

1. Record Nr.	UNINA9910915784003321
Autore	Nuttall William
Titolo	Commercialising Fusion Energy : How Small Businesses Are Transforming Big Science
Pubbl/distr/stampa	Bristol : , : Institute of Physics Publishing, , 2021 ©2020
ISBN	9780750340939 0750340932
Edizione	[1st ed.]
Descrizione fisica	1 online resource (246 pages)
Collana	IOP Ebooks Series
Altri autori (Persone)	Webbe-WoodDavid KonishiSatoshi TakedaShutaro PearsonRichard J Gonzalez de VicenteSehila M WindridgeMelanie MoriYoshitaka WilsonHoward ChapmanIan
Soggetti	Nuclear fusion Energy development
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Editor biographies -- William J Nuttall -- Satoshi Konishi -- Shutaro Takeda -- David Webbe-Wood -- List of contributors -- Chapter 1 Introduction -- 1.1 Background -- 1.2 What is nuclear fusion? -- 1.3 Purpose and structure of this book -- References -- Chapter -- 2.1 Introduction -- 2.2 Three key conceptual spaces for fusion reactors: MCF, ICF and MIF -- 2.2.1 Magnetic confinement fusion -- 2.2.2 Inertial confinement fusion (ICF) -- 2.2.3 Magneto-inertial fusion (MIF) -- 2.3 Concept-specific engineering challenges for MCF, ICF and MIF -- 2.3.1 Plasma production and control -- 2.3.2 Fuelling and exhaust systems -- 2.3.3 Diagnostics -- 2.4 Summary -- Supplementary Tables -- References -- Chapter 3

Considerations for commercialization strategies for fusion energy --
 3.1 Introduction -- 3.1.1 Background -- 3.1.2 Content of this chapter --
 3.2 Future market -- 3.2.1 Energy demand forecasts -- 3.2.2 The
 role of nuclear fusion in climate change mitigations -- 3.2.3 Future
 market for fusion energy systems -- 3.3 Commercialization pathways --
 3.3.1 Four commercialization pathways -- 3.3.2 The benefits and
 the risks of spinoff businesses -- 3.3.3 Technology readiness level --
 3.3.4 Investment strategies for fusion enterprises -- 3.4 Fusion power
 core design methodology -- 3.5 Constraints -- 3.6 Conclusions --
 Acknowledgment -- References -- Chapter 4 Funding and financing
 commercial fusion power plants -- 4.1 Introduction -- 4.2 Possible
 sources of funding -- 4.2.1 Provision of funds by a commercial
 operator -- 4.2.2 Funds provided by a bank or similar investor -- 4.2.3
 Funding provided by government -- 4.2.4 Funds provided by the
 consumer -- 4.3 Sources of income -- 4.3.1 Income from sale of
 electricity -- 4.3.2 Income from other uses of the energy -- 4.4
 Conclusions -- Acknowledgment -- References -- Chapter.
 5.1 The case for fusion energy -- 5.2 The Tokamak Energy approach-
 spherical tokamaks and high temperature superconductors -- 5.3 The
 combination of spherical tokamaks and high temperature
 superconductors -- 5.4 Progress so far -- 5.5 Future plans and
 business overview -- 5.6 Summary -- References -- Chapter 6 Laser
 fusion CANDY GPI/Hamamatsu -- 6.1 Introduction -- 6.2 Laser fusion
 activities in the world -- 6.2.1 How the laser fusion reactor generates
 power -- 6.2.2 Laser fusion activities and trends -- 6.3 Laser fusion
 activities in Hamamatsu -- 6.3.1 Why laser fusion in Hamamatsu? --
 6.3.2 Strategy of GPI -- 6.4 Laser fusion mini-reactor CANDY -- 6.4.1
 Concept of CANDY -- 6.4.2 Laser technology -- 6.4.3 Plasma fuel
 physics -- 6.4.4 Target injection -- 6.5 Summary -- Acknowledgments
 -- References -- Chapter 7 Pioneers of commercial fusion -- 7.1
 Introduction -- 7.2 Private investment in fusion -- 7.2.1 Private
 investment into clean energy technology -- 7.2.2 Private investment in
 fusion: same but different -- 7.3 Private fusion companies -- 7.3.1 TAE
 Technologies -- 7.3.2 General Fusion -- 7.3.3 Lawrenceville Plasma
 Physics -- 7.3.4 MIFTI Fusion -- 7.3.5 First Light Fusion Ltd -- 7.3.6
 Proton Scientific Inc. -- 7.3.7 Helion Energy -- 7.3.8 Lockheed Martin's
 Skunk Works -- 7.3.9 CTFusion -- 7.3.10 Agni Fusion -- 7.3.11
 Commonwealth Fusion Systems -- 7.3.12 Compact Fusion Systems --
 7.3.13 Hyperjet Fusion -- 7.3.14 HB11 Energy -- 7.3.15 ZaP Energy --
 7.3.16 Marvel Fusion -- 7.3.17 Renaissance Fusion -- 7.4 Discussion:
 the prospect of private fusion success -- References -- Chapter -- 8.1
 Introduction -- 8.2 Three components towards fusion
 commercialization -- 8.3 The role of private fusion companies -- 8.4
 STEP-spherical tokamak for energy production -- 8.5 Fusion power
 from a spherical tokamak plasma.
 8.6 Technical risks to commercial viability of a spherical tokamak --
 8.7 Conclusions -- Acknowledgments -- References -- Chapter 9
 DEMO design activities and helical initiatives in Japan -- 9.1 Japan's
 policy on fusion research and development -- 9.2 Status of tokamak
 DEMO design in Japan -- 9.3 Helical reactor design as alternatives --
 9.4 Issues towards commercialization -- References -- Chapter -- 10.1
 Introduction -- 10.2 Engineering challenges to commercial fusion --
 10.2.1 Fusion reactor materials -- 10.2.2 Blankets for tritium breeding
 and power generation -- 10.2.3 Tritium handling systems -- 10.2.4
 Waste management and remote handling -- 10.2.5 Balance of plant
 systems -- 10.3 Fusion innovation -- 10.3.1 Seeking successful fusion
 innovation -- 10.3.2 Commercial drivers for fusion -- 10.3.3 An
 innovation strategy for cooperative public and private sector fusion

development -- 10.4 Conclusions -- References -- Chapter 11
Commercial opportunities for nuclear fusion -- 11.1 Introduction and historical origins -- 11.1.1 Fusion energy ambitions live in the shadow of nuclear fission success-1960s and 1970s -- 11.1.2 Atomic energy-the allure of electricity -- 11.1.3 Fusion follows fission's footsteps -- 11.2 Civil fusion's first success -- 11.3 The painful story of 'cold fusion' -- 11.4 Looking ahead: fusion's potential commercial attributes -- 11.5 Fusion can do better than electricity generation -- 11.6 The importance of net-zero and deep decarbonization -- 11.7 Non-electricity commercialization -- 11.7.1 Process heat applications -- 11.8 Conclusions -- Acknowledgements -- References -- Chapter 12
Fusion energy and carbon management -- 12.1 Fusion and carbon-based chemistry -- 12.2 Pyrolysis and gasification of biomass -- 12.3 Market for biofuel -- 12.4 Electricity generation by SOFC -- 12.5 Effect of subsidy -- 12.6 Fusion charcoal production. 12.7 Market in carbon credits -- 12.8 Economic analyses of CCS -- 12.9 Carbon credit trading -- 12.10 Biomass feedstock and supply chain -- 12.10.1 Residential garbage and its collection -- 12.10.2 Agricultural by-products and their characteristics -- 12.11 Summary -- References -- Chapter 13 Conclusions -- References -- Index.

Sommario/riassunto

This edited book provides an overview of the commercialisation of fusion energy technology, giving emphasis to the emerging role of private sector entities. The editors believe there is a need for a good overview of a complex phenomenon that has the potential to transform fusion energy research after decades of leadership by governmental and inter-governmental efforts. The book addresses not only the science and technology of fusion commercialisation, but also the associated innovation management.
