

Bernard Bigot

(1950–2022)

Director-general of ITER, the world's largest fusion experiment.

Bernard Bigot said, “We try to understand nature, and then we try, within human limitations, to recreate what nature shows us.” He was referring to fusion energy, to which he devoted the final years of his life. The statement illuminates equally well his contributions to society as a chemist, physicist, educator, administrator and inspirational leader. He was a committed civil servant, adviser to French presidents, former administrator-general of the French Alternative Energies and Atomic Energy Commission (CEA) and, from 2015, director-general of the ITER Organization in southern France, which oversees the world's largest experimental fusion reactor. He has died in office aged 72.

For Bigot, the universal availability of massive carbon-free energy sources was a central goal in his mission to bring about a better world. ITER, a 35-country collaboration to build the first industrial-scale fusion facility, clearly fell into this vision. When he arrived, the project was experiencing difficulties that threatened its very existence. Starting with a series of structural and managerial reforms, including a move to centralized decision making and the creation of cross-organizational project teams, Bigot put it back on track. He eventually conquered the twin challenges of the machine's complexity and its manufacture being dispersed across three continents. Many have argued that he saved ITER and restored momentum to the quest to make fusion power part of society's future.

Born in Blois in the Loire Valley, France, in 1950, Bigot won admission to the *École Normale Supérieure* (ENS) of Saint-Cloud, where he pursued two teaching degrees. In 1979, he graduated with a PhD in theoretical chemistry from the Pierre and Marie Curie University in Paris. He led research teams at the ENS and at the Institute of Research on Catalysis in Lyon, in both cases building on his growing reputation as a modeller of real systems, such as heterogeneous catalysis systems, as well as photochemistry and condensed-state chemistry. He organized the transfer and transformation of the ENS from Saint-Cloud to Lyon in the mid 1980s and was appointed director of the century-old institution in 2000.

Yet his sense of a duty to advance the common good led him from academic research to civil service, where he made his greatest contributions. Both the fission of atomic nuclei and their fusion are potential sources



of almost unlimited energy. Fission is now globally industrialized: in France, 56 reactors account for 70% of electrical power generation. Fusion is still in its experimental phase, and ITER is designed to demonstrate its technological and industrial feasibility. At its heart is a tokamak, a doughnut-shaped vacuum chamber roughly the weight of the Eiffel Tower, surrounded by magnetic coils. In the chamber, a gas of hydrogen isotopes at high temperature forms a plasma in which nuclei can fuse in the same reaction that powers the Sun, producing energy as heat.

Bigot's contributions to carbon-free energy began in fission, as he helped to shape France's nuclear policy. From 2002 to 2003, he was chief of staff to French research minister (and former astronaut) Claudie Haigneré. He was high commissioner for atomic energy from 2003 to 2009, and then headed the CEA until 2015. During his tenure, the commission officially added 'Alternative Energies' to its name and became a driving force in the ITER project.

Bigot's international network, and his natural diplomatic talent, proved precious when he came to steer ITER – a collaboration between China, Europe, India, Japan, South Korea, Russia and the United States – through sometimes treacherous waters. His greatest challenge came in 2020, with the onset of COVID-19. ITER's massive components – superconducting

magnets the weight of a Boeing 747 aeroplane, precision-forged and welded pieces of steel the size of Stonehenge, pieces of the vacuum vessel that took more than five years to make – were beginning to arrive for integrated assembly. Bigot rallied ITER's partners to a consensus that the project would continue without pause, a decision that ultimately proved successful.

Bigot and I were involved in ITER from its very early days, well before the ITER Organization was born. We sat on different sides of the table, he for France and I for Japan, discussing where we would build the facility. It was my joy that I was able to work with him, sitting at the same table, after he called me to join him in 2015. We talked for 15 minutes in his office at 7.45 every morning, before the day became hectic. During these calm, quiet, yet efficient meetings, I learnt a lot about his way of living, thinking and working, together with his incredible integrity, passion and energy.

The French call men of Bigot's nature and attitude *moine-soldat*, meaning that they combine in their personality and behaviour the simplicity (sometimes perceived as austerity) of the monk and the determination, loyalty and dedication of the soldier. Bernard Bigot was a monk-soldier, but also a man of a deep human warmth and sensitivity as a husband, father and friend. To his grandchildren, he explained his role at ITER as like that of a builder of a medieval cathedral who would not live to see the final masterpiece, but whose work created hope that would drive others to complete the task.

An educator at heart, Bigot had a rare talent for explaining the most complex ideas. Government executives, media representatives and others will remember how fusion seemed simple and thrilling when he explained it.

As committed to the present as he was engaged in the future, Bigot remained deeply attached to a number of educational institutions and foundations, including the *Maison de la Chimie* Foundation – a Paris-based centre for chemistry – of which he was president. Preparing younger generations for the challenges they will face was always central to his pre-occupations. Well beyond ITER and the international research community, his premature passing will be felt as a tremendous loss.

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