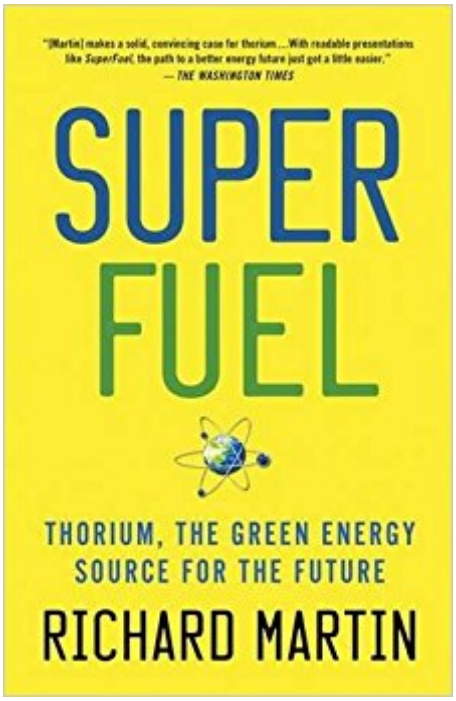
SuperFuel: Thorium, The Green Energy Source For The Future (MacSci)



Synopsis

A riveting look at how an alternative source of energy is revoluntionising nuclear power, promising a safe and clean future for millions, and why thorium was sidelined at the height of the Cold War In this groundbreaking account of an energy revolution in the making, award-winning science writer Richard Martin introduces us to thorium, a radioactive element and alternative nuclear fuel that is far safer, cleaner, and more abundant than uranium. At the dawn of the Atomic Age, thorium and uranium seemed to be in close competition as the fuel of the future. Uranium, with its ability to undergo fission and produce explosive material for atomic weapons, won out over its more pacific sister element, relegating thorium to the dustbin of science. Now, as we grapple with the perils of nuclear energy and rogue atomic weapons, and mankind confronts the specter of global climate change, thorium is re-emerging as the overlooked energy source as a small group of activists and outsiders is working, with the help of Silicon Valley investors, to build a thorium-power industry. In the first book mainstream book to tackle these issues, Superfuel is a story of rediscovery of a long lost technology that has the power to transform the world's future, and the story of the pacifists, who were sidelined in favour of atomic weapon hawks, but who can wean us off our fossil-fuel addiction and avert the risk of nuclear meltdown for ever.

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Customer Reviews

â œBesides briefly covering everything technical you need to know about the 90th element on the

periodic table, SuperFuel provides engaging detail on the history and likely future of using thorium as a comparatively safe and substantially beneficial nuclear fuel . . . [Martin] makes a solid, convincing case for thorium as a superfuel, not simply to replace uranium, but to reduce the use of much dirtier fuels such as coal . . . With readable presentations like SuperFuel, the path to a better energy future just got a little easier.â • â •The Washington Timesâ œMakes the case that thorium, an abundant, safe element that cannot easily be turned into a weapon, should be fuelling our reactors instead of uraniumâ |Martin is at his best when describing the human struggles of the cold-war era that spelled theirâ |convincing.â • â •New Scientistâ œTraces the history of nuclear power development. . . Recommended.â • â •Choiceâ œRichard Martin has done an exemplary job of exploring a technically demanding subject in a gripping narrative form. The implications of this subject could not be more vital -- for oil prices, energy security, the chances of coping with climate change -- and 'Superfuel' clearly and fairly spells out the reasons for both optimism and for caution. If every technical book were written in this clear and engaging a style, we'd all be a lot better informed! I am very glad to have read this book.â • â •James Fallows, The Atlantic, author of China Airborneâ œBringing back to light a long-lost technology that should never have been lost, this fascinating and important biography of thorium also brings us a commodity that's rare in discussions of energy and climate change: hope.â • â •Chris Anderson, editor in chief of Wiredâ œThorium is the younger sister to uranium, less volatile, slower to self-consume, and as many have contended without success, much better suited as a source of nuclear power than uranium. Superfuel by award-winning science writer Richard Martin tells the Cinderella story of thorium in a fast-paced, insider's account. This short, well-written book is a must read for those interested in understanding thorium's past and its potential to be a clean, renewable energy source for the future.â • â •Cynthia Kelly, President Atomic Heritage Foundationâ œOur future energy supplies rely upon hard choices. Richard Martin educates us on our troubled history with nuclear energy, and even more importantly, how to develop this essential source of 21st century clean energy. This is the type of book that can make a difference!â • â •John Hofmeister, author of Why We Hate the Oil Companiesâ œThe story of the slightly radioactive element thorium, a much-touted alternative fuel for nuclear power plants. Abundant in the Earth's crust, thorium has been used in various industrial processes since its discovery in 1828. Advocates, writes Martin, an award-winning journalist and senior research analyst for Pike Research, a clean energy firm, say the silver-gray element has another possible use: as a cheap, safe energy source with the potential to solve our power crisis.â |A lucid overview of a still-developing chapter in the story of nuclear power.â • â •Kirkus Reviews

Richard Martin is an award-winning science writer whose work has appeared in Wired, Time, Fortune, The Atlantic, and The Best Science Writing of 2004. He is the editorial director of Pike Research, a leading clean energy firm. He lives in Boulder, Colorado.

The story of thorium as a planetary energy source is almost too incredible to be believed. To think that for almost seventy years we have known about a source of energy that would last longer than the Sun will shine and we haven't exploited it? One has to wonder why.In this book Rick Martin does a marvelous job telling the amazing and true story of the almost forgotten power of element 90: thorium. During the Manhattan Project thorium was passed over for consideration because it wasn't practical for nuclear weapons, but after the war researchers discovered how thorium and its fissile derivative uranium-233 would be the best fuel for clean and safe nuclear reactors--they just didn't know exactly what form those reactors would take. Then in the 1950s and 1960s at Oak Ridge National Lab, Dr. Alvin Weinberg and his team figured out the right way--a revolutionary new kind of reactor that used liquid fluoride salts rather than solid ceramic pellets as a nuclear fuel. No one could believe that such a machine could work, but Weinberg's team actually built and operated two of them very successfully.But the atomic energy establishment in the United States and around the world wanted a plutonium fast breeder reactor--a reactor totally different in every way from Weinberg's safe fluoride-salt reactor--and they convinced Nixon to make it national policy, which he did in 1971. Then they used that position of strength to cancel all of the research at Oak Ridge in thorium and fluoride salts and they got Weinberg fired as director. Without their leader and their political support, the Oak Ridge team dissolved and disbanded and the notion of a safe, clean, efficient thorium reactor was lost.Nuclear engineering students don't learn about it today. It's not taught in their schools. You can get an MS or PhD in nuclear engineering and never hear anything about Weinberg's work. I speak from first-hand experience!Read this book and you'll learn the incredible true story of how energy security and energy independence for the whole world is feasible, possible, and affordable through the liquid-fluoride thorium reactor (LFTR)!

Please read this book. You may not agree with everything Martin writes (I don't). You may even want to scream at him (I did a couple of times). But this book is a very good opener for a discussion on an important subject that few are familar with. Equally important, if the proponents of the liquid fluoride thorium reactors (LFTRs) are essentially right this technology offers an important contribution (not a panacea) to solving the energy crisis and aleviating global warming.This is not exactly a balanced book. Richard Martin is advocating for the thorium-based technology and makes

no bones about it. At the same time, he does not ignore the problems of this technology (although to my taste he minimizes some of them, about which more below), and he makes a reasonable effort to be fair to competing views.The historical chapters are illuminating. If you have wondered how we ended up burning increasing amounts of fossil fuel sixty-odd years after we were hyperbolically promised "electricity too cheap to meter", Martin will show you. The technical chapters are good considering that this is a book for the general public and more detail is available in the blogosphere. The last chapters, which discuss present business activity and future prospects, are up-to-date and present a convincing case for allocating resources to the (re)development of this technology. Success is by no means guaranteed, but at this point I would rather see a couple of billions going into LFTRs than into fusion or (heavens) into "clean" coal.Now here are things I'm not so crazy about (but you should read the book anyway!). First off, I think Martin does not fully acknowledge the fact that thorium technology, while much "greener" than the uranium/plutonium technology, still generates a lot of fission nuclear waste. It is true that most of these radioactive isotopes are relatively short-lived and will be essentially gone in a few centuries. However, there is still the danger, in an untested design, of an uncontrolled release into the environment. Especially in a high-temperature reactor, some volatile species (xenon, iodine, volatile fluorides of tin and antimony etc.) may be released accidentally if there is a gaseous leak (the author does mention repeatedly how the gaseous Xe-135 isotope will be separated and removed). This brings me to another de-emphasized issue: potential corrosion of metals in contact with hot liquid salts, if any oxygen finds its way in. There may be good technical solutions to this but I didn't see them mentioned in this book and I sure hope the issue is not being pushed under the rug. For these and related reasons I would call LFTR "greenish" at best, not "green" as the cover would have it.I think Martin appreciates - but I hope the various fire-breathing investors he interviewed do too - that after Fukushima there is little chance for this technology to take off without the buy-in of the environmental community and the wider public. That's why all relevant issues have to be addressed squarely and without PR legerdemain, and in any development plan the safety of the public and the workers has to be - and to be shown to be - truly "Job 1". This is why I object to two ideas that Martin seems to find appealing: (1) small stand-alone reactors, and (2) giving one man (following the model of General Groves in the Manhattan project) absolute authority over the project. The first idea will make inspection more difficult and will increase the chances that skilled personell for performing emergency operations will not be available at all times. (Banks of many modular reactors sharing a site should be OK however.) The second idea was workable in time of war, but is inconsistent with democracy and will cause deep suspicions toward the project. People who care should also watch

against the established nuclear industry trying to "greenwash" themselves by sprinkling a little thorium into their conventional fuel rods.There is much more to say about this book. It is well and persuasively written but not so well edited, and it’s not hard to find factual mistakes: potassium has 3 natural isotopes, not one (p.36); most but not all materials expand when heated (p.73); the boiling point of the fluoride salts used by Weinberg must have been way above 680 degrees F (p.129); and the 1960s were obviously Weinberg’s, not Weinberger’s heyday (p.132). A nuclear engineer would probably have his/her own list.So, this is not the "perfect" thorium book. But read it anyway. It is well worth a few TV-less evenings.

(Aura, Healing Stones, Crystal Energy, Crystal Healing, Energy Fields, Emotional Healing, Gemstone) Energy Finance and Economics: Analysis and Valuation, Risk Management, and the Future of Energy Energy Accounts: Architectural Representations of Energy, Climate, and the Future