A map of the Korean Peninsula and surrounding regions, including parts of China and Japan. The map features a grid of latitude and longitude lines. Major cities like Nampo, Haeju, Incheon, Seoul, Taegu, and Wolsong are labeled. Two red stars with white outlines are placed on the eastern coast of Korea, one near Wolsong and another further south. The text is overlaid in large, bold, black font.

**Overview of Republic of
Korea Nuclear Power Plant
Accident Exercise October
2015**

**Trinity Section ANS
Lighting Talks #8
August, 2021**

K.L. "Ken" Groves, FHPS

A Short Lesson on Geography

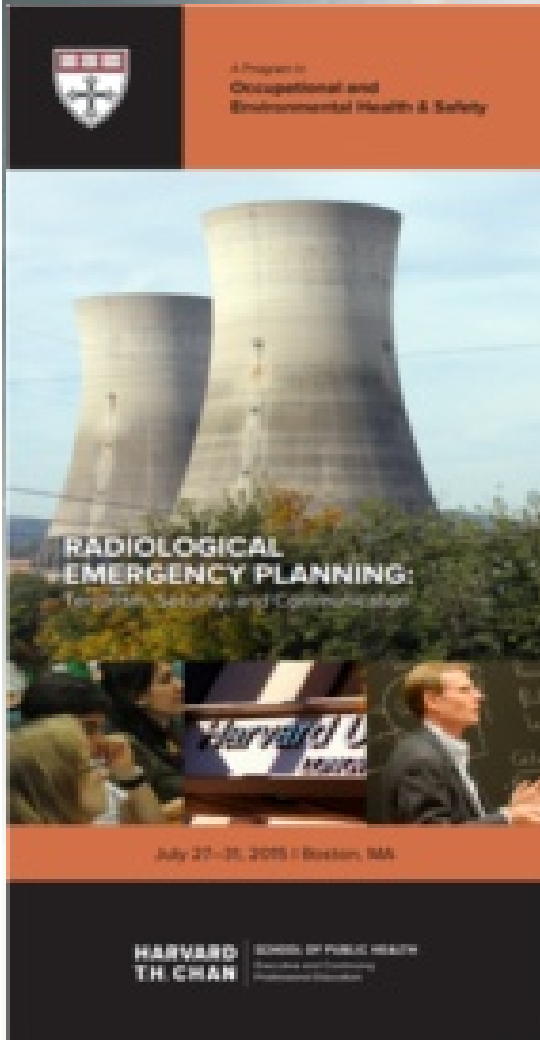


A Short Lesson on Geography (Con't)



**South Korea
(Republic of
Korea)**

How did my trip come about?



I am fortunate to have been on the faculty of the T.H. Chan, Harvard School of Public Health, where I taught a class on “Federal Radiological Response Teams” as a part of a one week-long course on ***Radiological Emergency Planning*** open to students from around the world. One of the students from Korean Institute of Nuclear Safety (KINS) in South Korea “enjoyed” my talk and invited me to visit/consult with both KINS and Korean Atomic Energy Research Institute (KAERI) on a upcoming set of accident exercises involving both a commercial Nuclear Power Plant (full field) and a government Research Reactor (tabletop).

Trip Schedule and Locations

- Arrive Seoul on October 10, 2016 for visit to **Korea Institute of Nuclear Safety (KINS)** ROK equivalent of US NRC
- Recover from 24+ hours in the air from ABQ to Seoul-October 11
- Travel from Seoul to Daejeon by train to meet KINS hosts, drive to Yonggwang, begin discussions on exercise (visit exercise site)-October 12 (ate “strange”, but good Korean dinner)
- Observe Nuclear Power Plant Exercise at Yonggwang; Travel from Yonggwang to Daejeon by car-October 13 (ate “even stranger” food)
- Visit KINS complex, Review exercise with observers/players; provide presentations on US Emergency Response Resources (FRMAC and AMS-centric): October 14 (ate best Japanese dinner ever)
- Meet with KINS senior management and give presentation of my exercise observations-October 15 (ate best Chinese dinner ever)
- Out brief with KINS hosts; travel by train from to Seoul-October 16
- Weekend of R&R at U.S. Army Dragon Hill Lodge, Seoul-October 17-18
- Opportunity to have spaghetti, steak & baked potato and Cesare Salad!

Trip Schedule and Locations (Con't)

- Travel Seoul to Daejeon by train for visit to **Korean Atomic Energy Research Institute (KAERI)**-October 19 (host provided Korean Dinner)
- Meet with KAERI Hosts, visit KAERI site and in brief with KAERI Emergency Management Senior Staff; provide overview of US NRC and IAEA Regulatory/Recommended Plans (emphasis on Research Reactor safety and security)-October 20 (ate best Indian Food ever)
- Observed Tabletop Exercise (TTX) at KAERI's research reactor (HANARO), the largest (30MW Capacity) dedicated research reactor in the world. Tour of Korean Traditional Site and Buddhist Temple -October 21 (ate more great Japanese food)
- Review observations of TTX with HANARO senior staff and provide overview of US Emergency Response Assets (DoD, DOE, EPA and HHS); out brief with KAERI hosts-October 22 (mucho sake/wine/beer & Korean Bar-B-Q with KINS and KAERI hosts at farewell party)
- Travel to Incheon Airport by train and fly to Beijing to meet wife for two week tour of China-October 23

South Korean nuclear power plants

Six out of the country's 23 nuclear reactors are now closed.

STATUS OF REACTORS

- In operation
- Shut down*

Hanbit/Yonggwang



50 miles
50 km

SOUTH KOREA

Urban areas

Seoul

Hanul/Ulchin



Shin Wolsong



Wolsong



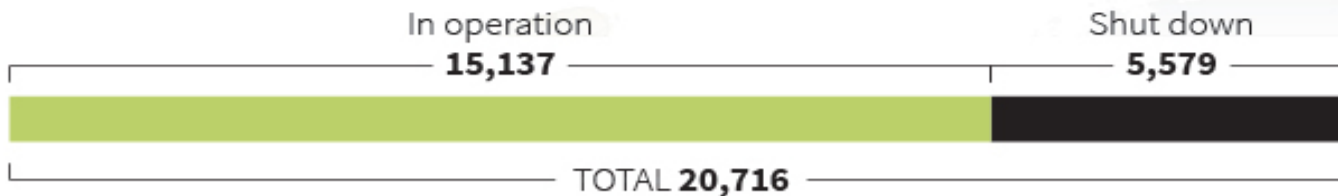
Shin Kori



Kori

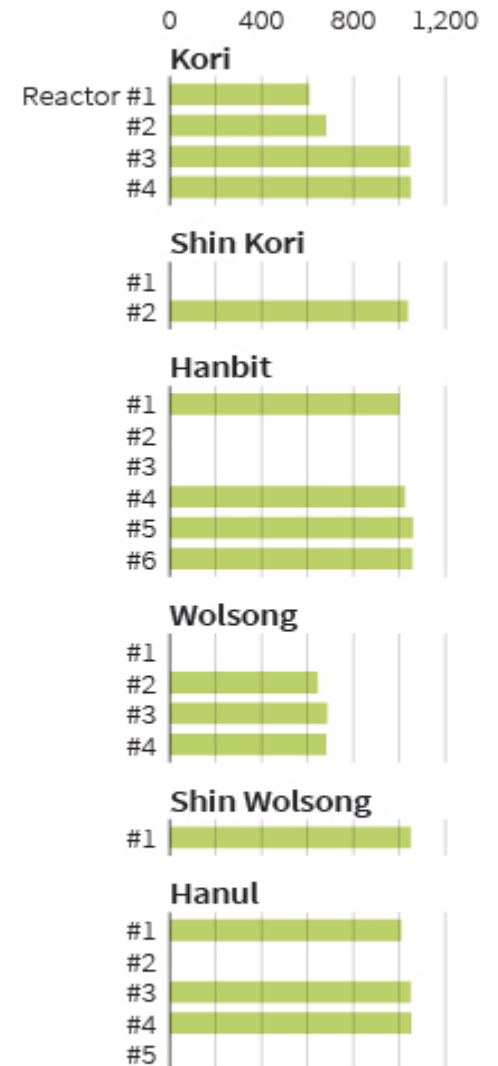


NET CAPACITY — ELECTRICITY OUTPUT IN MEGAWATTS (MWE)



OUTPUT

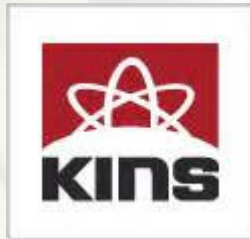
As of Nov. 18, in megawatts



* Wolsong No.1 is waiting for life span expansion approval. The rest are shut for maintenance.

Sources: Korea Hydro & Nuclear Power Company; World Nuclear Association; Global Energy Observatory.

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015



**K.L. "Ken" Groves, MS, FHPS
President, S²-Sevorg Services, LLC**

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015

Disclaimer: The following set of slides will attempt to offer an independent review of observations by myself and do not represent the thoughts of my sponsor, B.J. Kim, Ph.D. or any others I have interviewed or observed during the exercise.

I hope the critique I offer will in some small way help with the continuous improvement process that is the basis for the development of regulations/guidance, performing training, and holding drills and exercises at South Korea's NPPs.

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015

First and foremost, I want to congratulate you and all the participants in the exercise I had the honor of observing yesterday:

- Exercises are NEVER EASY and the significant efforts put into the planning for this exercise were obvious.
- No Exercise can fully represent the impact of an actual NPP accident, however, this exercise did an excellent job in offering a “realistic” scenario for the participants.
- The critical “self-assessment” provided in the Review of operations of the **Joint Radiological Emergency Monitoring Center (JREMC)**, at the end of the exercise; I thought was one of the best summary’s I have ever observed--Thank You Mr. Choi.

Exercise Background Information

- I'll be going through some slides with some pictures as a starting point for the Full Field Exercise I observed.
 - Facilities Used During the Exercise
 - Survey Teams and Equipment/Instrumentation
 - Aerial Measuring System
 - Displays of Data Collected/Analyzed
 - Good Friends Made!

Facilities Utilized



Korean
Institute of
Nuclear
Safety
Emergency
Management
and Response
Center



Utilities Off-Site Management
and Emergency Response Center

Facilities Utilized (Con't)



Survey Teams and Equipment/Instrumentation



Aerial Measuring System



Displays of Data Collected/Analyzed



Displays of Data Collected/Analyzed (Con't)



Field Monitoring/Aerial Monitoring Plan vs. Reality



“Planned/Directed” Data Collection by the Field Survey/AMS Teams

“Actual” Data Collection by the Field Survey/AMS Teams

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015

NOW TO MY OBSERVATIONS:

There are, in my opinion, **five major issues**, that I would like to address today:

- **Communications**
- *Communications*
- Communications
- Communications
- And finally, **Communications!**



Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015

- Mr. Choi's list of the four issues he addressed during his excellent review of the exercise confirm my observations.
- I'm sure the fact that so many of the issues identified have, "**lack of, improper, late, misunderstood, not timely, confusing, not confirmed, not followed up on or simply assumed**" communications are no surprise to any of us. (and by the way this is not unique for this exercise or any I have ever observed (US, UK, UAE and others)!

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015

Let me now go over a list of questions that I think will offer some insights into what I observed during the exercise—I hope we can discuss these and the “take away” will be issues KINS and the Nuclear Utility can address as the exercise program goes forward and continues to mature.

OBSERVATIONS

- What is **the level of confidence** in the SIREN monitoring system? Is it “high” enough to base initial decisions on the information it provides?
- How often do the senior KINS staff participate in exercises and is there a “formal” follow up **to assess their effectiveness** (not everyone can do every job)?
- Is having the players **know the scenario in advance** the most effective way to assess their ability to respond to an actual NPP accident? (I understand the pressures of conducting a one-day full field exercise).

OBSERVATIONS

- Are the briefings given to the Field Monitoring Teams **adequate to ensure** they understand the mission and the expected results?
- Is the training for the Field Monitoring Teams **adequate in terms of knowledge** of the instruments and their function?
- What instructions do the Field Monitoring Teams **get in advance** to deal with the problems of blocked or damaged roads, people self-evacuating and other issues that would not allow them to get the data they are assigned to obtain? (Scenario was an earthquake near the NPP)

OBSERVATIONS

- Who **determines the “source term”** assigned to the KINS model used to predict the movement of radiological material in the initial stages of the accident?
- Is mandatory evacuation a practical philosophy for reducing exposure or **should there be a balance** between evacuation and sheltering in place?
- In the case of this scenario, how would you deal with the **competing issues** of evacuation for radiological reasons and evacuation/rescue of the earthquake victims.

OBSERVATIONS

- Does the information **move in a timely manner** from the Field Monitoring Teams **“To”** the JREMC, **“To”** the Decision Makers, and is the assessment of that data adequate?
- Is the current organization of the JREMC **“nimble” enough to handle/deal with unexpected events** that could occur during the exercise or an actual NPP accident.
- Are the exercise participants **comfortable with the use of “nanosieverts”** in the displays when the regulations are in “micro” or millisieverts?

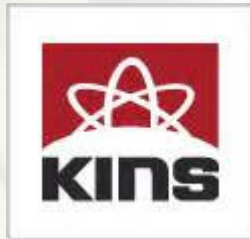
OBSERVATIONS

- Would there be value in (or has there ever been) an exercise that **required a “shift change”** to test the ability to staff for multiple shifts of participants?
- Who would be **responsible for the logistical arrangements** for the exercise (or a real NPP accident) to support “around the clock” activities such as existed at Fukushima?
- Is there an **adequate system of “checks and balances”** to ensure critical facilities or activities are not in the area of radioactive material deposition (i.e., the Medical Facility as in this exercise)?

OBSERVATIONS/DISCUSSIONS

I would like to be sure we have the time to address any other issues you may have so I would like to open the discussion—thank you again for offering me the opportunity to observe what I think was an excellent exercise.

Review of Hanbit Unit 1 Nuclear Power Plant Exercise held October 13, 2015



**K.L. “Ken” Groves, MS, FHPS
President, S2-Sevorg Services, LLC**

KOREAN Survival Skills



Visit to Buddhist Temple

KOREAN Survival Skills (Con't)



Enjoy the Kids or Even Act Like One!



KOREAN Survival Skills (Con't)



Great Food and if
You Don't Eat with
Chop Sticks You
May Starve!



Made Great Friends!



QUESTIONS?

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