Emergency Response Support Tool Used in Taiwan

Te-Chuan Wang
Associate Scientist
Nuclear Engineering Division
Institute of Nuclear Energy Research

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Outline

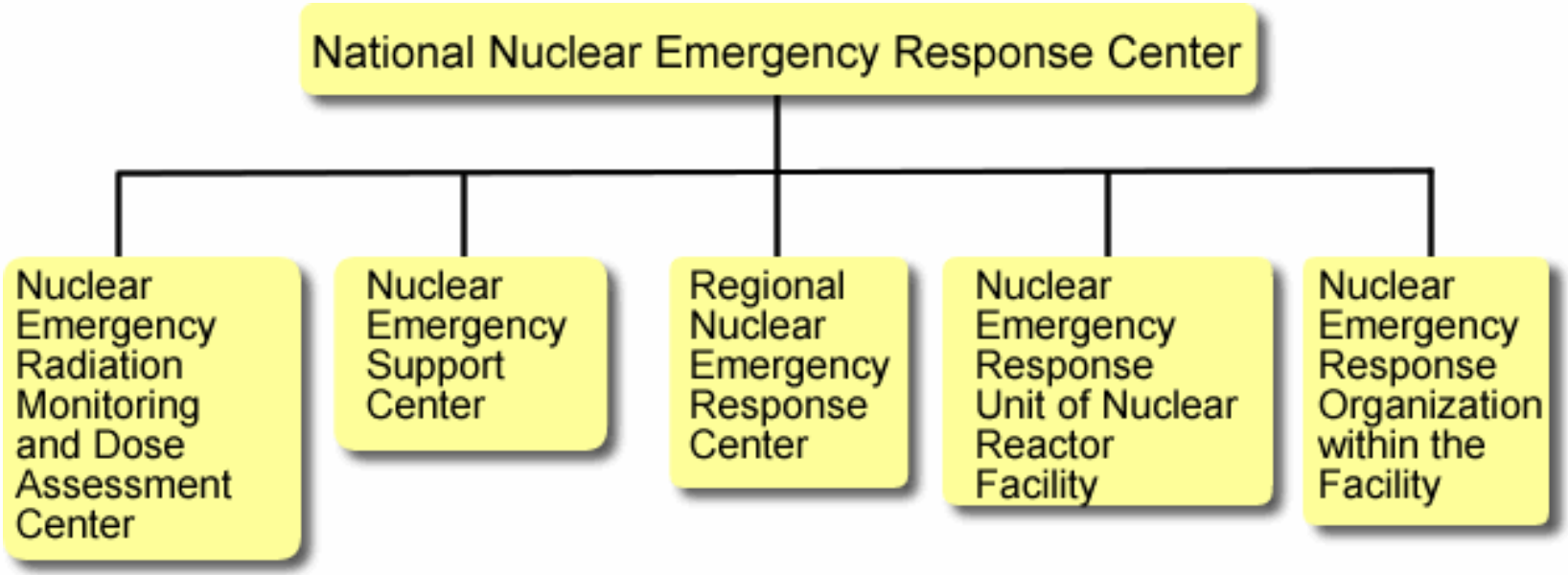
- Introduction
- Emergency Response Support System (ERSS) of Maanshan Nuclear Power Plant
- -Accident Status Display System (ASDS)
- -Accident Diagnostic System (ADS)
- -Accident Prediction System (APS)
- -Accident Management Monitoring System (AMMS)
- -Accident Database
- ERSS Future Works

Introduction

- **ERSS**
  - **Function**
    - Assist accident evaluation team to evaluate the plant conditions during emergency response
    - Provide source terms to evaluate the dose rate
    - Provide accident information
  - **Use MAAP5 code as a prediction tool in ERSS**

Introduction

- **Emergency Response Organization**

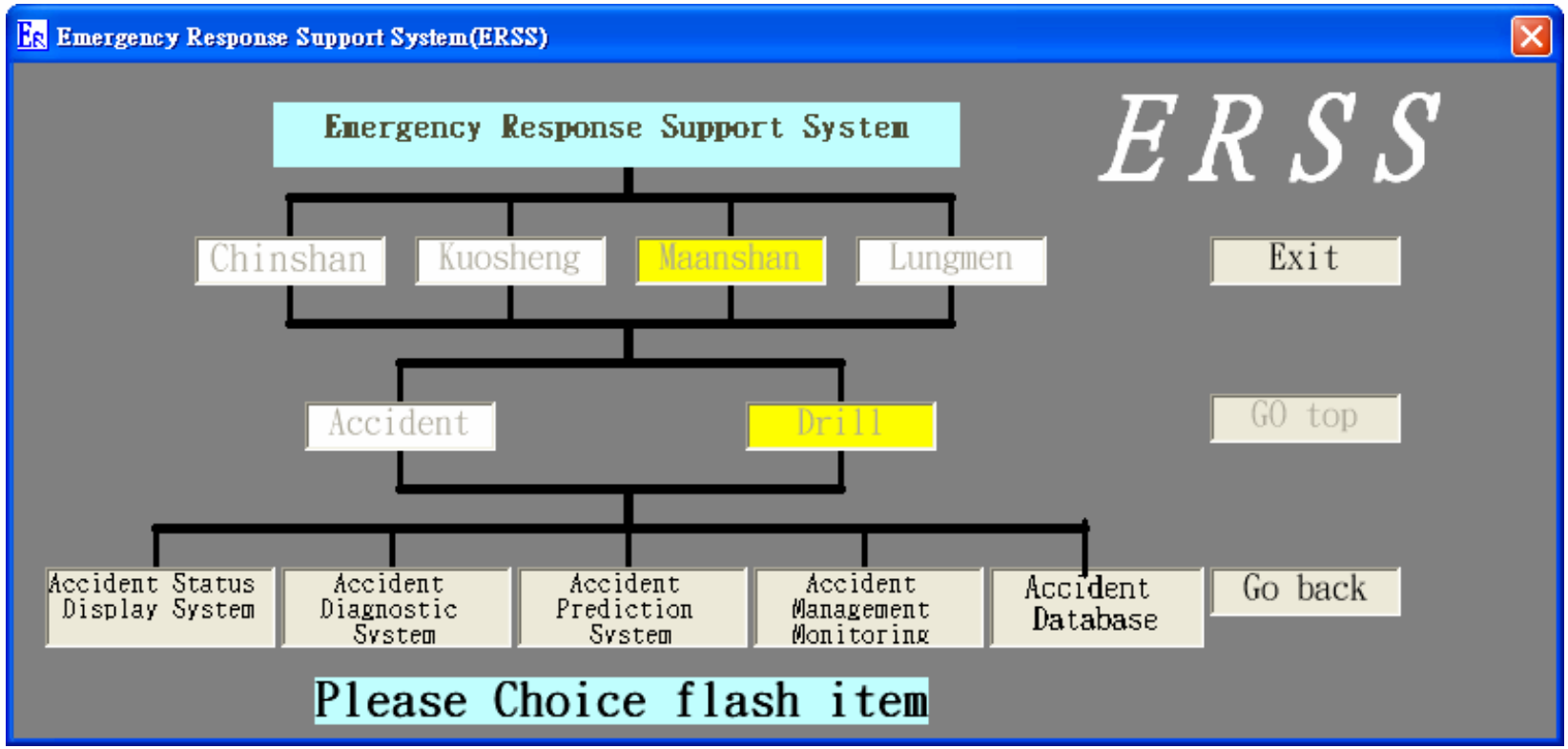


Introduction

- **MAAP5 Benefits**
  - BWR Version, PWR Version (SG Model)
  - Include ESF system, protection system, control system model
  - Easy to use
  - Fast running
  - Graphical interface system
  - In-plant and ex-plant dose calculation

Introduction

- **ERSS Entry Structure**



Database

Drill

SPDS

Accident

ERSS

APS

ADS

AMMS

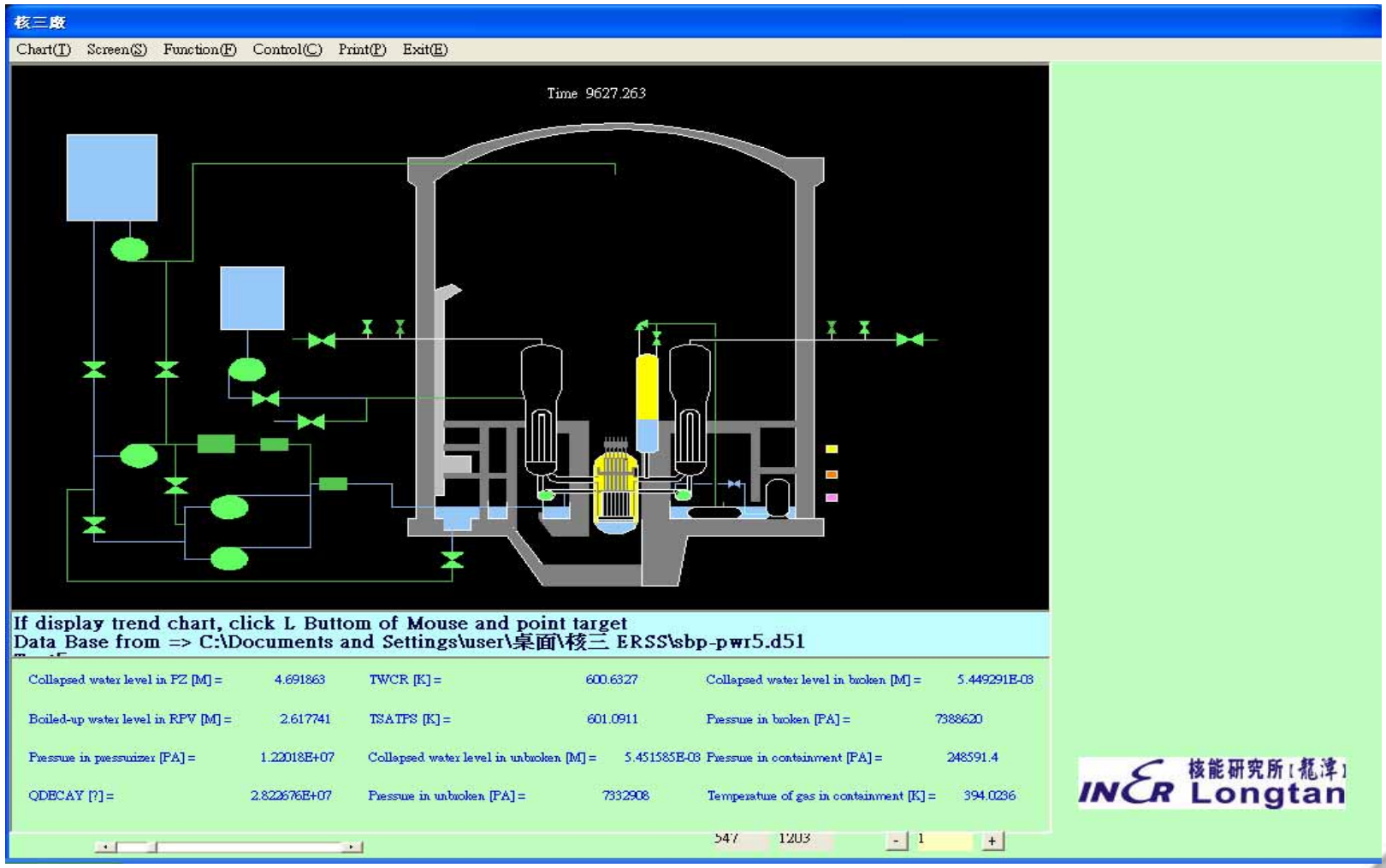
Database

ASDS

Maanshan ERSS (ASDS)

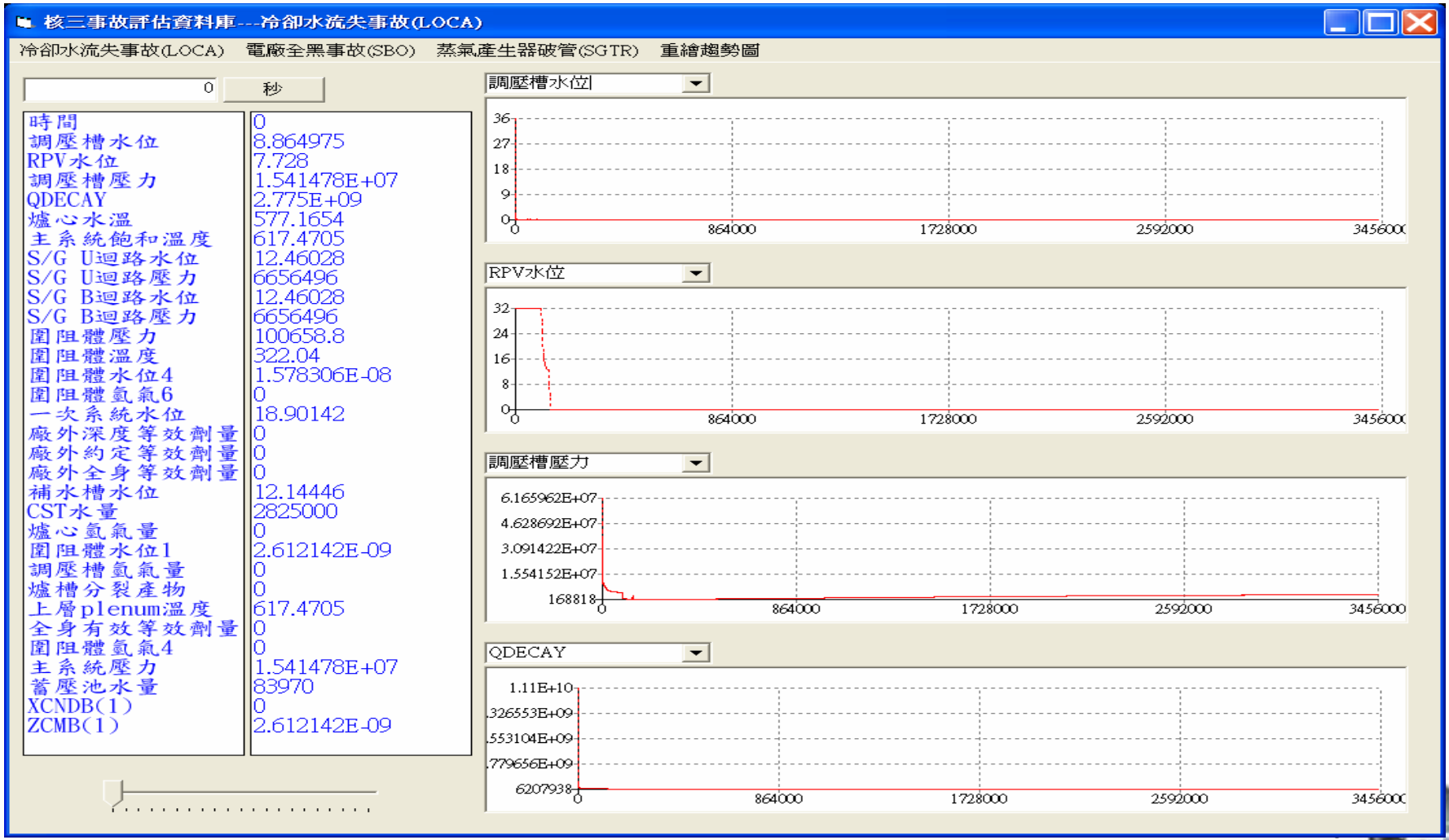
- **Accident Status Display System**
  - **Display on-line plant data or information**
  - **Graphical display system**
    - Plant condition（pressure, water level, temperature etc）
    - Injection system conditions (CCP, RHR, etc)

Maanshan ERSS (ASDS)



Maanshan ERSS (ASDS)

- **On-line Parameter Plots of Primary System**



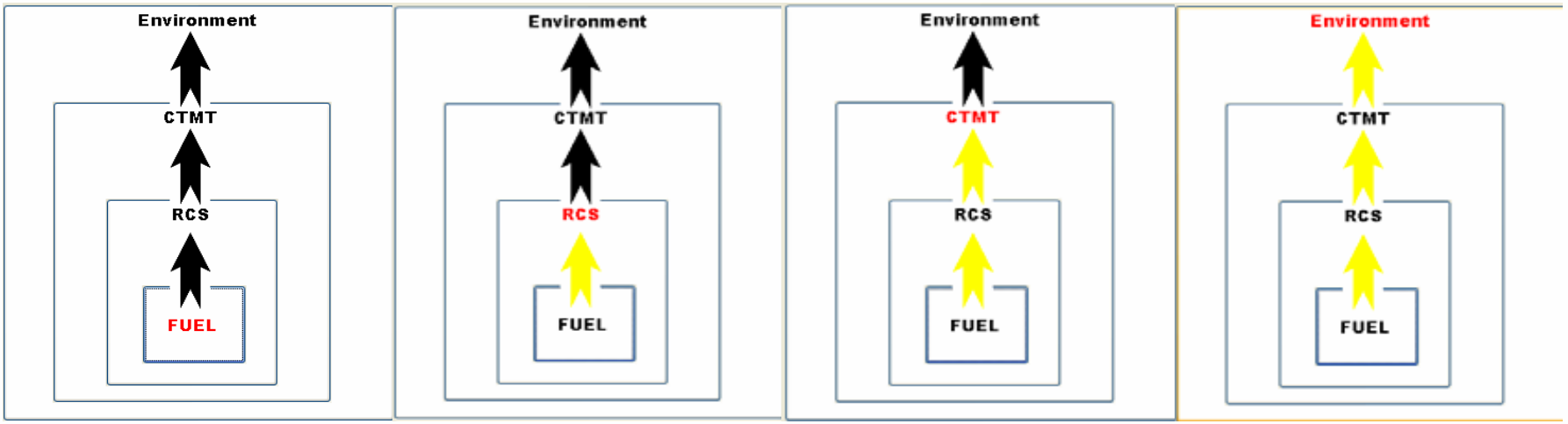
Maanshan ERSS (ADS)

- **Accident Diagnostic System**
  - Decide initiation events
    - SBO、LOCA、SGTR
  - **Decide Accident Emergency Class**
    - General Emergency, Site Area Emergency, Alert, Unusual Event

Maanshan ERSS (ADS)

– Decide Fission Products Barriers Status

- Fuel rod、RCS、Containment

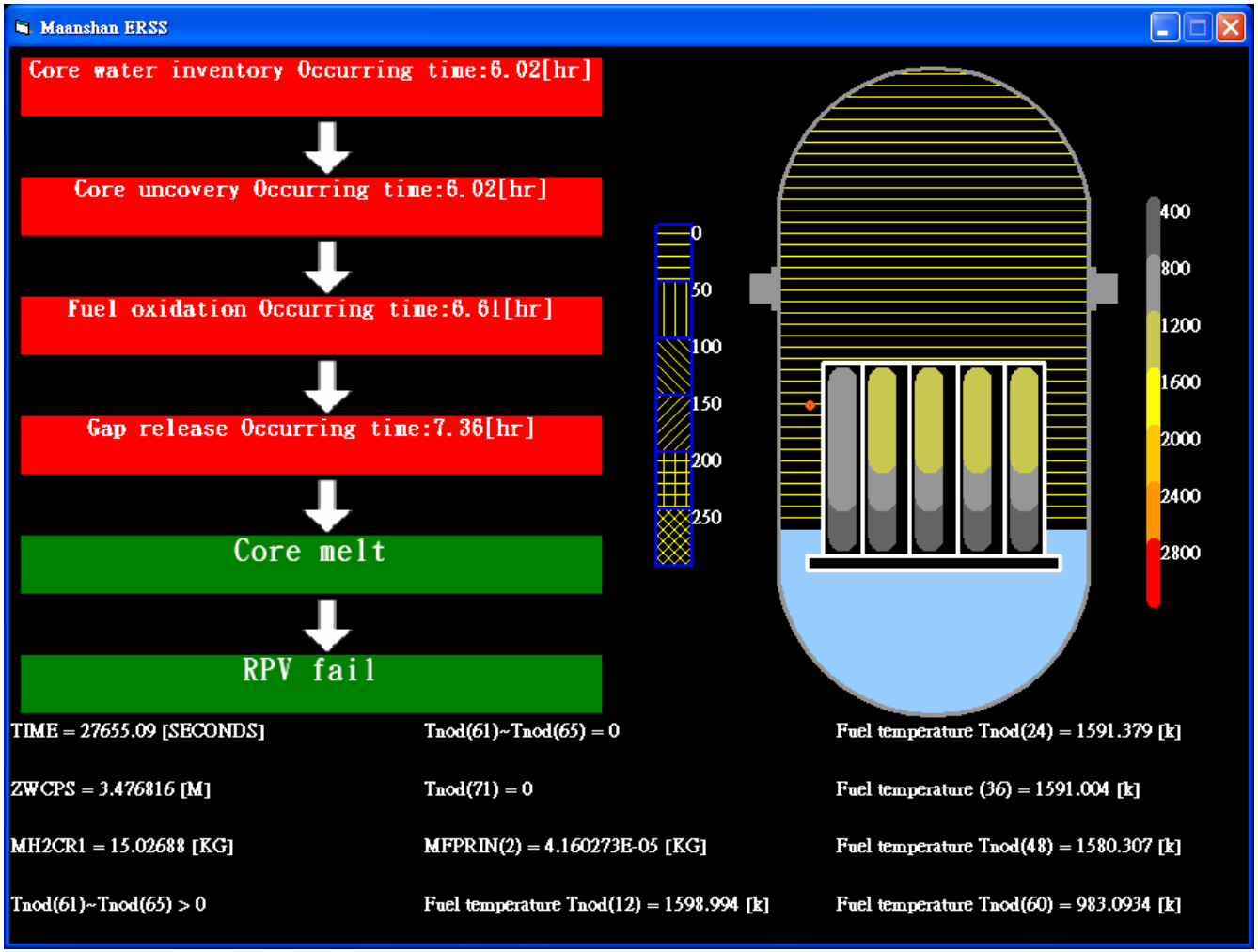


Maanshan ERSS (ADS)

– **Decide Core Status**

- Core uncover, Fuel rod oxidation, Fission products released from fuel rod, Core damage, RPV failure

Maanshan ERSS (ADS)



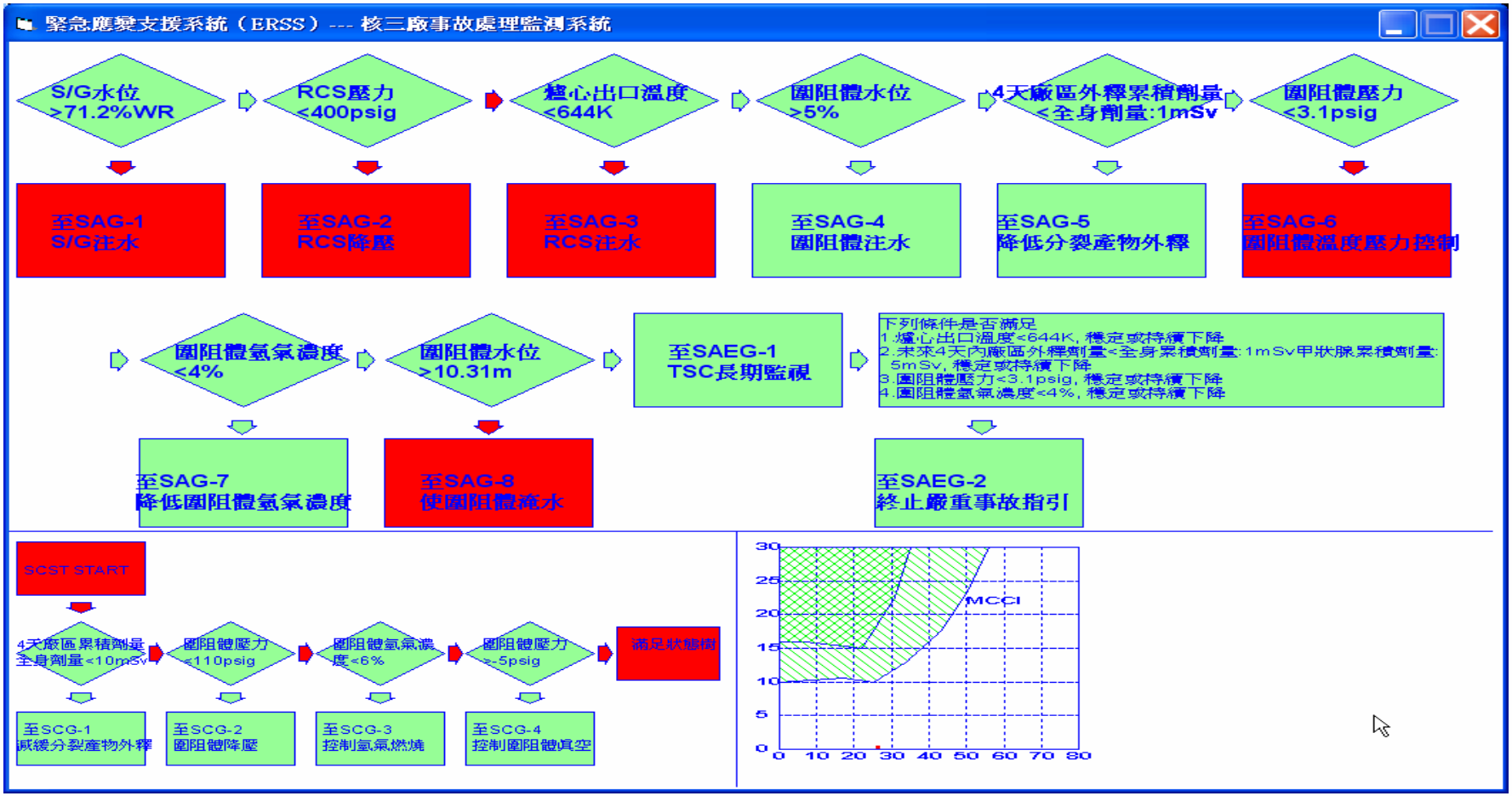
Maanshan ERSS (ADS)

- **Evaluate Core Damage Fraction**
  - **Radiation scale**
  - **Hydrogen concentration**

Maanshan ERSS (APS)

- **Accident Prediction System**
  - MAAP5 code
  - Simulate severe accident phenomena
  - Fast prediction capacity
  - Predict core damage fraction
  - Predict containment failure
  - Predict in-plant and ex-plant dose

Maanshan ERSS (AMMS)



Maanshan ERSS (Database)

- **Accident Evaluation Database**
  - **Establish severe accident response, sequences of events and source terms in advance**
    - Typical accidents: SBO, SGTR, LOCA
    - Base on accident types and core melt fraction to calculate source term for dose calculation

Maanshan ERSS (Information)

– **Provide Accident Information**

- Initiation accidents
- Plant status
- Accident evaluation and trend prediction
- Source term
- Response actions

ERSS Future Work

- ERSS Project is supported by AEC
- Maanshann (PWR) ERSS was successfully applied in the emergency response exercise in 2008.
- Kuosheng and Chinshan (BWR) ERSS will be finished in 2009.
- Connect with SPDS plant data will be finished in 2011.

ERSS Future Work (Connect with SPDS)

Accident Status Display System

The ESF plays important role in decision making during emergency response. With the SPDS plant data, the status of ESF systems and the trend plots of important parameters can be demonstrated in the ERSS.

ERSS Future Work (Connect with SPDS)

Tracking of Accident

MAAP5 can generates the full power steady state condition. With the SPDS plant data, a simple algorithm is used to identify the type of accident, such as SBO, LOCA, ATWS, and SGTR.

ERSS Future Work (Connect with SPDS)

Estimation of Core Status

The core status is classified into core uncovery, metal-water reaction, gap release, fuel relocation, and RPV failure. It provides the progression of the severe accident. Convert the SPDS data into a simple core status for understanding the core status.

ERSS Future Work (Connect with SPDS)

Accident Management Monitoring System

Couple the SPDS plant data with the flowchart of SAMG, the evaluator can monitor the accident management status of the plant.

Thanks for your attention