Korea Electric Power Industry Code,
KEPIC

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Nuclear Power Generation in Korea
Electric Power Generation in Korea

◈ Status of Installed Capacity

<table>
<thead>
<tr>
<th>Power Source</th>
<th>Installed Capacity (MW)</th>
<th>Portion (%)</th>
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<tr>
<td>Coal</td>
<td>25,151</td>
<td>31.7</td>
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<tr>
<td>Gas</td>
<td>21,740</td>
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<tr>
<td>Nuclear</td>
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<td>23.6</td>
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<tr>
<td>Oil</td>
<td>5,475</td>
<td>6.9</td>
</tr>
<tr>
<td>Others</td>
<td>8,251</td>
<td>10.4</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>79,342</strong></td>
<td><strong>100</strong></td>
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- Others: Hydroelectric, Renewable, etc.
- Data Source: Korea Power Exchange (14 June, 2012)
### Status of Electric Power Generation

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<tr>
<th>Power Source</th>
<th>Electric Power (GWh)</th>
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<td>Coal</td>
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<td>Gas</td>
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<tr>
<td>Oil</td>
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<td>3.9</td>
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<td><strong>Total</strong></td>
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<td><strong>100</strong></td>
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- Others: Hydroelectric, Renewable, etc.
- Data Source: Korea Power Exchange (14 June, 2012)
## Operating NPPs in Korea

<table>
<thead>
<tr>
<th>Unit</th>
<th>Installed Capacity (MW)</th>
<th>Reactor Type</th>
<th>Commercial Operation</th>
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<tr>
<td>Kori #1</td>
<td>587</td>
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<tr>
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<td>650</td>
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<tr>
<td>Kori #3</td>
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</tr>
<tr>
<td>Kori #4</td>
<td>950</td>
<td></td>
<td>29 Apr., 1986</td>
</tr>
<tr>
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<td>1,000</td>
<td></td>
<td>28 Feb., 2011</td>
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<tr>
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<td>679</td>
<td>Pressurized Heavy Water Reactor</td>
<td>22 Apr., 1983</td>
</tr>
<tr>
<td>Wolsong #2</td>
<td>700</td>
<td></td>
<td>1 July, 1997</td>
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<tr>
<td>Wolsong #4</td>
<td>700</td>
<td></td>
<td>1 Oct., 1999</td>
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<tr>
<td>Yonggwang #1</td>
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<td>25 Aug., 1986</td>
</tr>
<tr>
<td>Yonggwang #2</td>
<td>950</td>
<td>Pressurized Light Water Reactor</td>
<td>10 June, 1987</td>
</tr>
<tr>
<td>Yonggwang #3</td>
<td>1,000</td>
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<td>31 Mar., 1995</td>
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## Operating NPPs in Korea

<table>
<thead>
<tr>
<th>Unit</th>
<th>Installed Capacity (MW)</th>
<th>Reactor Type</th>
<th>Commercial Operation</th>
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<tr>
<td>Yonggwang #4</td>
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<td>Pressurized Light Water Reactor</td>
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<tr>
<td>Yonggwang #5</td>
<td>1,000</td>
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<td>21 May, 2002</td>
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<tr>
<td>Yonggwang #6</td>
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<td>24 Dec., 2002</td>
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<tr>
<td>Ulchin #1</td>
<td>950</td>
<td>Pressurized Light Water Reactor</td>
<td>10 Sep., 1988</td>
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<tr>
<td>Ulchin #2</td>
<td>950</td>
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<td>30 Sep., 1989</td>
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<tr>
<td>Ulchin #3</td>
<td>1,000</td>
<td></td>
<td>11 Aug., 1998</td>
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<tr>
<td>Ulchin #4</td>
<td>1,000</td>
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<td>31 Dec., 1999</td>
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<tr>
<td>Ulchin #5</td>
<td>1,000</td>
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<td>29 July, 2004</td>
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<td>Ulchin #6</td>
<td>1,000</td>
<td></td>
<td>22 Apr., 2005</td>
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<tr>
<td>Total (21 units)</td>
<td>18,716</td>
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## Under Construction and Planning NPPs

<table>
<thead>
<tr>
<th>Status</th>
<th>Unit</th>
<th>Capacity (MW)</th>
<th>Reactor Type</th>
<th>Process (%)</th>
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<tr>
<td><strong>Under Construction</strong></td>
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<tr>
<td></td>
<td>ShinKori #2</td>
<td>1,000</td>
<td>Pressurized Light Water Reactor</td>
<td>99.97</td>
</tr>
<tr>
<td></td>
<td>ShinKori #3</td>
<td>1,400</td>
<td></td>
<td>89.84</td>
</tr>
<tr>
<td></td>
<td>ShinKori #4</td>
<td>1,400</td>
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<td>89.84</td>
</tr>
<tr>
<td></td>
<td>ShinUlchin #1</td>
<td>1,400</td>
<td></td>
<td>30.09</td>
</tr>
<tr>
<td></td>
<td>ShinUlchin #2</td>
<td>1,400</td>
<td></td>
<td>30.09</td>
</tr>
<tr>
<td></td>
<td>ShinWolsong #1</td>
<td>1,000</td>
<td></td>
<td>99.25</td>
</tr>
<tr>
<td></td>
<td>ShinWolsong #2</td>
<td>1,000</td>
<td></td>
<td>99.25</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>ShinKori #5</td>
<td>1,400</td>
<td></td>
<td>(2019)</td>
</tr>
<tr>
<td></td>
<td>ShinKori #6</td>
<td>1,400</td>
<td></td>
<td>(2019)</td>
</tr>
<tr>
<td></td>
<td>ShinKori #7</td>
<td>1,400</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>ShinKori #8</td>
<td>1,400</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>ShinUlchin #3</td>
<td>1,400</td>
<td></td>
<td>(2021)</td>
</tr>
<tr>
<td></td>
<td>ShinUlchin #4</td>
<td>1,400</td>
<td></td>
<td>(2021)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13 (7+6) units</td>
<td>17,000</td>
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<td>-</td>
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Safety Improvement Activities Response to Fukushima
Activities in Summary

◆ Ongoing Activities

52 ongoing improvements will be completed according to the established implementation plan by 2015.
- 4 improvements were finished in 2011

◆ Lessons Learned from Fukushima

Additional improvements which reflect lessons learned from Fukushima will be continuously applied to domestic NPPs.
- International Institute Reports: IAEA, WANO, INPO, NRC, etc.
- National Reports: Japan, USA, France, etc.
- EU Stress Test Results
- Safety Improvements of Overseas NPPs
Korea Hydro & Nuclear Power (KHNP)
KHNP reviewed safety of all operating NPPs from 16 March to 18 March, 2011.

Korean Government
The Government also reviewed safety of them from 23 March to 3 May, 2011.

What they reviewed?
- Safety of structures and equipment against earthquake and tsunami,
- Safety of electrical power and cooling systems in case of flooding,
- Severe accident & emergency response systems.
Identified Improvements

- 50 short to long term improvements were verified to secure safety, even for worst case events similar to the Fukushima accident.

- 46 of 50 improvements to be performed by KHNP, 4 by other organizations.

- 10 additional improvements to be performed were verified from cross-checking with 83 items recommended by IAEA, Japan, NRC, and France.
7 Areas of 56 Improvement Plans

1. Coastal Barrier
   - Making the coastal barrier higher at Kori site
2. Portable Emergency Diesel Generator (EDG)
   - Preparing a vehicle with a portable EDG at each site
3. Battery
   - Securing the safety of emergency battery power from flooding
4. EDG
   - Installing watertight doors at EDG facilities
5. Drain Pump
   - Water-proof sump pumps
6. Containment Building
   - Installing passive H₂ removal systems which operate without electricity
7. Exhaust
   - Installing exhaust and decompression equipment
Improvements Completed in 2011

1. Firefighting Plan
   - Improved firefighting plan established effective cooperation systems between the internal and external fire stations of the NPP

2. Training for Severe Accidents
   - KHNP developed various severe accident scenarios and extended the training time from 8 hours every 2 years to 10 hours per year

3. Radiation Emergency Plan
   - KHNP amended the radiation emergency plan to cope with simultaneous natural disaster emergencies at multiple units

4. Purchase Quality Assurance System
   - KHNP reinforced quality requirements in the purchase spec. to avoid using defective parts for equipment that can induce a reactor’s shutdown
Key 12 Improvement Activities

1. Installing Automatic Seismic Trip System (by 2013)
   - Reactors are automatically shut down when detecting an earthquake above a certain seismic level (0.18g)

2. Extension of Kori NPP Seawall (by 2012)
   - The height of Kori NPP seawall is extended to equal the height level (10 m) of other NPPs site

3. Installation of Waterproof Gates (by 2014)
   - Waterproof gates in structures that are seismically designed to cope with the flooding

4. Movable Vehicle for a Generator (by 2014)
   - Vehicle-mounted portable emergency generators
5. Alternative Cooling of the Spent Fuel Pool (by 2012)
   - Supplementary method for cooling water using a fire truck and a connection point

6. Wall Barriers for Outdoor Tanks (by 2014)
   - Wall barriers to cope with potential damage to the outdoor tanks

7. Passive Hydrogen Removal Equipment (by 2013)
   - Passive Autocatalytic Recombiner (PAR) can operate without power supply

8. Filtered Ventilation System (by 2015)
   - Filtered vent facilities within the containment buildings to prevent the excessive rise of pressure in preparation for severe accidents
Key 12 Improvement Activities

   - Primary and secondary injection conduits for emergency cooling water

10. Additional Protection Equipments A (by 2012)
    - Additional potassium iodine (KI) and gas masks for protecting residents near NPPs

11. Additional Protection Equipments B (by 2012)
    - Additional protection devices such as protective clothing radiation detectors at more than 200 % of the current inventory levels

12. Reinforcing the Radiation Emergency Training (by 2012)
    - A practical scenario for earthquake and coastal flooding and using it for training
Introduction to KEPIC
Definition of KEPIC

• A set of integrated standards applicable to the whole phases of design, manufacturing, installation, operation, testing, inspection and maintenance of electric power facilities and components so as to ensure their safety and reliability.

Technical Requirements
- Material
- Design
- Manufacture
- Installation
- Testing & Inspection
- Operation
- Maintenance

Ensure safety & reliability of electric facilities

Administrative Requirements
- Quality Assurance
- Certification
- Administration
Basic Policies of KEPIC Development

◈ Technical requirements
  Compliance with related national rules such as Electric Utility Act, Atomic Energy Act, Building Act, Framework Act on Fire Services.

◈ Developed by the adaptation of foreign reference standards applied to electric power facilities in Korea.

◈ Identical to the reference standards except for some editorial changes such as the use of KEPIC's own categorizing & numbering system.

◈ Developed on the basis of advanced domestic technologies in the absence of proper foreign reference standards.
Basic Policies of KEPIC Development

◇ Administrative requirements
   Based on ASME BPVC Sec. III NCA "General Requirements" and modified to be suitable for the industrial circumstances and situation in Korea.

◇ Established KEPIC's own Certification System for nuclear safety-related items including nuclear certification, authorized inspection, RPE, etc.

◇ Adopted the ISO 9000 quality system and the authorized inspection system for non-nuclear safety related and thermal power items.
Application Scopes of KEPIC

◈ Overall electric industry fields such as nuclear power plants, thermal power plants, transmission · transformation · distribution facilities, etc.

◈ Whole phases including design, manufacturing, installation, operation, testing, inspection, maintenance, etc.
History of KEPIC

Phase 1 ('87~’88)
- Feasibility study and planning
- KEPIC ‘95 Ed.
  Standards for nuclear & fossil power generation
  1995 edition Issue
  - 5 parts, 33 Vol.,
  - Approx. 12,000 pages

Phase 2 ('92~’95)
- KEPIC ‘95 Ed.
  Standards for transmission, transformation and distribution
  2000 edition Issue
  - 6 parts, 59 Vol.,
  - Approx. 20,000 pages

Phase 3 ('96~’00)
- KEPIC ‘00 Ed.
  Standards for rad-waste facility and radiology
  2005 edition Issue
  - 6 parts, 82 Vol.,
  - Approx. 25,000 pages

Phase 4 ('01~’05)
- KEPIC ‘05 Ed.
  Standards for environmental facility
  R&D studies for the improvements of the developed standards
  2010 edition Issue
  - Bilingual edition,
  - 138 Vol.,
  - Approx. 60,000 pages

Phase 5 ('06~’10)
- KEPIC ‘10 Ed.

Phase 6
- Period of Phase 6 is from 2011 to 2015.
- 2011 Addenda was published in November, 2011.
KEPIC Development Organizations

Korea Electric Association

KEPIC Financial Executive Operation Board

KEPIC Dept. Secretariat
- Project Management Team
- Nuclear Team
- Thermal Power Team
- Electrical and I&C Team
- Conformity Assessment Team

KEPIC Policy Committee
- Technical Committee
- Subcommittee
- Working Group
• Steering Committee : 1
• Technical Committee : 8
• Subcommittees : 31
KEPIC Development Process

- Draft
  - Review (1st) [Subcommittee]
  - Public Review [Industry]
- Review (2nd)
  - Approval [Technical Committee]
  - Issuance [Policy Committee]
Editions and Addenda

◈ Editions
   Every five years, a revised and updated KEPIC Edition is published that incorporates all addenda issued during the last 5 years, including the newly developed codes and standards.

◈ Addenda
   KEPIC Addenda are issued annually to reflect and/or incorporate the followings:
   - Changes in reference codes and standards,
   - Feedbacks and comments from industrial applications,
   - Requirements to be revised according to the result of the KEPIC inquiry and reply system,
   - Other changes for improvements.
## Structure of KEPIC & Reference Standards

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<tr>
<th>Part</th>
<th>Subpart</th>
<th>Reference Standards</th>
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| Quality Assurance (KEPIC-Q) | QAP : Nuclear Quality Assurance  
QAI : Authorized Inspection  
QAR : Registered Professional Engineer | ASME NQA-1  
ASME QAI-1  
ASME Sec.III. App.XXXIII |
| Mechanical (KEPIC-M)     | MN : Nuclear Mechanical Components  
MG : Non-nuclear Mechanical Components  
MC : Cranes  
**MH : Nuclear Air & Gas Treatment**  
MD : Materials  
ME : Non-destructive Examination  
MW : Welding & Brazing Qualification  
MI : In-service Inspection  
MO : In-service Testing  
MF : Qualification of Mechanical Equipment  
MB : Power Boilers  
MT : Turbine & Generators  
MP : Performance Test  
MM : Maintenance | ASME Sec.III. Div.1  
ASME Sec.VIII, HEI, API  
ASME NOG-1, CMAA 70  
**ASME AG-1**  
ASME Sec.II  
ASME Sec.V  
ASME Sec.IX  
ASME Sec.XI  
ASME OM  
ASME QME-1  
ASME Sec.I  
Manufacturer’s Spec.  
ASME PTC  
ASME PCC |
| Electrical (KEPIC-E)     | EN : Class 1E Equipment  
EM : Measuring & Control Equipment  
EE : Electric Equipment  
EC : Cables & Raceways  
ET : Transmission, Transformation and Distribution | IEEE, ANSI, ISA, etc.  
IEEE, ISA, IEC, etc.  
NEMA, IEC, ANSI, etc.  
ASTM, NEMA, IEEE, etc.  
IEC, IEEE, etc. |
| Structural (KEPIC-S)     | SN : Nuclear Structures  
SG : Non-nuclear Structures  
ST : Extra-Provisions for Structures  
SW : Structural Welding | ASME Sec.III, ACI 349, etc.  
ACI 318, AISC, etc.  
ASCE 4, 7  
AWS D1.1, D1.3 |
| Nuclear (KEPIC-N)        | NF : Nuclear Fuels  
ND : Design of Nuclear Power Plants  
NR : Radiation Protection Design  
NW : Radioactive Waste Control  
NP : Probabilistic Safety Assessment | RCC-C, ASTM, etc.  
ANS 51.1, etc.  
ANS 6.4, etc.  
ANS 55.1, etc.  
ASME RA-S, ANSI 58.21 |
| Fire Protection (KEPIC-F) | FN : Fire Protection for Nuclear Power Plants | NFPA, 803, 804, 805, etc. |
| Environmental (KEPIC-G)  | GG : Air Pollution  
GS : Noise/Vibration  
GW : Water-treatment | None  
None  
None |
# KEPIC Editions Publication Status

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<td>Quality Assurance [Q]</td>
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<td>241</td>
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※ 2010 Edition was issued as a bilingual (Korean-English) version.
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<tr>
<th>Regulatory Body</th>
<th>Notice No.</th>
<th>Notice Title</th>
<th>Applicable KEPIC</th>
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<tr>
<td></td>
<td>2012-17</td>
<td>Detailed Requirements for Quality Assurance of Nuclear Reactor Facilities</td>
<td>Adoption of KEPIC-QAP</td>
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<td>2012-9</td>
<td>Regulation on Safety Classification and Applicable Codes and Standards for Nuclear Reactor Facilities</td>
<td>Adoption of KEPIC-MN, EN, SN</td>
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<td>Standards for Safety Valves and Relief Valves of Nuclear Reactor Facilities</td>
<td>Adoption of KEPIC-MD, MN</td>
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<td>2012-10</td>
<td>Regulation on In-Service Inspection of Nuclear Reactor Facilities</td>
<td>Adoption of KEPIC-MI</td>
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<td>2012-23</td>
<td>Regulation on In-Service Test of Safety-related Pumps and Valves</td>
<td>Adoption of KEPIC-MO</td>
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<td>2012-25</td>
<td>Guidelines on Application of Technical Standards for Assessment of Continued Operation of Nuclear Reactor Facilities</td>
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<td>Ministry of Knowledge Economy</td>
<td>2006-65</td>
<td>Electro-technical Regulations</td>
<td>Substitutive Application of KEPIC for Thermal Power Plants</td>
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Inquiry and Reply System

◈ Purpose
- To clarify the meaning of KEPIC requirements, and to prevent the misunderstanding of KEPIC users.

◈ Inquiry
- a brief and accurate inquiry which could be answered clearly "Yes" or "No".
- Inquiry is available in the KEPIC homepage (www.kepic.or.kr).

◈ Reply
- Reply is prepared in conformity to related inquiry guides and, if required, published as interpretations or code cases after review and approval by respective KEPIC committee.

◇ Interpretation
It provides means to understand technical and administrative viewpoints and contents of KEPIC but is not part of KEPIC.

◇ Code Case
It is a specific case to clarify the intent of KEPIC requirements or a new provision to urgently provide supplementary rules for any incomplete requirement of KEPIC. It is a part of the KEPIC and has the equivalent effectiveness.
- The KEPIC certification program is a system that the qualified organizations and personnel by KEA (Korea Electric Association) in accordance with KEPIC requirements perform their appropriate code activities for nuclear safety-related items so as to achieve the safety and reliability goals of electric power facilities, especially nuclear power plants.

- The KEPIC certification program has been established by referring and modifying certification programs of foreign codes and standards which had previously been applied to domestic industries.

- Correcting the problem that unauthorized foreign certification programs in Korea were applied.

- Easy acquisition of certificates and related information through the program operated by domestic certification and accreditation body.

- Economizing costs needed for acquisition and holding of one or more foreign certificates.
Nuclear Certification Program

Scope

Organization Certification
- plant owner & designer, manufacturer, installer & constructor, material organization, and service organization,
- authorized inspection agency (AIA),
- pressure relief device testing laboratory,
- equipment qualification (EQ) testing organization.

Personnel Qualification
- authorized nuclear inspector/supervisor
- registered professional engineer (RPE)
Certification of Quality Assurance System

KEPIC certification system, being similar to ASME's N-type certificate system for pressure equipment (KEPIC-MN), has been extended to class 1E electrical and I&C items (KEPIC-EN), seismic category I reinforced concrete and steel structure (KEPIC-SN), and HVAC (KEPIC-MH). Nuclear safety-related organizations should obtain KEPIC Certificate from KEA in accordance with general requirements of each nuclear standard.

Organization and work scope

<table>
<thead>
<tr>
<th>Field</th>
<th>Applicable KEPIC</th>
<th>Organizations</th>
<th>Work Scope</th>
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</thead>
<tbody>
<tr>
<td>Mechanical</td>
<td>KEPIC-MN</td>
<td>owner, manufacturer, installer, material organization, service organization</td>
<td>Activities for Class 1, 2, 3, MC, and CS components</td>
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<tr>
<td>Electrical</td>
<td>KEPIC-EN</td>
<td>owner, manufacturer, installer, EQ testing organization</td>
<td>Activities for Class 1E equipment</td>
</tr>
<tr>
<td>Structural</td>
<td>KEPIC-SN</td>
<td>owner, designer, auxiliary item manufacturer, constructor, material org., service organization</td>
<td>Activities for Seismic Category I structures or equipment</td>
</tr>
<tr>
<td>HVAC</td>
<td>KEPIC-MH</td>
<td>manufacturer, installer</td>
<td>Safety class air cleaning unit/air conditioning unit and components</td>
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</table>
Certification for Authorized Inspection Agency/Authorized Inspector

- The pressure equipment manufacturer and installer shall be inspected by an authorized inspector who is employed by the Authorized Inspection Agency (AIA). It is necessary for Authorized Inspector and Authorized Inspector Supervisor to take the training program and pass the qualifying examination. And then AIA makes application for their registration to KEA.
- Scope: KEPIC-MNX, MIX, SNB, MGB, MGE, MBB

Qualification for Registered Professional Engineer (RPE)

- RPE reviews the nuclear pressure equipment's design documents, such as the design specifications and design reports, and certifies those documents with an RPE stamping of acceptance. The person who intends to be qualified as a KEPIC RPE must possess the appropriate national technical qualification certificate and must be equipped with enough code knowledge and experiences.
- Scope: KEPIC-MNX, SNB
Certification for a Pressure Relief Device Testing Laboratory
- KEA certifies testing laboratories and designated organizations which perform the relieving capacity test and also certify the capacity in accordance with KEPIC-MNX, KEPIC-MGB, and KEPIC-MBB.

Certification for an EQ Testing Organization or Service Organization
- Equipment qualification testing organizations shall be certified by KEA.
- Organizations which perform service activities such as non-destructive examination, pressure equipment design, and heat treatment shall be certified by KEA or KEPIC certificate holders.
KEPIC-MH
Nuclear Air & Gas Treatment
Structure of the Subcommittee

Nuclear Mechanical Technical Committee

Nuclear Air & Gas Treatment Subcommittee

WG on In-Service Test of KEPIC-MH Systems

Project Committee on Nuclear Air Cleaning

Project Committee on Alternative Materials of KEPIC-MH
# Role of WG and Project Committees

<table>
<thead>
<tr>
<th>WG or PC</th>
<th>Role or Duty</th>
</tr>
</thead>
<tbody>
<tr>
<td>WG on In-Service Test of KEPIC-MH Systems</td>
<td>- Develop the new draft of KEPIC-MHN 511 to be published in 2012 referencing ASME N-511</td>
</tr>
<tr>
<td>Project Committee on Nuclear Air Cleaning</td>
<td>- Feasibility study on adaptation of ASME N-509, N-510, and N-511 to new KEPIC-MH standards (terminated in Dec., 2011)</td>
</tr>
<tr>
<td></td>
<td>- Develop the draft of KEPIC-MH 2012 Addenda referencing ASME AG-1a-2009.</td>
</tr>
<tr>
<td>Project Committee on Alternative Materials of</td>
<td>- Study on developing an acceptable Korean Standard (KS) materials table equivalent to or more ASME/ASTM material specification listed</td>
</tr>
<tr>
<td>KEPIC-MH</td>
<td>in KEPIC-MH.</td>
</tr>
</tbody>
</table>
Status of KEPIC-MH

**KEPIC-MH vs. ASME AG-1**
- KEPIC-MH identically adopted ASME AG-1,
- excluding national law.

**Example of National law in KEPIC-MH**

<table>
<thead>
<tr>
<th>Article</th>
<th>KEPIC-MHA</th>
<th>ASME AG-1, Div. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA-1130</td>
<td><strong>safety-related equipment</strong>: equipment for air and gas treatment systems or equipment that is essential to - the capability to shut down the reactor and maintain it in a safe shutdown condition - the capability to prevent or mitigate the consequences of accidents that could result in offsite exposures in excess of the limits stated in <a href="#">Atomic Energy Act</a>.</td>
<td></td>
</tr>
<tr>
<td>Definitions and Terms</td>
<td>Note (1) It refers to Item 2, Article 12 (Standards for Permit), Atomic Energy Act and Article 13, Notice of the Minister of Science and Technology No. 1996-35 (Sep. 13, 1996).</td>
<td>safety-related equipment**: equipment for air and gas treatment systems or equipment that is essential to - the capability to shut down the reactor and maintain it in a safe shutdown condition - the capability to prevent or mitigate the consequences of accidents that could result in offsite exposures in excess of the limits stated in <a href="#">10 CFR 100</a>.</td>
</tr>
</tbody>
</table>
Status of KEPIC-MH

Adoption Gap between KEPIC-MH and ASME AG-1

|------------|-----------------------|-----------------------|-----------------------|------------------------|--------------------------|--------------------------|--------------------------|

※ KEPIC-MH 2000 Edition was re-issued as a bilingual (Korean-English) version at 1 Sep. 2010 to be applied to abroad NPPs, especially to UAE Braka units.
※ KEPIC-MH 2012 Addenda will be published late 2012 including the new KEPIC-MHN 511 referencing ASME N511.
※ New standards will be developed referencing AMCA standards by 2020.

Structure of KEPIC-MH

◇ KEPIC-MHA = ASME AG-1 Div. I General Requirements
◇ KEPIC-MHB = ASME AG-1 Div. II Ventilation Air Cleaning & Ventilation Air Conditioning
◇ KEPIC-MHD = ASME AG-1 Div. IV Testing Procedures
Revision Drafts (KEPIC-MH only)

Spot Flame Resistance Requirements of Sec. FC & FK

Background

- Filter manufacturers and a filter test laboratory in Korea asked KEPIC Nuclear Air & Gas Treatment Subcommittee for updating the spot flame resistance requirements of KEPIC-MHB, Articles FC 5160, FK 5160, FK 5260, FK 5460.
- First issue: an additional requirement was needed for the sophisticated structure of HEPA filters.
- Second issue: if a filter continues flaming on the upstream even though flaming on the downstream has been extinguished, it can satisfy the requirement.
- Third issue: they want to clarify the sustaining time limit of flaming on the downstream.

Status

- The subcommittee accepted the 3rd draft and then decided to put it on the next agenda of KEPIC Nuclear Mechanical Technical Committee.
- If the draft is approved by the Technical Committee, it will be adopted into KEPIC-MH 2012 addenda.
## 3rd Revision Draft for the Spot Flame Resistance

<table>
<thead>
<tr>
<th>Article</th>
<th>Before Revision (2010 edition)</th>
<th>After Revision (2012 Addenda)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEPIC-MHB</td>
<td>The Bunsen burner flame shall then be directed into a top corner of the filter unit in such a manner that the tip of the blue cone contacts the case, filter pack, and sealing materials. The flame shall be applied for a period of 5 min. The test shall be repeated upon the opposite top corner of the sample filter unit.</td>
<td>The Bunsen burner flame shall then be directed into a top corner of the filter unit in such a manner that the tip of the blue cone contacts the case, filter pack, and sealing materials. The flame shall be applied for a period of 5 min. In case of structure of filter that is hard to contact flame on filter pack, frame and sealant, the Bunsen burner flame shall be compulsorily directed into a top corner of the filter in minimum one place. The test shall be repeated upon the opposite top corner of the sample filter unit.</td>
</tr>
<tr>
<td>FC 5160, FK 5160, FK 5260, FK 5460</td>
<td>After removal of the test flame at each point of application, there shall be no sustained flaming on the downstream face of the unit. An Underwriters Laboratories label with a traceable control number or UL-586 designation shall be acceptable objective evidence of compliance with FC 5160.</td>
<td>After removal of the test flame at each point of application, the downstream face of filter shall not continue to flame more than 2 seconds. Also there shall be not continually sustained flaming on the upstream face of the unit, because it must have self-extinguishing. An Underwriters Laboratories label with a traceable control number or UL-586 designation shall be acceptable objective evidence of compliance with FC 5160.</td>
</tr>
</tbody>
</table>
Field Acceptance Test Requirement of TA 3300

Background
- The Owner in Korea required KEPIC Nuclear Air & Gas Treatment Subcommittee to clarify the testing organization of the field acceptance test requirement of KEPIC-MHD, Article TA 3300.
- Issue: The manufacturers have low reliability for the reason that several test results performed by themselves have been proved by the regulatory body as not in compliance with KEPIC-MH. The Owner suggested to specify the testing organization as the Owner or an independent test facility or organization.

Status
- The subcommittee accepted the 2nd draft and then decided to put it on the next agenda of KEPIC Nuclear Mechanical Technical Committee.
- If the draft is approved by the Technical Committee, it will be adopted into KEPIC-MH 2012 addenda.
## 2nd Revision Draft for the Acceptance Test Requirement

<table>
<thead>
<tr>
<th>Article</th>
<th>Before Revision (2010 edition)</th>
<th>After Revision (2012 Addenda)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KEPIC-MHD TA 3300</td>
<td>Acceptance tests ~ an integrated system. The Owner shall define system test boundaries and evaluate system performance with respect to system functional requirements in accordance with the Owner’s design specifications. Field acceptance tests shall be implemented as applicable and in accordance with this section. Test designations associated with tests required by Article TA 4000 are listed in Table TA 3000-2. Within the context of Article TA 4000 ~ a test requirement.</td>
<td>Acceptance ~ an integrated system. The Owner shall define system test boundaries and evaluate system performance with respect to system functional requirements in accordance with the Owner’s design specifications. Field acceptance tests shall be implemented by the Owner or an independent test facility or organization as applicable and in accordance with this section excluding the equipment manufacturer and supplier. Test designations associated with tests required by Article TA 4000 are listed in Table TA 3000-2. Within the context of Article TA 4000 ~ a test requirement.</td>
</tr>
<tr>
<td>KEPIC-MHD TA 1130</td>
<td>&lt;No definition for the term, ‘Independent Test Facility or Organization for field acceptance testing’&gt;</td>
<td><strong>Independent Test Facility or Organization for field acceptance testing</strong>: an autonomous body not affiliated with manufacturer or supplier of air treatment, heating, ventilating, and air conditioning system in nuclear facility subject to this Code section but capable of performing the tests necessary to demonstrate the ability of field acceptance testing to meet this Code section.</td>
</tr>
</tbody>
</table>
Possible Independent Test Facility

Korea Filter Testing Laboratory (KFTL)

KFTL is a unique laboratory in Korea that possesses public certification approved by Korea Laboratory Accreditation Scheme (KOLAS), the government official organization. The certification implies the testing and qualification of air and gas filters, air cleaning units and HVACs.

KFTL professionals have unique experience and expertise in the performance, design, construction, acceptance testing, and quality assurance for special High Efficiency Particulate Air (HEPA) filters.

Annually this expertise has been used to provide useful technical information to engineers working in nuclear power plants or related company and also used to training them the testing method for in situ leakage and air cleaning technology.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Status</th>
<th>Period</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study on developing an acceptable Korean Standard (KS) materials table equivalent to or more ASME/ASTM material specification listed in KEPIC-MH</td>
<td>Reviewing related documents and books including internal documents of material suppliers to define the term, ‘equivalent to or more’.</td>
<td>Jan., 2012 ~ June, 2013 (18 mon)</td>
<td>Project Committee on Alternative Materials of KEPIC-MH</td>
</tr>
<tr>
<td>Study on standardization of procedures for tests and inspections of KEPIC-MH equipments</td>
<td>Three major manufacturers have submitted their internal procedure documents for fans, dampers, electric heating coils, and chillers to the Nuclear Air &amp; Gas Treatment Subcommittee.</td>
<td>Apr., 2012 ~ Sep. 2013 (18 mon)</td>
<td>Nuclear Air &amp; Gas Treatment Subcommittee</td>
</tr>
</tbody>
</table>
Thank You!