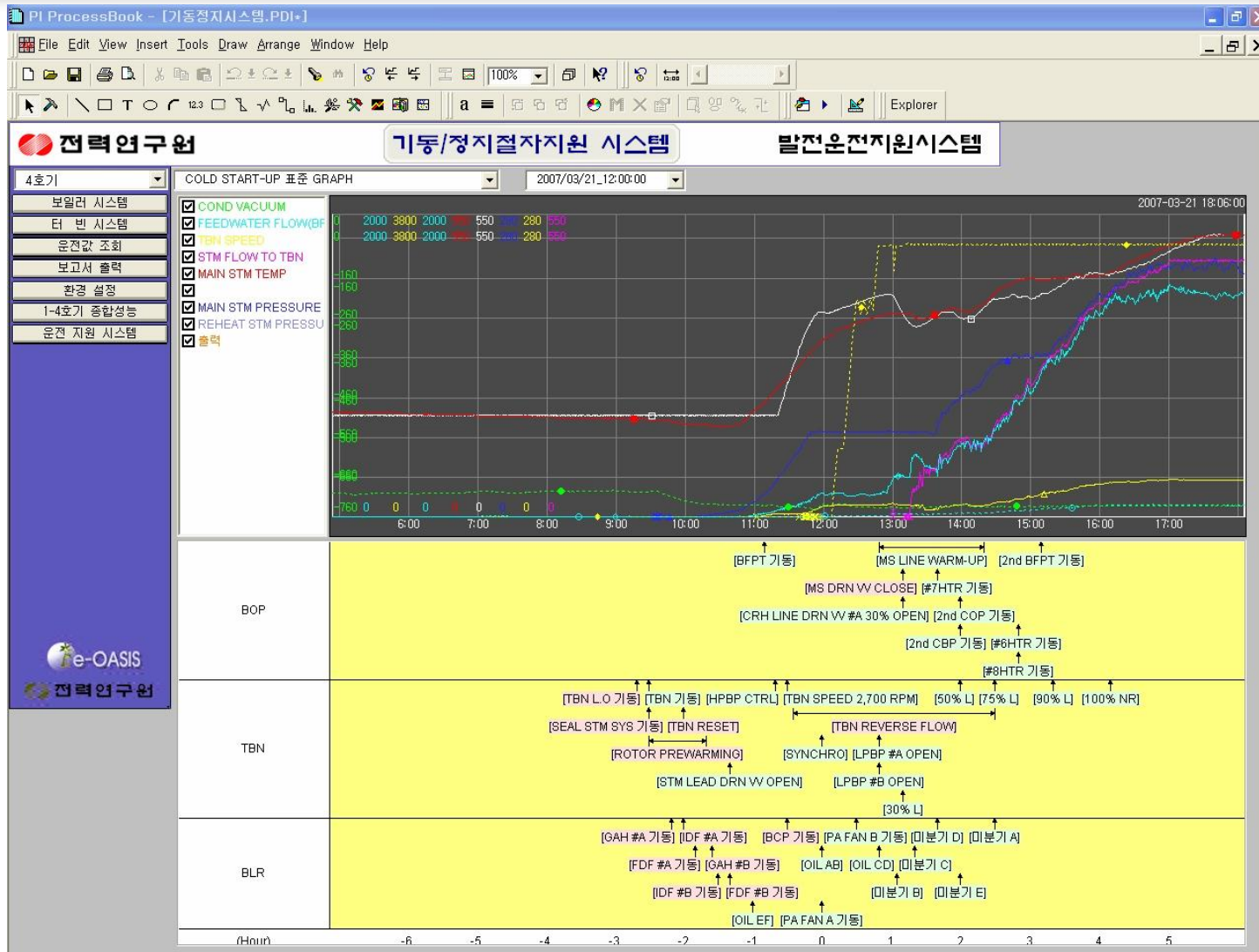
3. 조 치

가. Run FDR To Minimum시 출력 50 ~ 100MW 감발
나. HPU System 현상상태 확인 (PR, Filter오염, 누유, 진동, 미음상태 등)
다. Clean Out Conveyor Belt 상태확인 및 정비
라. PULV 내부 이물질 유입여부 확인
마. Silo Plugging 상태 점검 및 정비

Ready Server Time NUM



PS3 - Client

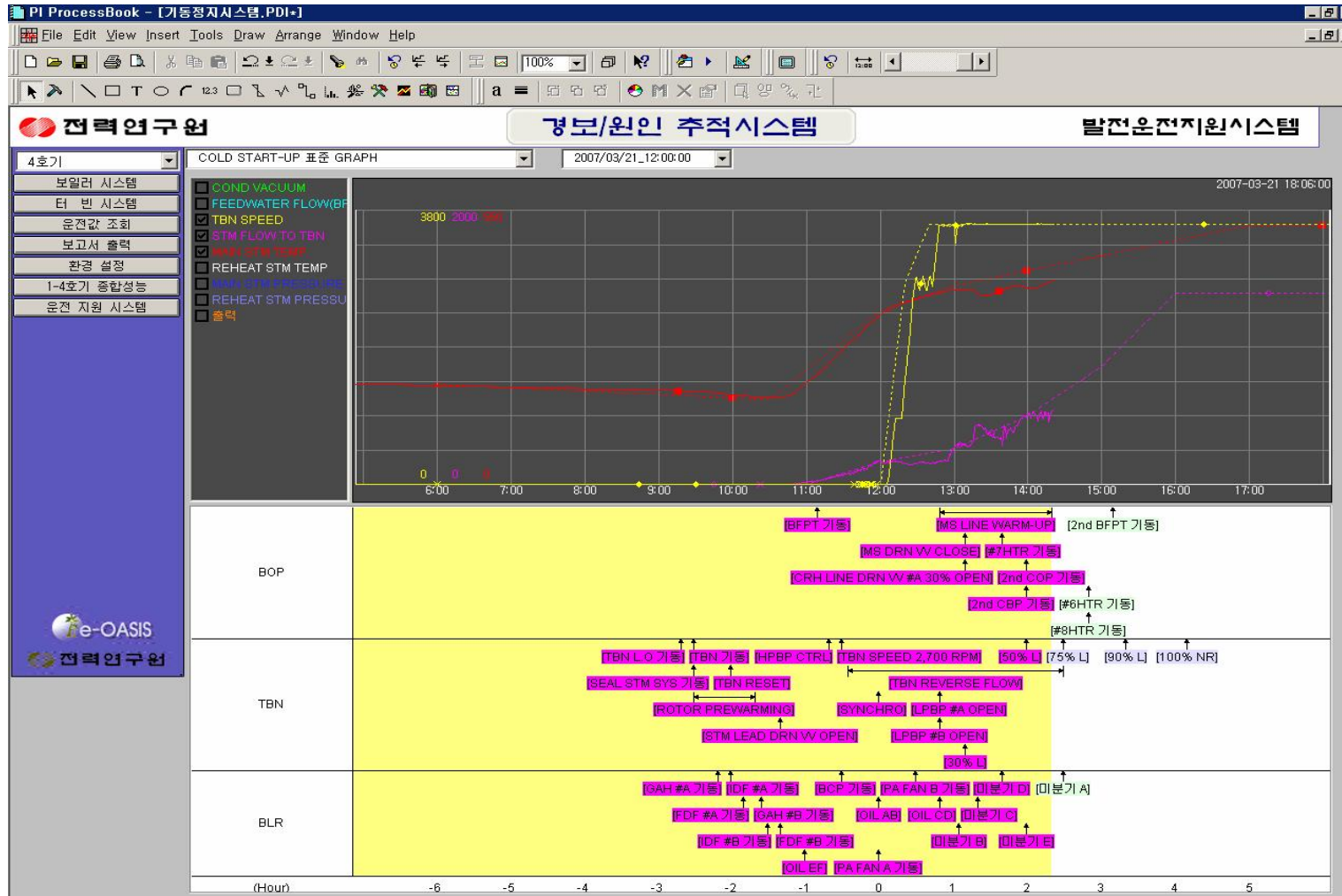


Trend
Part

Procedure
of plant
start-up
/stop



PS3 - Client



Trend
Part

Procedure
of plant
start-up
/stop



PS3 – Scheduler

Trend
Part

Procedure
of plant
start-up
/stop

가동/정지 일정 입력

새 일정 만들기 기존 일정 불러오기 전력연구원

호기 : 4호기 대분류 : COLD START-UP 표준 GRAPH

기준 시간 : 2007-03-21 12:00:00 Start Time : -360 End Time : +300

소분류 : 4호기_2007/03/21_12:00:00_COLD START-UP 표준 GRAPH

설 명

COND VACUUM
FEEDWATER FLOW(BFPM)
TBN SPEED
STM FLOW TO TBN
MAIN STM TEMP
REHEAT STM TEMP
MAIN STM PRESSURE
REHEAT STM PRESSURE
출력

그래프

태그 : 4PI_CON_VAC 입력

최소값 : -760.000000 최대값 : 0.000000

순서	시간	값
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추가 수정 삭제 위로 이동 아래로 이동

선택된 항목의 시간 변경 : 변경

분류

BOP
TBN
BLH

추가 삭제

포인트

순서	종류	설명	태그	값	시작	끝
1	단일	GAH #A 기동	4AP_XAZY01__AXU03	ON	-130	-
2	단일	IDF #A 기동	4FG_IDFA____AXB01	:S OI	-120	-
3	단일	FDF #A 기동	4SA_FDFA____AXB01	:S OI	-110	-
4	단일	GAH #B 기동	4AP_XBZY01__AXU03	ON	-95	-
5	단일	IDF #B 기동	4FG_IDFB____AXB01	:S OI	-90	-
6	단일	FDF #B 기동	4SA_FDFB____AXB01	:S OI	-80	-

추가 수정 삭제 위로 이동 아래로 이동

선택된 항목의 시간 변경 : 변경

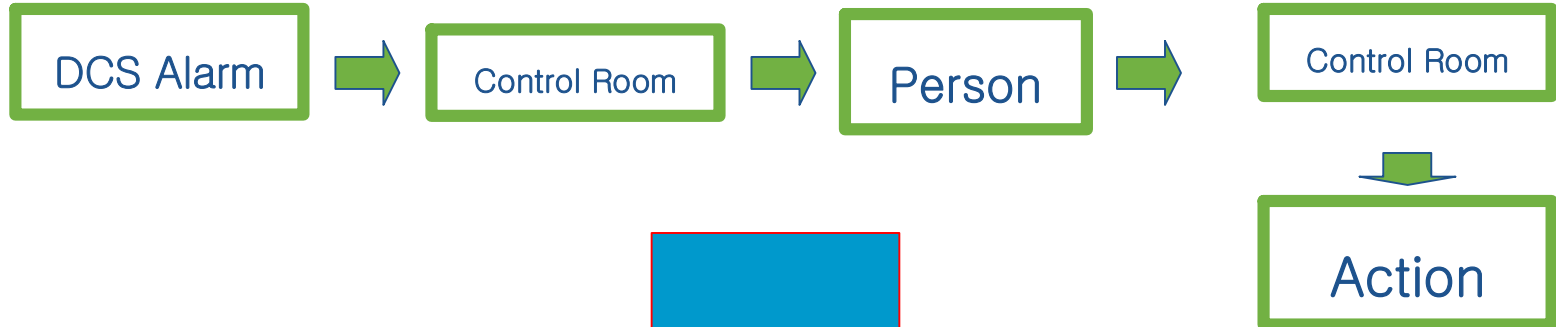
새 일정으로 추가 변경사항 저장 현재 일정 삭제



The Effect of APACHE 1/3

Control Procedure Improved

Before



After



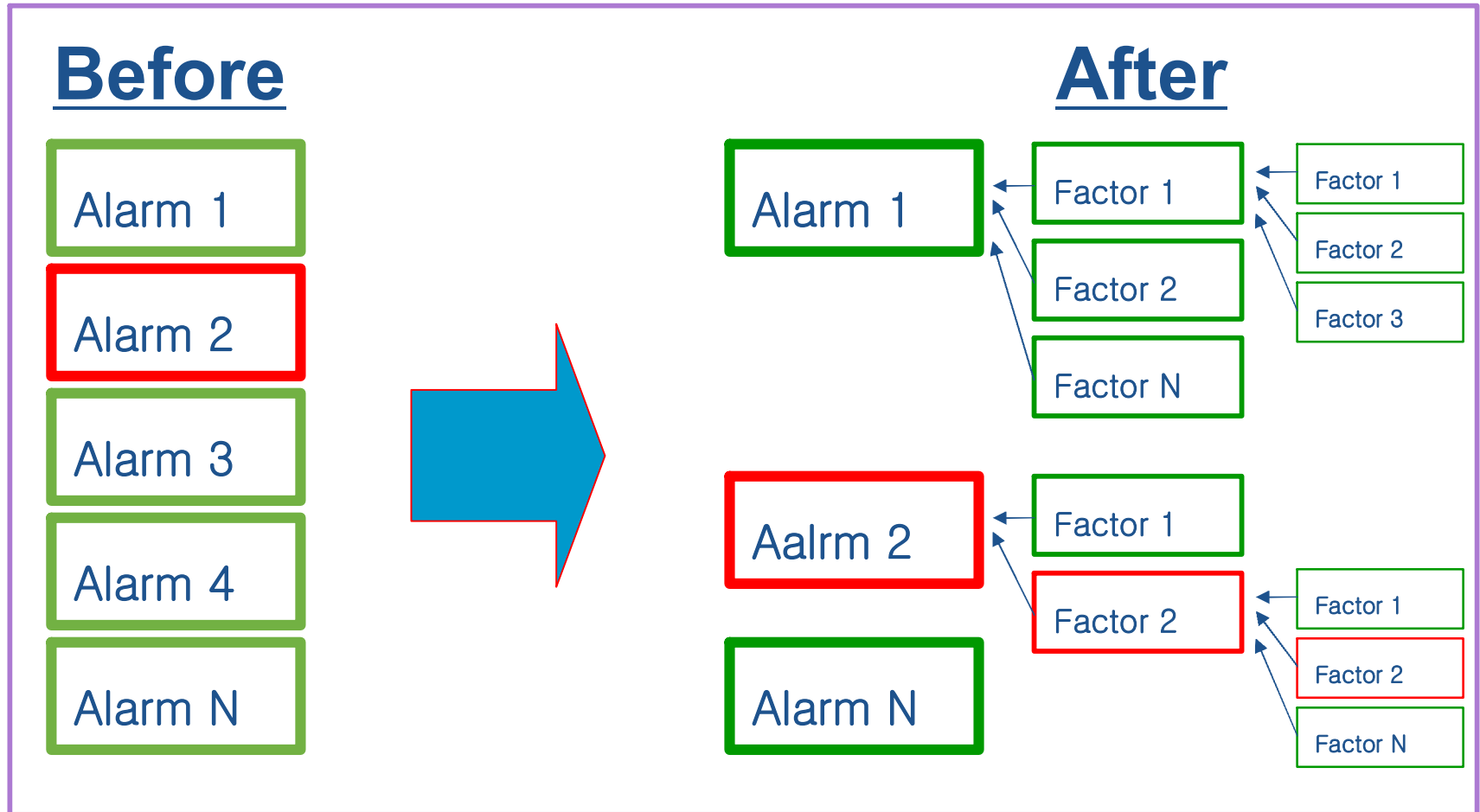
Slide 15

HJCHO1 HongJun Cho, 8/7/2007



The Effect of APACHE 2/3

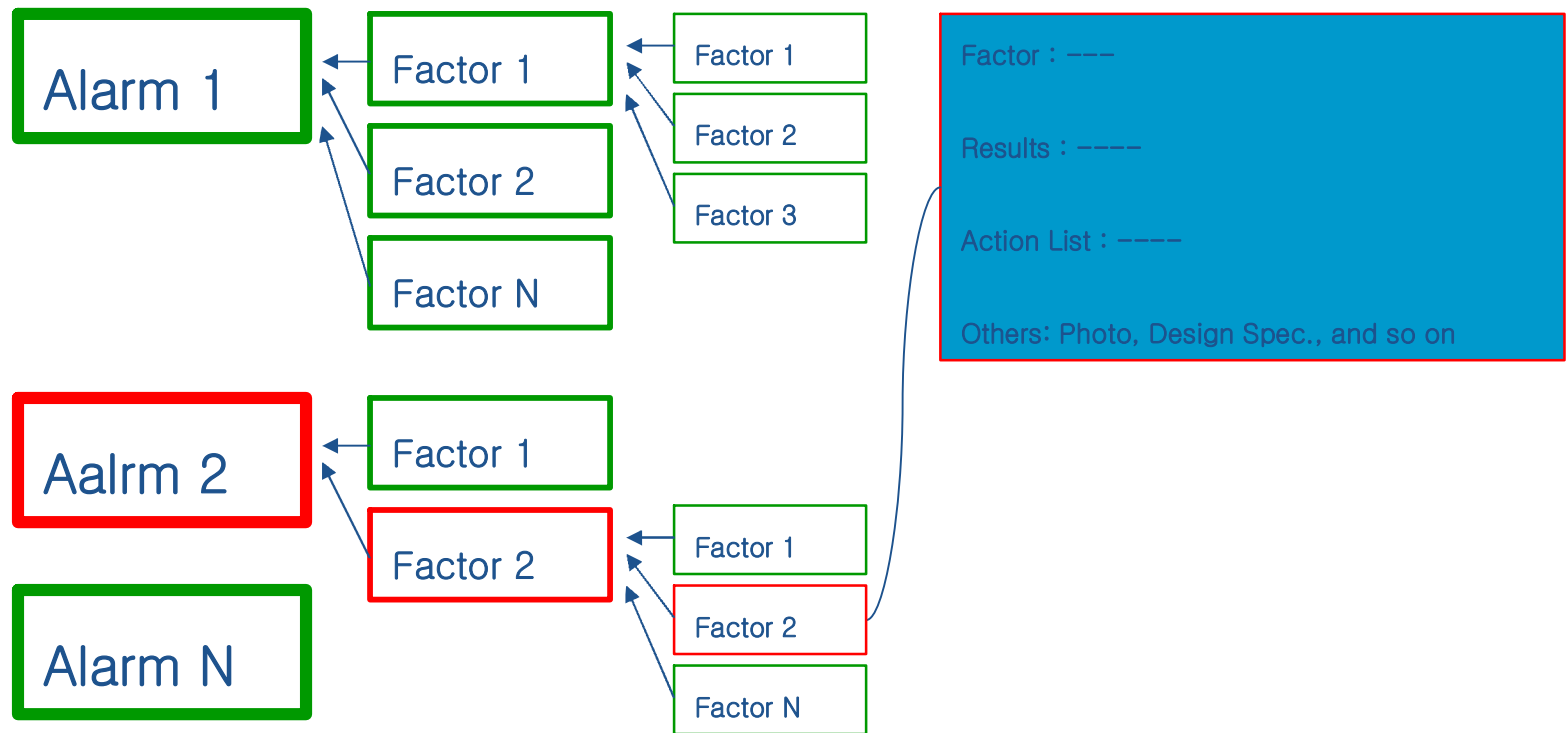
Detail Factors Provided





The Effect of APACHE 3/3

Detail Action list provided





The Effect of PS3

Start/Stop Procedure Assistance

Before

Start/Stop Plan



Manual Comparison



Operation Result

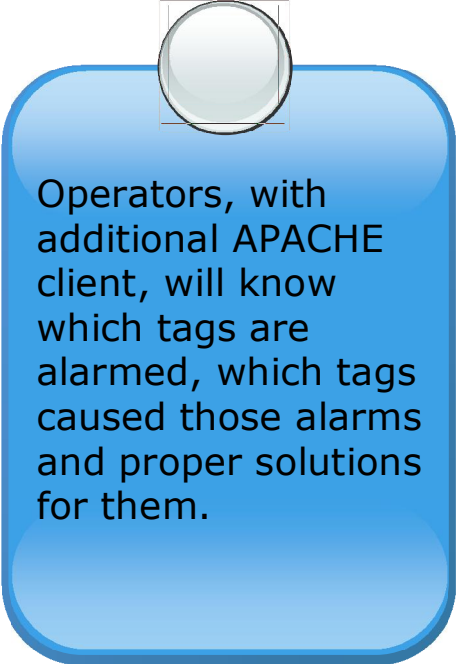


After

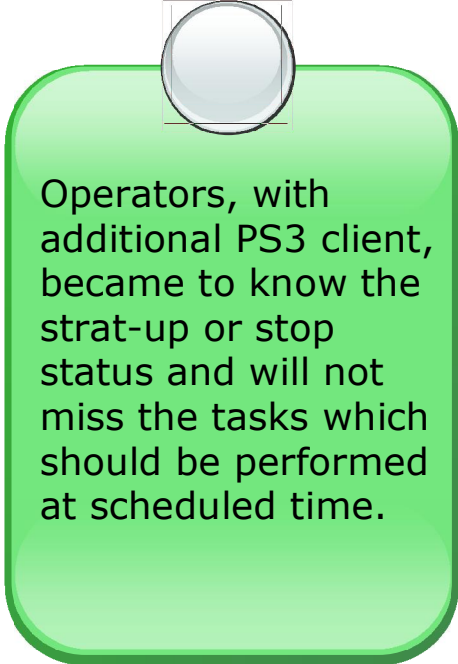

- Real-time Comparison between Start/Stop Plan vs. Operation Status
- Condition based action and more detail status information provided



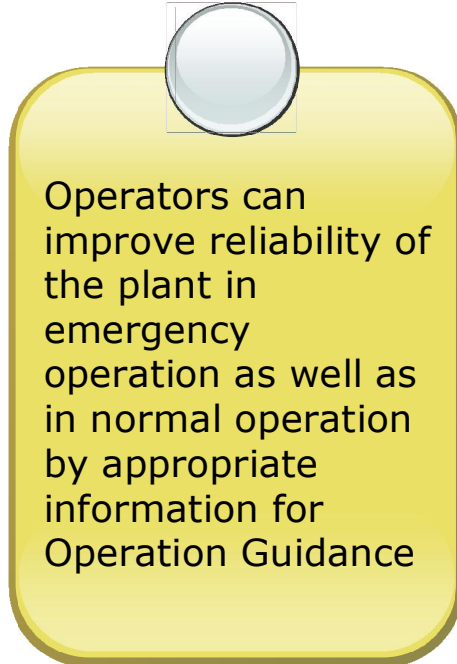

Conclusion




Operators, with additional APACHE client, will know which tags are alarmed, which tags caused those alarms and proper solutions for them.



Operators, with additional PS3 client, became to know the strat-up or stop status and will not miss the tasks which should be performed at scheduled time.



Operators can improve reliability of the plant in emergency operation as well as in normal operation by appropriate information for Operation Guidance

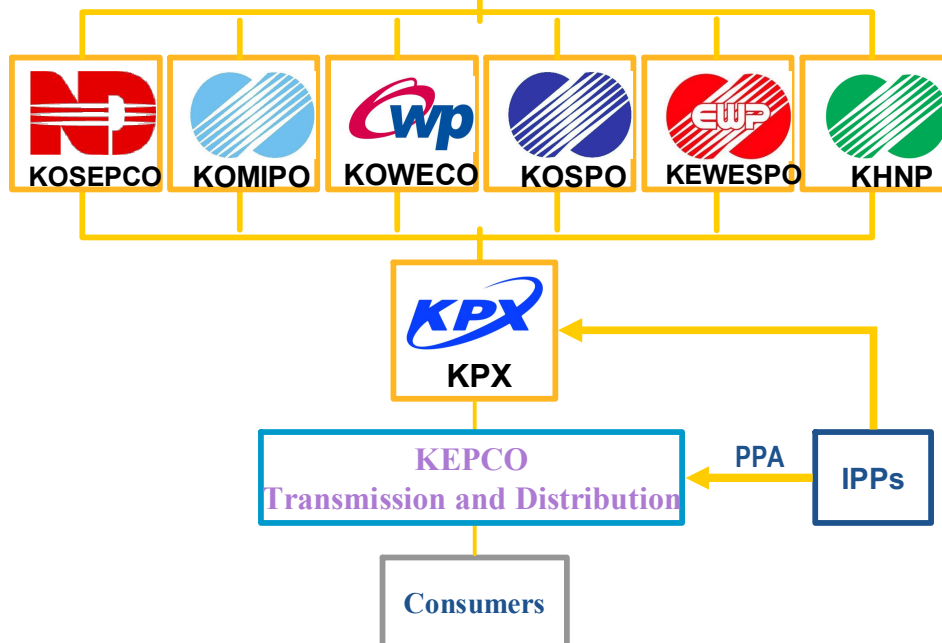


A photograph of the Chicago skyline at sunset. The sun is low on the horizon, creating a bright glow and lens flare effects. The silhouettes of several skyscrapers are visible against the bright sky, including the Willis Tower on the right. The sun's reflection is visible on the water in the foreground. A black horizontal bar with the text "Thank You !" in blue with a white outline is superimposed over the middle of the image.

Thank You !



Policy control and supervision



- **Preparation stage**
(Jan. 1, 1999 to Apr. 2, 2001)
- **IPPs can supply electricity to KEPCO pursuant to existing PPA**
- **April, 2001 : Generation Sector separated from KEPCO**
 - Non-nuclear and non-hydro part
⇒ 5 separate wholly-owned gencos
 - Hydro and Nuclear part
⇒ 1 separate wholly-owned genco
- **KEPCO has retained monopoly position for only T&D parts**
 - IPP : Independent Power Producer
 - PPA : Power Purchase Agreement



- ❖ R&D planning and implementation
- ❖ R&D project proposal, selection, and conduct
- ❖ Evaluate, use, and transfer of R&D results
- ❖ Technical home doctor
- ❖ Engineering support and training for facility operation and construction
- ❖ Electric power industry technology evaluation and planning concerning fund management

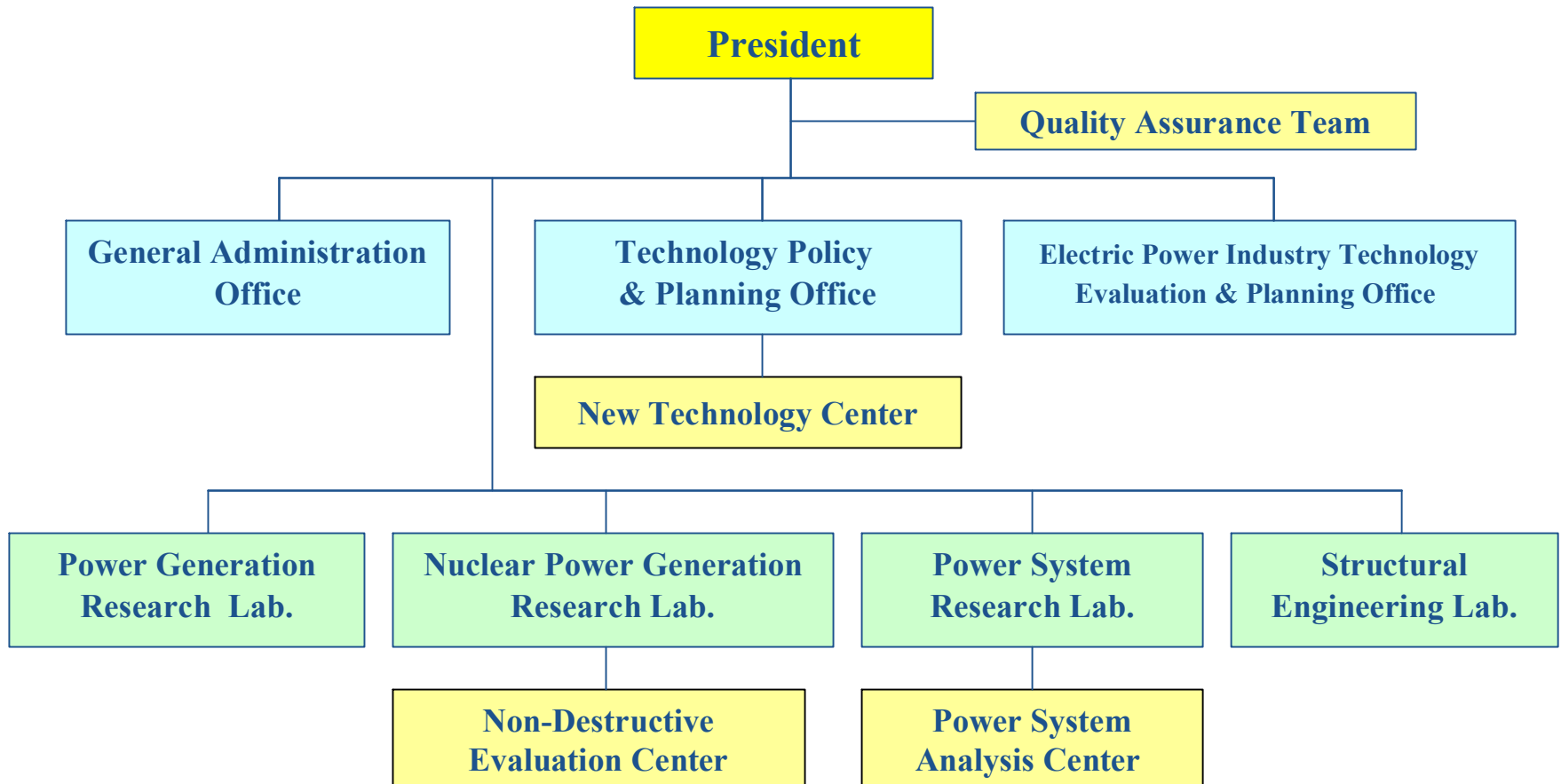


❖ History of KEPRI

Time	Name	Contents
Now		
2001. 4	KEPRI (Big Transition Time)	<ul style="list-style-type: none">• Restructuring of Electricity Industry• Changes in the Role and Responsibility of KEPRI• Research institute for KEPCO and other Gencos• R&D funds from Electricity industry and Government
1995.11	KEPRI (Korea Electric Power Research Institute)	<ul style="list-style-type: none">• Mckinsey Consulting• World Class R&D Institute• Invitation of Foreign Scientists• Focus on the development of O&M Technologies• Significant Economic Contribution to Power Plant
1984. 5	KEPCO Research Center	<ul style="list-style-type: none">• Government R&D Policy• Technology Research Office at KEPCO Head Office
1972. 3	Technology Development Research Laboratory	
1961. 7	Electricity Laboratory	



❖ Organization of KEPRI

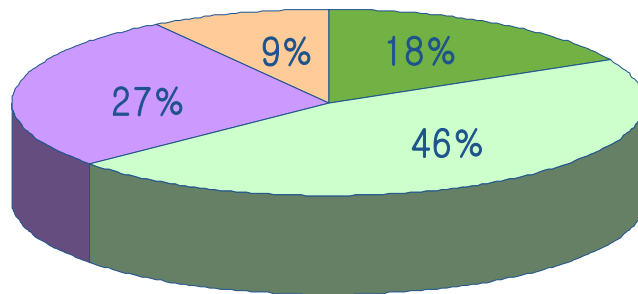




❖ Human Resource

As of Jan. 2004

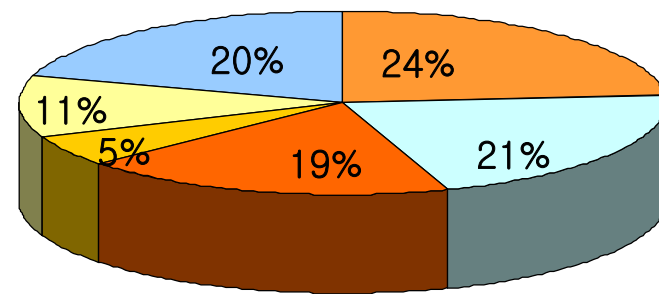
Academic Background



■ Doctor ■ Master ■ Bachelor ■ Others

Degree	Doctor	Master	Bachelor	Others	Total
Number	93	244	144	48	529

Field



■ Generation ■ Nuclear ■ T/D
■ Structure ■ Tech. Plan ■ Admin.

Field	Generation	Nuclear	T/D	Structure	Tech. Planning	Admin.
Number	125	111	101	27	58	107



Korea Western Power Co., Ltd.

Korea Western Power co., Ltd. established on 2 April 2001, is one of 6 power generation companies in Korea. Western Power was separated from Korea Electric Power Corporation(KEPCO) to the restructuring and privatization plan for the power generation sector.

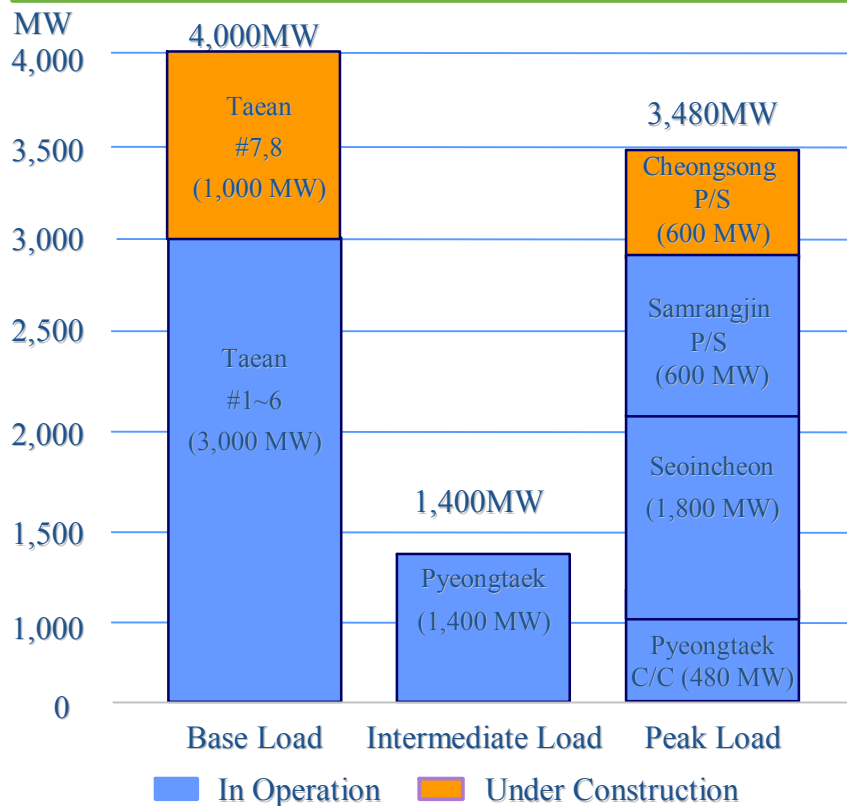
Western Power is comprised of 5 power generating stations

- Taean Thermal Power Plant : $6 \times 500\text{MW}$
 $2 \times 500\text{MW}$ (Under construction)
- Pyongtaek Thermal Power Plant : $4 \times 350\text{MW}$ & $4 \times 80\text{MW}$ GT & $1 \times 160\text{MW}$ ST
- SeoInchon Combined Cycle Power Plant : $8 \times 150\text{MW}$ GT & $8 \times 75\text{MW}$ ST
- Samrangjin Pumped Storage Power Plant : $2 \times 300\text{MW}$
- Cheongsong Pumped Storage Power Plant : $2 \times 300\text{MW}$ under construction



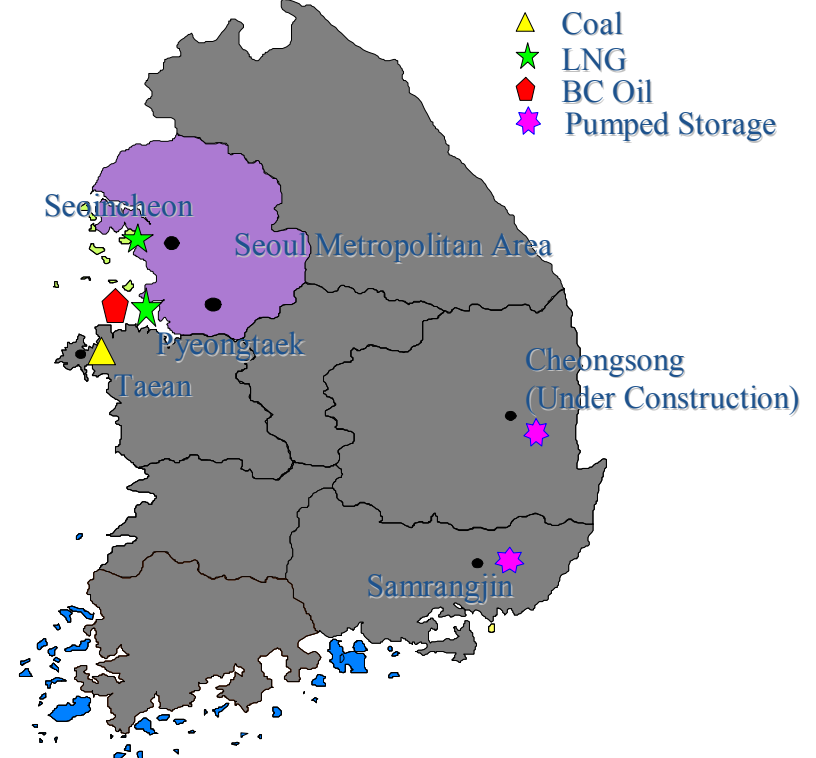
- ❖ 90% of capacity is located near the Seoul and Gyeonggi metropolitan areas

Generation Capacity by Type of Plant



Notes: As of January 31, 2004

Plant Complex Location





AID Corporation

Company Overview



CEO : Huh, Hyunghoe (founder)

Employees: 25+

OSIsoft Distributor in Korea since 1993

Homepage: www.aidcorp.com

Mission

To provide the customers with

**the most proper,
the most cost-effective integrated solutions**

with the best support for their engineering, operation and
decision making which enable the customers

to maximize their productivity



PS3 - Overview

Plant
Start-up /
Stop
Supervisor

- Register schedules plant start-up/stop
- Register Operation Guidance

Manager PC

Schedules
And Operation Guidance

Schedules
of plant start-up/stop
And Operation Guidance
for each equipment

RDMBS

- PS3 Client

Client PC

Realtime Operation Data

PI Server

Operation Data



Unit 1 Unit 2 Unit 3 Unit 4