# 2018 NEA International Mentoring Workshops

## Joshikai II for Future Scientists

Japan, Tokyo – August 2018

*In co-operation with* JAEA

## Mentoring Workshop in Science and Engineering

Spain, Ávila – September 2018

*In co-operation with* WiN España

OECD
BETTER POLICIES FOR BETTER LIVES

60th anniversary
NEA
NUCLEAR ENERGY AGENCY

# Foreword

In recent years, many countries have made important inroads in enhancing female representation in leadership positions, promoting women's entrepreneurship and encouraging more young women to study science, technology, engineering and mathematics (STEM) subjects. It is an issue that the OECD is addressing directly through various initiatives, thereby helping to increase the prominence of gender equality within national and global policy agendas. Yet gender gaps still persist in all areas of life and across countries.

For many countries, this represents a tremendous loss in opportunity and productivity. It makes sense for many nations to take additional steps to reduce the gender gap. We at the Nuclear Energy Agency (NEA) believe in the importance of such efforts. This is because many of our member countries are finding that fewer young people are studying science, mathematics and engineering than was the case in previous generations, and this has a direct effect on the capabilities of our member countries in areas of science and technology relevant to our mission. Such a skills shortage would have serious implications for the future, and it is therefore essential to ensure that all young people, including young women, have the opportunity to explore careers in science and technology.

The NEA has co-operated with the Japan Atomic Energy Agency (JAEA) to take another step towards giving young Japanese women what may, for some, prove to be a life-changing experience at a two-day workshop, "Joshikai II for Future Scientists: International Mentoring Workshop in Science and Engineering". During the workshop, 51 female students from 12 Japanese high schools and junior high schools enjoyed the unique experience of talking in an informal and personal manner with 6 highly accomplished women from Japan and from 3 other countries about the lives, careers and experiences of women in science and engineering. This 2018 workshop in Tokyo, Japan, included a special session for parents and teachers to solicit their advice and input, since family and teacher support is considered key in encouraging girls to study and work in STEM fields.

Building on the two successful events held in Japan (the first in Chiba, Japan in 2017), an NEA International Mentoring Workshop *"Impulsando a las futuras líderes en Ciencia y tecnología"* was also held for the first time in Europe, in Ávila, Spain, jointly organised with the Spanish Women in Nuclear Association. Around 50 female students from Spanish high schools had the opportunity to exchange with 12 highly accomplished Spanish women scientists and engineers with the objective of motivating young female students to explore science and engineering careers, as well as suggest ways to overcome any barriers that they may face along the way.

We recognise that workshops such as these will not close the STEM gender gap overnight. It is our strong belief, however, that if even a modest portion of the young women who participate in these workshops find the encouragement to become science and technology professionals, it will have been a very worthwhile effort.

**William D. Magwood, IV**
Director-General, Nuclear Energy Agency


> "At the NEA, we encourage our member countries to explore ways of attracting, recruiting and retaining women in science and technology. The NEA hopes to strengthen the momentum towards encouraging a future generation of female leaders to actively participate in science and engineering fields."
>
> – NEA Director-General Magwood's opening remarks at "Joshikai II for Future Scientists: International Mentoring Workshop in Science and Engineering".

## The Nuclear Energy Agency "International Mentoring Workshops"

Our mentoring workshops are in line with the efforts being undertaken by countries around the world to ensure that expertise is maintained in highly technical areas such as nuclear safety, radiological protection and other critical disciplines. A significant, global shift in workforce demographics is currently underway, with an increasing demand for trained staff in all areas related to nuclear technology, including energy applications, medicine and scientific research. The urgency of maintaining certain skills has been highlighted repeatedly by many NEA member countries. To mitigate the possibility of future shortages, capacity-building efforts focusing on STEM fields need to be sustained and reinforced – particularly those aimed at young women on the cusp of choosing a career path, as women are significantly under-represented in many areas.

It is in this spirit that the NEA partnered with Japan's National Institutes for Quantum and Radiological

# What is the state of women in science and engineering?

Many countries have made efforts to address the lack of female representation in leadership positions in technical fields. Despite these efforts, progress has been slow. This is particularly true in the field of nuclear science and technology, which encompasses not only energy but many other areas such as medicine, manufacturing and the environment (OECD, 2012).

## Career choices made at an early age

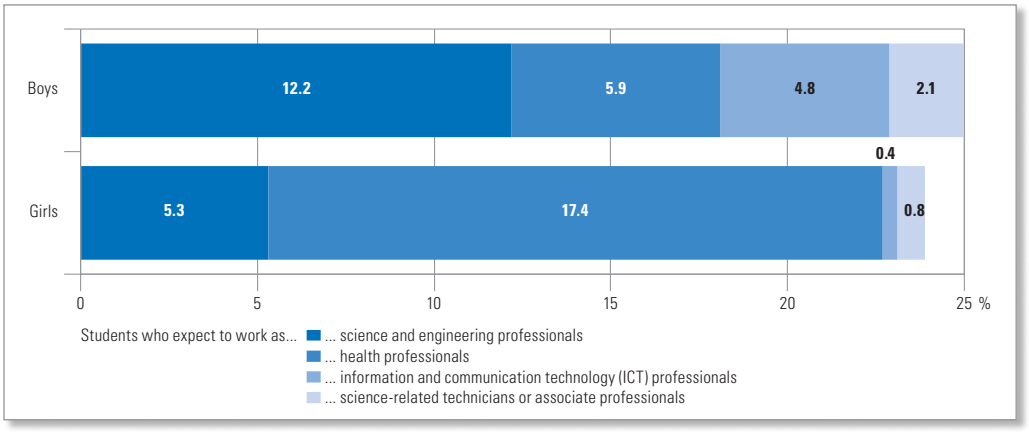
Important divergences on career paths emerge between girls and boys at an early age. Data from the OECD Programme for International Student Assessment (PISA) shows that by age 15, on average, the expectation of boys and girls that they will be pursuing a career in a science-related profession when they are 30 is almost equal. However, there are sharp differences in terms of the branch in which they expect to work; boys are more interested than girls in physics and chemistry, while girls tend to be more interested in health-related topics (OECD, 2017a). Data from the same study also shows that parents are more likely to expect their sons, rather than their daughters, to enter a science, technology, engineering and mathematics (STEM) career – even when boys and girls perform equally well in mathematics (OECD, 2016; OECD, 2015).

## At university

While female students in many countries do very well in mathematics and science early in their academic careers, they often decide not to pursue careers in these areas. Even though many countries have made progress in reducing or closing the gender gap in terms of educational attainment, women are still under-represented in STEM fields. On average across OECD countries, half of the men who pursue doctoral studies enter a STEM field of study, but just a third of women do so. In these fields, men are twice as likely as women to pursue a PhD in engineering, manufacturing and construction and three times as likely to enroll in a doctoral programme in information and communication technologies (OECD, 2018). A similar trend can also be observed at the tertiary level of education. While a high share of male graduates obtain a degree in engineering, manufacturing and construction (25% on average across OECD countries), the proportion of female graduates in this field is low (6% on average) (OECD, 2018).

**Women are under-represented among new entrants in STEM fields in higher education**

Expectations of a science career, by gender (OECD average)




Source: OECD (2016), *PISA 2015 Results (Volume I): Excellence and Equity in Education.*

Science and Technology (GST) in 2017 to organise its first International Mentoring Workshop in Science and Engineering, on 25-26 July 2017 in Chiba, Japan. The success of this first workshop has led to the organisation of two additional workshops in 2018, both of which are introduced in this brochure – one in Tokyo, Japan, and the other in Ávila, Spain. These workshops are a clear manifestation of the NEA's commitment to maintaining, and further strengthening, its momentum in encouraging a future generation of female leaders in science and engineering fields.

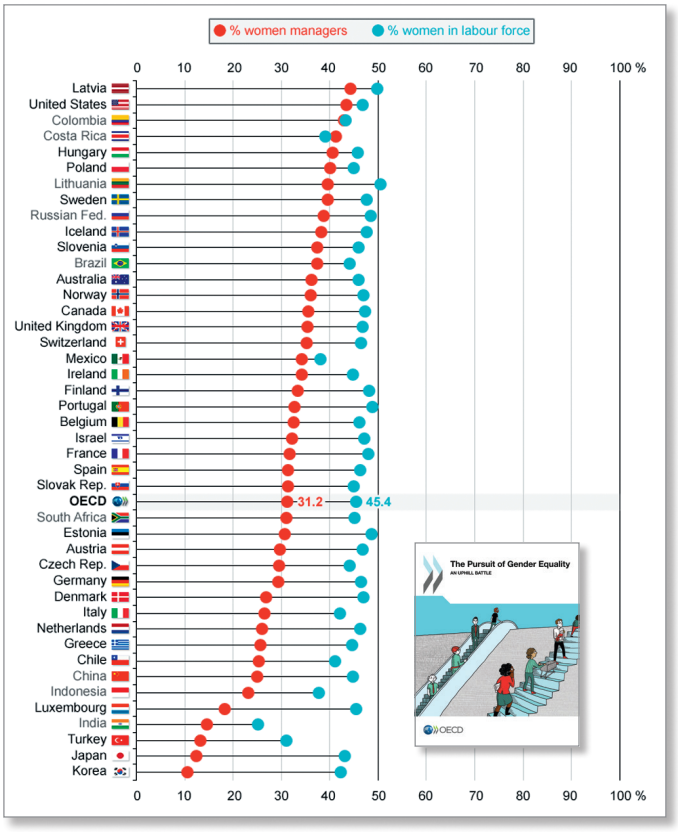
The NEA encourages its membership to continue promoting science and technology careers at every stage of girls' education, and to explore ways of attracting, recruiting and retaining women in science and technology fields.

## In the workforce

In OECD countries, men are almost four times more likely than women to be employed in engineering and computing. Women remain under-represented in leadership positions with far fewer becoming CEOs, sitting on boards of private companies or holding public leadership positions. Among the factors that can explain the "leaky pipeline" phenomenon and the lack of women at the top is the stronger likelihood that they will interupt their careers to care for family, that they work part-time, or that they face discrimination (OECD, 2017). More work still needs to be done to reverse this trend.

### Women are under-represented in management positions

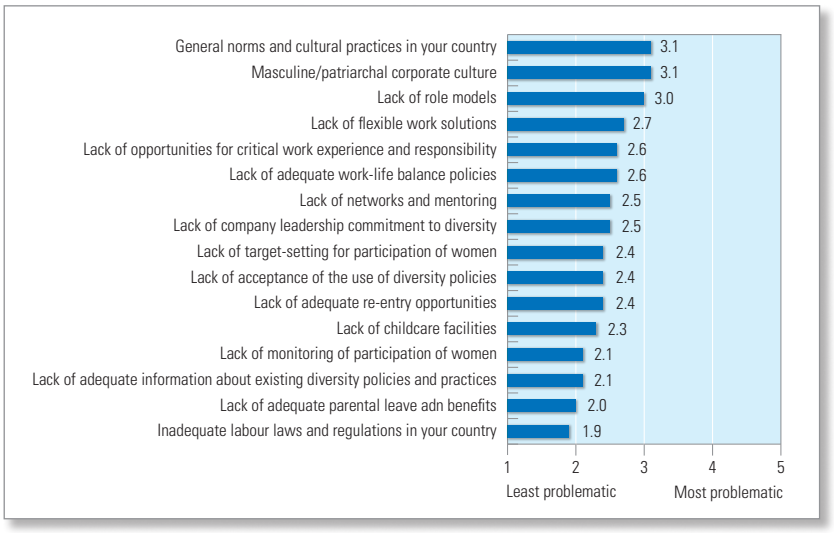
Female share of management employment and female share of labour force, all ages, 2015 or latest available year




Source: OECD (2017), *The Pursuit of Gender Equality: An Uphill Battle.*

Note: OECD partner countries and accession candidates are indicated in grey.

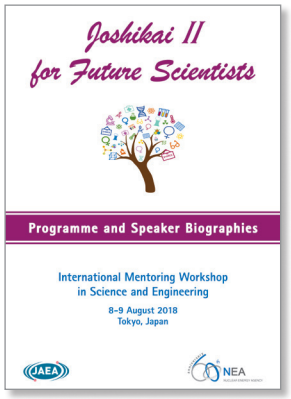
### Cultural and corporate practices are perceived as the main barriers to women's rise to leadership, contributing to a "leaky pipeline" phenomenon




Source: OECD (2012), *Closing the Gender Gap: Act Now.*

# “Joshikai II for Future Scientists: International Mentoring Workshop in Science and Engineering”

## 8-9 August 2018, Tokyo, Japan




The “Joshikai II for Future Scientists: International Mentoring Workshop in Science and Engineering” was held on 8-9 August 2018 in Tokyo, Japan in co-operation with the Japan Atomic Energy Agency (JAEA), to motivate young female students to explore science and engineering careers, and to suggest ways to overcome any barriers that they may face along the way.

The workshop brought together 51 female students from Japanese high schools and junior high schools with highly accomplished women scientists and engineers from Japan and from 3 additional NEA member countries. During the two-day workshop, mentors discussed the lives, careers and experiences of women in STEM fields through panel discussions, dialogue sessions, hands-on activities and group discussions with students, as well as during a special, first-of-a-kind session for parents and teachers.

Opening remarks were delivered by Yuhei Yamashita, the Parliamentary Vice-Minister of the Cabinet Office for the Government of Japan; as well as by Hideki Niizuma, the Parliamentary Vice-Minister of Education, Culture, Sports, Science and Technology (MEXT) in Japan. The Japan Atomic Energy Agency President, Toshio Kodama, and Nuclear Energy Agency Director-General, William D. Magwood, IV also provided introductory remarks. Keynote speeches were given by Ayumi Asai, Associate Professor at the Astronomical Observatory, Graduate School of Science at Kyoto University, and by Cait MacPhee, Professor of Biological Physics at the School of Physics and Astronomy, University of Edinburgh. As was the case at the first workshop in 2017, a special video address by Hélène Langevin-Joliot, distinguished nuclear physicist and granddaughter of Marie Skłodowska-Curie, was shown to the students.

## Workshop leadership

*(From left)*
Marie Oshima;
Sama Bilbao y León;
Sonoko Watanabe;
Cait MacPhee;
Kayo Inaba;
William D. Magwood, IV;
Shizuko Kakinuma;
Yeonhee Hah
and Malgorzata Sneve.

### Workshop co-chairs and mentors

**Marie Oshima:** Professor, University of Tokyo.

**Sama Bilbao y León:** Head of the Division of Nuclear Technology Development and Economics, Nuclear Energy Agency.

**Cait MacPhee:** Professor of Biological Physics, the School of Physics and Astronomy, University of Edinburgh.

**Kayo Inaba:** Executive Vice-President for Gender Equality, International Affairs, and Public Relations, Kyoto University.

**Malgorzata Sneve:** Director of the Regulatory Cooperation Programme, Norwegian Radiation Protection Authority.

**Shizuko Kakinuma:** Director of the Department of Radiation Effects Research at the National Institute of Radiological Sciences National Institutes for Quantum and Radiological Science and Technology (NIRS, QST); and Unit Leader of the QST Diversity Management Unit.

# Impulsando a las futuras líderes en ciencia y tecnología

## (Encouraging future leaders in science and technology)

### 24 September 2018, Ávila, Spain


Building on the two previous, successful events in Japan in 2017 (Chiba) and in 2018 (Tokyo), an NEA International Mentoring Workshop in Science and Engineering was held for the first time in Europe in 2018. The workshop, entitled *Impulsando a las futuras líderes en Ciencia y tecnología*, was held in Ávila, Spain, in the margins of the 44th Annual Meeting of the Spanish Nuclear Safety Society on 24 September 2018. Jointly organised with the Spanish Women in Nuclear Association, the objective of the workshop was the same as those held in Japan: to motivate young female students to explore science and engineering careers, as well as to suggest ways to overcome any barriers that they may face along the way.

The workshop brought together 50 female students from Spanish high schools with 12 highly accomplished women scientists and engineers from Spain. These mentors included Sama Bilbao y León, Head of the Division of Nuclear Technology Development and Economics at the NEA, and Olvido Guzmán, Radiological Protection Specialist at the NEA. Mentors discussed the lives, careers and experiences of women in STEM fields with the students participating in the event.

The workshop was co-sponsored by the Spanish Nuclear Safety Council (CSN), the City Council of Ávila, and the Electric Power Research Institute (EPRI). Opening remarks were delivered by Matilde Pelegri, President of Women in Nuclear, Rosario Velasco, CSN Vice-President, Jose Antonio Gago, President of the Spanish Nuclear Society, and Tina Taylor, EPRI Senior Director R&D and Deputy Chief Nuclear Officer. Other speakers included Yeonhee Hah, Head of the NEA Division of Radiological Protection and Human Aspects of Nuclear Safety, and two Spanish mentors: Susana Falcón, Head of Education and Training in Radiation Protection and Nuclear Technology at Ciemat, and Izaskun García from the Almaraz Nuclear Power Plant.

The workshop was considered a success to be followed by a series of further workshops in other countries in the coming years to promote science and technology careers among young female students.

## Workshop leadership


*(From left)*

Amparo García; Adoración Arnaldos; Olvido Guzmán; Matilde Pelegrí; Sama Bilbao y León; Carolina Ahnert; Yeonhee Hah; Rosario Velasco; William D. Magwood, IV; Patricia Cuadrado; Carolina Pérez; Rosa González; Pilar Sánchez'; Susana Falcón; Teresa Palacio; Izaskun García and Tina Taylor.


JOSHIKAI
for
FUTURE
SCIENTISTS
JAEA

## Observations during the workshops

- It is a valuable experience for high school and junior high school students to have the chance to exchange views and interact with female professionals because it allows the students to meet their role models.
- Studying abroad, especially through student exchange programmes, is a worthwhile way for students to learn about differences and gaps and maximise their chances of succeeding in STEM fields.
- Students may change their career paths at a given point and for this reason various pathways should be made available to them.
- Female students must be passionate about their careers, but it should never be an obstacle for them to maintain their family life.

# Feedback from students

Overall, most students found the workshop to be an enlightening event as it broadened their horizons in relation to society, as well as the world outside their countries. Student feedback on the workshops in Japan revealed that more than 90% felt that they had achieved the objectives that they had set for their participation in the workshop. Having listened to the mentors and discussed different perspectives, the students learned about the possible obstacles in their career paths, as well as more positive ways to prepare for these obstacles. One of the biggest concerns that students expressed at both the 2017 and 2018 workshops in Japan was that of finding a work-life balance.


*Whenever a challenge comes with a solution, we should be brave enough to face it.*

*We can do it because our mentors did!*

*I found that changes and differences are the spice of life.*

Students were also able to clarify their future visions and were highly motivated to pursue their goals with confidence, building upon the knowledge and tips that they had learned during the workshop. Some discovered a new talent, and others changed their visions entirely after completing the two days of activities.


*I saw that I had a talent in forming opinions and making presentations.*

*I expanded my limits after understanding that there are more options to choose from.*

*Before joining this event, I held to the idea of getting a secure career position and sticking to it for a lifetime. Now, I feel it is important to pursue my own interests as well.*

*I had thought that the university I attended and what I studied would directly influence my career path. I learned from mentors that it isn't necessarily true, and there is a wide range of career choices open to me. Now, I'd like to reconsider my course in life.*

*One of the mentors mentioned that she chose her path based on her intuitions and that she had confidence in her choice. I thought that's what I need for my future.*

*The best piece of advice that my mentor gave me is to believe in myself.*

*Books and television can provide information to us, but there's nothing more persuasive than the actual words coming from mentors.*

*It was a great opportunity to be exposed to different values and fresh concepts that I would never have come across myself.*

*It was very unique to learn the perspectives of mentors coming from overseas, where more women participate actively in society than in Japan.*

# Mentors' words of wisdom

*"Keep your eyes and ears open. Make sure that you are not only aware of the opportunities, but also take advantage of them."*

*"If people come to you with an opportunity, grasp it with both hands."*

*"Make sure to try to break any gender stereotypes in the home every day."*

*"Watch your footsteps right in front of you to navigate your future."*

*"You'll solve these challenges if you're happy, if you're lucky and if you have passion."*

*"There's no correct path for your career. There's also no wrong way to balance your career and your family life. So you do whatever is correct for you at that time."*

# Parents and teachers session at Joshikai II

When a young girl is considering pursuing her education and a career in a STEM field, families and teachers can have a large impact on their final decision (OECD, 2015). This echoes views expressed at the first International Mentoring Workshop organised in 2017, when it was underlined that family support is key, and that teachers should be more aware of the positive influence that they can have in encouraging girls to study and work in STEM fields. During both workshops, it was also noted that many of the girls who wish to pursue an education or career in a STEM field often have parents working in the same area. One might ask, however, how can students be supported when they do not have parents working in the field? The role of parents and teachers, regardless of their own background, in encouraging girls to study and work in STEM fields is therefore key.

The report *The Pursuit of Gender Equality: An Uphill Battle* (OECD, 2017) outlines how teachers and parents can help build girls' self-confidence in relation to their abilities in mathematics and science. This can be achieved by both evaluating these abilities and by giving positive feedback on work that they do well, so as to help them in areas where they are weaker without necessarily giving them lower marks. The report also emphasises that training teachers to recognise and address any gender biases that they may harbour will help them to teach more effectively (OECD, 2017). Together parents and teachers can challenge gender stereotypes about STEM-related activities and occupations and thereby allow girls to achieve their goals.

Based on these experiences and observations, the 2018 workshop in Japan included for the first time a special session for parents and teachers. During the session participants explored how to guide young female students who aspire to study or pursue a career in STEM fields. All the invited mentors and a dozen parents and teachers took part in the session, taking note of the following points:

- Many researchers tend not to regard their profession as a "job", but choose to work in the field because they love the subject.
- Pursuing studies in STEM can provide female students with a variety of career options not limited to research.
- Businesses and industries should be more positive and flexible in providing career opportunities in STEM fields to young women who have extensive research experience and a strong technical background.
- Finding a mentor is just as important as becoming a mentor.

> *If I had had the chance to attend a similar event in my high school years, it would have changed my life. This opportunity has shown young women another world.*
>
> – Teacher's comment


# Where to go from here?

Science and engineering are ubiquitous in our daily lives. They have an impact everywhere – from maintaining one's health, to managing waste, ensuring food security, weighing the costs and benefits of electricity, or to mitigating the consequences of accidents and of climate change. An understanding of science and engineering is therefore critical not just for those whose careers depend on it directly.

### Findings from PISA

Boys and girls, and students from various backgrounds, often differ in the ways they engage with science and envisage themselves working in science-related occupations. Gender-related differences in science engagement and career expectations appear more related to disparities in what boys and girls think they are good at and is good for them, than to differences in what they actually can do. Parents and teachers can challenge gender stereotypes about science-related activities and occupations to allow girls and boys to achieve their potential. To support every student's engagement with science, they can also help students become more aware of the range of career opportunities that are made available with training in science and technology (OECD, 2016).

At the same time, more research is needed to determine how parents and teachers can encourage girls and boys to study science and engineering, and what governments and policymakers can do to achieve that end.

The NEA is willing to support more International Mentoring Workshops in both NEA and partner countries. These workshops can provide formative experiences for students, with leaders from nuclear science and technology fields sharing their experiences and helping to answer some difficult questions. As this brochure highlights, OECD analyses demonstrate that girls in many countries have different ideas than boys about science and engineering, that they sometimes lack confidence in themselves, and that they wonder about how they will survive in a labour market that favours men. Women are in fact an underutilised asset that could help to provide the skills and capabilities that all countries will need to respond to an ever-changing, ever more complex world. Many female students would like to be a part of the solution to the world's challenges. NEA International Mentoring Workshops may help give a few young women the confidence they need to pursue their dreams.

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# Acknowledgements


## Joshikai II for Future Scientists: International Mentoring Workshop in Science and Engineering

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*The NEA is also particularly grateful to the National Institutes for Quantum and Radiological Science and Technology (QST), Fukushima University, National Institute of Technology, Fukushima College and Japan Analytical Instruments Manufacturers' Association (JAIMA), who provided their invaluable resources and support to the workshop.*

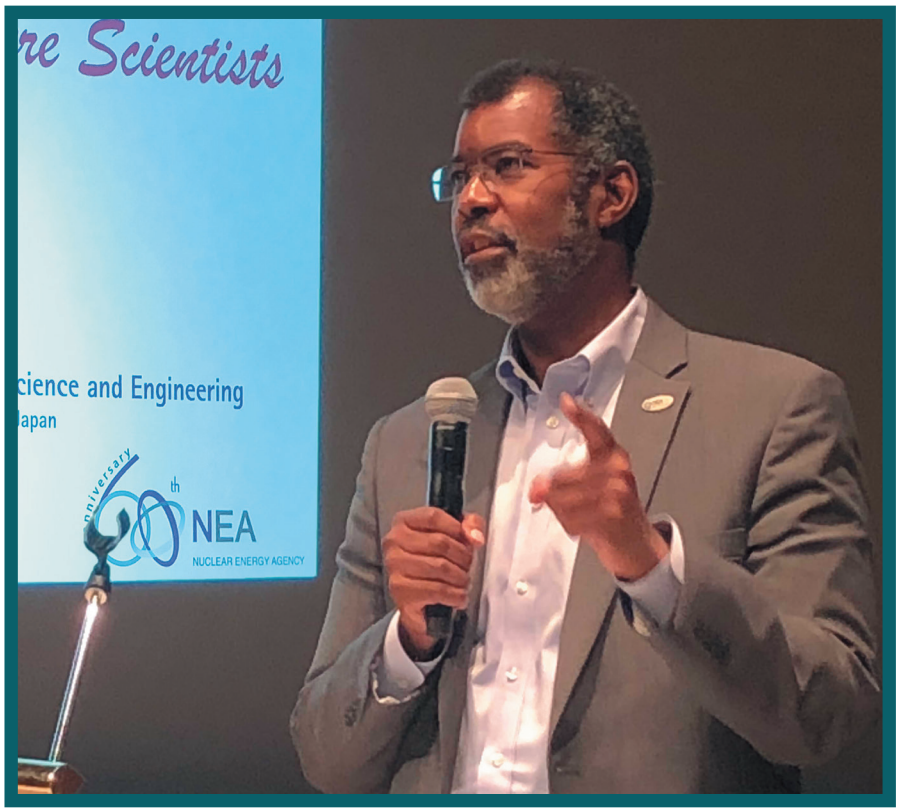
*Additionally, the NEA thanks the Cabinet Office of Japan, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and others in the government of Japan who supported this work and who encouraged this workshop.*

*Finally, the NEA thanks the outstanding Co-chairs, the four incredible mentors, the keynote speakers, the teachers, schools and parents who participated in the activities, and most importantly, the 51 young students who impressed everyone with their maturity and thoughtfulness, and give us so much confidence in the future.*

## Impulsando a las futuras líderes en ciencia y tecnología (Encouraging future leaders in science and technology)

*The NEA thanks Rosario Velasco, Spanish Nuclear Safety Council (CSN) Vice-President and member of the NEA Committee on Nuclear Regulatory Activities (CNRA) for her strong support for this initiative and for having brought the International Mentoring Workshop to Spain. The NEA is particularly grateful to Matilde Pelegri, President of Women in Nuclear, who co-ordinated the organisation of the workshop.*

*The NEA also thanks the sponsors of the workshop – the City Council of Ávila, the Spanish Nuclear Safety Council (CSN), the Spanish Nuclear Society and the Electric Power Research Institute (EPRI) – for their strong support. Finally, we thank the 12 outstanding Spanish mentors for their enthusiasm in the preparation and implementation of the workshop. Last, but not least, the NEA thanks the 50 young students for their great interest in discussing their future studies and careers.*




"We encourage you to consider careers as engineers and scientists.
Your country needs you and the world needs you."

For more information on the International Mentoring Workshop in Science and Engineering, please visit our website: oe.cd/joshikai2 or send an email to: mentoring@oecd-nea.org

**Nuclear Energy Agency (NEA)**
46, quai Alphonse Le Gallo
92100 Boulogne-Billancourt, France
Tel.: +33 (0)1 45 24 10 00
nea@oecd-nea.org www.oecd-nea.org