

# **The Self-Assessment of Nuclear Safety Culture based on IAEA SCART Methods at Center for Radioactive Waste Technology in Indonesia**

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**KOREA INSTITUTE OF NUCLEAR SAFETY**

**KOREA ADVANCED INSTITUTE OF SCIENCE & TECHNOLOGY**

# Abstract

The suggestions that should be considered to strengthen weak attributes



The division of work in accordance with the competence and position, communication between the leadership and employees should be improved,



The planning and implementation of corrective actions from the evaluation of an event should be more orderly,



The employees need facilities to learn from incidents that have occurred.



Furthermore, open communication in order to evaluate the cause of the incident and provide space for employees to provide input for improvement, so discussions of incidents that occur are not taboo.

# Abstract (cont'd)

A nuclear safety culture has always been a focus of the Center for Radioactive Waste Technology-BATAN in Indonesia.

IAEA Safety Culture Assessment Review Team (SCART) methods are used to evaluate the success of nuclear safety culture implementation with 5 characteristics and 37 attributes [IAEA, Services Series No. 16].

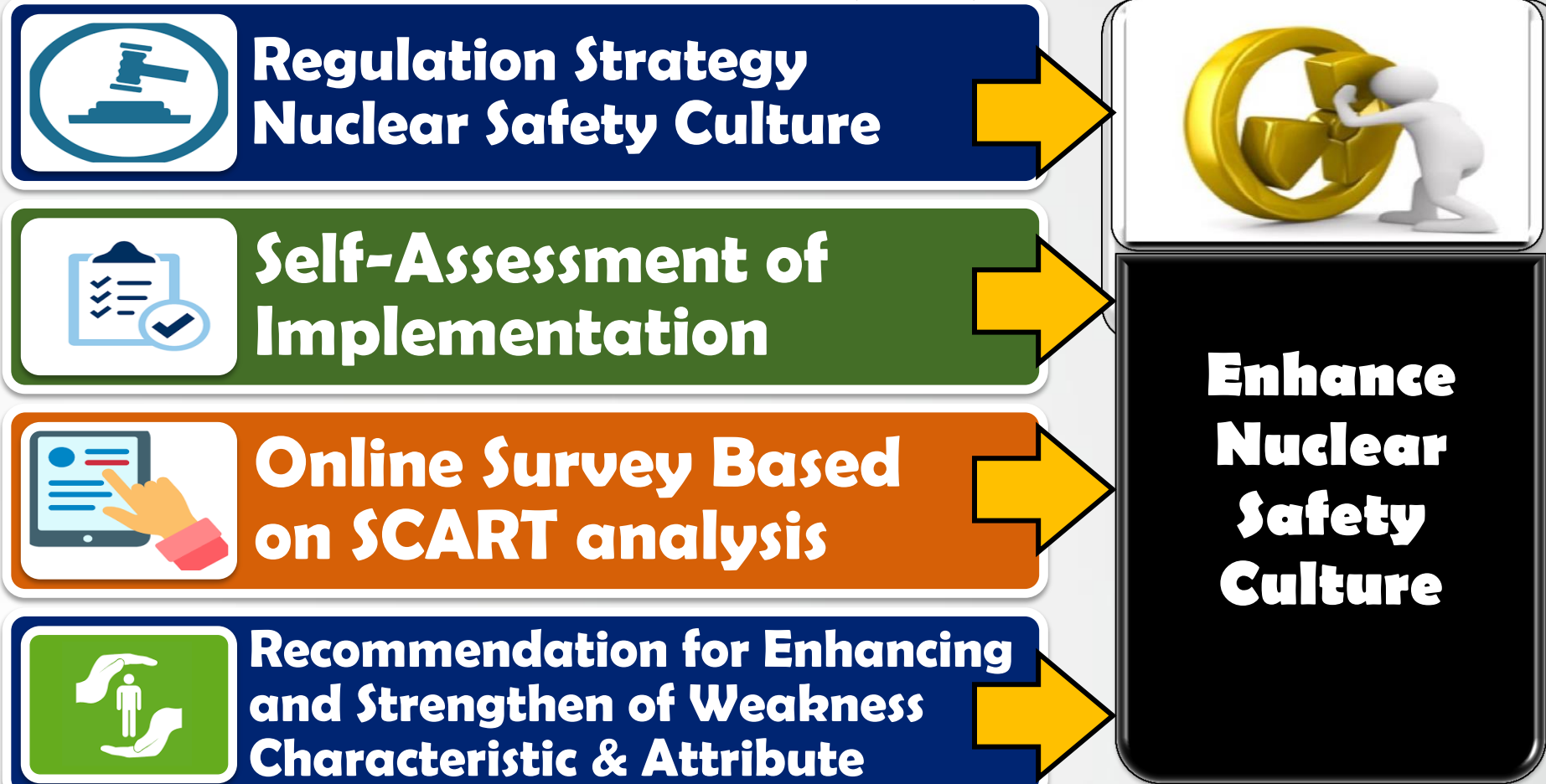
The results of the 2018 self-review survey indicate that the Center for Radioactive Waste Technology is in the A scoring range with a total value of 92.2%.

The strongest of the attribute characteristic of 93.2% shows that safety is a clearly recognized value.

The weakness of the attribute characteristic of 91.4% shows that safety is integrated into all activities.

# 1. Introduction

The safety culture was implemented in spent fuel and radioactive management organization. For enhanced safety culture, it needs to evaluate using IAEA guideline like IAEA Safety Culture Assessment Review Team (SCART) methods.



### 2.1. Role and Regulations of Nuclear Safety Culture

**IAEA, Services Series No. 16, Reference Report for IAEA Safety Culture Assessment Review Team (SCART), July 2008**



**IAEA, TECDOC-1329, Safety Culture in Nuclear Installations: Guidance for Use in the Enhancement of Safety Culture, Vienna, 2002**



**IAEA Safety Series Report, International Nuclear Safety Advisory Group No 75-INSAG-4 , Safety Culture, 1991**



**BATAN Chairman Regulation 200/KA/X/2012. The Guidance for Implementation of Safety Culture Assessment**



**BAPETEN Chairman Regulation 04/2010. The Facilities Management System and Utilization Activity of Nuclear Applications**

### 2.2. Term and Definition

#### Nuclear Safety Culture

The traditions, values, custom, goal and practices of an organization define the culture of an organization and are reflected in the behavior of its agents.

Safety culture is that assembly of characteristics and attitudes in organizations and individuals which establishes that as overriding priority, nuclear plant issues receive the attention warranted by their significance

A good safety culture in nuclear installation is reflection of the values, which are shared throughout all levels of the organization and which are based on the belief that safety is important and that it is everyone's responsibility.

The regulatory body defines nuclear safety culture as the core values and behaviors resulting from a collective commitment by leaders and individuals

The regulatory body recognizes that it is important for all organizations performing or overseeing regulated activities to establish and maintain a positive safety culture

# 3. Methodology and Identification Nuclear of Safety Culture Characteristic Attribute

Statistical Analysis	Likert Score	Percentage	BATAN Chairman Reg.200/KA/X/2012*)
Strongly Disagree	2	20%	7%
Disagree	4	40%	20%
Undecided/Neutral	6	60%	40%
Agree	8	80%	67%
Strongly Agree	10	100%	100%

\*) a bit difference with BATAN Chairman Regulation 200/KA/X/2012. The Guidance for Implementation of Safety Culture Assessment

## 4.1. Respondents

### Total respondents minimum using Slovin's Formula

The total radiation worker of Center for Radioactive Waste Technology-BATAN = 88 persons,

The interval of confidence = 95%,

The error significant = 5%,

Total Respondents Minimum:  
 $88 / (88 \times (0.05)^2) + 1 = 72$  persons

List respondents in [www.batan.go.id/ptlr/safetyculture](http://www.batan.go.id/ptlr/safetyculture)



## 4.2. Online Survey

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www.batan.go.id/ptlr/safetyculture/

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Name  
Adi Wijayanto, ST  
It's just research, don't worry your name won't be published

Characteristic A: Safety is a clearly recognized value

**Attribute A.1: Center for Radioactive Waste Technology provides the highest level of safety priority as outlined in documentation, communication and in the decision-making process.**

Strongly Disagree    Disagree    Undecided/Neutral  
 Agree    Strongly Agree

**Attribute A.2: Center for Radioactive Waste Technology determines safety to be the primary consideration in resource allocation.**

Strongly Disagree    Disagree    Undecided/Neutral  
 Agree    Strongly Agree

**Attribute A.3: Everything related to safety is contained in the mywork plan or Center for Radioactive Waste Technology work plan.**

Strongly Disagree    Disagree    Undecided/Neutral  
 Agree    Strongly Agree

**Attribute A.4: The implementation of safety and work in Center for Radioactive Waste Technology harmoniously.**

Strongly Disagree    Disagree    Undecided/Neutral  
 Agree    Strongly Agree

[www.batan.go.id/ptlr/safetyculture](http://www.batan.go.id/ptlr/safetyculture)

## 4.3. Characteristic A : Safety is a Clearly Recognized Value

Characteristic and Attribute Description	Result of Surveys		
Characteristic A : Safety is a Clearly Recognized Value	Answer	Frequency	Score
A.1: Center for Radioactive Waste Technology provides the highest level of safety priority, as outlined in documentation, communication and in the decision-making process.	8 10	21 51	9.42
A.2: Center for Radioactive Waste Technology determines safety to be the primary consideration in resource allocation.	8 10	24 48	9.33
A.3: Everything related to safety is contained in my work plan or Center for Radioactive Waste Technology work plan.	8 10	31 41	9.14
A.4: The implementation of safety and work in the Center for Radioactive Waste Technology harmoniously.	8 10	31 41	9.14
A.5: The high priority is given to safety is shown in documentation, communications and decision making.	8 10	24 48	9.33
A.6: Center for Radioactive Waste Technology supports obedience and safety behavior formally and informally.	8 10	17 55	9.52
Agree: 8, Strongly Agree:10	Average		9.32

Characteristic and Attribute Description	Result of Surveys		
Characteristic B: Leadership for Safety is Clear	Answer	Frequency	Score
B.1: The Head of Center for Radioactive Waste Technology shows a clear commitment to safety.	8 10	17 55	9.52
B.2: The safety commitment of Center for Radioactive Waste Technology structural officials can be observed in the performance of its duties and responsibilities.	8 10	27 45	9.24
B.3: Leadership in safety in Center for Radioactive Waste Technology can be observed from the involvement of structural officials in safety-related activities.	8 10	34 38	9.05
B.4: Leadership skills in Center for Radioactive Waste Technology are developed systematically.	8 10	34 38	9.05
B.5: Head of Center for Radioactive Waste Technology ensures the availability of sufficient and competent employees.	8 10	31 41	8.96
B.6: The structural officers at Center for Radioactive Waste Technology attempt to involve employees to take an active role in improving safety	8 10	17 55	9.52
B.7: The Center for Radioactive Waste Technology has considered the implications for the safety of the change process occurring, whether changes to procedures and/ or equipment and/ or organization.	8 10	14 58	9.62
B.8: Structural Officials at Center for Radioactive Waste Technology demonstrate efforts to build openness and good communication.	8 10	21 51	9.43
B.9: Structural officials at Center for Radioactive Waste Technology-BATAN have the ability to resolve existing conflicts.	6 8 10	7 31 34	8.67
B.10: The working relationship between employees with superiors in Center for Radioactive Waste Technology is built on mutual trust.	8 10	41 31	8.86
Undecided/Netral:6, Agree: 8, Strongly Agree:10	Average		9.19



## 4.5. Characteristic C: Accountability for safety is clear

Characteristic and Attribute Description	Result of Surveys		
Characteristic C: Accountability for safety is clear	Answer	Frequency	Score
C.1: The Center for Radioactive Waste Technology maintains a good relationship with the supervisory (internal external) so that safety accountability is maintained in accordance with prevailing regulations/ permits.	6 8 10	3 24 45	9.28
C.2: The roles and responsibilities in the Center for Radioactive Waste Technology are defined and clearly understood.	8 10	24 48	9.33
C.3: Every individual within Center for Radioactive Waste Technology has a high level of compliance with applicable rules and procedures (SOPs)	6 8 10	3 21 48	9.24
C.4: The structural officers at Center for Radioactive Waste Technology delegate responsibilities to employees with appropriate authority so that accountability can manifest clearly.	8 10	27 45	9.24
C.5: Everyone (both structural officials and employees) at the Center for Radioactive Waste Technology has a high sense of concern for safety.	8 10	27 45	9.24
Undecided/Netral:6, Agree: 8, Strongly Agree:10	Average		9.27

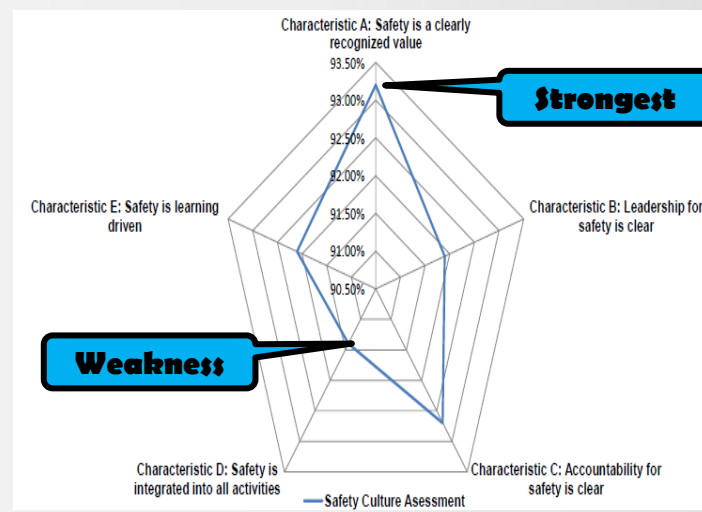
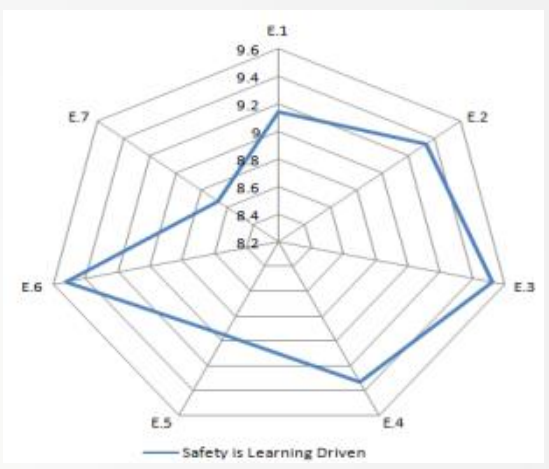
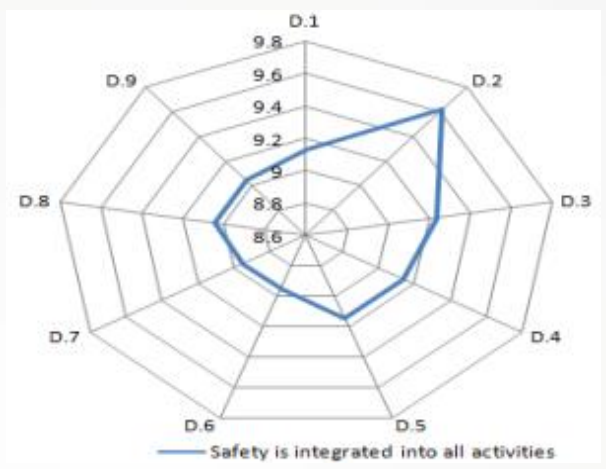
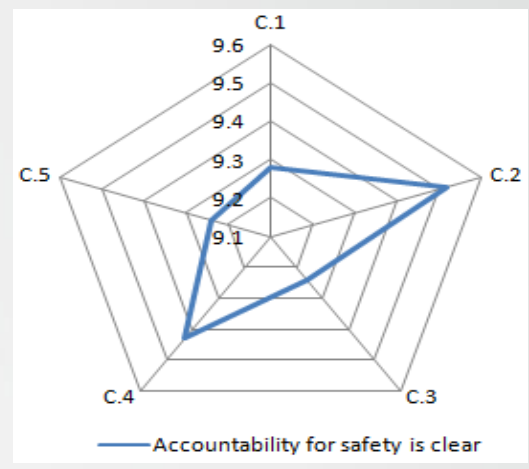
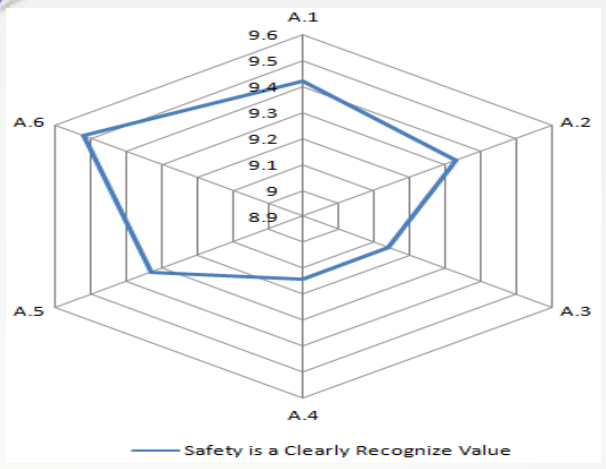
## 4.6. Characteristic D: Safety is integrated into all activities

Characteristic and Attribute Description	Result of Surveys		
Characteristic D: Safety is integrated into all activities	Answer	Frequency	Score
D.1: The attitude of trust has been pervasive to all employees in Center for Radioactive Waste Technology-BATAN.	6 8 10	7 21 45	9.13
D.2.: The Center for Radioactive Waste Technology has implemented safety, nuclear safety and environmental safety	8 10	14 58	9.62
D.3: The documentation and work procedures (SOPs) in Center for Radioactive Waste Technology are good quality in accordance with applicable terms and regulations	6 8 10	3 21 48	9.24
D.4: The flow of activities/ work processes in the Center for Radioactive Waste Technology, from planning, implementation to evaluation and review, has worked as well	6 8 10	3 24 45	9.14
D.5: Each individual in Center for Radioactive Waste Technology has sufficient knowledge and understanding to carry out the work	4 8 10	3 21 48	9.14
D.6: Structural officials at Center for Radioactive Waste Technology take into account and consider factors that may affect employee's motivation and job satisfaction.	4 8 10	3 27 41	8.95
D.7: Center for Radioactive Waste Technology seeks good working conditions by considering time pressure, workload and perceived stress in the execution of work.	4 8 10	7 24 41	8.95
D.8: Cooperation involving inter-field and expertise has worked well in Center for Radioactive Waste Technology -BATAN	4 8 10	3 27 41	9.05
D.9: The Outcomes of commitment to quality is evident from housekeeping activities and maintenance of existing facilities/ equipment conditions.	4 8 10	3 27 41	9.05
<b>Undecided/Netral:6, Agree: 8, Strongly Agree:10</b>	<b>Average</b>		<b>9.14</b>

## 4.7. Characteristic E: Safety is Learning Driven

Characteristic and Attribute Description	Result of Surveys		
Characteristic E: Safety is Learning Driven	Answer	Frequency	Score
E.1: The attitude of inquiring has awakened to everyone in Center for Radioactive Waste Technology - BATAN.	6 8 10	3 24 45	9.14
E.2: Center for Radioactive Waste Technology encourages everyone to report unsafe and open conditions and/ or unsafe behavior.	6 8 10	3 17 51	9.33
E.3: Center for Radioactive Waste Technology uses audit results, internal and external assessments and self-assessment results to evaluate the performance of the work.	8 10	17 55	9.52
E.4: Center for Radioactive Waste Technology uses safety related experiences, both within and outside BATAN as a learning process.	8 10	24 48	9.33
E.5: The learning process at Center for Radioactive Waste Technology is done by the ability of diagnostic deviations, formula and implementation of corrective actions and monitoring the results of improvements	6 8 10	3 31 38	8.95
E.6: Center for Radioactive Waste Technology always monitors evaluate and improve safety performance indicators to achieve good results	8 10	17 55	9.50
E.7: Center for Radioactive Waste Technology develops the competence of each employee in a good and systematic way.	4 8 10	3 38 31	8.67
Disagree:4, Undecided/Netral:6, Agree: 8, Strongly Agree:10	Average		9.21

# 4.8. The Average Result of Nuclear Safety Culture



## 4.9. The Rating Expressed Qualitative Statement of Nuclear Safety Culture

<p><b>Rating A</b> <b>(100% &lt;score&gt; 80%)</b></p>	<p>In this rating nuclear installations or facilities have safety performance above the required requirements. Topics or program reviews meet and consistently exceed performance requirements and expectations. Performance is fixed or increasing. Any rising or emerging problems or problems should be and can be resolved quickly, so these issues do not pose a risk to health, safety, environment or compliance with safety requirements.</p>
<p><b>Rank B</b> <b>(80% &lt;score&gt; 60%)</b></p>	<p>In this rating nuclear installations or facilities have safety performance in accordance with the required provisions. Assessment topics or programs according to the content or purpose of performance requirements and expectations. The deviation is only minor deviations from the requirements or expectations of the design and or program implementation, but the deviation does not pose a risk to health, safety, security, the environment</p>
<p><b>Rank C</b> <b>(60% &lt;score&gt; 40%)</b></p>	<p>In this rating nuclear installations or facilities compliance rating safety requirement with this nuclear installation or facility has safety performance under the required conditions. Performance changes and falls below what is expected, or an assessment topic or program deviates from the content or purpose of the requirements. Such deviations will cause risks to health, safety, security, the environment, or compliance with the existing requirements. Although these risks are low, performance or program improvements are required to address them, so permit holders should take immediate corrective action.</p>
<p><b>Rank D</b> <b>(40% &lt;score&gt; 20%)</b></p>	<p>Topics or self-assessment programs are significantly below the requirements or from evidence in the field of low safety performance. Safety limits can be compromised. In the absence of corrective action, it is likely to lead to inefficiency and continue to pose a risk to health, safety, security, the environment, or compliance with existing requirements.</p>
<p><b>Rank E</b> <b>(score &lt; 20%)</b></p>	<p>Evidence of inefficiency, insufficiency, lack of control / control over the topic or program. This has resulted in the greatest risks to health, safety, the environment. Fulfillment of safety requirements is not done at all. Rapid and appropriate response from the Supervisory Board is urgently needed, where legal action should be applied (the act of detention or revocation of permit from the permit holder).</p>



## 4.10. Best Practices to Enhanced Nuclear Safety Culture

Characteristic	Root Cause Analysis of Attribute	Countermeasure to Enhance Nuclear Safety Culture
<p>A. Safety is a Clearly Recognized Value</p>	<p>A.1: Center for Radioactive Waste Technology provides the highest level of safety priority, as outlined in documentation, communication and in the decision-making process.</p> <p>A.3: Everything related to safety is contained in my work plan or Center for Radioactive Waste Technology work plan.</p>	<p>A suggestion to increase the scores for attributes A.3 and A.4 is to improve the work plan and safety job analysis before the beginning of work and implement the harmonious the safety relationship of work.</p>
<p>B. Leadership for Safety is Clear</p>	<p>B.5: Head of Center for Radioactive Waste Technology ensures the availability of sufficient and competent employees.</p> <p>B.9: Structural officials at Center for Radioactive Waste Technology-BATAN have the ability to resolve existing conflicts.</p> <p>B.10: The working relationship between employees with superiors in Center for Radioactive Waste Technology is built on mutual trust</p>	<p>A suggestion to increase the scores for attributes B.5, B.9 and B.10 is to improve communication between leadership and employees. In addition, we suggest the division of work in accordance with competence and position, the creation of an official structure for conflict resolution, and development of mutual trust in order to increase good working relationships between employers and supervisors.</p>

## 4.10. Best Practices to Enhanced Nuclear Safety Culture

Characteristic	Root Cause Analysis of Attribute	Countermeasure to Enhance Nuclear Safety Culture
C. Accountability for safety is clear	-	Characteristic C required no suggestions for improvement due to receiving a high score
D. Safety is integrated into all activities	<p>D.1: The attitude of trust has been pervasive to all employees in Center for Radioactive Waste Technology-BATAN.</p> <p>D.4: The flow of activities/ work processes in the Center for Radioactive Waste Technology, from planning, implementation to evaluation and review, has worked as well</p> <p>D.5: Each individual in Center for Radioactive Waste Technology has sufficient knowledge and understanding to carry out the work</p> <p>D.6: Structural officials at Center for Radioactive Waste Technology take into account and consider factors that may affect employee's motivation and job satisfaction.</p> <p>D.7: Center for Radioactive Waste Technology seeks good working conditions by considering time pressure, workload and perceived stress in the execution of work.</p> <p>D.8: Cooperation involving inter-field and expertise has worked well in Center for Radioactive Waste Technology -BATAN</p> <p>D.9: The Outcomes of commitment to quality is evident from housekeeping activities and maintenance of existing facilities/ equipment conditions</p>	<p>A suggestion to increase the scores for attributes D.1 D.4 D.5 D.6 D.7 D.8 D.9 is to improve open communication in order to evaluate the cause of the incident and provide space for employees to provide input for improvement, so discussions of incidents that occur are not taboo. the planning and implementation of corrective actions from the evaluation of an event should be more orderly, and employees need facilities to learn from incidents that have occurred, and the management must provide the knowledge and understanding training for each individual to increase safety leadership.</p>

## 4.10. Best Practices to Enhanced Nuclear Safety Culture

Characteristic	Root Cause Analysis of Attribute	Countermeasure to Enhance Nuclear Safety Culture
<p>E. Safety is Learning Driven</p>	<p>E.1: The attitude of inquiring has awakened to everyone in Center for Radioactive Waste Technology - BATAN.</p> <p>E.5: The learning process at Center for Radioactive Waste Technology is done by the ability of diagnostic deviations, formula and implementation of corrective actions and monitoring the results of improvements</p> <p>E.7: Center for Radioactive Waste Technology develops the competence of each employee in a good and systematic way.</p>	<p>A suggestion to increase the scores for attributes E.1 E.5 and E.7 is to improve worker morale is to provide continuous training opportunities. Furthermore, the organization must develop the competence of each employee with good planning and a systematic strategy.</p>

# Conclusions

The results of the 2018 self-review survey indicate that the Center for Radioactive Waste Technology is in the A scoring range with a total value of 92.2%.



Based on the received score of 93.2% safety is a clearly recognized value.



In addition, the weakness attribute characteristic of 91.4% shows that safety is integrated into all activities.



The suggestions that should be considered to strengthen weak attributes like the division of work in accordance with the competence and position, communication between the leadership and employees should be improved,



The planning and implementation of corrective actions from the evaluation of an event should be more orderly, and employees need facilities to learn from incidents that have occurred.



Furthermore, open communication in order to evaluate the cause of the incident and provide space for employees to provide input for improvement, so discussions of incidents that occur are not taboo.

# REFERENCES

[1]. BATAN Chairman Regulation 200/KA/X/2012. The Guidance for Implementation of Safety Culture Assessment (in Indonesian).

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**BAPETEN Chairman Regulation 04/2010. The Facilities Management System and Utilization Activity of Nuclear Applications**

# Thank You 감사합니다 Terima Kasih

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