# Quo Vadis Nuclear Reactor Physics in Korea


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# Recalling Reactor Physicists



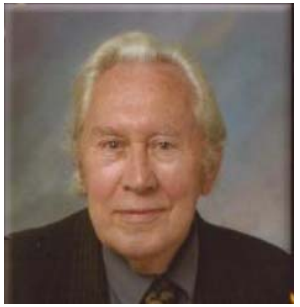





**溫 故 知 新**





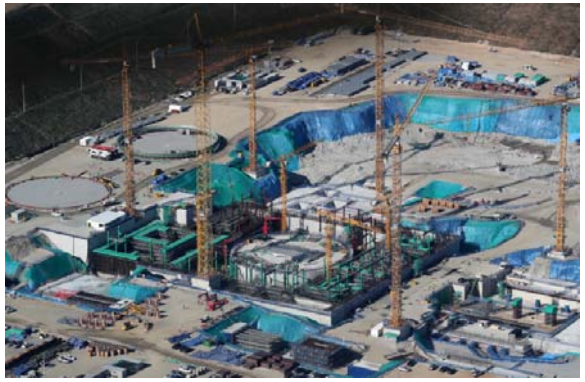


# Nuclear Policy in Korea

脫 核

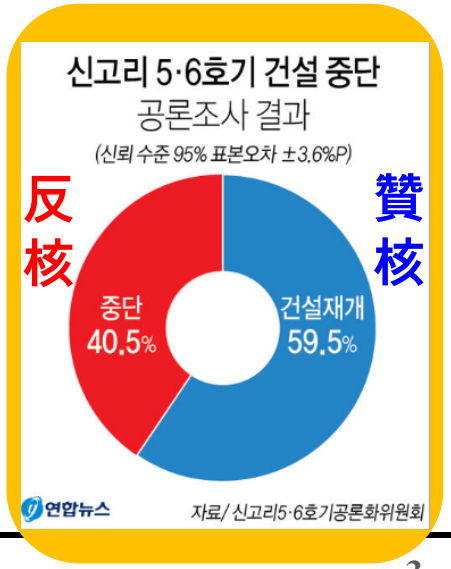


反 核

脫 脫 核 = 贊 核

公 論 調 査
Deliberative
Public Poll

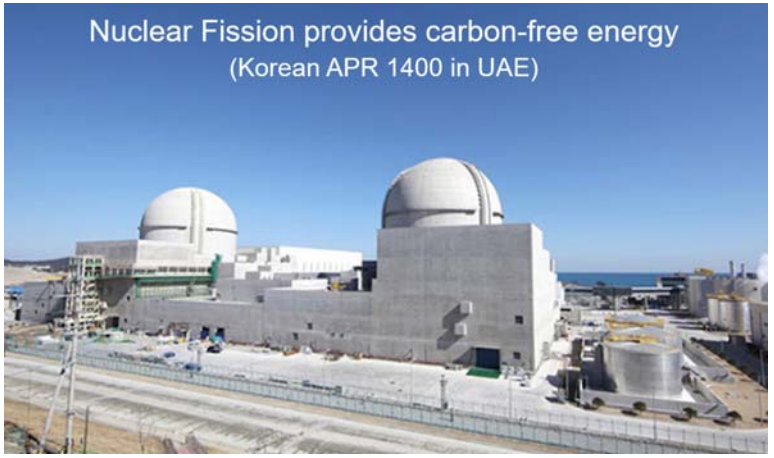



# Nuclear Policy in Korea


**原 電 輸 出**

**NUCLEAR EXPORT ?**

**By AntiNuC**






**Signature Collection Campaign**

**Pro-Nuclear from > 60% Public**

# Reactor Physics Departments

**Hanyang University**

**Seoul National University**

**Kyunghee University**

**Chosun University**

**KAIST**

Jeju University

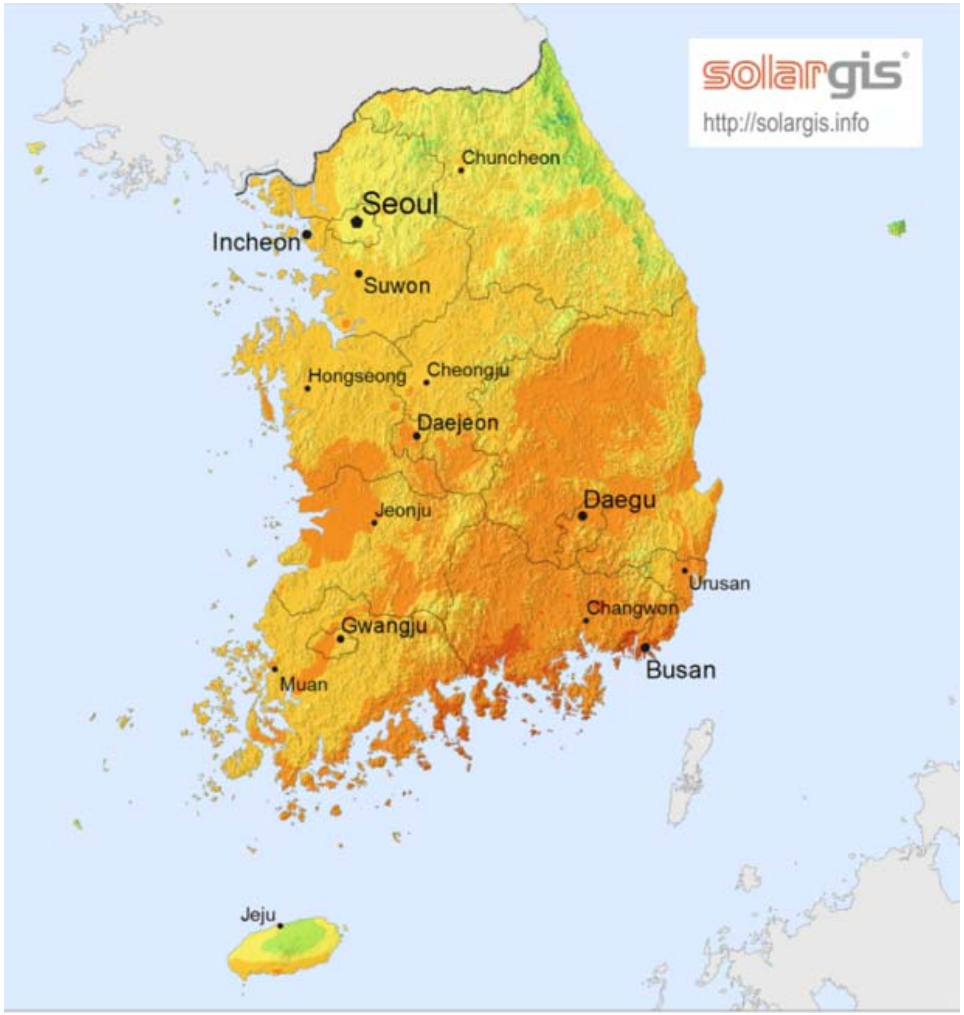
Joongang University

**Ulsan National Institute of S&T**

**Sejong University**

**Pusan University**

**A few more 'small' programs**

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**No. of Members = ~386, as of May 2019**

# Major National R&D Activities

**SFR-Pyro:** largely reduced budget and possibly earlier termination in 2020

**SMART development with Saudi Arabia:** in sha Allah

**D&D (Decommissioning and Decontamination):** new focus

**MMR (Micro Modular Reactor) for special purposes:** new focus

**iPOWER:** very slow progress

**Accident Tolerant Fuel (ATF):** current focus

**Safety and Severe Accident Managements:** current focus

Autonomous SMR

Nuclear-Renewable hybrid or synergy

High-fidelity reactor analysis methods

LFR (Lead-cooled Fast Reactor) & MSR

:

# Methodology Developments

- **Monte Carlo codes**
  - McCARD, MCS, iMC (McBOX)
  - Time-dependent MC methods

- **Deterministic methods**
  - Whole-core transport methods
  - Corrected diffusion **nodal** or **pinwise** approaches

- **Hybrid Method**
  - MC-deterministic two-step methods

- **Multi-physics Methods**
  - Neutronics-TH-Fuel coupling

- **Uncertainty Analysis**

- **Nuclear Data Library**

  :

  :

**Nowadays**
**Sufficiently high-fidelity method for the conceptual innovations**

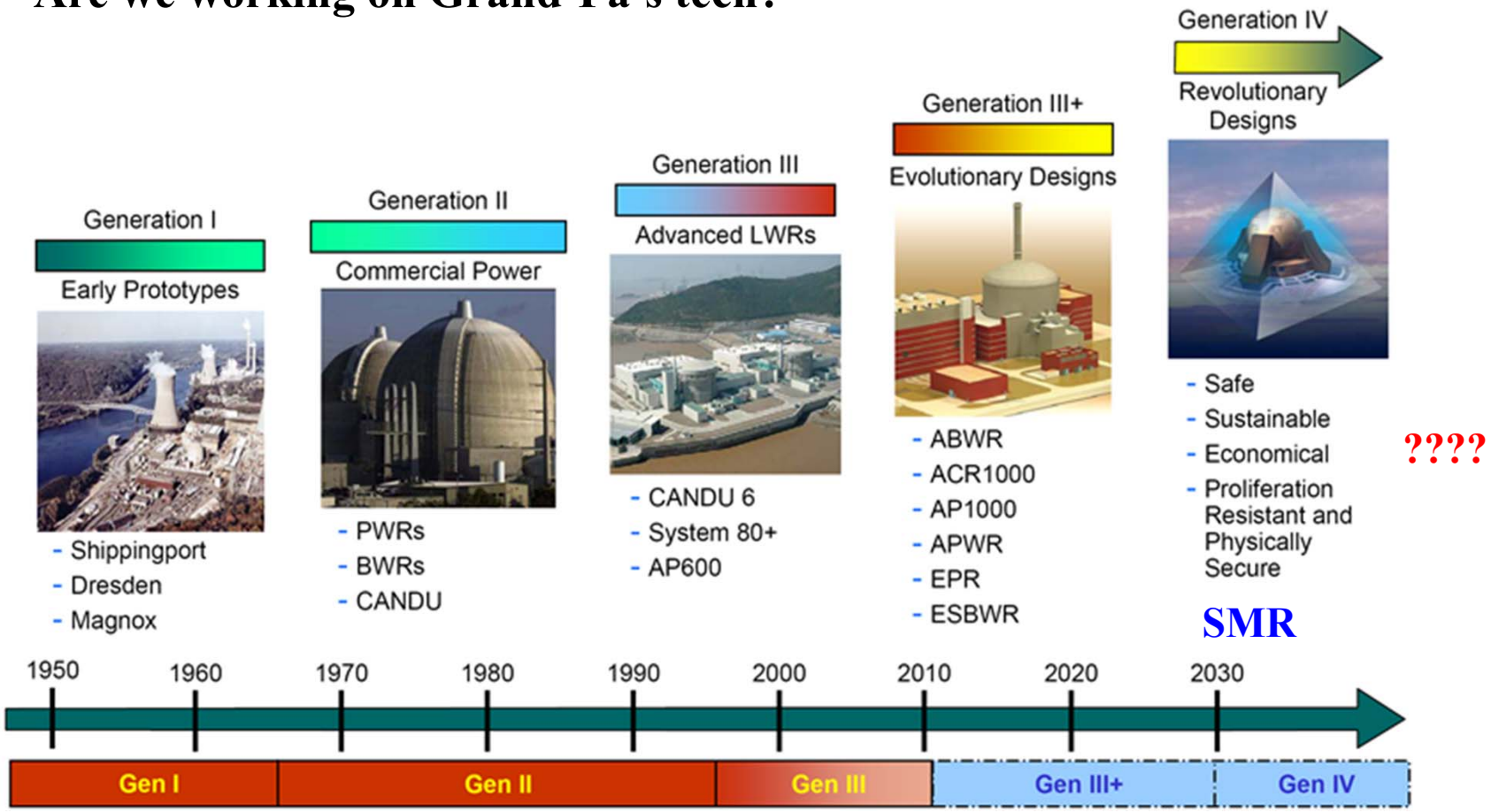
**50's-60's**
**Creative minds**
**Genius brains with rulers**

**Monte Carlo in 50's**

# Evolution of NPPs

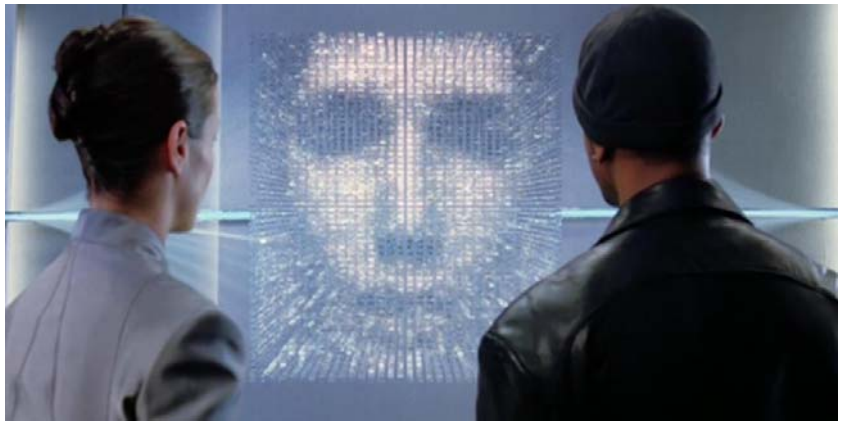
- We are mostly rekindling the old 'good' ideas of 50's-60's!
- Innovation is impossible without 'innovative' reactor physicists!

**Are we working on Grand-Fa's tech?**



# Future Artificial Intelligence

- Super AI with Super Computer?
- Transport and Diffusion Solutions by AI?
- Reactor Design & Analysis by AIs?
- Loading Pattern by AI?
- NPP Operation by AI?

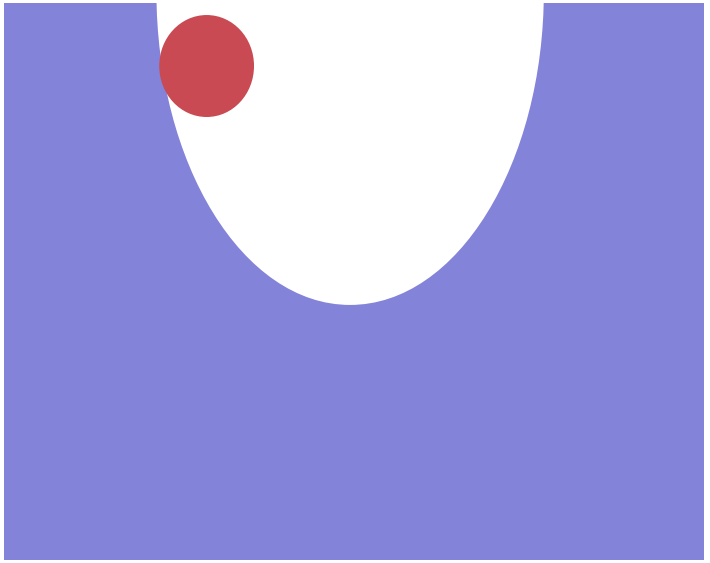


VIKI in “I-Robot”

JARVIS in “Iron man“


# Naturally Uncertain Reactor Design

- **Stochastic natures of the cross sections → Naturally uncertain neutronics**
- In addition, bigger uncertainties in the thermo-mechanical modellings of the nuclear reactors results in more uncertain coupled neutronics results.
- Nevertheless, **a lot of uncertainties are allowable due to the self-controllable nuclear reactor via the negative feedbacks.**
- One **big contributions** of the **reactor physics** to the 'viable' nuclear engineering



→ **FOM (Figure Of Merit) of method**

**Happy & Wonderful New Year!**

**Thank you !**