Moktar Hamdi, J Earth Sci Clim Change 2017, 8:10(Suppl)
DOI: 10.4172/2157-7617-C1-036

Analogy between biofuels and nuclear energy and their contributions in the climate change mitigation

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The nuclear power which is an important technology option in climate change mitigation strategies must be strengthened by innovation to maintain an acceptable level of performance and security. Commercialized nuclear power plants which continue in mitigation of climate change require innovation in term of performance, cost, safety and extension of the useful life to improve reductions of GHG emissions. Through human creativity and critical thinking, sustainable innovative solutions for cleaner and cheaper nuclear energy will be provided thanks to multilateral collaborations and open innovation. Ecosystems use sustainable energy from sun that leads to biofuels energy. Bio-refinery is defined as the sustainable processing of biomass into a spectrum of marketable products and energy (Fig 1). By analogy to bio-refinery, we suggest the new concept of nuclear-refinery which is a facility that integrates nuclear fuels conversion processes and equipment to produce fuels, power, and by- or co-products (Fig. 2). Lessons learned from bio-refinery concept allowed to identify some opportunities for sustainable innovation through nuclear fuel cycle in order to contribute in mitigation of climate change by: Maximizing the production of energy contained in the fuel and maximizing the use of produced energy; minimizing material loss (by- or co-products) and maximizing the reuse of wastes; integration of non-electric applications (cogeneration, desalination); the connection to renewable energy and wastes treatment; use nuclear energy in agro food development (water, processing). The new concept of nuclear refinery and lessons learned from bio-refinery concept should allow overseeing challenges of the sustainability of nuclear power plant and increasing its contribution in the mitigation of climate change.

Biography

Moktar Hamdi is a Professor at University of Carthage. He attended the University of Provence (France), where he took an Engineer degree in industrial and applied microbiology and subsequently obtained a PhD degree in Microbiology, followed by a Post-doctoral period at INSA Toulouse (France). In 1999, he joined National Institute of Applied Sciences and Technology as an Associate Professor being promoted in 2004 to full Professor in Biological Engineering, where he was Head of Department of Biological and Chemical Engineering from 2003 to 2008, and Head of Doctoral School from 2009 to 2012. He is also Director of Research Laboratory in Microbial Ecology and Technology at University of Carthage since 2004. He has published over 180 papers, over 10 patents and some chapters in several books. He is a scientific advisory boards and has served on many editorial boards of many indexed scientific journals.

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