Activities of ATENA

February, 2024
Atomic Energy Association
(ATENA)

1. Outline of ATENA
2. Past Activities
3. Evaluation to date, future tasks, and direction

Overview of ATENA

Board of Directors

President & CEO Hiroto Uozumi (formerly of Hitachi, Ltd.), 2 directors, and 2 auditors

Staff

Experts in each field have been gathered from nuclear operators and plant manufacturers (approx. 30 people)

(Areas of expertise) Safety design, external natural events, mechanical/electrical equipment, etc.

Member companies/organizations

11 utilities, 4 plant manufacturers, 4 related organizations

Hokkaido Electric Power Co., Inc., Tohoku Electric Power Co., Inc., Tokyo Electric Power Company Holdings, Inc., Chubu Electric Power Co., Inc., The Kansai Electric Power Company, Incorporated, Hokuriku Electric Power Company, Inc., The Chugoku Electric Power Co., Inc., Shikoku Electric Power Company, Incorporated, Kyushu Electric Power Company, Inc., The Japan Atomic Power Company, Electric Power Development Co., Ltd.,
Toshiba Energy Systems & Solutions Corporation, Hitachi, Ltd., Mitsubishi Heavy Industries, Ltd., Mitsubishi Electric Corporation, The Federation of Electric Power Companies of Japan(FEPC), Central Research Institute of Electric Power Industry(CRIEPI), Japan Atomic Industrial Forum, Inc.(JAIF), The Japan Electrical Manufacturers' Association(JEMA)

Observers: Japan Nuclear Safety Institute (JANSI), Japan Nuclear Fuel Limited (JNFL), Japan Atomic Energy Agency (JAEA)

ATENA's Mission and Vision

Mission

- ATENA will make decisions on introducing voluntary and effective safety measures **effectively utilizing the knowledge and resources of the entire nuclear industry**, and encourage nuclear operators to incorporate these effective measures into their actual site operations, thereby raising the level of safety at nuclear power stations even higher.

Vision

- ATENA will **exercise leadership in the nuclear industry and step forward to address issues related to nuclear safety**, thereby promoting initiatives by nuclear operators to enhance safety.

To achieve the above, ATENA will take on the following.

◎ The nuclear industry will implement safety measures voluntarily and in advance

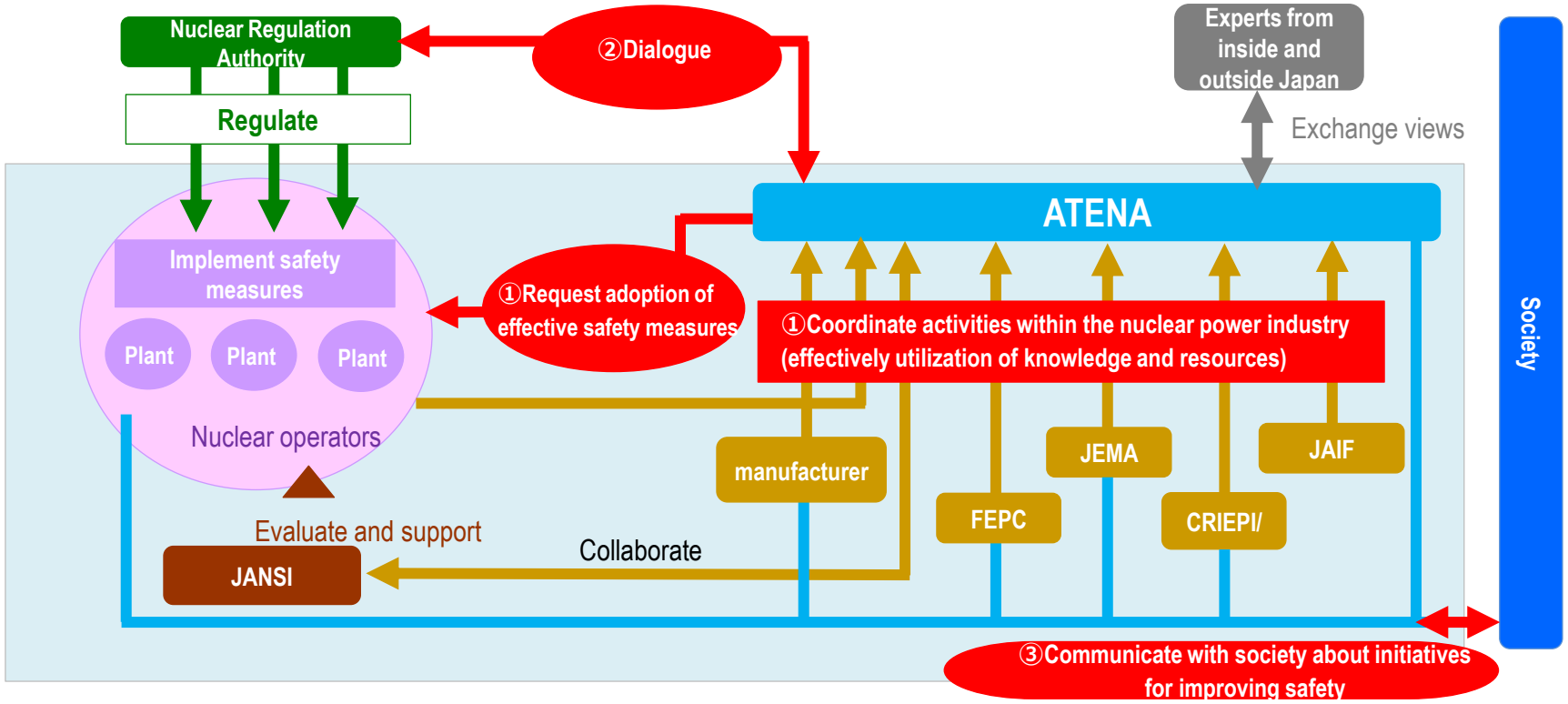
◎ Constantly question if existing safety measures could be improved

◎ Implement measures to voluntarily achieve an upward spiral in safety improvement

The above efforts are implemented while ensuring **"active participation from manufacturers" and "having the industry as a whole participate with the awareness that they are members of ATENA".**

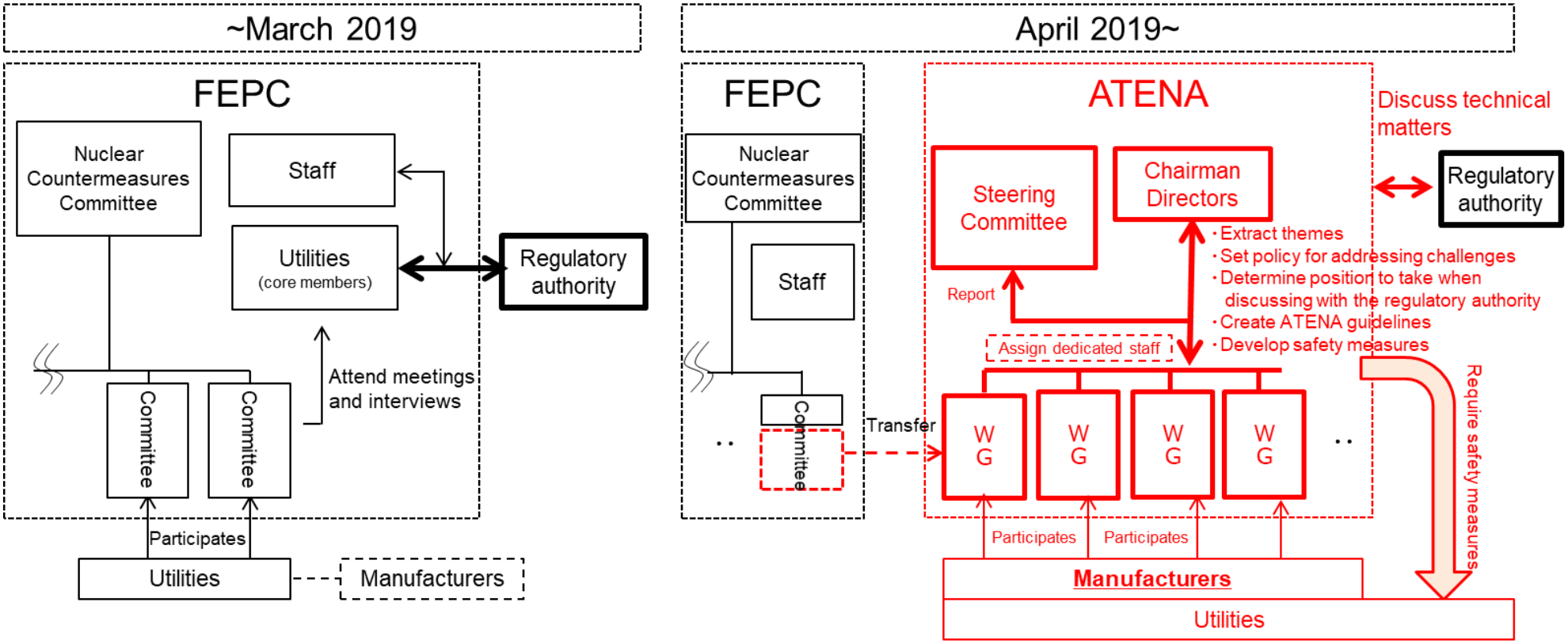
Role of ATENA

① Develop effective safety measures and request operators implement these safety measures by taking full advantage of ATEANA ‘s composition which complies of experts not only from utilities but also from manufactures.
Coordinate efforts across the industry in the identification and addressing phase so that effectively utilize the knowledge/resources available in each organization.
② Actively engage in dialogue with the regulatory authority under the common goal of improving safety.
③ Communicate with various stakeholders to improve safety.



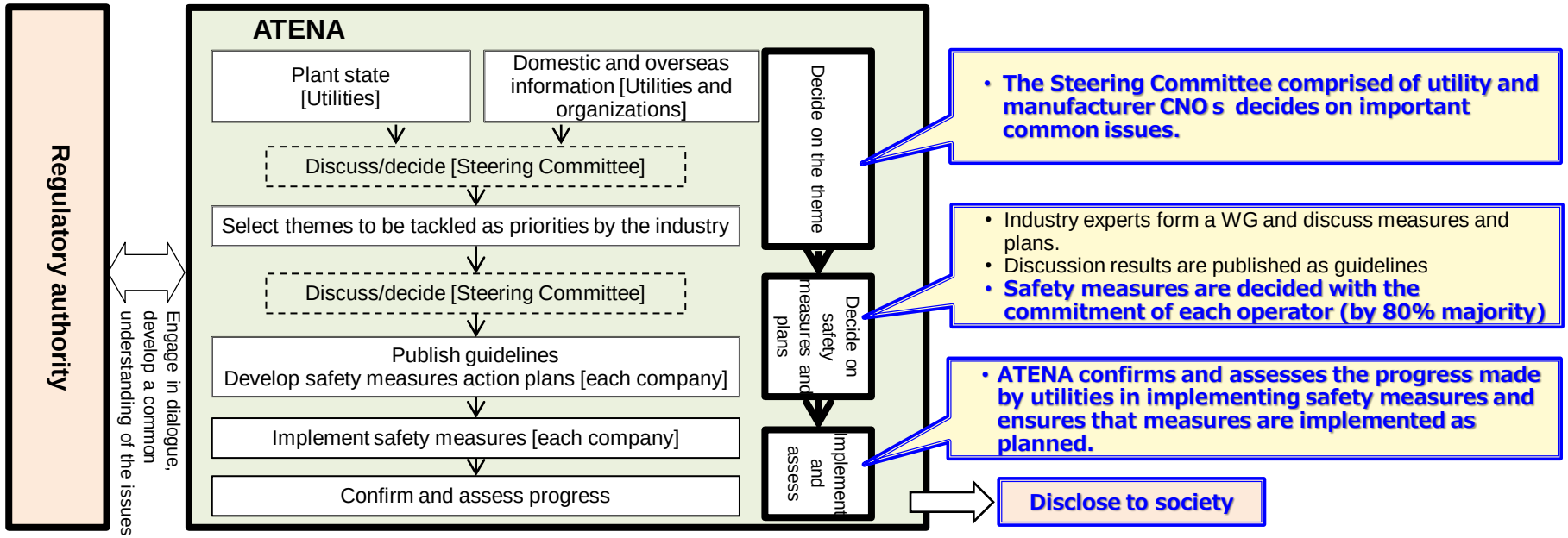
ATENA's operational structure

◯ Technical matters related to common regulatory challenges are discussed in working groups led by expert ATENA staff, **attended by manufacturers, with the approval of the Chairman and Directors.**



Mechanism and characteristics of ATENA activities

- Utility and manufacturer CNOs **deliberate on important common technical issues and determine themes in the Steering Committee through a process that doesn't require unanimous agreement.**
- **All utilities commit** to implementing the measures decided in the Steering Committee.
- Staff assigned to ATENA with high levels of expertise discuss technical issues and stipulate safety improvement measures in guidelines. These measures are rolled out at each utility. **Activities implemented by the industry are coordinated in the technical discussions to effectively use resources**.
- ATENA as a representative of the industry, **engages in dialogue with the regulatory authority on common technical issues**.
- Results and progress in activities including technical reports are **disclosed to society.**



ATENA's approach to common technical issues

ATENA is to address the following common issues based on lessons learned from the Fukushima Daiichi Accident and subsequent efforts for safety improvement by utilities.

Key cause of the accident	Lessons learned from the accident	Industry's post-accident efforts	Further initiatives by the industry	
			ATENA's Approach	Common issues
Loss of safety Functions caused by tsunami + Accident management measures deployed at that time could not work sufficiently	Insufficient preparedness against external events voluntary efforts to improve safety had not progress enough after the deployment of AM measures Insufficient preparedness of off-site activities in case of radioactive material release	**Strengthening existing reactor safety measures** Prompt response of reinforcing safety measures and conformance to new regulatory requirements, which results; ・Strengthening measures for various external events ・Reinforcing defense in depth especially in 3rd and 4th layers + **Strengthening industry-wide framework** Establishment of JANSI and NRRC	Optimizing risk management in the entire range of the defense in depth ◎Step forward to address nuclear safety measures	①Proactively utilize new knowledge and advanced technologies
			◎Continuously ask if there are any areas for improvement in safety measures	② Prepare thoroughly for various external events
			Further Enhancing voluntary efforts ◎Continuously pursue a system which encourages a positive spiral of voluntary safety improvement efforts	③Establish a framework which promotes voluntary efforts for safety improvement

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Activities since the establishment of ATENA

FY	Accomplishments	Issues
2018	・Establishment of ATENA (July 2018) ・Selected common technical issues as themes and started review activities	・Prepare for starting dialogues with NRA ・Steadily implement technical reviews
2019	・Started dialogues with NRA (April 2019) ・Started producing fruitful results in the review of technical issues eg. Reduction of incidents due to human factors in emergency diesel generators (EDGs) (FY 2019: 1 incident; FY 2020: 0 incident)	・Establish practices such as conducting developing safety measures and requesting utilities to introduce countermeasures. ・Conduct active dialogues with NRA
2020	・Established a reasonable approach for the grace period for backfitting (Design basis ground motion formulated without specifying the epicenter). ・Conducted technical discussions with NRA on aging management initiatives, then NRA compiled its views on the operation period rule.	・Extract "potential risks" in addition to current technical issues ・Conduct productive dialogues with NRA and reinforce communication with stakeholders
2021	・Reinforced safety measures at each company in response to the inappropriate treatments in physical protection procedures at TEPCO. ・Enhanced cooperation with overseas organizations (Web meetings by senior management)	・ATENA actively proposes issues to the NRA ・Building trust with the NRA
2022	・A self-review of our efforts to date, four years since the establishment of ATENA ・Further efforts to identify issues for more effective promotion of safety improvement initiatives of the industry	・Identification of issues to be addressed ・Further strengthen cooperation with external organizations, such as overseas organizations
2023	・Conducted a meeting between NRA and ATENA management alone to exchange opinions (2023.7) ・Proposal for risk information utilization (AOT review, online maintenance) (2023.10) ・Promotion of safety measures based on a new framework	・Pursuit of safety improvement beyond regulatory framework ・Building trust with regulators ・Initiatives to enhance the value of nuclear energy

Achievements: Activities where the mechanism and structure of the activities are functioning (1/2)

In the five years since ATENA was first launched, ATENA has been implementing activities under the mechanisms and structures that it has established.

I. Examples of initiatives with functioning mechanisms

A committee attended by utility and manufacturer top management selects themes from important common technical challenges and clarifies the safety improvement measures to be implemented for them in the guidelines.

① Cases in which operators have addressed issues ahead of the regulatory, learning from overseas examples (implement safety measures ahead of the regulatory authority)

- Measures for **common cause software failure in digital safety protection systems** (expand the functions of analog circuits)
- Measures for **Electromagnetic compatibility (EMC)** (confirm that electromagnetic phenomenon won't affect electronic equipment)
- Measures for **open phase conditions*(OPC)** (install automatic detectors)

* Event in which the circuit of one of the phases in external power (three-phase AC power) experiences open failure

② Cases where operators sought to improve safety beyond the regulatory requirement framework (question if there is no room for improvement)

- **Measures for natural events that exceed the assumptions in regulatory requirements**

③ Cases to realize safe long term operation (achieving an upward spiral of safety improvement)

- **Published aging degradation management guides and reports** to have existing reactors that have met the new regulatory requirements and restarted operate safely in the long term
- **Established an Aging Degradation Knowledge Expansion WG** and created an action plan for managing aging degradation

Achievements: Activities where the mechanism and structure of the activities are functioning (2/2)

II. Examples of initiatives with functioning structures

➢ **Initiatives led by ATENA** (implement safety measures ahead of the regulatory authority)

Safety measures are decided **by an 80% majority instead of setting the pace to accommodate the weakest utility. ATENA requires all utilities to implement the passed measures** by having the Chief Nuclear Officers (CNOs) of each utility commit to it.

- Measures for 24-hour operation testing of emergency diesel generators

⇒ All utilities had been performing 3-hour continuous operation of the EDGs. ATENA led discussions to implement 24-hour continuous operation to further increase equipment reliability and to gain data.

- Measures to incorporate learnings from the investigation/analysis of the Fukushima Daiichi NPS accident

⇒ ATENA led discussions on hydrogen protection measures for BWR reactor buildings. It created a guide based on the knowledge gained from the discussions and required the implementation of safety measures according to the guide.

➢ **Initiatives where manufacturers actively participated** (Active participation by manufacturers, awareness as a member of ATENA)

ATENA has built a discussion structure where manufacturers participate in discussions. Most highly case, around 60% of attendees of ATENA WGs and NRA public meetings are **manufacturers who take an active role in discussions and** speak as part of ATENA.

- Measures for common cause software failure in digital safety protection systems
- Cybersecurity measures (develop hardware measures and structural enhancement)
- Measures for EMC
- Measures to introduce new fuel (BWR10×10 fuel) (improve safety by mitigating the thermal load)

Achievements: Priority initiatives for improving safety

III. Examples of new safety improvement initiatives (achieving an upward spiral of safety improvement)

- ATENA proposed risk-informed initiatives to the Nuclear Regulatory Authority (NRA) with the aim of extracting plant weaknesses and operational challenges, and incorporating new information, as well as investing resources in effective safety improvement measures

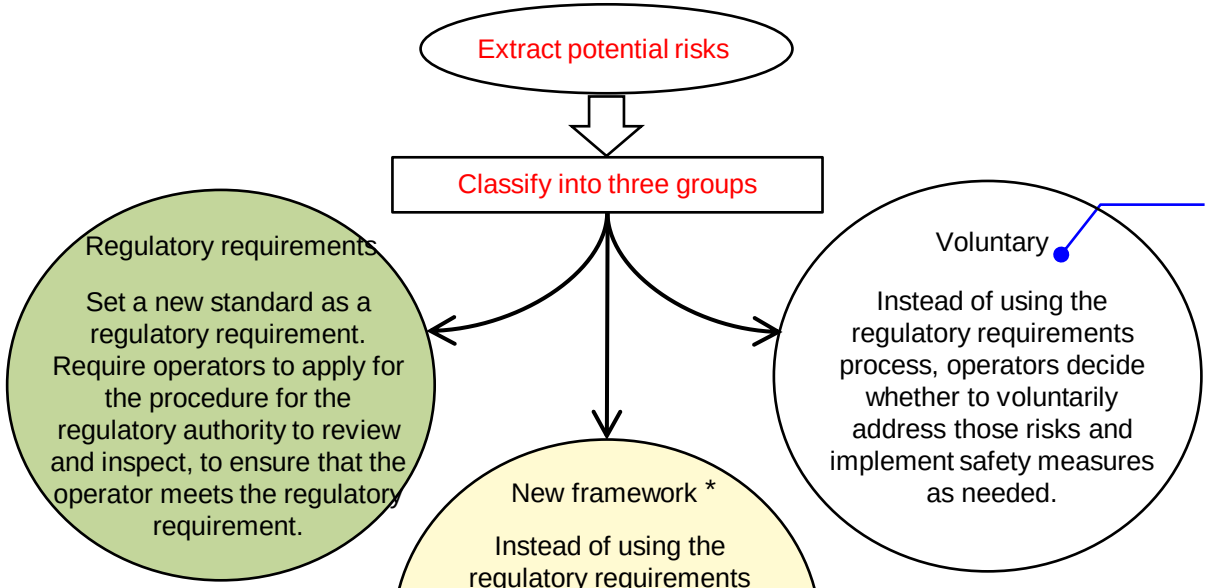
- **Review AOT* based on risk assessments** *: The time allowed for equipment to recover when it enters limiting conditions of operation due to equipment failure
  AOT could be modified if risk assessment finds the increase in accumulated risk is small.

- **Expand the scope of online maintenance**
  Work quality could be improved by increasing the scope of online maintenance and reducing the amount of work that needs to be done during peak times in periodic inspections. The industry developed a guide on measures to secure safety when expanding the scope of online maintenance, e.g., risk assessment and risk management during the planning and implementation stages of online maintenance.

ATENA will further strengthen its cooperative ties with the Nuclear Risk Research Center (NRRC) at CRIEPI to lead the charge in applying standardized risk assessment methods in actual plants, and NRRC will continue to refine PRA models and equipment failure rate data.

Achievements: ATENA's activities model

- ATENA illustrated activities to pursue nuclear safety improvements using a three-balloon model.
- Common technical issues (potential risk) to be tackled were extracted and classified. Operators, who are knowledgeable about the field, **create effective measures that are informed by the reality on the ground and implement safety measures early on.**



- Measures for natural events that exceed what is assumed in regulatory requirements
- Measures to ensure safe long-term operation (publish aging degradation management guides and reports, create an aging degradation management action plan)
- Measures for open phase conditions (OPC)
- Measures for EMC

*[New framework]
・ Clarify safety measures in guidelines and disclose (make a promise to society)
・ Check the plans for measures and progress operators are making in implementing the plans (disclose)
・ Expected effects
  - ✓ **Realize safety measures early on**
  - ✓ **Create effective measures informed by the reality on the ground that the operators are most knowledgeable about**
  - ✓ Continue to flexibly and voluntarily improve

- Measures for common cause software failure in digital safety protection systems
- Measures to incorporate knowledge gained from the investigation and analysis of the Fukushima Daiichi NPS accident

Achievements: Dialogue with the regulatory authority

- ○ Since July 2019, ATENA has been participating in NRA-CNO opinion exchange meetings and have been engaging in discussions with the NRA Commissioners. In **July 2023, the first opinion exchange meeting just with the NRA and ATENA management was held**, where ATENA talked with the NRA Chairman and Commissioners
- ○ ATENA directors and practitioners (including manufacturers) participated in the open meetings and technical opinion exchange meetings held by the NRA to discuss technical matters.
- ○ In the regular administrative meetings, ATENA explained its stance on the opinion exchange themes and ways to make progress in technical issues.

[Results]

- ➢ 1 NRA-ATENA opinion exchange meeting (starting July 2023)
- ➢ 9 NRA-CNO opinion exchange meetings
  (number of times ATENA has participated since July 2019)
- ➢ 25 open meetings/technical opinion exchanges (in the last year)
- ➢ Weekly regular administrative meetings
  (held around 50 times in the last year)

<Open meeting>

Collaboration with external organizations: Domestic and international collaboration

◯ ATENA **signed technical cooperation agreements with nuclear-related organizations domestic and abroad** to effectively and efficiently promote ATENA activities.
◯ Technical issues are being examined while sharing opinions and information with each organization.

Nuclear power industry	Overseas organizations	Nuclear Energy Institute (signed cooperation agreement in June 2019)	・Exchange opinions at management level ・Exchange opinions on technical issues (e.g., open phase condition) by practitioners ・Obtain technical information (e.g., duration of emergency diesel generators operation test of each country) ・CEO of NEI provides commentary on ATENA activities and expectations ・Participation in the ATENA Forum
		Électricité de France (signed cooperation agreement in November 2018)	・Exchange opinions at management level ・Exchange opinions on technical issues (e.g., supplier nonconformance) by practitioners ・Participation in the ATENA Forum
	Domestic organizations	・CRIEPI ・JANSI (Japan Nuclear Safety Institute) ・Federeation of Electric Power Companies of Japan ・JEMA (The Japan Electrical Manufacturers' Association) ・Japan Atomic Industrial Forum, Inc.	・Exchange opinions at management level ・Exchange information, attend committee meetings each other ・Exchange information on use of risk information (NRRC at CRIEPI) ・Signed a cooperative agreement with JANSI ・Cooperate on gathering overseas information with JANSI
Academic associations			・Coordinate with activities implemented by academic associations, share information

Communication with various stakeholders

○ Hosted the ATENA Forum

- Held in February every year as a public event
- In the 2022 Forum, panelists discussed on ATENA's Commitment to Voluntary Safety Improvement

<Forum in session>

○ Presented ATENA activities in academic conference

- Planning session of the Fall Meeting of the Atomic Energy Society of Japan (AESJ) (September 2023)
- Symposium on Power and Energy Technology of the Japan Society of Mechanical Engineers (September 2023)

○ Articles in newspapers and journals

- Industry Newspaper "Denki Shimbun": Publication of articles related to the Cybersecurity(January 2024)
- Journal of the AESJ : Publication of articles related to Long-term operation (February 2024)

○ Meetings with executives of organization overseas

- US – Japan Round Table (February 2023)
- Meeting with Nuclear Energy Institute (NEI) (February, November 2023)
- Meeting with EDF (March, September, November 2023)

○ Mail magazine

- Started to deliver ATENA mail magazine (January 2023)

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3. Current assessment, future challenges, and direction

Current assessment, future challenges and direction

Current assessment

- **The following initiatives have taken root and the mechanisms and structures for those initiatives are functional.**
  - Address nuclear safety issues ahead of the regulatory
  - Check that the implemented safety measures to see if there is room for improvement
  - Have the industry voluntarily aim to realize an upward spiral of safety improvement
  - Have manufacturers actively participate
  - Have all members of the industry participate with an awareness that they are members of ATENA

Future challenges and direction

- **Pursue safety improvements in nuclear power**

  We will pursue safety improvements in nuclear power, **beyond the regulatory framework, gathering the full force of the industry.**

- **Build a relationship of trust with the regulatory authority**

  To promote the sound use of nuclear power, we will continue to engage in dialogue to build a relationship of trust with the regulatory authority.

- **Efforts to increase the value of nuclear power**

  We will work to further increase the value of nuclear power while maintaining its safety.

  (E.g., operate the plant efficiently through the use of risk information, discuss challenges to introducing innovative light water reactors, discuss measures to realize long-term operation)

List of common technical issues (themes)

Technical issue	Theme
① Proactively utilize new knowledge and advanced technologies	Develop a new guideline for Cyber security
	Develop a new guideline to adopt measures for common cause failures in digital safety protection system
	Pursue efficient and effective operation with appropriate consideration of importance classification of SA equipment
	Establishment of improvement measure for “Open Phase Condition”
	Establishment of proper management of electromagnetic compatibility (EMC) related to the instrumentation and control system
	Propose back-fit processes with appropriate consideration of safety significance
	Develop the advanced methodology of soil liquefaction assessment
	Response to the findings from the investigation and analysis of the TEPCO's Fukushima Daiichi Nuclear Power Station Accident
	Deployment of new fuel
② Prepare thoroughly for various external events	【Completed】 Review of the methodology to assess “design basis ground motion formulated without specifying seismic sources”
	【Completed】 Establish evaluation method to ensure conformance of base isolated buildings housing SA equipment to technical standards
	Establish optimized approach to natural events with significant uncertainty
	Establish reasonable treatment process when updating design basis ground motion (Ss) through new knowledge
③ Establish a framework which promotes voluntary efforts for safety improvement	Develop industry’s guide documents for specific procedure to fulfill the NRA’s inspection reform
	【Completed】 Establish guideline for responding to incompatibility of manufacturers’ or component suppliers’ product
	Initiative of aging management for safe long-term operation
	Propose incentive mechanism to enhance licensees’ voluntary efforts of improving nuclear safety
	Propose more efficient procedures of operation and maintenance of equipment newly installed to conform new regulatory requirement
④ Others	Establishment of further improvement measures for Emergency Diesel Generators(EDG) reliability by analyzing operating experience
	Review and improve the current scheme of “Emergency Action Level”
	Further Investigation Related to the Intergranular Cracking on Stainless Steel Piping of PWR Primary System
	Cooperation to NRA’s initiative of continuously improving the regulatory standards by reflecting review experience
	Adoption of extended-cycle operation

Published technical reports and schedule for reports

FY2019	Publication date
○ Improvement Measures Proposed by Assessing Trends in Emergency Diesel Generator Malfunctions in Domestic Nuclear Power Plants	(June 21, 2019) [Rev. 1, November 7, 2019]
○ Guideline Regarding Performance Indicators (PI) Used in Nuclear Regulatory Inspections	(June 28, 2019)
○ Voluntary Guide on Introducing Cybersecurity Measures at Nuclear Power Plants	(March 12, 2020)
FY2020	**Publication date**
○ Guideline on the implementation of Licensee Inspections	(July 31, 2020)
○ Maintenance Guideline for Long-term Plant Shutdown	(September 25, 2020)
○ Guideline on Assessing Design Obsolescence	(September 25, 2020)
○ Discontinued Product Management Guideline	(September 25, 2020)
○ Design Guideline for the Base-Isolated Buildings Housing Severe Accident Equipment	(September 29, 2020)
○ Guideline for Deterrence and Adequate Response to Fraudulent Activity by Manufacturer/Component Supplier	(October 28, 2020)
○ Technical Requirements for Mitigation Measures of Software Common Cause Failures of Digital Safety Protection System	(December 24, 2020)

FY2021	Publication date
○ Report of knowledge build-up related to aging for safe long-term operation	(March 25, 2022)
FY2022	**Publication date**
○ Operational safety program revision guideline for improving safety through a diverse range of facilities	(July 29, 2022)
○ Technical Requirements for Mitigation Measures of Software Common Cause Failures of Digital Safety Protection System	【Rev.1 October5, 2022】
○ Guideline Regarding Performance Indicators (PI) Used in Nuclear Regulatory Inspections	【Rev.1 March 2, 2023】
○ Position paper on electromagnetic compatibility	(March 3, 2023)
FY2023	**Publication date**
○ Improvement of Crack Characterization Method by Ultrasonic Testing of PWR Primary Stainless Steel Piping Intergranular Cracks	(April 28, 2023)
○ Guidelines on Assessing Design Obsolescence	【Rev.1 June 6, 2023】
○ AMG Revision Guidelines for Hydrogen Protection Measures in BWR Reactor Buildings	(June 13, 2023)
○ Guideline Regarding Performance Indicators (PI) Used in Nuclear Regulatory Inspections	【Rev.2 July 7, 2023】
To be published	**Publication date**
○ Report on the advancement of liquefaction evaluation methods (working title)	