



Growing skills for **R**eliable **E**conomic **E**nergy for **N**uclear

The **GREEN** Centre for Doctoral Training

Professor Colin Boxall, Lancaster University
Standing in for: Professor Scott Heath, University of Manchester



Engineering and
Physical Sciences
Research Council



Overview



Building on the success of predecessor CDTs Nuclear FIRST and NGN, the mission of GREEN is, in collaboration with industry, to provide high quality research training in the science and engineering underpinning nuclear technologies (primarily TRLs 1-3), developing the subject matter experts of tomorrow

2019-2027: target of 90 PhD students – likely to hit 120
£6M from EPSRC, £4.1M from Industry, £2.8M from HEIs



16 Industry partners



Engineering and
Physical Sciences
Research Council



Model



Three submission rounds for project proposals

- Based on half studentships
- Halves funded by UKRI/EPSRC, industry partners or Universities
- Driven by project needs, halves are matched to make whole studentships
- **Resulting in leverage of 2:1 with respect to EPSRC funded studentships**

Management structure

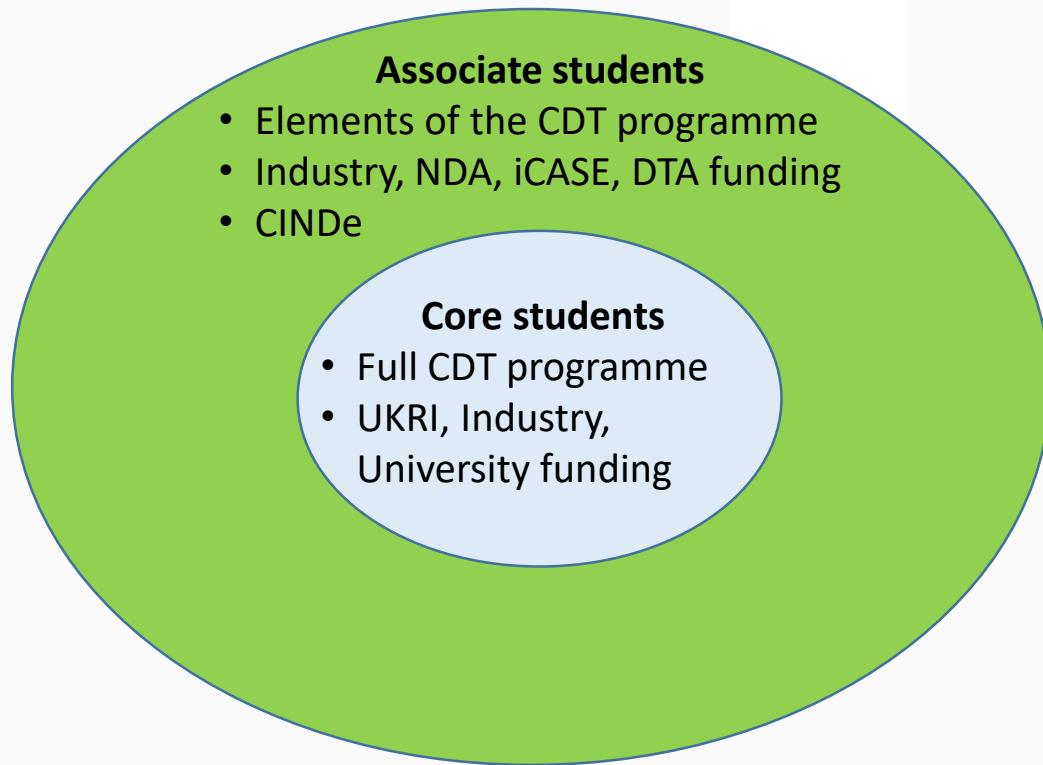
- **GREEN Strategy via Industrial Advisory Board:** Meetings of all HEI & non-HEI partners as required and annually at Winter School
- **GREEN Management via GREEN Management Board:** Meetings of 5 HEIs every 6 weeks by conference call and face-to-face every quarter
- **Oversight of GREEN student experience:** panel of 3 externals (B'Ham, Strathclyde, NNL)



Engineering and
Physical Sciences
Research Council



Structure



Full time and part time routes available

University & Industry-based projects (“EngD” route) available

Timetable:

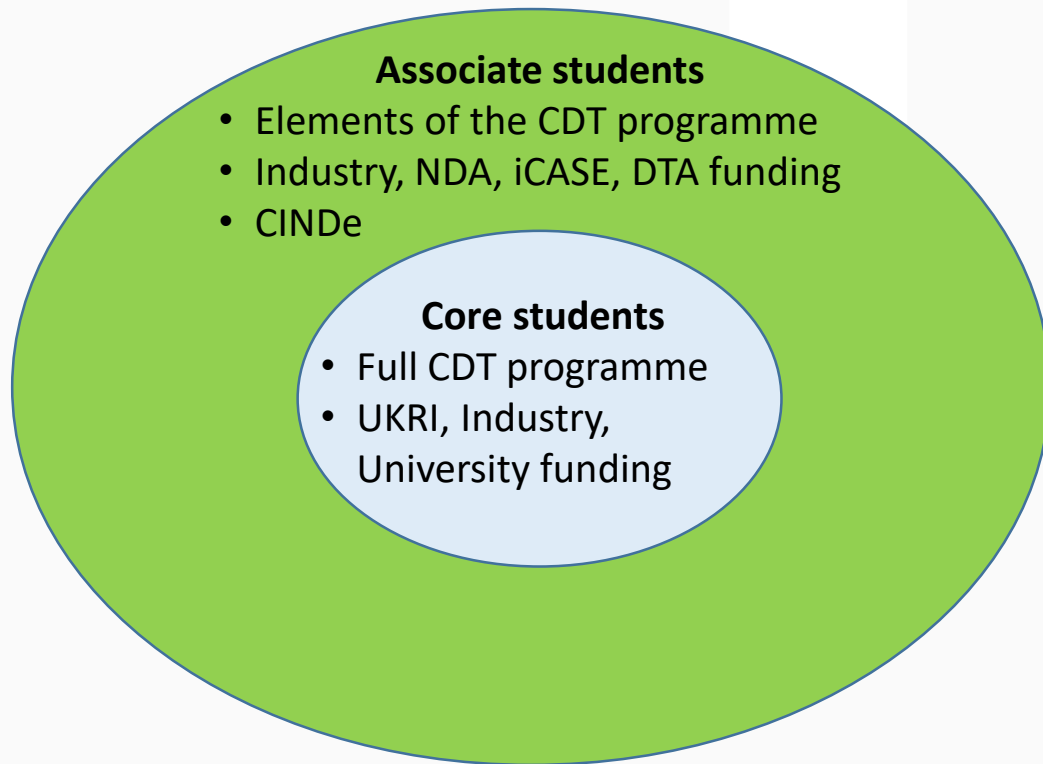
4 Months Bespoke Taught Programme, Sept-Dec

- 12 week ‘Introduction to Nuclear Energy’
- No specific nuclear background required
- Business Games, Exercises, Case Studies
- Strong ‘real life’ contribution
- Site visits – Sellafield, Springfields, Heysham
- **2022/3 – visit to Research Reactor, Taiwan – more anon**

Winter School, January

- 3 day residential, >200 attendees

Structure



6 Months Student Specific Training (SST) – Feb-Jul

- SST1 – Literature review and report
- SST2 - Project specific training and report
- Presentation and poster days
- End-of-year student conference



36 Months PhD Research

- Host HEI PGR QA system
- Co-supervision
- **EngD Route**
- Ongoing CPD and steps towards SQEP status
- Training - Responsible Research and Innovation; Risk awareness; International Nuclear Law; Careers

Throughout - Outreach

- Public engagement training and events – MOSI, Jodrell Bank, Bluedot, ScienceX at Trafford Centre, Schools

Student numbers: Cohorts 1-3 – 53 FTE



Current Nuclear Programmes

- Spent Nuclear Fuel and Nuclear Materials Management 5
- Decommissioning and Clean-Up 6
- Geological Disposal 3
- Current Operating Reactors 7
- New Build Reactors 6
- Nuclear Security 1

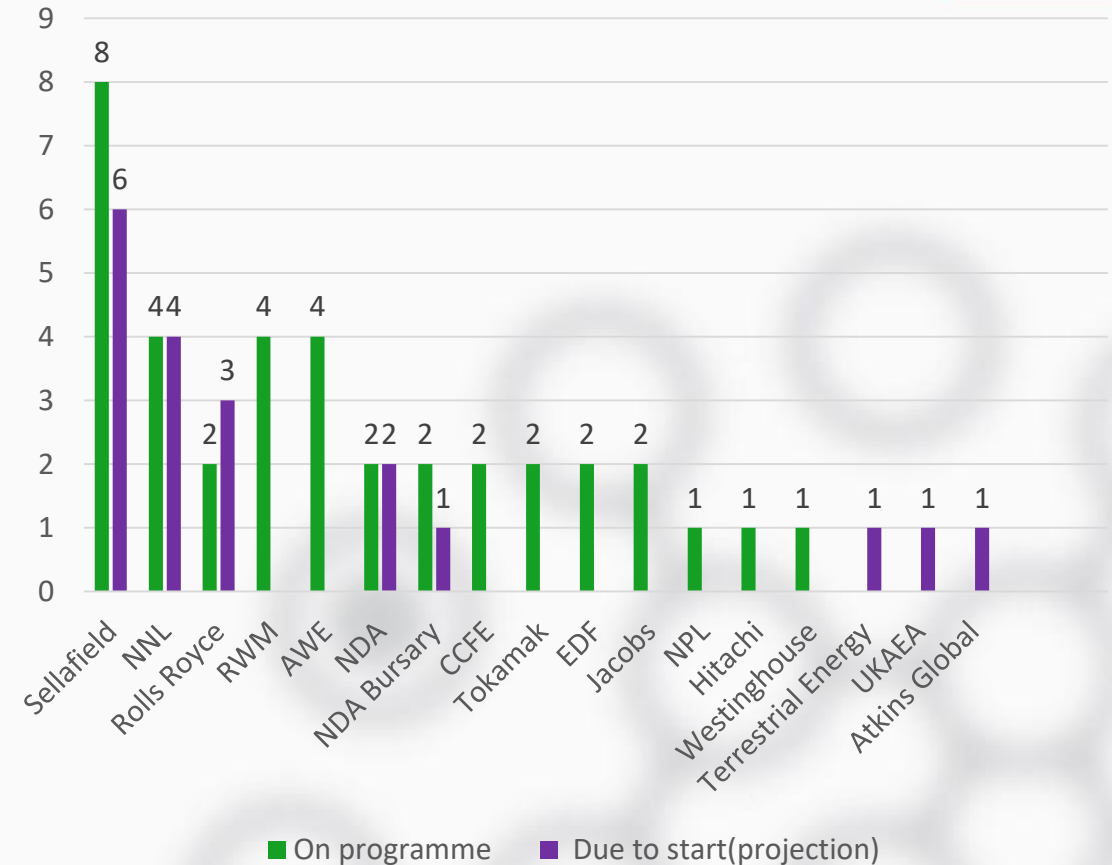
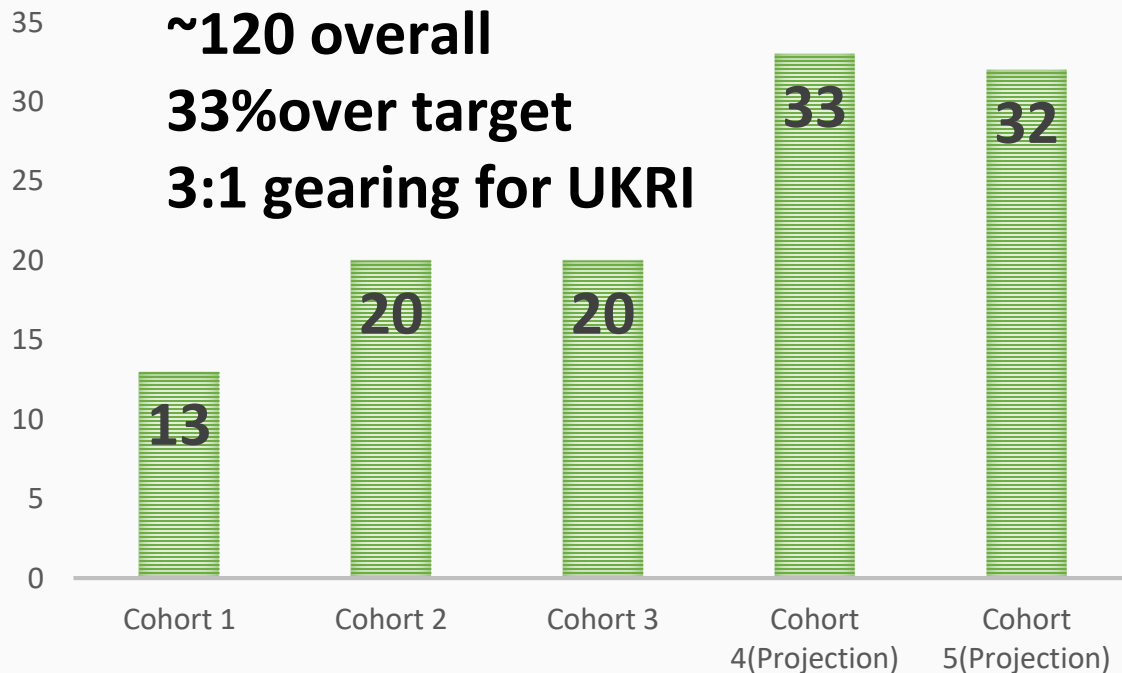
Future Nuclear Energy

- Fusion 6
- Future Fuel Cycles 4
- Advanced Reactors: Liquid Metal, Molten Salt, Gas Cooled 11
- Co-generation

Nuclear Energy in a Wider Context

- Regulation 2
- Manufacturing 1
- Interaction of Infrastructure and Environment 2
- Societal Issues including Economic & Finance 8
- Management 3

Cohorts 4 and 5...in partnership



Use of National Facilities



Manchester

- RADioactive waste management & Environmental Remediation (RADER), CRR, DCF; NFCE

Lancaster

- ADRIANA; Lancaster Accelerator Mass Spectrometer; UTGARD Phase I & 2

Leeds

- MUFFIN (MULTiphase Fluid Flow In Nuclear systems)

Sheffield

- MIDAS, HADES (High Activity Decommissioning Engineering Science)

Cohorts 1-3: EDIA & COVID impacts



Gender	All Cohorts
Male	31
Female	21
Non-Binary	6 or less
Transgender	6 or less
Home/International	
Home	46
EU/International	7
Age	
21-24	33
25-29	12
30-39	7
40+	6 or less

2019 Intake – Cohort 1

Winter School held, then COVID. CDT office operating remotely; Redesign of SST2 and PhD phase; UKRI extensions managed by home HEIs

2020 Intake – Cohort 2

Winter School cancelled, replaced with virtual sessions. Taught programme & SST1 on-line; SST2 socially distanced; Poster session by Mozilla Hubs

2021 Intake – Cohort 3

In person teaching resumed – but no site visits. Winter School returned; Summer School created



Engineering and
Physical Sciences
Research Council



Alumni and The Future



The Future

- Cohort 4 – a return to normal delivery of taught course, the winter school, student seminar events and site visits. Outreach events now in person once more
- Cohort 5 – recruitment ongoing,
- Taught course refresh – inclusion of fusion module?
- National Lab tour, USA, incl ORNL and INL
- Taiwan, political situation permitting
- Interim review

Finally – Key Output - Alumni

- 70% of Nuclear FIRST and NGN graduates in nuclear
- 90% in technical careers



Engineering and
Physical Sciences
Research Council

