

Nuclear Technology Special Interest Group Climate Change Action Plan

<p>Introduction Overall problem statement</p>	<p>The Nuclear Technology Special Interest Group (NTSIG) notes IChemE's position on climate change.</p> <p>The action plan presented here follows on from this statement and forms part of IChemE's delivery against several of the commitments set out, namely to:</p> <ul style="list-style-type: none"> ■ develop detailed positions and action plans for economically sustainable and secure transitions to net zero carbon emissions in all areas of chemical engineering practice and regions where members are active. <p>It will also help underpin work on several other commitments, including:</p> <ul style="list-style-type: none"> ■ provide policy advice to governments based on chemical engineering experience and expertise; ■ engage in public outreach activities with businesses and communities, to understand their concerns about the threats and uncertainties posed by climate change; ■ develop training courses and mandate continuing professional development (CPD) to provide the knowledge and skills to support members in the transition to a net zero carbon economy and in climate change adaptation; ■ encourage all regional members groups and special interest groups to hold webinars and seminars as part of the CPD programme, to enhance skills and knowledge in pursuit of zero carbon futures and understanding of climate risks, and to engage with the wider membership.
<p>Specific problem statement</p>	<p>The problem is to be effective and realistic as a special interest group for nuclear technology which is dominated by governments and government policies, where the full support of the ICHEME Executive is required to put forward plans that can make a difference within the Climate Change Action Plan initiatives being promoted. There is value in forming partnerships to bring together nuclear technologies with other chemical processes and chemical engineering interests, which will reduce emissions in the UK and other nations.</p> <p>To develop an approach in 2020 to the NTSIG specific problem statement, the NTSIG consulted its members on the IChemE's position statement on climate change, in order to provide a group view. Members were asked to complete an online web form on aspects of nuclear technology, outside of the primary function of zero carbon electricity generation, that could be part of the technological aims of the IChemE climate change strategy; ie:</p> <ul style="list-style-type: none"> ■ a means of combatting the causes of climate change through reducing the numbers of heat generating facilities and ships emitting greenhouse gases;

	<ul style="list-style-type: none"> ■ a means to mitigate against the effects of climate change through adaption of and development of resilient and robust processes that reduces the carbon dioxide and harmful gases emitted; ■ a means of halting or reversing the effects of climate change by further developing carbon capture and storage processes, using both technological, and nature. <p>In total there were 33 responses, mainly from the UK, but with responses from Austria, Australia, New Zealand, and the USA. There was also a range of backgrounds, mostly industry, but with regulator and academia also represented. Importantly, the areas of interest of the responders covered aspects of the nuclear fuel cycle and nuclear reactor types and applications.</p> <p>There was some consensus that nuclear technologies do and can aid decarbonisation of processes in the following applications:</p> <ul style="list-style-type: none"> ■ electrolysis of water for hydrogen production with hydrogen replacing hydrocarbon fuels or being added to natural gas to lower carbon dioxide output; ■ desalination of salt water that uses nuclear power to replace fossil fuel plants, including gas power stations, especially in the Middle East and USA; ■ using the hot gases from nuclear HTGR's (Hot Temperature Gas Reactor) to provide a high temperature process heat supply as is being developed in China (200MW); ■ cogeneration plant producing hot water and/or steam for local domestic/commercial heating grids; ■ using nuclear reactors with some load balancing capabilities to complement other renewable energy generation sources for more consistent generation levels through their turn down periods. <p>There were other areas highlighted that are not core chemical engineering processed, such as marine power (ie shipping) where smaller nuclear reactors and floating nuclear power plants can reduce emissions. This includes the proposals for producing heat and electricity in the Arctic.</p> <p>One aspect that was highlighted amongst the responders was the implementation of Small Modular Reactors (SMR) and Advanced Modular Reactors (AMR) for some of the applications requiring less than a Gigawatt, for example petrochemical and chemical processes and where staged implementation of the larger Light Water Reactor (LWR) units are required, that are currently planned in the UK and globally.</p> <p>The NTSIG plans to develop these areas in more detail, in accordance with the final IChemE position statement, and in order to produce more specific position statements relating to the roles nuclear technologies and nuclear reactors can fulfil to reduce carbon dioxide emissions in combatting, or reducing, the future rates of detrimental emission driving climate changes due to global warming.</p>
<p>What actions need to be taken to address the issue?</p>	<p>The NTSIG will plan to develop the aforementioned areas in more detail, in accordance with the final IChemE position statement, in order to produce a more specific position statement relating to the role of nuclear technology in combatting climate change.</p> <p>The five specific areas of interest listed above from the survey of our members will help inform the NTSIG Forward Action Plan, which along with an Engagement Plan and an Education Plan, will form the three pillars of work that become part of the focus for the NTSIG for the next year.</p> <p>The NTSIG needs to engage with its members to produce more educational webinars as well as hold discussion forums to explain how the use of nuclear technologies and nuclear reactors and within chemical, petrochemical and desalination plants engineered as combinations of technologies can support the IChemE's climate change action plan and those climate action plans being pursued by others.</p>

	<p>NTSIG can produce case studies and concept feasibility studies on how the use of nuclear reactor power plants instead of fossil fuel power plants will decrease the volumes of carbon dioxide being produced and emitted, or having to be stored anywhere in the World.</p> <p>NTSIG will review the use of nuclear batteries for storage of energy to help sustain the power output of natural energy sources of renewable energy.</p> <p>It is acknowledged that in the UK nuclear decommissioning works and some nuclear waste processes, sustainability requirements are becoming embedded as a policy requirement to support long term operations. However, further engagement with the decommissioning works and some nuclear waste processes organisations is required to understand how sustainability requirements are being addressed in other organisations / countries.</p> <p>It is noted that the implementation of new technologies and nuclear power plants and research are funded by governments and/or through aid programmes, as for East Europe by the USA, or by Russia and China for foreign relations reasons by their government policies, and require significant official engagement to successfully proceed to implementation. The UK is not active in these areas compared with USA, Russia, China, and France currently. The IChEME can along with other professional bodies remind members of developments.</p>
<p>What skills, training gap or facilitation requirements need to be addressed?</p>	<p>One of the focuses of the NTSIG for the coming year will be to promote an Education Plan, to track and promote developments and support members to be aware of and understand the proliferation of knowledge and information; so that students and those already in industry are able to be informed and kept up to date with nuclear technologies and achievements. The International Atomic Energy Agency is currently promoting wider dissemination of nuclear applications that are beneficial including Climate Change Action Plans.</p> <p>The NTSIG is requesting an Education Lead to the engagement process and the creation and delivery of new training with universities, government and non-government organisations, as well as with the IChemE.</p> <p>Many of the decisions on nuclear research, projects and facility building are made by governments and within the policy planning process, and because of this delivering the training will require significant engagement with different authorities to be adopted. Cooperation with organisations may be necessary.</p>
<p>What actions should the SIG and its members take to support delivery of the above actions?</p>	<p>The NTSIG will engage with its members to provide the education webinars and discussion forums on nuclear technologies and applications and projects, combining nuclear reactors with chemical and other processes to stimulate interest and produce information and events.</p>
<p>What actions will you encourage others to take?</p>	<p>The NTSIG will join with other IChEME special interest groups and members, not in specific special interest groups, to promote the awareness and engage people to join the NTSIG tasks and to provide ideas and inputs that encourage others to join in and contribute.</p>
<p>Next steps</p>	<p>In the next 12 months, we will:</p> <ul style="list-style-type: none"> ■ have new roles within the NTSIG to support development and delivery of new educational material to support understanding of new nuclear technologies;

- have additional engagement with members to understand where we can most benefit and align with the IChemE's sustainability goals;
- continue our programme of webinars looking at new and existing nuclear technologies;
- engage with other organisations including the Nuclear Institute, to discuss and understand how to best communicate the NTSIG aims to a wider and interested audience.

In the next 24 months, we will:

- organise engagements, especially looking at hosting a nuclear specific conference within the UK.

Note: Any opinions are those of the authors and do not necessarily represent those of IChemE.