Korea's Opportunities for Gender Balance in the Nuclear Sector

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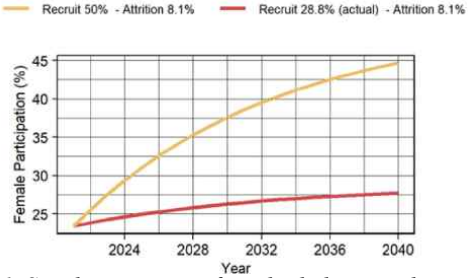
1. Introduction

This year, on International Women's Day (March 8), the NEA (Nuclear Energy Agency) published its first *Gender Balance in the Nuclear Sector* report. The 112 page document falls under NEA's Human Aspects of Nuclear Safety topic. "Human aspects is a multi-disciplinary approach to nuclear safety that includes human and organizational factors and the promotion of a healthy nuclear safety culture."[1] ANS recognizes that such women as Marie Skłodowska-Curie, Lise Meitner, Chien-Shiung Wu, and Katharine Way were pioneers in nuclear science and technology.[2] Women continue to make vital contributions, but female representation in the nuclear sector remains limited. "This is especially the case in science, technology, engineering and mathematics (STEM) and leadership roles. STEM fields benefit from diversity, as it spurs collaboration and productivity. The lack of diversity represents a loss of potential innovation and growth and is a critical threat to the future viability of the field."[3]

Because limited data were available in 2021, the NEA surveyed over 8000 women in the nuclear workforce in 32 countries. In addition, they collected human resource data from 96 nuclear organizations in 17 countries. Based on their findings, recommendations were proposed to support countries working to improve gender balance in the nuclear sector.

Based on these data, Figure 1 is a simple model projecting future female participation in the nuclear sector assuming no change in the overall size of the workforce and attrition at 8.1%, which is the current rate for the workforce sample of men and women. The red line shows the trajectory if female recruitment continues at its current rate of 28.8%. The gold line models the scenario if future recruitment was balanced at 50%. This is a restricted model, but one that shows the essential features and indicative time scales



<Fig. 1. Simple projection of gender balance with current and balanced recruitment [6]>

This presentation will highlight the Korean data presented in the NEA report, specifically focusing on labor force representation issues and career trajectories.These are two areas where building on existing norms could achieve discernable improvements in hiring practices and in support of women's career development into professional and executive technical and management positions. The suggested approaches will be compatible with NEA's guiding framework, which consists of three pillars:
1. ATTRACT women into the nuclear sector.
2. RETAIN and support women in the workforce, including impacts related to familial responsibilities.
3. ADVANCE and develop women as leaders and enhance their contributions.[4]

Post pandemic is the perfect time to see what steps we can take to work together with like-minded colleagues and managers to make the nuclear work environment more inclusive.

2. Methods

To better understand women's current representation and career trajectories in the nuclear sector, the NEA surveyed member countries in 2021. The first survey was quantitative and was sent to the human resources departments of nuclear companies. The second survey was a voluntary opinion-based survey of women in the nuclear sector. The following is a brief discussion of how each of these methods was carried out.

2.1. Human resource (HR) data

A quantitative survey was sent to NEA member countries to collect human resource data from nuclear organisations. The data requested focused on such issues as new hires, attrition, promotions, salaries and participation in career development programmes. These data were broken down by gender, job type (STEM/non-STEM) and management level. The data were collected between June and October 2021.

Typically these data were reported in percentages and were broken down into specific groups:

1. STEM Professionals, STEM Workers, Non-STEM Professionals, and Non-STEM Workers
2. Non-management, Lower Management, Middle Management, Upper Management, and Executive.

2.1.2. *Korean HR data*

The Korean data were collected from the following six sources:
• Korea Atomic Energy Research Institute
• Korea Hydro & Nuclear Power Co., Ltd.
• Korea Institute of Nuclear Nonproliferation and Control
• Korea Institute of Nuclear Safety
• Korea Radioactive Waste Agency
• Korea Institute of Radiological & Medical Sciences

2.2. Qualitative voluntary opinion-based survey of women

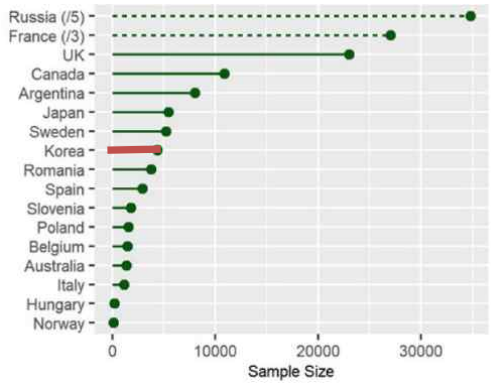
Women in the global nuclear sector were invited to complete an online survey. Again, NEA surveyed member countries. The NEA questionaire consisted of 34 multiple

choice question (8 required and 26 optional) using the SurveyMonkey software. The survey was publicly available for three months on the NEA website in eight languages: English, French, Italian, Japanese, Korean, Romanian, Russian and Spanish. The survey was promoted by NEA through email distribution, the NEA website and social media; 6748 surveys were completed and submitted. No attempt was made to normalise or weight the data. The data analysis was aimed to inform the development of strategies and interventions that could over time improve gender balance.

3. Results

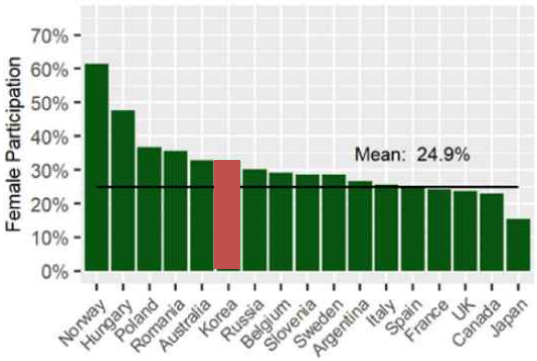
3.1. *Qualitative HR survey results*

The total workforce compiled from the reporting of HR departments (in 17 countries) was 326,358. The workforce by country is shown in Figure 2, with a median country sample of 3,335. The dotted lines were reduced in length to more suitably display the range of values. The scale factors used are provided in parentheses.



<*Fig. 2.Total workforce (men and women) by country [3]*>

Though there was a wide variation between countries, the mean representation of women was 24.9% of the total nuclear sector workforce (Figure 3). Norway and Hungary reported strong female participation, but the sample size in both cases was < 200. The range seen in Figure 3 may be due in part to the number and kinds of organisations that responded to the survey in different countries.

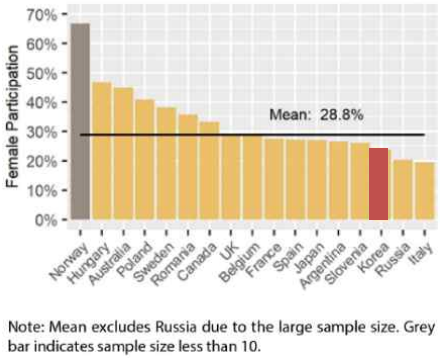


<*Fig. 3.Overall female nuclear workforce participation by country[3]*>

NEA's summary of the key HR findings is as follows:

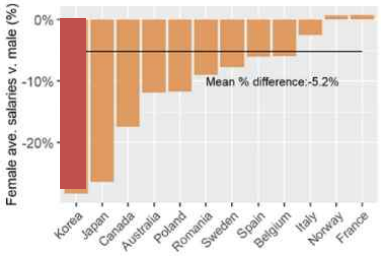
- Women are 24.9% of the nuclear workforce, and the percentage is lower for women in STEM and senior leadership roles
- Women are 28.8% of new hires, with even fewer women in STEM and mid-to-senior leadership roles
- Women are 27.1% of promotions, which are clustered in non-STEM roles
- Women are paid less than men (based on limited datasets)
- Women experience workplace hostility and sexual harassment
- Women face negative career impacts from pregnancy and family responsibilities
- Women are eager to advance but are hindered by barriers, cultural biases and a lack of support.

In Korea the nuclear sector's male and female workforce is composed of a little less than 5,000 workers (see Figure 2). As seen in Figure 3, Korea's female nuclear workforce is above the mean. Korea is below the mean for new hires (see Figure 4), but this could be due to the Moon admistration's antinucler power policies, which were in place during the 2021 NEA survey.



<*Fig. 4. New hires, female participation by country [3]*>

Unfortunately when it comes to pay parity, Korea has the greatest desparity of all the nations surveyed. This may be due to the fact that data were collected from only about one-third of the approximately 5,000 person sample size.



<*Fig. 5. Pay parity: the difference between women's and men's salaries[3]*>

This lack of pay parity is not limited to Korea's nuclear sector. Even though there have been modest improvements over the last decades, Korea continues to have the highest wage gap among OECD countries. On average, Korean women are paid one-third less than their male counterparts (see Figure 6).

<*Fig. 6. Gender wage gap in Korea (2000 - 2019)[6]*>

3.2. Quantitative survey of women in the nuclear sector

The survey of women in the nuclear sector was not broken down by country, but as mentioned in the introduction, it used geographic regions: (1) Northern Europe, (2) Northern America, (3) Latin America, (4) Western Europe, (5) Eastern Europe, (6) Southern Europe and (7) Asia and Oceania. These are geographic regions as per the United Nations M49 Standard. This combining of reported data did not make it possible to identify what was occurring for women employed in any one country.

The survey consisted of 34 questions. Personal backgroud questions included employment, location, education, age, family and minority status. Seven questions focused on perceptions of gender balance in the workplace. These questions addressed women in the organisation, culture and policies, management, stereotypes, and gender. Eight questions addressed aspirations and professional development, including expectations and challenges, institutional support, and the presence of role models. Twenty questions tackeled barriers and challenges, addressing entry and advancement, family, pay, and work culture. The final four questions were aimed at identifying solutions, such as attracting women into the nuclear sector, supporting women's careers, and creating inclusive work environments.

Some of the key responses reported by NEA were as follows:

- Women would generally encourage female family members and friends to join the nuclear sector, though there was some ambivalence, and women from Asia and Oceania are less likely to be encouraging.

- Women said basic working conditions, like facilities, equipment, and protective gear, were equal between men and women. This was less the case in Asia and Oceania and in Latin America.

- Women from Northern Europe and North America generally felt more included and valued in their workplaces; this feeling did vary between organisation types.

- Women experienced workplaces in which accounts of sexual harassment and hostile behaviour were not uncommon.

- Women were eager to advance in their careers but experience sociocultural and institutional barriers. These barriers include unequal salaries and performance appraisals.

-Women did not have ready or meaningful access to effective career development programmes; this was particularly true in Latin America, Southern Europe, and Asia and Oceania.

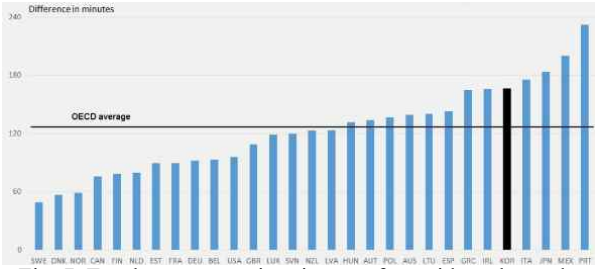
- Women sensed negative career impacts from pregnancy, parenthood and caregiving.

- Women were more likely to report negative impacts if they were a member of a minority group.

4. Discussion

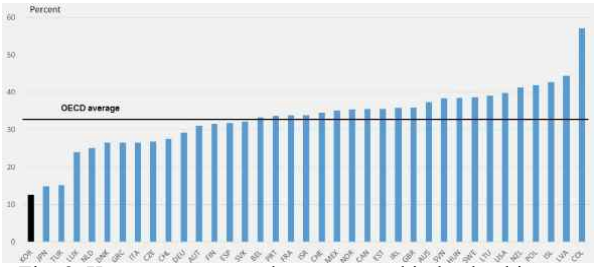
4.1. Current situation for working women in Korea

Since the 1990s, the gender gap in employment was slowly narrowing before the pandemic. In 2019, women spent 215 minutes a day on unpaid housework and caring for children, compared with 49 minutes a day for men. This is nearly a three hour per day difference (see Figure 7). Furthermore, only 6% of Korean men eligible for parental leave in 2018 elected to take the leave.



<Fig. 7. Employment gap in minutes of unpaid work per day, women minus men, for 15 to 64 year olds, by country (2019) [7]>

Although the share of Korean women with formal post-secondary education or training is the highest among OECD countries, the share of managerial positions held by women is the lowest in the OECD (Figure 8).



<Fig. 8. Korean women underrepresented in leadership positions (2018)[7]>

These obstacles to a level playing field in the workplace, along with the 30% pay discrepancy (see Figure 6), puts a significant burden on Korean women in the workforce. These difficulties are worsened when women are faced with the decision of whether or not to have children. As pointed out in the NEA report and previous OECD reports [6, 7, 8] women face negative career impacts from pregnancy, parenthood and caregiving.

The combination of these stresses, the cultural pressure for long workweek hours and the potential for harassment on the

job give women little margin for balancing their professional and personal lives.

4.2 Solving one challenge could have a domino effect

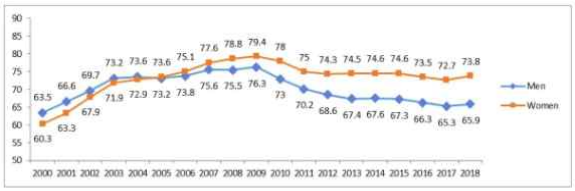
According to a 2022 survey, more women than men — 65 percent versus 48 percent — do not want children. There are well-documented reasons why young Koreans do not want to start a family. These reasons include the high costs of raising children, high price of home ownership, poor job prospects and long work hours. This lower desire to have children has resulted in Korea's having the lowest recorded fertility rate in the world for three years in a row. Women of reproductive age are having fewer than one child on average.

Though many people believe that women's desire for equality is the underlying reason for falling birth rates, others believe gender equality is one of the solutions to falling birthrates. When women are part of a system that assures pay equity, promotion based on merrit, employer support for childbearing and coworker acceptance of parental leave, for both men and women, women will see a way to pursue their personal and professional goals. It will not be easy, but it will be doable and rewarding.

There are signs that Korea is incrimentally moving toward a more equitable environment for women. Young couples have greater expectations that they will share more of the child raising responsibilities and their parents are finding a ways to accept this change in traditional values. However, without employer and coworker attitudes also moving in the direction of supporting equity for female employees, women will not be able to achieve the minimum margins necessary for reaching their professional and personal dreams.

The COVID-19 pandemic showed us that there are alternatives to being in the office five days (or more) a week, and work travel can be reduced because technology allows new work models. These and other incremental suggestions will be presented as ways that Korea's nuclear sector can improve working conditions for women.

Because improving the working conditions for women is part of a societal shift, this study will explain why Figure 9 is particularly disturbing. It does not mean that women are finally doing better than men in attaining undergraduate education - it does tell us something is not working well for young Korean men. This is as unacceptable as when women's rates of higher education were similarly unbalanced. For equality to be achieved, all participating members of society need to be supported.



Source: Ministry of Education of the Republic of Korea.

<Fig. 9. Higher education enrollment rate of Korea (2000 - 2018)[6] >

5. Conclusion

Everyone has a role to play in ensuring the future success of Korea. Because providing some margin for women will improve not only their lives but the lives of their family members and colleagues, it is important that we work together to carve out a common ground that benefits all of us.

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