



The PI System bringing high value to China Electric Utility Industry

Dr. Jun Zha
CTO, Fibrlink



AGENDA

- Background about China Grid
- GuoHua Power Group Enterprise Solution
- State's Green Value Initiative
- North China Grid WAMS Project
- South China Grid EMS Project
- ShenZheng Municipal T&D Project
- Q&A

Background about China Grid

About China Grid

What is China's GDP Current GDP Growth Rate:

- ▶ 2006 was **11.1%**, 2007 (first half) is **11.4%**
- ▶ China added additional **100,000 MW** of new generation capacity per year, the total generation capacity is **622,000 MW**
- ▶ it equivalents more the current total generation capacity of **Great Britain**
- ▶ It equivalents to build power plant for Spain **every week**
- ▶ Total investment of 590 Billion US

--From "2007 State Council Report"

State Grid' Number (Next 5 Years)

Power Generation

	North China	Northeast China	Northwest China	East China	Central China	South China	National Total
Year 2005							
Energy Demand (TWH)	563.8	217	187.6	594.5	437.2	437	2434
Installed Capacity (GW)	107.7	43.78	37.23	116.46	107.05	88.47	510
Year 2010							
Energy Demand (TWH)	781	285.3	260	834	587.5	617.7	3368
Installed Capacity (GW)	163.96	60.68	60.48	173.29	155.28	135.67	753

State Grid' Number (Next 5 Years)

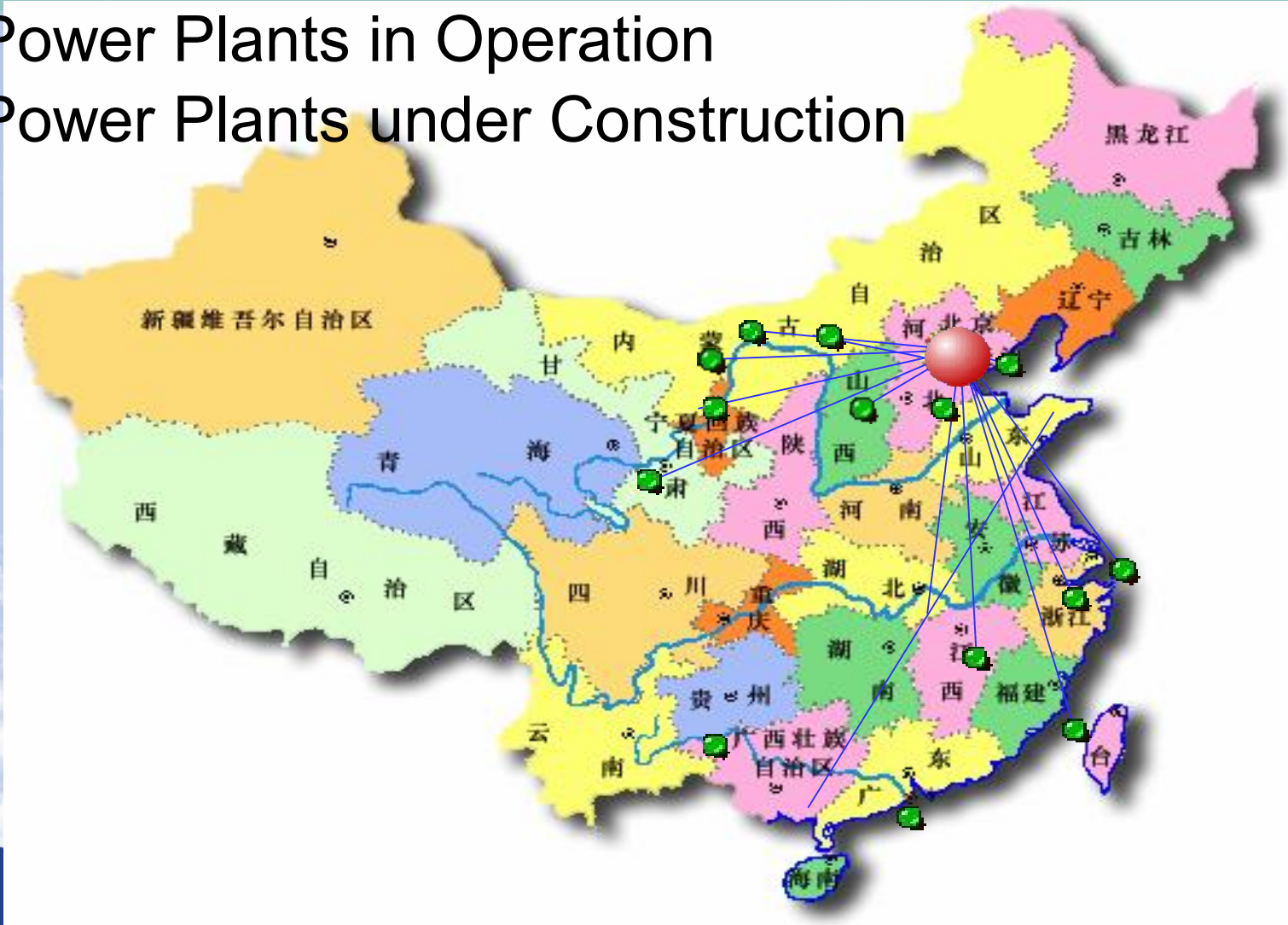
Power Transmission Development

Substation Project:	One Typical Province Planning (Year 2006 -2010)
500KVAC Qty.	22 + 2 (extend)
500KVAC Capacity (MVA).	39,500
220KVAC Qty.	145 + 54 (extend)
220KVAC Capacity (MVA).	64,000

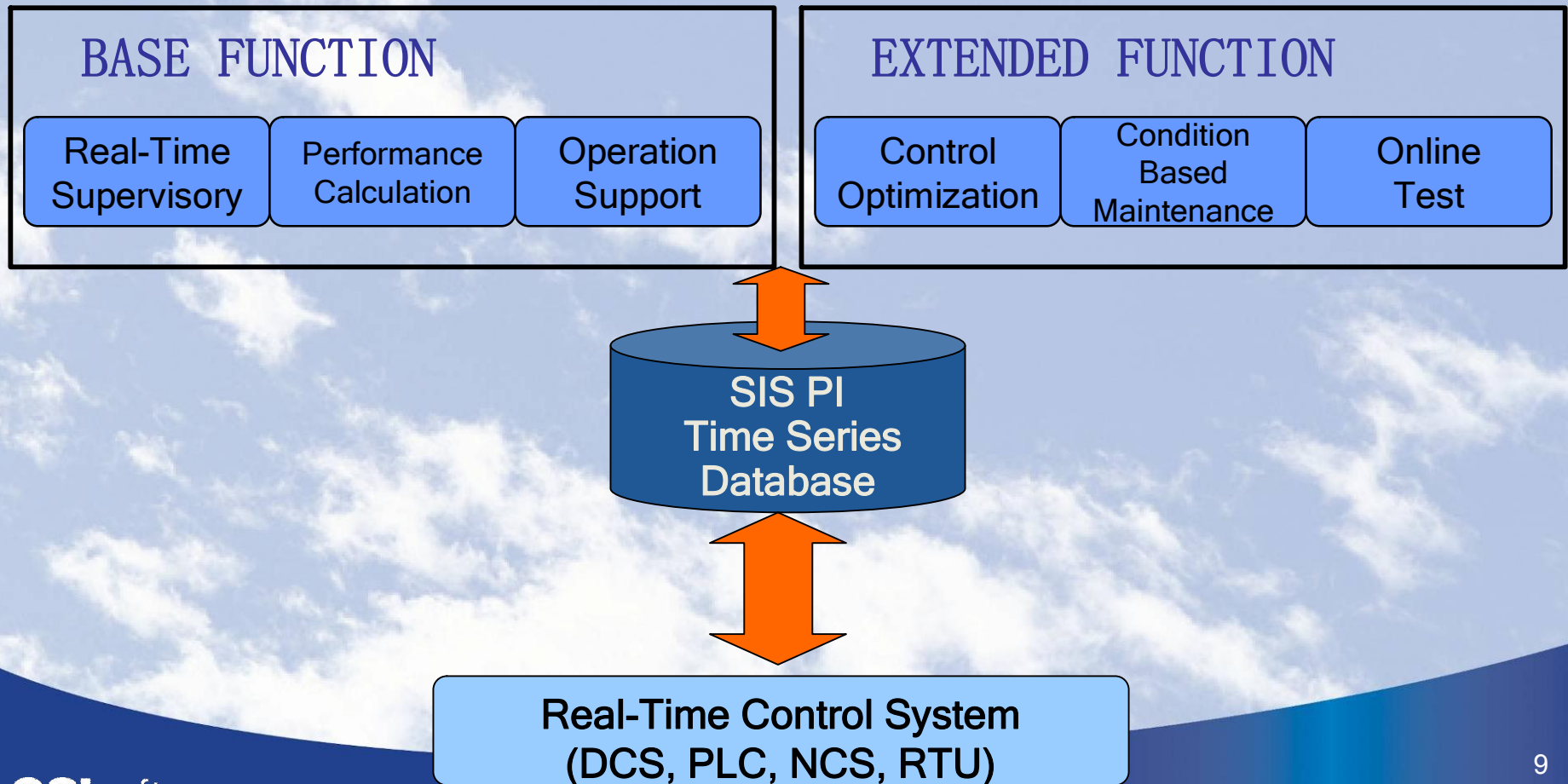
GuoHua Power Group Enterprise Performance Solution

GuoHua Power Group Location

- 13 Power Plants in Operation
- 10 Power Plants under Construction

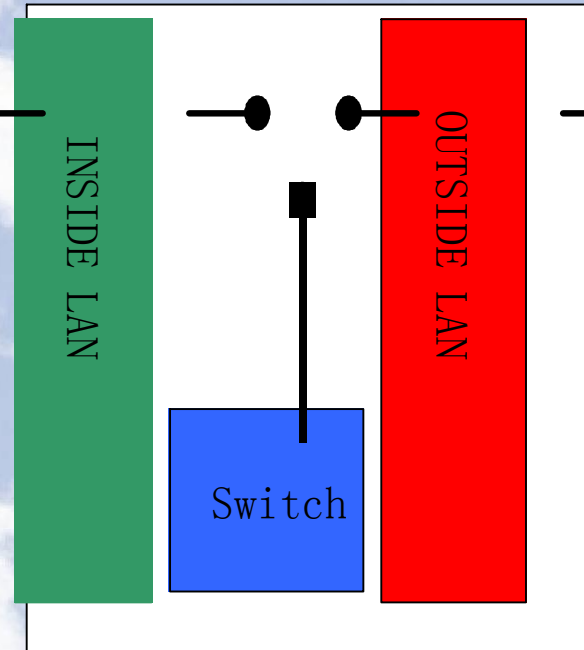
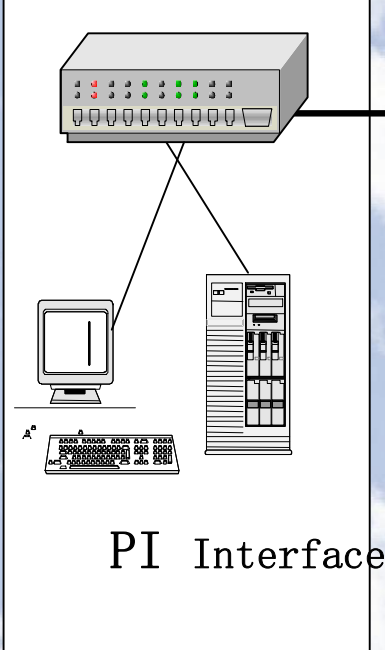


SIS-Supervisory Information System in All Power Plants

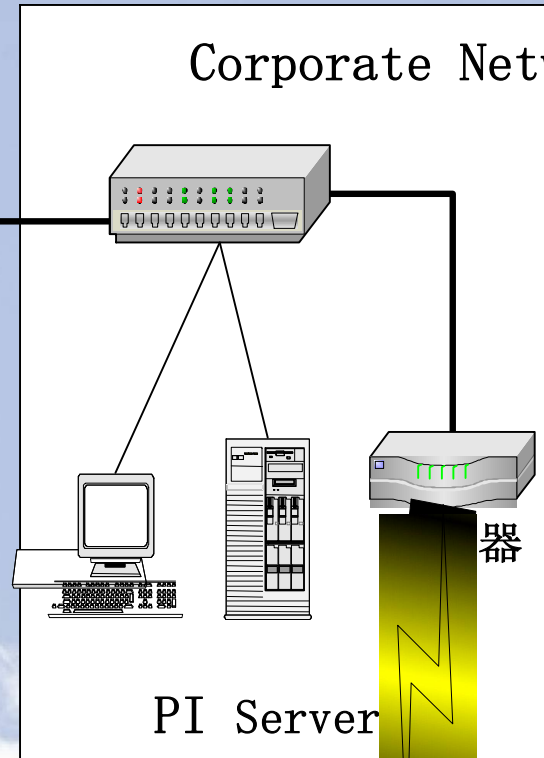


Physical Isolator

DCS Network



Corporate Network



Internet



Physical Isolator Spec

Highest Isolation Possible:

- Dual Power Supply

- No Electric Connection of Internal and External Networks

- One Way Traffic (User Configurable), Response by less 4 Bytes

- Rule Definition

- Emergency Manual Interruption

Support PI to PI Data Mirror:

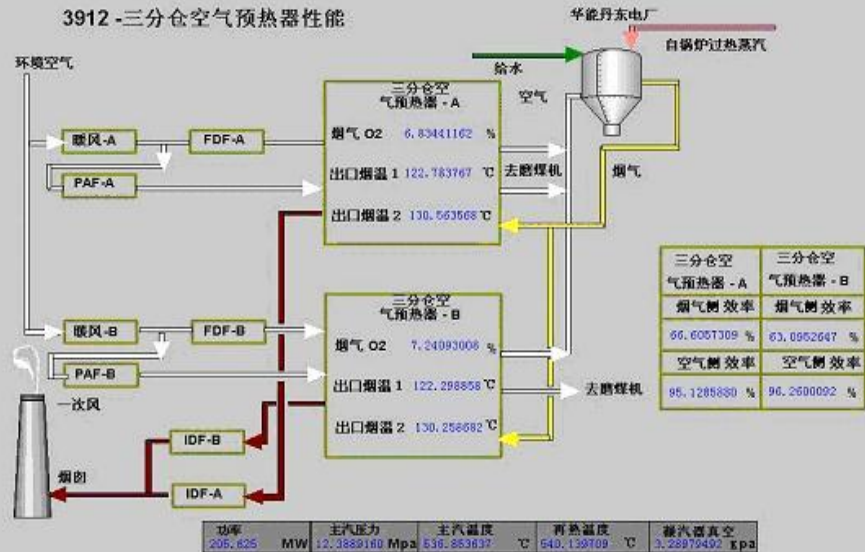
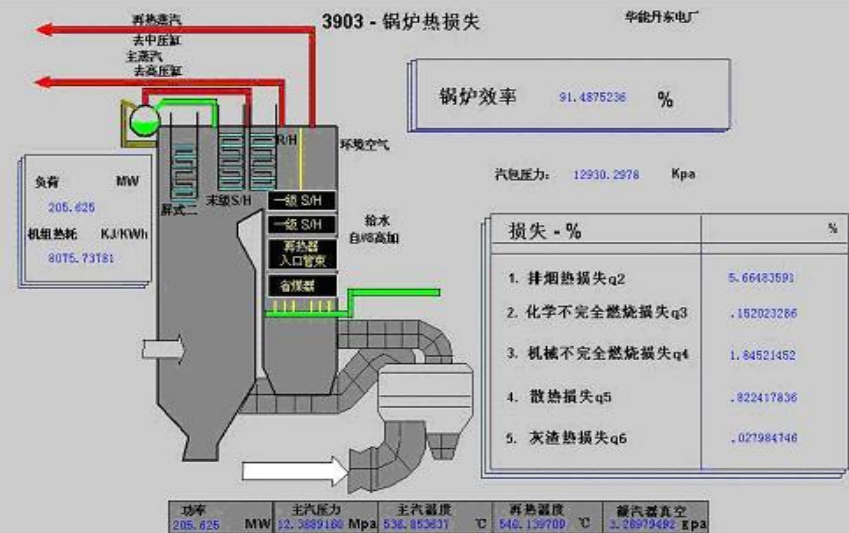
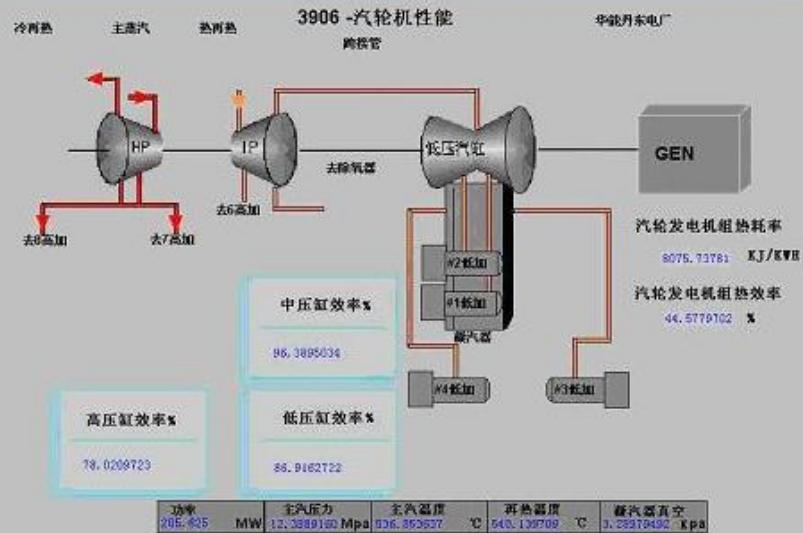
- One Way Data Synchronization between Operation PI server and Enterprise PI server

- Support APS (Auto Point Sync)

- Support Enterprise RtDC (Real-time Data Center) Configuration



Performance Monitoring at HQ in Beijing



Green Valley Initiative

What's the Next Technology Wave?

Silicon Valley of USA:

The source of last technology birthplace

Green Valley of China in Beijing: (By State Council)

Foster innovation in the energy Sector, green energy, renewable energy, efficient use of energy

Policy study to help China government facilitate investments or other programs

Expert think tank to help China power plant to be more efficient in operation and reduce CO2 emission

Establish real-time emission monitoring system to monitor all China large emission sources

Develop a Carbon Emission Reduction (CER) system to enable China to be an important player in future energy market

The PI System for Transmission and Distribution

Massive Construction of T&D Network to Deliver the Power

Requires Applications at Large Scale:

EMS

AMR

WAMS

Power Marketing System

Huge Amount of Real-Time Data from above system

Requires Concentration of Real-Time Data :

RTDC (Real-time Data Center)

North China Grid WAMS Project

Mission Impossible for WAMS

- **Problem with Real-time Data in Relational DB**

- ▶ **PMU for One Substation**

- Value: 48 Vector, 8 Analog and 20 Status → 268B
- Bandwidth: 20 ms per frame of data = $50 \times 268 = 13\text{KB/sec}$
- Event: $76 \times 50 = 3800$ events/sec

- ▶ **WAMS with 50 PMUs**

- Bandwidth: $13\text{KB} \times 50 = 650\text{KB/sec}$
- Event: $3800 \times 50 = 190000$ events/sec

- ▶ **Total Data Size**

- Data Stream: $650\text{KB} \times 60 \times 3600 = 14\text{G/day}$

WAMS Trend

2006 Year

North China: 37 PMUs

East China: 44 PMUs

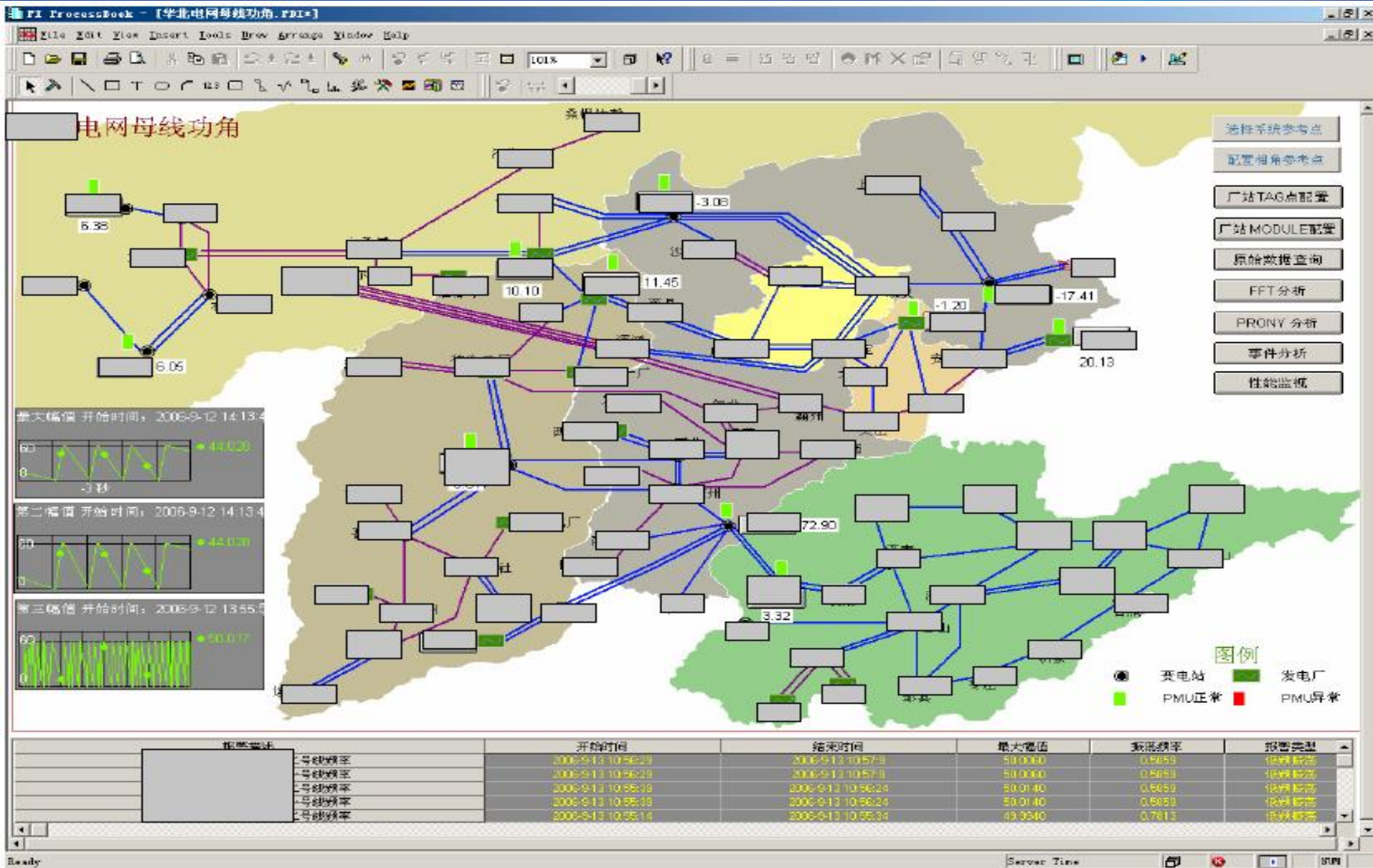
Central China: 35 PMUs

South China: 22 PMUs

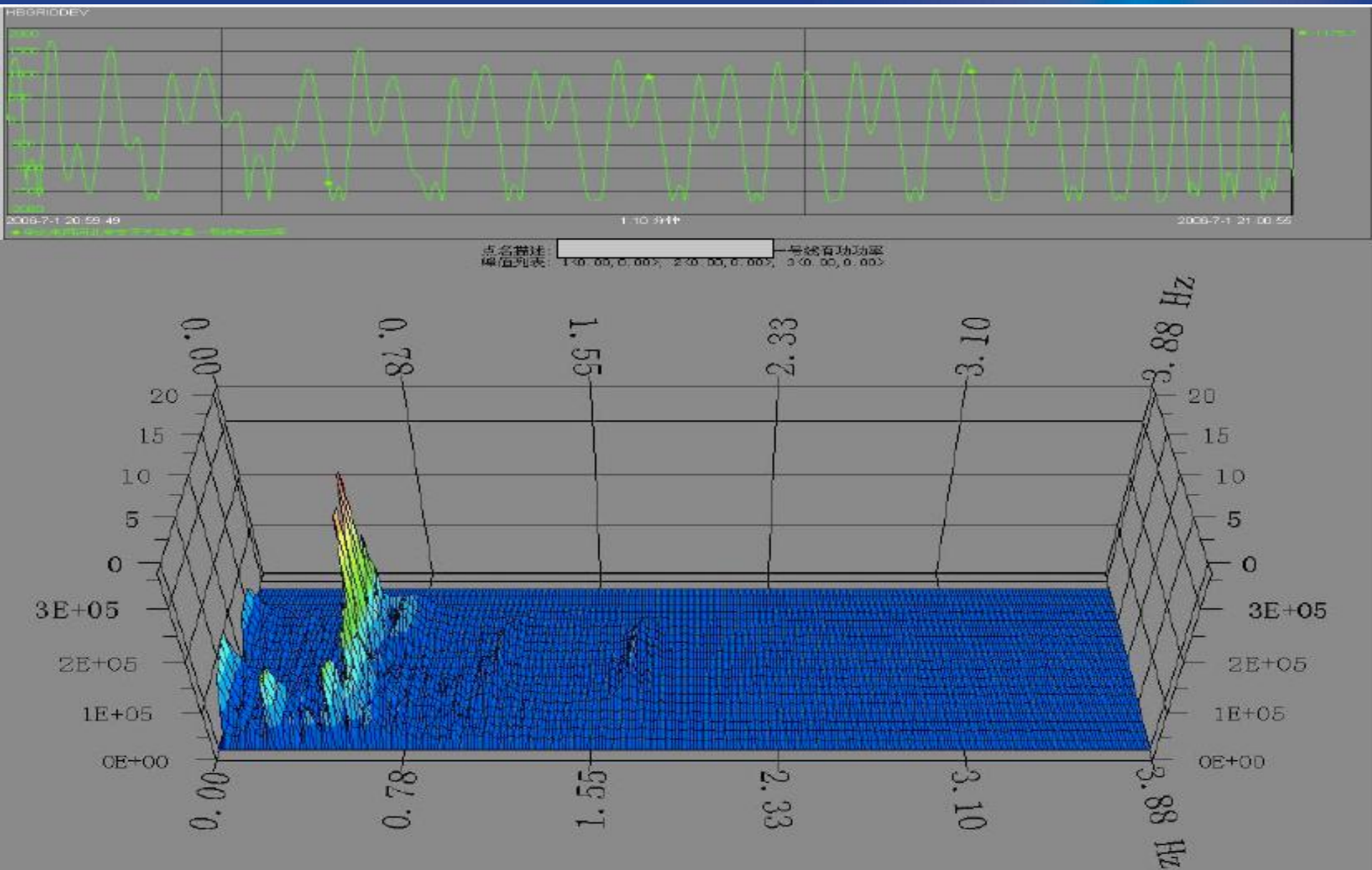
2007 Year

Provincial Level WAMS systems start

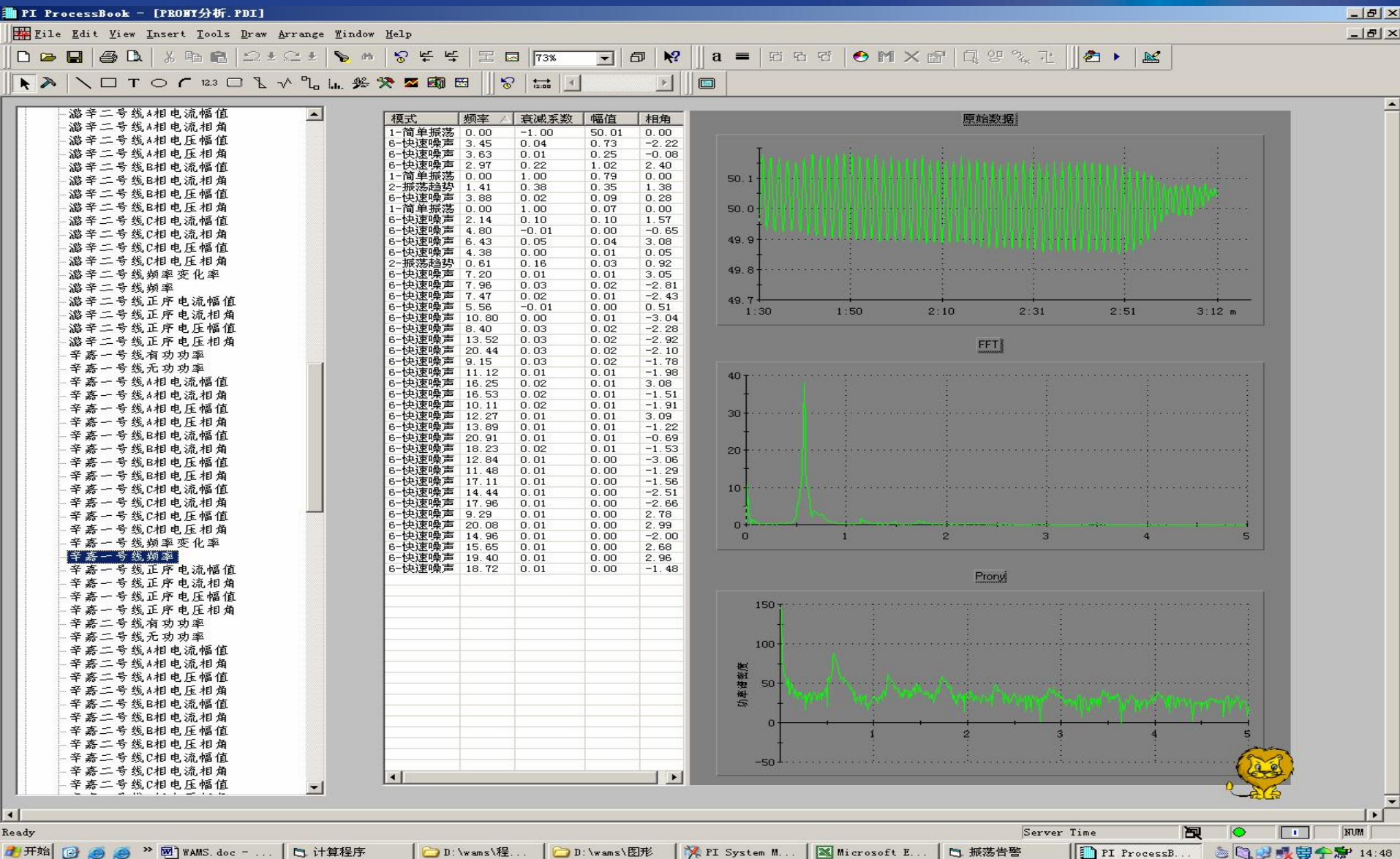
WAMS Project Area Display



Real-Time FFT



Prony Analysis

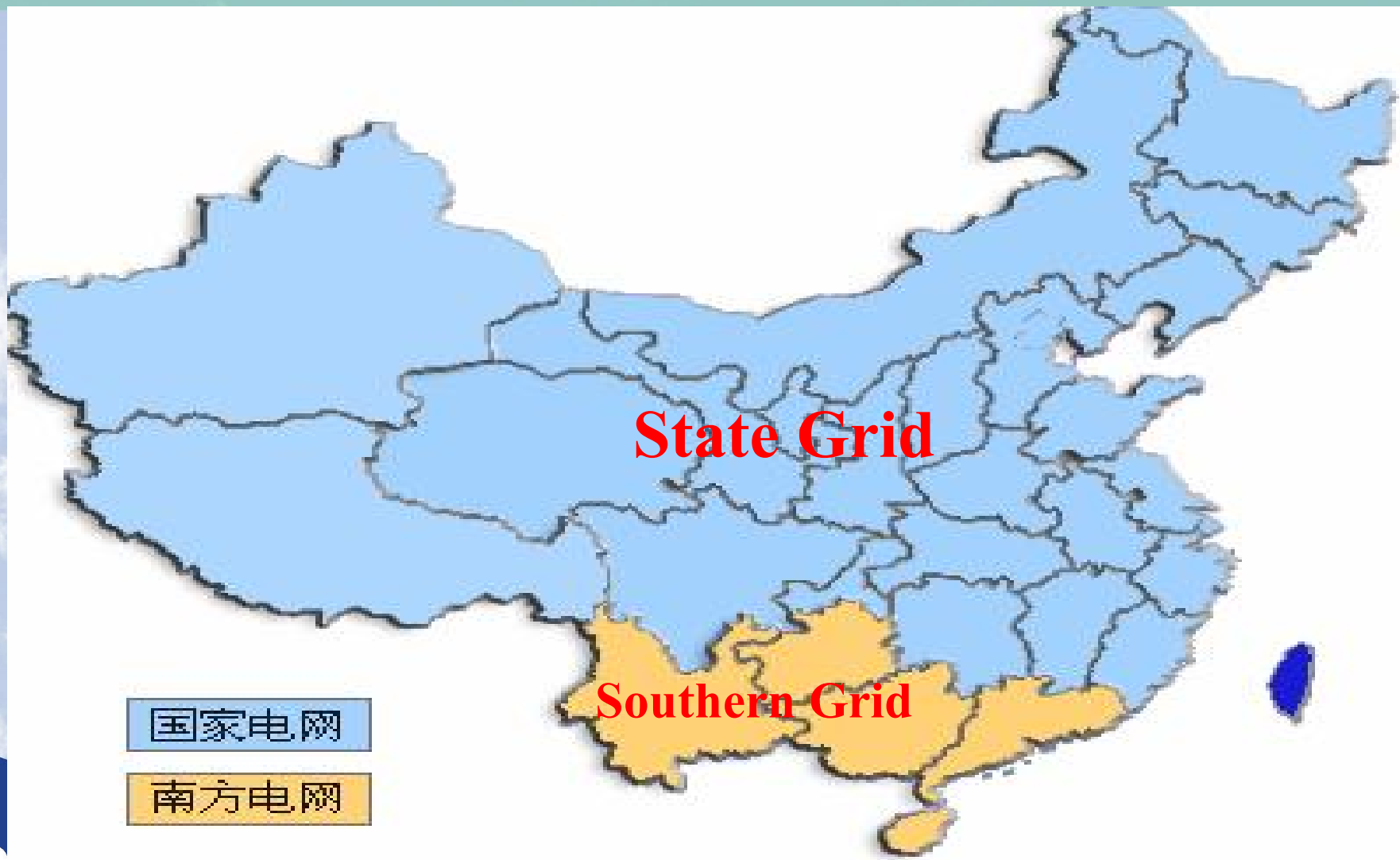


South China Gird EMS Project

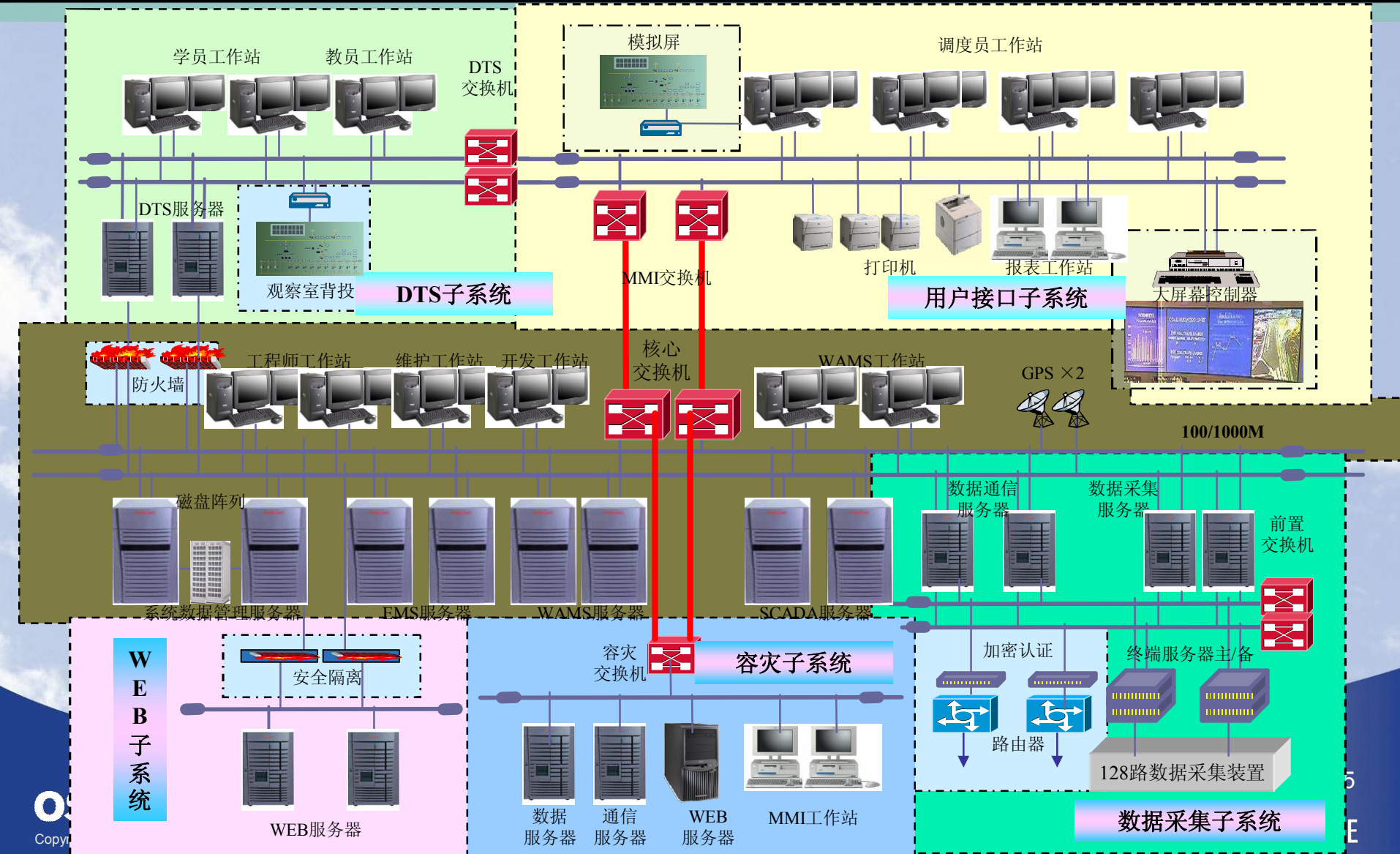
Next Generation EMS

- **Key Features**
 - **Single database**
 - **High Availability, Sustainable**
 - **CIM database for SCADA/EMS/DTS**
 - **Fast load flow solutions based on distributed computing**
 - **Advanced surface graphics**
 - **Advanced dispatching and generation control**
 - **Integrated State Estimator**
 - **Advanced damping control**
 - **Reliable**

South China Control Area

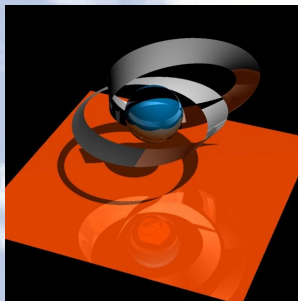


South China Grid EMS/Configuration



CIM-Common Information Model PI Database Synchronization

**Power System
Model**



CIM

**SISCO PI
Adapter**



**CIM Knowledge
MDB to AF Transfer**



Module Database

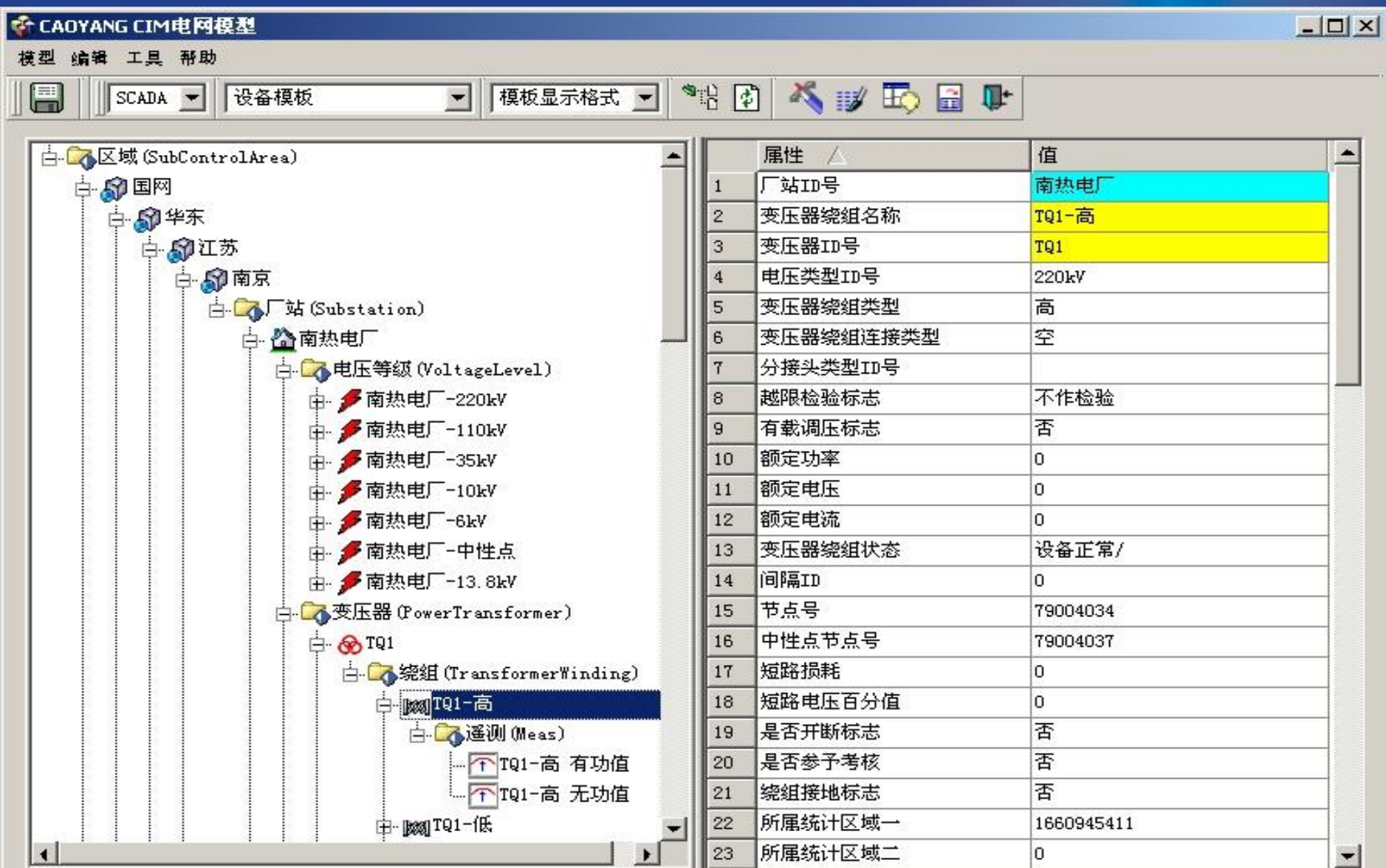


ProcessBook

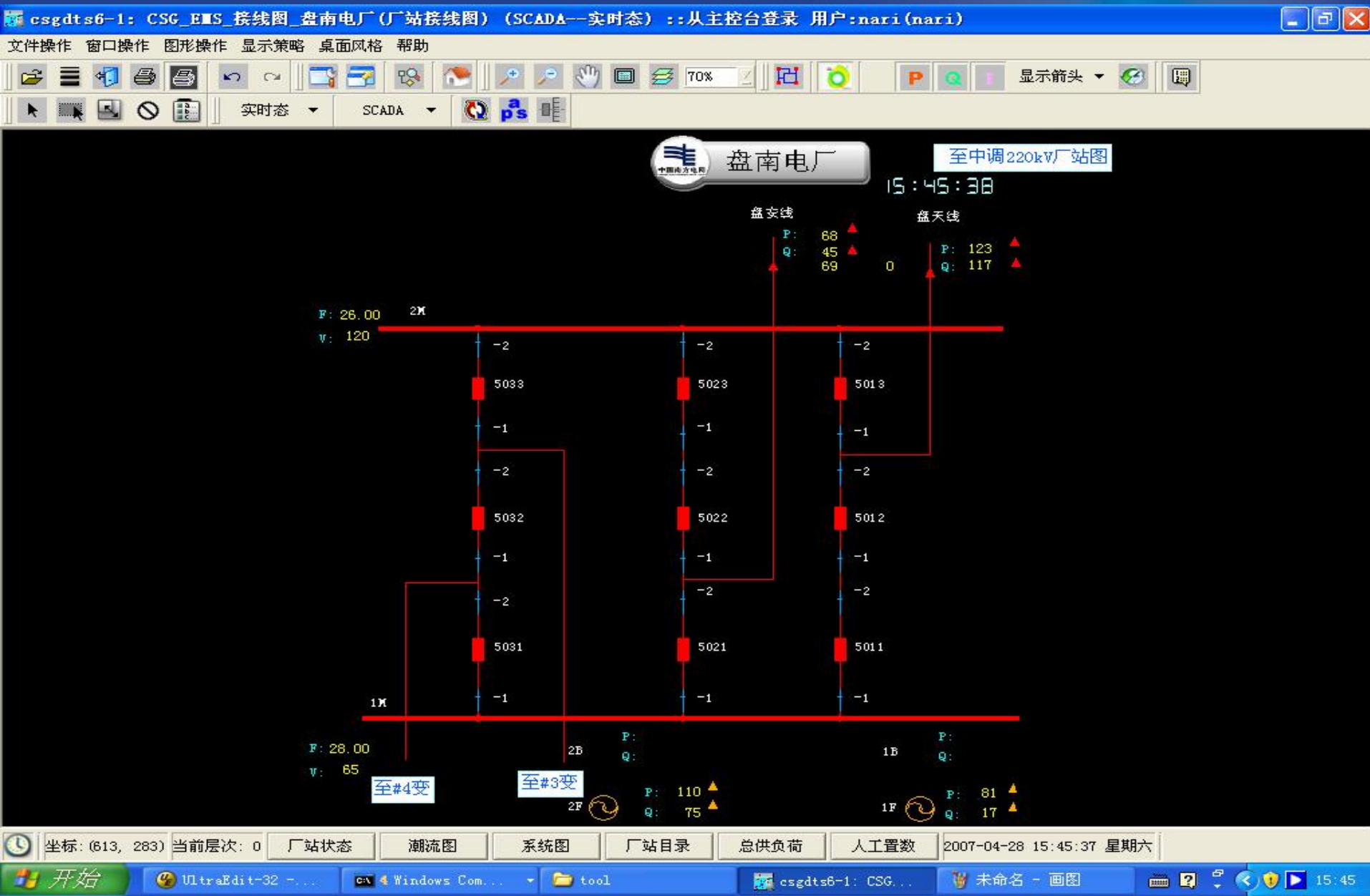


**Analysis
Framework**

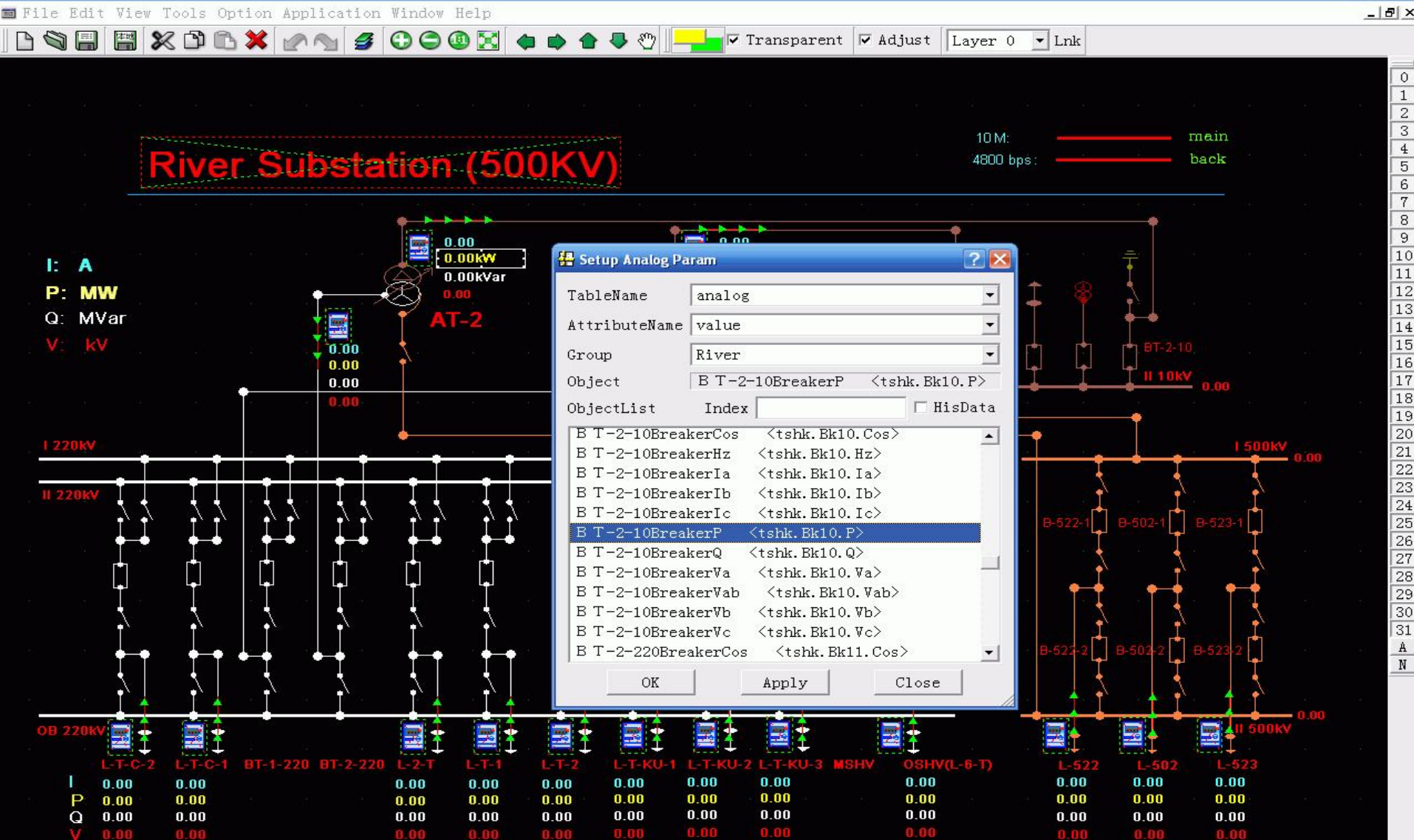
CIM for Data Management



CIM for EMS Online Generation

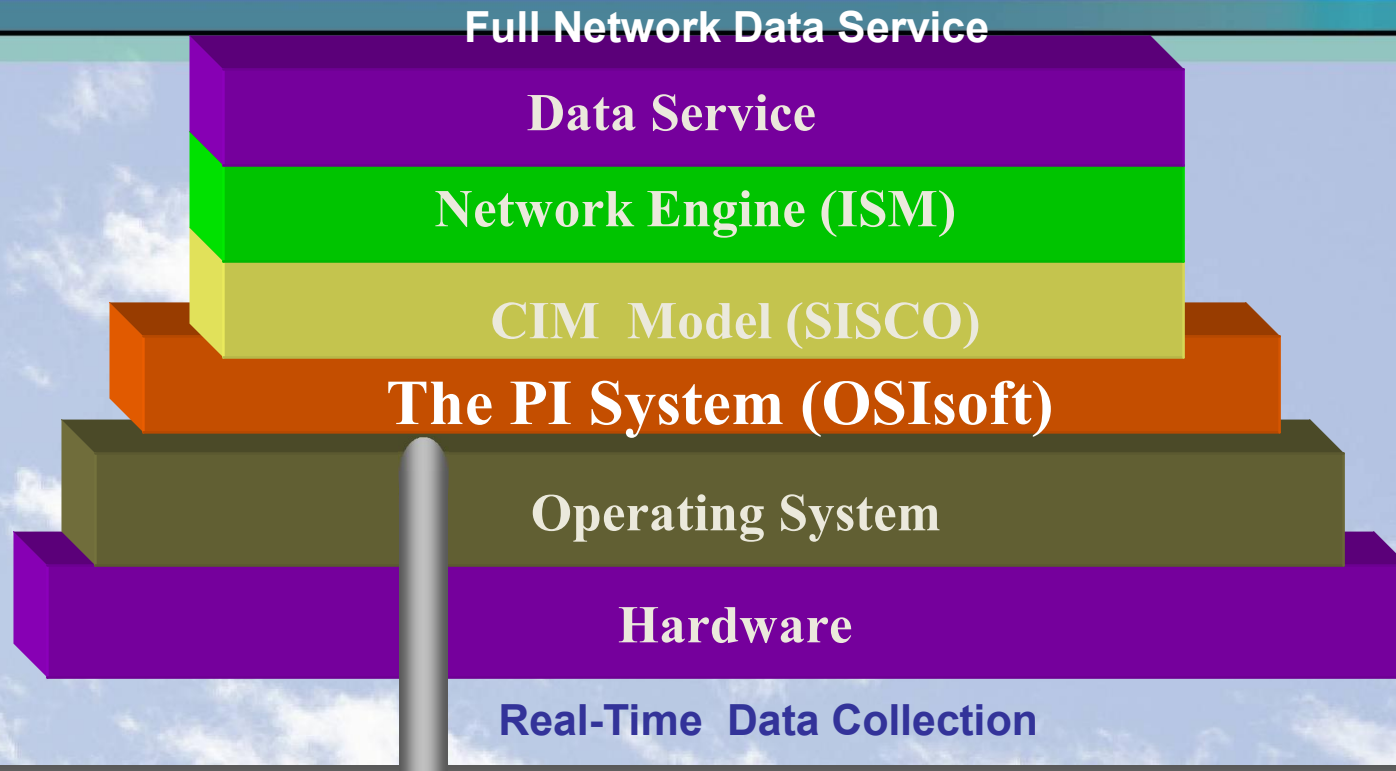


Graphical Tag Point Building Tool



Shenzhen Municipal RtDC Initiative

Virtual SCADA Service (RtDC)



VOYAGE2007



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