



PRIFYSGOL  
**BANGOR**  
UNIVERSITY



University of  
**BRISTOL**



# EPSRC CDT in Nuclear Energy Futures

*Nuclear Academics Discussion Meeting, September 6 2023*

Dr Mark Wenman  
Dr Jon Tate



UNIVERSITY OF  
**CAMBRIDGE**

**Imperial College**  
London

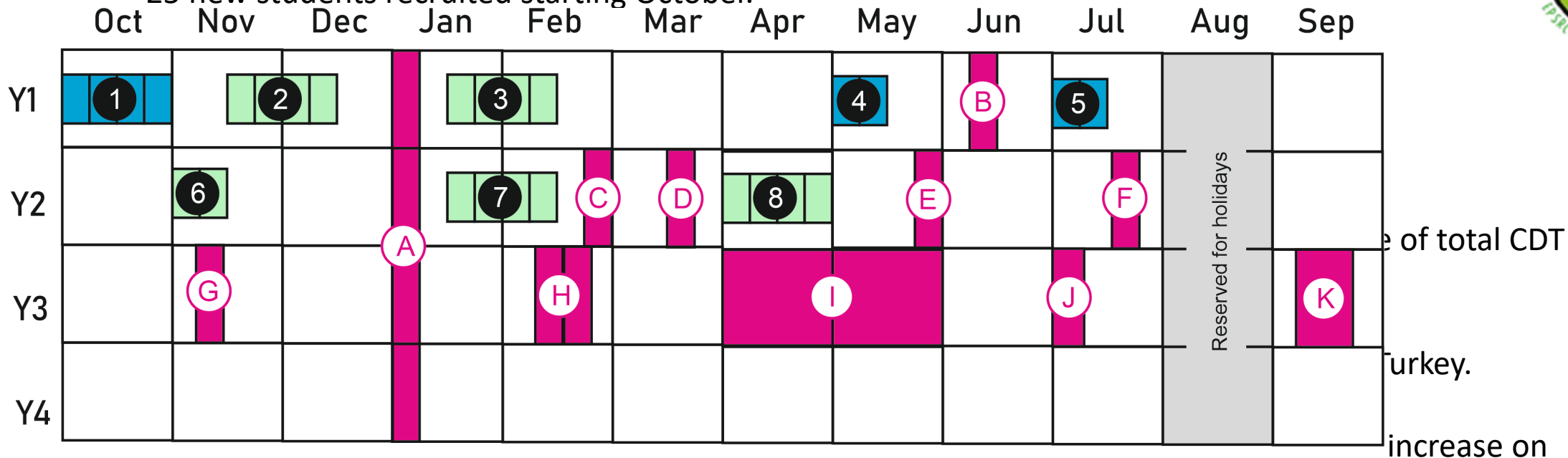


**The Open  
University**



## Cohort 5

- 25 new students recruited starting October.



### TRAINING PROGRAMME

- 1 Introduction to Nuclear Engineering (res. IC)
- 2 Nuclear Safety Management (distance)
- 3 Reactor Operation and Design (distance)
- 4 Nuclear Materials for Reactor Systems (res. UoBr)
- 5 Nuclear Fuel Cycle, Waste Management and Decommissioning (res. BaU)
- 6 Responsible Research and Innovation (distance)
- 7 Nuclear Policy (distance)
- 8 Innovation in Nuclear Technology (distance)

### COHORT BUILDING

- A Winter School
- B TRIGA test reactor, Romania
- C Public Engagement Workshop
- D Cambridge Science Festival
- E SCK-CEN, Belgium
- F Great Exhibition Road Festival
- G Sellafield, Westinghouse and Culham
- H Entrepreneurship Training
- I Grand Engineering Challenge
- J Student Conference
- K US National Labs

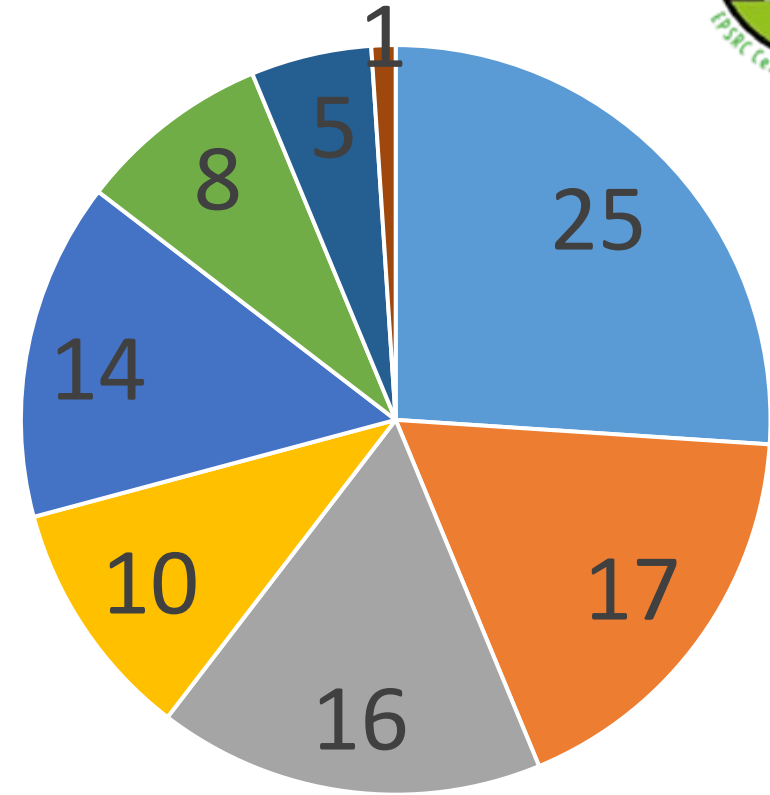
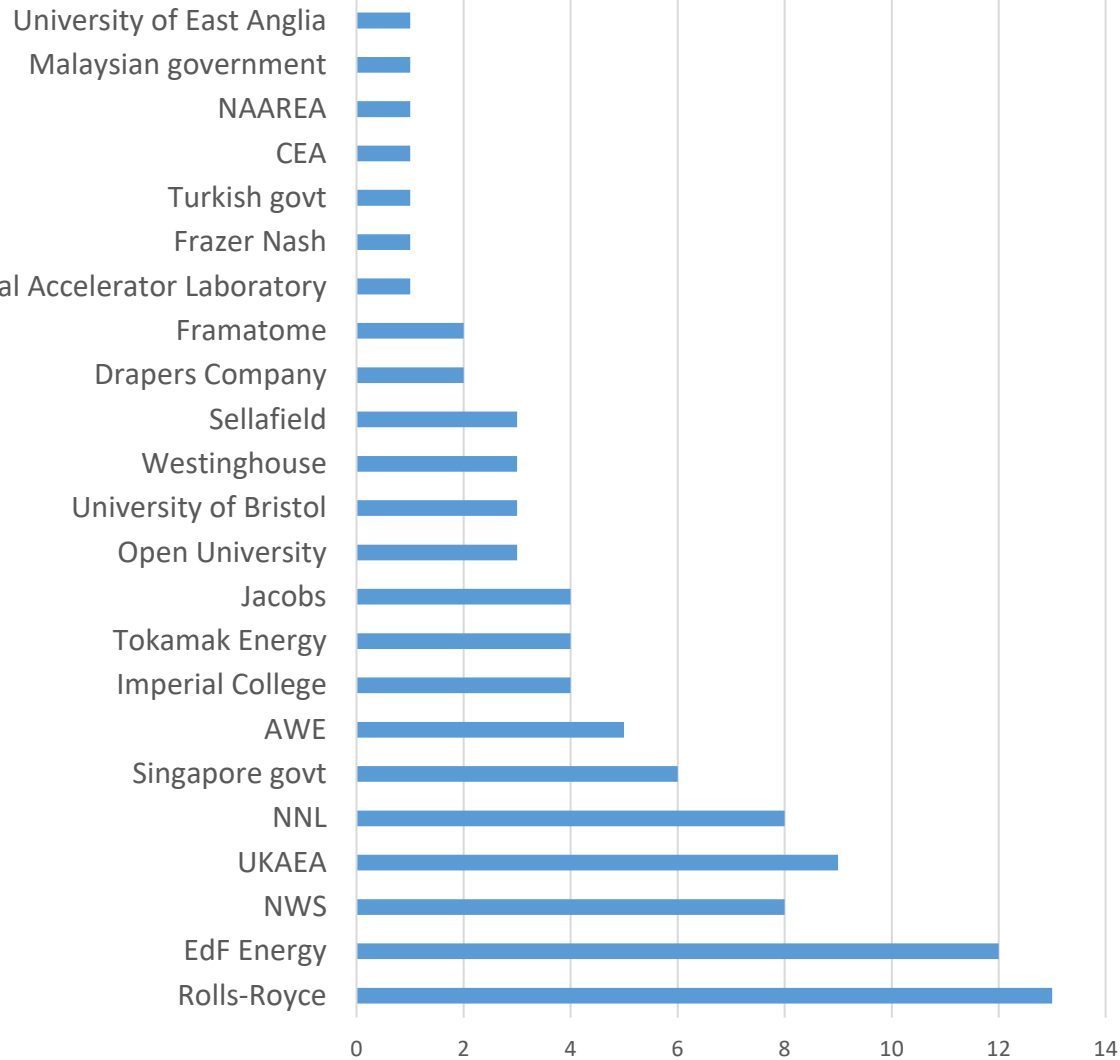
time study for

# Statistics

## Research



SPONSORS



- Reactors
- Fusion
- Advanced Reactors
- Waste
- Fuel Fabrication
- Cross-cutting technologies
- Policy
- Medical



# Impact

## Papers

### 2021

**Dominic J Brennan** and Geoff T Parks, Acceleration of Multi-objective Optimisation Calculations for Nuclear Burnup Studies using Intra-optimisation Objective Expansion, Mathematics and Computation, October 2021

**Tristan Calvet**, Yiqiang Wang, Minh-Son Pham, Catrin M. Davies, Prediction of J-Integrals at Defects in W-9CR Steel Sandwich-Type Cooling Pipes, Pressure Vessels and Piping Conference, July 2021

**Megan W. Owen**, Michael J.D. Rushton, Lee J. Evitts, Antoine Claisse, Mattias Puide, William E. Lee, Simon C. Middleburgh, Diffusion in doped and undoped amorphous zirconia, Journal of Nuclear Materials, 2021

Colin G. Windsor, Jack O. Astbury, **James J. Davidson**, Charles J.R. McFadzean, J. Guy Morgan, Christopher L. Wilson and Samuel A. Humphry-Baker, Tungsten boride shields in a spherical tokamak fusion power plant, Nucl. Fusion, 2021

D. Kumar, **J. Hargreaves**, A. Bharj, A. Scorrer, L.M. Harding, H. Dominguez-Andrade, R. Holmes, R. Burrows, H. Dawson, A.D. Warren, P.E.J. Flewitt, T.L. Martin, The effects of fusion reactor thermal transients on the microstructure of Eurofer-97 steel, Journal of Nuclear Materials, Oct 2021

**Mustafa J. Bolukbasi**, Simon C. Middleburgh, Scott Vrtiska, William E. Lee, Effect of ZrB<sub>2</sub> and UB<sub>2</sub> Discrete Burnable Absorber Pins on fuel reactivity, Progress in Nuclear Energy, October 2021

**Gareth F. Stephens**, Yan Ren Than, William Neilson, Lee J. Evitts, Mark R. Wenman, Samuel T. Murphy, Robin W. Grimes, Aidan Cole-Baker, Susan Ortner, Natasha Gotham, Michael J.D. Rushton, William E. Lee, Simon C. Middleburgh, The accommodation of lithium in bulk ZrO<sub>2</sub>, Solid State Ionics, Dec 2021

### 2022

**Thomas Griffiths**, Richard Pearson, Michael Bluck and Shutaro Takeda, The commercialisation of fusion for the energy market: a review of socio-economic studies, Prog. Energy, 2022

**Jones, E.**, Sciard, J. & Corcoran, J. The Influence of Creep Induced Grain Boundary Separation on Electrical Non-destructive Evaluation Measurements. *J Nondestruct Eval* (2022).

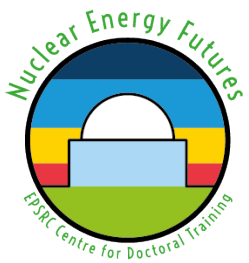
**D.J. Brennan** and G.T. Parks, "Intra-optimisation Objective Expansion Applied to Nuclear Fuel Design and Investigation of its Effects on Search Space Coverage," Proceedings of the International Conference on the Physics of Reactors, PHYSOR, Pittsburgh, USA, May, 2022.

**Hargreaves, J.**, Kumar, D., Dawson, H., Harding, L., Andrade, H., & Martin, T., Microanalysis of the Effects of Tokamak Thermal Transients on Eurofer 97 Steel, Microscopy & Microanalysis, Jul 2022

Elena V. Rosa Adame, Andrius Aleksa, Mark R. Gilbert, Martin Cuddy, **Tristan Calvet**, Zsolt Vizvary, Nicolas Mantel, Francesco Maviglia, Jeong Ha You, Qualification & testing of joining development for DEMO limiter component, Fusion Engineering and Design, July 2022

T.A. Haynes, **A. Battistini**, A.J. Leide, D. Liu, L. Jones, D. Shepherd, M.R. Wenman. Peridynamic modelling of cracking in TRISO particles for high temperature reactors. J. Nucl. Mater. **576** (2023).154283

**A. Battistini**, T. A. Haynes, Daniel Shepherd, M. R. Wenman A finite element analysis of the residual stresses in as-fabricated TRISO coated particle fuel. J. Nucl. Mater. **586** (2023) 154659.



# Impact

## Posters/presentations

### 2020

High Temperature Plant: Materials, Inspection, Monitoring & Assessment, Virtual, October 2020

The Nuclear Materials Conference, Virtual, October 2020

Universities Nuclear Technology Forum, Virtual, November 2020

### 2021

Pressure Vessels & Piping, Virtual, July 2021

European Nuclear Young Generation Forum, Virtual, September 2021

NuFuel, Bangor University, September 2021

International Conference on Fusion Reactor Materials, Virtual, October 2021

The International Conference on Mathematics and Computational Methods Applied to Nuclear Science and Engineering, American Nuclear Society, Virtual, October 2021

TopFUEL, Virtual, October 2021

### 2022

International Conference on Advanced Ceramics and Composites, Virtual, January 2022

Advanced Technology Fuels (ATLANTIC) Consortium conference, Virtual, January 2022

The Minerals, Materials and Materials Society, Anaheim, USA, Feb-Mar 2022

18th European Mechanics of Materials conference, Oxford, UK, March 2022

Materials Research Society, Honolulu, USA, May 2022

Synergistic utilisation of Informatics and Data centric Integrity engineering (SINDRI) conference, Bristol, UK, May 2022

International Conference on Physics of Reactors 2022 (PHYSOR22), Pittsburgh, USA, May 2022

Computer Simulation of IRadiation Effects in Solids (COSIRES2022), Porquerellos, France, May 2022

Ultra-High Temperature Ceramics: Materials for Extreme Environment Applications V, Salt Lake City, USA, June 2022

Progress in Non-destructive Evaluation, San Diego, USA, June 2022

Universities Nuclear Technology Forum, Bangor, UK, June 2022

20th International Symposium on Zirconium in the Nuclear Industry, Ottawa, Canada, June 2022

11th European Solid Mechanics conference, Galway, Ireland, July 2022

FuseNet, Padova, Italy, July 2022

Microscopy and Microanalysis, Portland, USA, Jul 2022

19th International Conference on Experimental Mechanics, Krakow, Poland Aug 2022

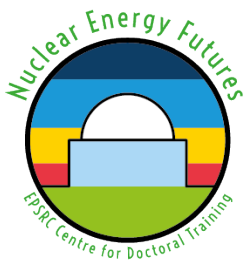
Symposium on Fusion Technology, Dubrovnik, Croatia, Sep 2022

International Conference on Atom Probe Tomography & Microscopy, Nanjing, China, October 2022

The Nuclear Materials Conference, Ghent, Belgium, Oct 2022

International Symposium on Metal-Hydrogen Systems, Perth, Australia, Oct-Nov 2022

Transformative Science and Engineering for Decommissioning (TRANSCEND), Glasgow, UK, November 2022



# Impact

## OUTREACH 2020

**Megan Owen** (Talk) – Ada Lovelace Day, Virtual, October 2020

## 2021

**Megan Owen** (Media appearance) – British Science Week, Virtual, February 2021

**Megan Owen** (Talk) – Women in STEM, Virtual, March 2021

**Megan Owen** (Media appearance) – BBC Radio Cymru, March 2021

**Megan Owen** (Media appearance) – Small nations, big ideas, July 2021

**Gareth Stephens** (Community) – EPSRC focus group representing PhD students, July 2021

**Mercedes Baxter Chinery** and **Jamie Davidson** (Talk) – Physics at Work, Virtual, September 2021

**Phil Smith** (Podcast) – PGRcast, Bristol, UK, 2022

## 2022

**Megan Owen** (Media appearance) – Welsh government carbon story, January 2022

**Megan Owen** (Activity) - M-SParc Women in STEM Day, Gaerwen, February 2022

**James Hargreaves** (Talk) – Climate Action Day, Bristol, UK, April 2022

**Megan Owen** (Talk) - Science Community in Cardiff, May 2022

**Tristan Calvet, Susannah Lea** and **Tom Ross** (Activity) – New Scientist Live: Nuclear Institute stand, London, September 2022

**Feena Arey** (Talk) - Women in Engineering Careers, University of Bristol, Bristol, October 2022

**Rosie Smart** (Media appearance) – Transformative Science and Engineering for Decommissioning (TRANSCEND), Glasgow, UK, November 2022

**Dominic Brennan** (Panel) – COP27, Sharm El-Sheikh, Egypt, November 2022

## BUSINESS, ENTREPRENEURSHIP & CONTINUOUS PROFESSIONAL DEVELOPMENT 2021

**Dominic Brennan** – Director - Six Degrees Cambridge Sustainability Consultancy

## 2022

**Thomas Griffiths** – Patent - CCFE Process Systems Code

**Feena Arey** - CPD - National Examination Board in Occupational Safety and Health (NEBOSH)

**Feena Arey** – CPD - Construction (Design and Management) 2015 Regulations (CDM2015) - Institute of Civil Engineers

**Phil Smith** – CPD - Future Learn: Global Citizenship, Virtual, November 2022

## COLLABORATIONS, PLACEMENTS & SECONDMENTS

### 2022

**Edmund Jones** – University of Cincinnati, Cincinnati, USA

**Fabio Martini** – Los Alamos National Laboratory, Los Alamos, USA

**Joseph Pollard** - Oxford Sigma, Oxford, UK

**Sarah Vallely** – Los Alamos National Laboratory, Los Alamos, USA

**Mustafa Bolukbasi** – UK Space Agency

## THIRD-PARTY FUNDING

### 2022

**Jamie Davidson** – Royce - Gas Pycnometry at the UKAEA Materials Research Facility

**Jamie Davidson** – National Nuclear User Facility - Laser Induced Breakdown Spectroscopy at University of Manchester



# Impact



## AWARDS, RECOGNITION AND OTHER ACHIEVEMENTS

### 2021

**Tristan Calvet** – Regional finalist (South-east UK) – Speaking competition, Young Generation Network, Nuclear Institute, May 2021

**Tristan Calvet** – Reviewer - Pressure Vessels and Piping Conference, July 2021

**Dominic Brennan** - Best student paper award - The International Conference on Mathematics and Computation Methods Applied to Nuclear Science and Engineering, American Nuclear Society, October 2021

### 2022

**Rosie Smart** – Best Nuclear MSc Dissertation – Awarded by Quintessa, Bristol, UK, April 2022

**Feena Arey** – Invited speaker - Women in Engineering Careers, University of Bristol, Bristol, October 2022

**Dominic Brennan** – Panel member - COP27, Sharm El-Sheikh, Egypt, November 2022

**Ryan Stroud** – Invited speaker - National Nuclear Users Facility Symposium, Manchester, December 2022

### 2023

**Susannah Lea** – Best Presentation – University Nuclear Technology Forum, University of Bristol, July 2023

\*Data covers up to  
September 2022 – 2023  
data will be collected  
over next 1-2 months\*



# Cohort and Outreach Activities

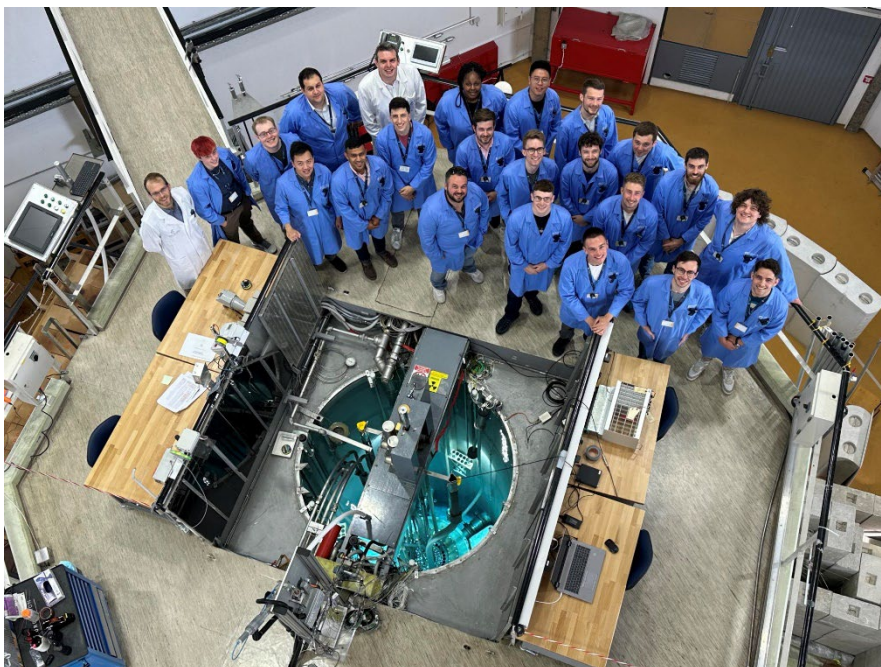


Dr Sannah Van Balen  
Director, 100,000 Genomes Project

▲ BBC Sci Comm Workshop / ▼ Cohort 4 JSI Slovenia



▲ L Cohort 3 ICL Science Festival / ▲ R Cohort 3 Cambridge Science Festival



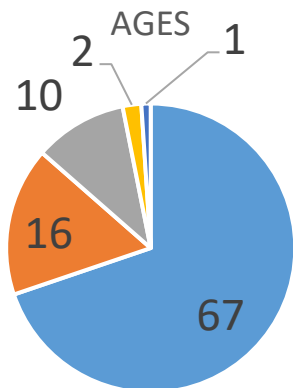
▲ Cohort 1 US National Labs

▲ Cohort 3 ITER & CEA

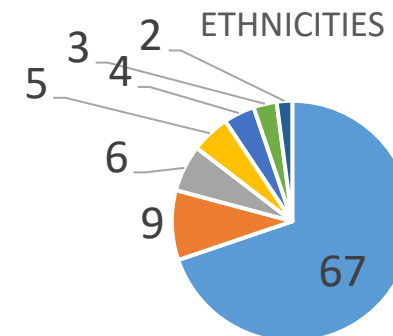


# Statistics

## Diversity

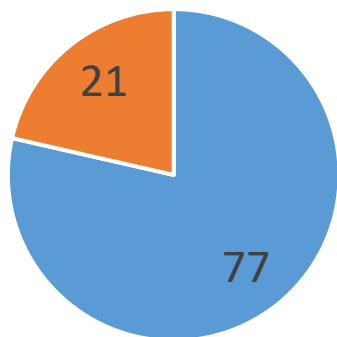


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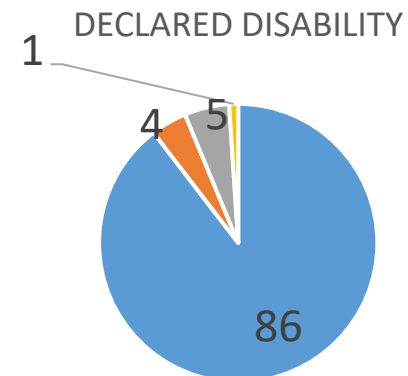


■ White ■ Asian ■ Black  
■ Chinese ■ Prefer not to say ■ Other  
■ Mixed

## GENDER



■ M ■ F



■ No known disability ■ Known disability  
■ Prefer not to say ■ Unknown