

Bölüm 2

ENERJİ TARİHİ

Chapter 2

HISTORY OF ENERGY

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Prof. Dr. İlhami Yıldız halen Kanada'nın Dalhousie Üniversitesi'nde akademik çalışmalarını sürdürmektedir. Kendisi biyosistem ve makine yüksek mühendisi olup, genel uzmanlık alanları, enerji, çevre, sürdürülebilirlik ve yenileşim konularını kapsamaktadır. Biyoreaktörler, çevre biyoteknolojileri, atıkların biyoyakıt ve diğer biyo-tabanlı ürünlere yönelik yönetimi, kompleks sistemler, ısı-çevre kontrolü, sera mühendisliği, ısı pompaları, birleşik ısı ve güç üretimi, baca gazlarının geri kazanımı ve sera gazlarının azaltılması, sıcak sulu ısıtma, kurutma ve sıcak su depolama sistemleri ise özel uzmanlık alanlarını oluşturmaktadır. Çeşitli uluslararası ödüllere de sahip olan Prof. Yıldız, her zaman, her yerde ve herkes için sıkı bir insan hakları savunucusudur.

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Prof. Dr. İlhami Yıldız continues his academic studies at Dalhousie University, Canada. He is a biosystem and mechanical engineer, and his general areas of expertise cover energy, environment, sustainability, and innovation. Bioreactors, environmental biotechnologies, waste management for biofuels and other bio-based products, complex systems, thermal-environmental control, greenhouse engineering, heat pumps, combined heat and power generation, flue gas recovery and greenhouse gas reduction, hot water heating, drying, and hot water storage systems constitute their specific areas of expertise. Prof. Yıldız has several international awards, and he is a staunch human rights defender anytime, anywhere, and for everyone.

Özet

İnsanoğlu günümüzde kendisini yeryüzünde başat bir tür olarak kabul ettirmiş durumdadır. Bunun arkasındaki en önemli etken ise, insanoğlunun enerjiyi kullanabilme ve kontrol edebilme kabiliyetidir. Bu çalışma, insanoğlunun tarih boyunca enerjiyi eşsiz bir biçimde geliştirebilme ve yaratıcı kullanıma sunabilme kabiliyetini incelemektedir. İnsanoğlu, içerisinde bulunduğu koşullara göre, ister zorunluluktan isterse arzusu dahilinde olsun, ateşin ilk kullanımından buharlı motorlara, oradan da fosil yakıtlara ve yenilenebilir enerjinin kullanımına kadar büyük dönüşümler geçirerek yaşadığı koşullara sürekli olarak uyum sağlamıştır.

Anahtar Kelimeler

Elektrik, Enerji, Endüstri, Fosil Yakıtlar, Devrim, Tarih, Ulaştırma, Yenilenebilir Enerji

Abstract

Mankind has quickly established himself as the dominant species on Earth. A lot of this development can be attributed to his ability to use and control energy. This paper examines man's unique approach to developing and implementing energy in creative ways throughout history. From the earliest uses of fire to the steam engine to massive fossil fuel dependence and the beginning of the major shift toward renewable energy sources man has continually adapted to his situation whether through desire or necessity.

Keywords

Electricity, Energy, Industry, Fossil Fuels, Revolution, History, Transportation, Renewable Energy

2.8. KAYNAKLAR / REFERENCES

- [1] I. Yildiz, C. MacEachern, Historical Aspects of Energy, in: Dincer, I. (ed.), *Comprehensive Energy Systems*, vol. 1, Oxford: Elsevier, 2018, pp. 24–48.
- [2] National Fire Protection Association, All about Fire. <http://www.nfpa.org/press-room/reporters-guide-to-fire-and-nfpa/all-about-fire> (ulařım 21.04.16)
- [3] F. Berna, P. Goldberg, L.K. Horwitz, J. Brink, S. Holt, M. Bamford, M. Chazan, Microstratigraphic evidence of in situ fire in the Acheulean strata of Wonderwerk Cave, Northern Cape province, South Africa. *Proceedings of the National Academy of Sciences*, 109(20) (2010) E1215-20.
- [4] R.W. Wrangham, J.H. Jones, G. Laden, D. Pilbeam, N. Conklin-Brittain, The raw and the stolen, *Current Anthropology* 40(5) (1999) 567-94.
- [5] R.M. Gorman, Cooking up bigger brains. *Scientific American* 22 (2012) 36-37.
- [6] R.B. Bird, D.W. Bird, B.F. Coddling, C.H. Parker, J.H. Jones, The “fire stick farming” hypothesis: Australian Aboriginal foraging strategies, biodiversity, and anthropogenic fire mosaics, *Proceedings of the National Academy of Sciences* 105(39) (2008)14796-801.
- [7] J.G. Pausas, J.E. Keeley, A burning story: the role of fire in the history of life, *BioScience* 59(7) (2009) 593-601.
- [8] J.D. Cornell, M. Miller, Slash and burn, *Encyclopedia of Earth*, 2007, p.31.
- [9] E. Gray, H. Marsh, M. McLaren, A short history of gunpowder and the role of charcoal in its manufacture, *Journal of Materials Science*, 17(12) (1982) 3385-400.
- [10] J.R. Partington, *A history of Greek fire and gunpowder*, JHU Press, 1960.
- [11] F. Habashi, *Fire and the art of metals: a short history of pyrometallurgy*, *Mineral Processing and Extractive Metallurgy*, 114(3) (2005) 165-71.
- [12] United States Environmental Protection Agency, *Metallurgical Industry: Coke Production*, 2008
- [13] A.J. Wood, B.F. Wollenberg, *Power Generation, Operation, and Control*, John Wiley & Sons, 2012
- [14] http://www.buch-der-synergie.de/c_neu_html/c_08_01_windenergie_geschichte.htm (ulařım 04/10/18)
- [15] P. Starkey, The history of working animals in Africa. The origins and development of African livestock: Archaeology, genetics, linguistics and ethnography (2000) 478-502.
- [16] A.G. Haudricourt, M.J. Delamarre, *L’homme et la charrue*. Renaissance du livre, 2000.
- [17] <http://www.thenagain.info/WebChron/MiddleEast/Sumer.html> (ulařım 04/10/18)
- [18] S.S. Nesterov, Kon v Kultah Tyurkoyazıcnıh Plemen Sentralnoy Azii v Epohu Srednevekovya, Novosibirsk, 1999, p. 3.
- [19] B. Ögel, *Türk Kültür Tarihine Giriř*, C. I-VII, Ankara, 1979, p. 495.
- [20] Sümer, F., *Eski Türk Atçılıęı Hakkında Notlar*, *Türk Dünyası Tarih Dergisi*, 107 (1995) 120.
- [21] A.A. Çınar, *Divanu Lügati’t-Türk’te At Kültürü*, *Türk Kültüründe At ve Çaędař Atçılık*, İstanbul, 1995.
- [22] K. Belek, *Eski Türklerde At ve At Kültürü (Dünden Bugüne Kırgız Kültürel Hayatı Örneęi)*, *Gazi Türkiyat* 16 (2015) 111-128.
- [23] E.E. Kuzmina, Rasprostraneniye Konevodstva i Kulta Konya u İranoyazıcnıh Plemyon Sredney Azii i Drugih Narodov Starogo Sveta, Srednaya Aziya v Drevnosti i Srednevekovie (İstoriya i Kultura), Moskva, 1977, pp. 28-29.
- [24] P.M. Borodin, Domestikatsiya i Tsivilizatsiya. Vestnik VOGiS, Moskva, 2003, p.5.
- [25] A. Petrenko, G. Asilgarayeva, Konevodstvo v Kulture Narodov Volgo-Uralskogo Regiyona: Perspektivi İssledovaniya, Srednevekovaya Arheologiya Evraziyskih Stepey, II, Kazan, 2007, p.120.
- [26] S. İ. Vaynřteyn, *Mir Koçevnikov Tsentra Azii*, Moskva, 1991, pp. 90-91.
- [27] D.W. Eberhard, *Çin’in Şimal Komřuları*, Ankara, 1996, p. 120.
- [28] E. Steppe, Domestication of the horse. *Ancient Europe*, p. 363.
- [29] B.B. Akmoldoyeva, Konevodstvo v Sisteme Traditsyonnoho Hozyaystva Kirgizov (Konets XIX-naçalo XX vv.), Frunze, 1989, pp. 6-7.
- [30] A.D. Graç, *Drevniye Koçevniki v Sentre Azii*, Moskva, 1980, pp. 5-10.
- [31] N.E. Masanov, *Koçevaya Tsivilizatsiya Kazahov: Osnovı Cizne Deyatelnosti Nomadnogo Obřestva*, Almatı, 2002.

- [32] İ. V. P'yankov, K Voprosu ob Etničeskoj Sıtusii v Stepyah Evrazii, The Aryans in the Eurasian Steppes: the Bronze and Early Iron Ages in the Steppes of Eurasia and Contiguous Territories: Elena Kuz'mina Memorial Volume, Barnaul: Altai State University Press, 2014, pp. 147-150.
- [33] V.S. Alekseyev, Domaşnaya Loşad Mongolii. Arheologičeskiye, Etnografičeskiye i Antropologičeskiye İssledovaniya v Mongolii. Novosibirsk. Arheologiya Kazahstana, Almatı, 1981, pp. 149-164.
- [34] K. Belek, Kırgızlarda At ve At Kültürü, Kırgızistan-Türkiye Manas Üniversitesi Sosyal Bilimler Enstitüsü Tarih Anabilim Dalı, Yüksek Lisans Tezi, Bişkek, 2008, p. 15.
- [35] F. Sümer, Türklerde Atçılık ve Binicilik, İstanbul, 1995, pp. 1-2.
- [36] O. Doğan, Bozkır Kavimlerinin Kültür ve Mitolojilerinde At, Gazi Üniversitesi Sosyal Bilimler Enstitüsü, Eskiçağ Tarihi Bilim Dalı, Yüksek Lisans Tezi, 2006.
- [37] B. Ögel, Türk Kültür Tarihine Giriş, C. I-VII, Ankara, 1979, pp. 23-27.
- [38] A.A. Çınar, Türklerde At ve Atçılık, Ankara, 1993, p. 1.
- [39] İstoriya Vostoka, Vostok v Drevnosti, I, Moskva, 1997, pp. 103-104.
- [40] A.K. Nefyedkin, Boevie Kolesnitsı v Drevney Gretsii (XVI - I vv. do n. e.), Avtoreferat, Sankt-Petersburg, 1997, p. 3-6.
- [41] E.E. Kuzmina, Rasprostraneniye Konevodstva i Kul'ta Konya u İranoyazičnıh Plemyon Sredney Azii i Drugih Narodov Starogo Sveta, Srednaya Aziya v Drevnosti i Srednevekovie (İstoriya i Kultura), Moskva, 1977, p. 33.
- [42] S. İ. Vaynşteyn, Mir Koçevnikov Tsentra Azii, Moskva, 1991, p. 214.
- [43] Britannica Encyclopedia, Chariots. <http://www.britannica.com/technology/chariot> (ulaşım 24.04.16)
- [44] B. Ögel, Türk Kültür Tarihine Giriş, C. I-VII, Ankara, 1979, pp. 391-422.
- [45] Arheologiya SSSR, Pod obşey redaktsey akademika Rıbakova B. A, İzdatel'stvo "Nauka", Moskva, 1984, pp. 129-131
- [46] S.G. Klyaştorıy, D.G. Savinov, Stepnie İmperii Evrazii, St.-Petersburg, 2005, p. 9.
- [47] Arheologiya SSSR, Pod obşey redaktsey akademika Rıbakova B. A, İzdatel'stvo "Nauka", Moskva, 1984, pp. 130-131.
- [48] S.S. Nesterov, Kon v Kultah Tyurkoyazičnıh Plemen Sentralnoy Azii v Epohu Srednevekovya, Novosibirsk, 1999, p. 3-46
- [49] G. Cumakunova, Kızgız ve Türkmen Türkçelerinde Atçılık Terminolojisi, Modern Türklük Araştırmaları Dergisi, 6(2) (2009) 40-45.
- [50] Ş. Elçin, Türklerde Atın Armağan Olması, Türk Kültüründe At ve Çağdaş Atçılık, İstanbul, 1995, p.160.
- [51] İ. Kafesoğlu, Türk Milli Kültürü, İstanbul, 2002, p. 317.
- [52] S. İ. Vaynşteyn, Mir Koçevnikov Tsentra Azii, Moskva, 1991, p. 284.
- [53] L. Ligeti, Attila ve Hunlar, Asya Hunları, İstanbul, 1962, pp. 3-19.
- [54] L. Ligeti, Attila ve Hunlar, Asya Hunları, İstanbul, 1962, p. 67.
- [55] O.F. Sertkaya, Eski Türk Kültüründe At, Türk Kültüründe At ve Çağdaş Atçılık, İstanbul, 1995, p.26.
- [56] R.P. Lindner, Nomadism, Horses and Huns, Past and Present, Oxford, 1981, p. 18
- [57] A. Mokeyev, XVI-XVIII. Yüzyıllardaki Tanrı Dağları Kırgızlarının Siyasi Teşkilatındaki Kadim Unsurlar, Kırgız Devletçiliği Dergisi, Özel sayı, 2002, p. 41.
- [58] İ. Durmuş, Bozkır Kültürünün Oluşumu ve Gelişiminde At, Gazi Üniversitesi F.E.F. Sosyal Bilimler Dergisi, 2, 1997, pp. 13-19.
- [59] J. Clutton-Brock, Origins of the dog: domestication and early history. The domestic dog: Its evolution, behaviour and interactions with people (1995) 7-20.
- [60] S. Mark, The earliest sailboats in Egypt and their influence on the development of trade, seafaring in the Red Sea, and state development. Journal of Ancient Egyptian Interconnections 5(1) (2013) 28-37.
- [61] P.K. O'Brien, Atlas of World History, Oxford University Press, USA, 2002.
- [62] C. Scheepers, Phoenician ships: types, trends, trade and treacherous trade routes, 2012
- [63] B. Sorensen, History of, and recent progress in, wind-energy utilization, Annual review of energy and the environment 20(1) (1995) 387-424.
- [64] N. Nath, Windmills and Mill Wrighting, Cambridge University Press, UK, 1957.

- [65] L. Sprague de Camp, *The ancient engineers*, 1963.
- [66] M.J. Lewis, *The Greeks and the early windmill*, *History of Technology* 15 (1993) 141-89.
- [67] B.M. bin Shakir, Model 90, in: *The book of ingenious devices*. A.Y. Al-Hassan (Ed.), University of Aleppo, 1981.
- [68] G. Ferrand, *Relations de voyages et textes géographiques arabes, persans et turks relatifs à l'Extrême-Orient du VIIIe au XVIIIe siècles*, Cambridge University Press, 2015.
- [69] Salim TS Al-Hassani, *1001 Inventions: The Enduring Legacy of Muslim Civilization*, Foundation for Science, Technology & Civilisation (2010) 128-131
- [70] R.J. Forbes, *Studies in ancient technology* 5. Brill Archive, 1964.
- [71] <https://solute.es/en/blog/2014/07/30/historical-approach-wind-energy> (ulařım 04/10/18)
- [72] S.I. Yannopoulos, G. Lyberatos, N. Theodossiou, W. Li, M. Valipour, A. Tamburrino, A.N. Angelakis, *Evolution of water lifting devices (pumps) over the centuries worldwide*, *Water* 7(9) (2015) 5031-60.
- [73] T.V. Cech, *Principles of Water Resources: History, development, management, and policy*, John Wiley & Sons, 2010.
- [74] O. Wikander, *Handbook of Ancient Water Technology*, Brill: Leiden, 2000, p. 741.
- [75] Salim TS Al-Hassani, *1001 Inventions: The Enduring Legacy of Muslim Civilization*, Foundation for Science, Technology & Civilisation (2010) 122-126
- [76] <http://www.1001inventions.com/devices> (ulařım 04/10/18)
- [77] C. Lira, *Brief history of the steam engine*. *Introductory Chemical Engineering Thermodynamics*, 2012
- [78] M. Kerker, *Science and the steam engine*, *Technology and Culture* 2(4) (1961) 381-90.
- [79] T. McNeese, *The Industrial Revolution*, Lorenz Educational Press, 2000.
- [80] J. Perlin, *From space to earth: the story of solar electricity*, Earthscan, 1999.
- [81] R.C. Allen, *The industrial revolution in miniature: The spinning jenny in Britain, France, and India*, *The Journal of Economic History* 69(04) (2009) 901-927.
- [82] A. Lakwete, *Inventing the cotton gin: machine and myth in Antebellum America*, JHU Press, 2005.
- [83] Cambridge Historical Society, *Elias Howe's sewing machine*. <http://www.cambridgehistory.org/discover/innovation/Sewing%20Machine.html> (ulařım 01.05.16)
- [84] Natural Resources Canada, *Natural Gas: A Primer*. <http://www.nrcan.gc.ca/energy/natural-gas/5641> (ulařım 06.16.16)
- [85] J.B. Curtis, *Fractured shale-gas systems*, *AAPG Bulletin*, 86(11) (2002)1921-38.
- [86] R.D. Singh, *Principles and practices of modern coal mining*, New Age International, 2005.
- [87] L.T. Benjamin Jr, *Behavioral science and the Nobel Prize: A history*, *American Psychologist* 58(9) (2003) 731.
- [88] *Britannica Encyclopedia*, Alfred Bernhard Nobel. <http://www.britannica.com/biography/Alfred-Bernhard-Nobel> (ulařım 02.05.16)
- [89] W.E. Swinton, *Physician contributions to nonmedical science: Abraham Gesner, inventor of kerosene*, *Canadian Medical Association Journal* 115(11) (1976) 1126.
- [90] P.A. Dickey, *The first oil well*. *Journal of Petroleum Technology* 11(01) (1959) 14-26.
- [91] U. Davé, *Edwin Drake and the Oil Well Drill Pipe*, PA Book, 2013.
- [92] I.M. Tarbell, *The History of the Standard Oil Company*, Cosimo, Inc., 2009.
- [93] J.S. McGee, *Predatory price cutting: the Standard Oil (NJ) case*, *The Journal of Law & Economics* 1 (1958) 137-69.
- [94] M. Fowler, *Historical beginnings of theories of electricity and magnetism*, *Recuperado el*. 23(5) (1997) 2012.
- [95] M.J. Jernegan, *Benjamin Franklin's "Electrical Kite" and Lightning Rod*, *The New England Quarterly* 1(2) (1928) 180-96.
- [96] *Britannica Encyclopedia*, Charles-Augustin de Coulomb. <http://www.britannica.com/biography/Charles-Augustin-de-Coulomb> (ulařım 12.05.16)
- [97] *Britannica Encyclopedia*, Andre-Marie Ampere. <http://www.britannica.com/biography/Andre-Marie-Ampere> (ulařım 12.05.16)
- [98] *Britannica Encyclopedia*, Michael Faraday. <http://www.britannica.com/biography/Michael-Faraday> (ulařım 12.05.16)
- [99] *Britannica Encyclopedia*, James Clerk Maxwell. <http://www.britannica.com/biography/James-Clerk-Maxwell> (ulařım 24.05.16)

- [100] P. Grimes, Historical pathways for fuel cells, The new electric century. In: Battery Conference on Applications and Advances, The Fifteenth Annual Conference, IEEE, Jan. 11, 2000, pp. 41-45
- [101] Britannica Encyclopedia, Arc Lamp. <http://www.britannica.com/technology/arc-lamp> (ulařım 03.05.16)
- [102] The Franklin Institute. Edison's Lightbulb. <https://www.fi.edu/history-resources/edisons-lightbulb> (ulařım 03.05.16)
- [103] A. Lantero, The War of the Currents: AC vs. DC Power, Energy. gov., 2013.
- [104] T.P. Hughes TP. The Electrification of America: The System Builders, Technology and Culture 20(1) (1979) 124-61.
- [105] Bellis M. Outline of railroad history. <http://inventors.about.com/library/inventors/blrailroad.htm> (ulařım 01.06.16)
- [106] Britannica Encyclopedia, John Blenkinsop. <http://www.britannica.com/biography/John-Blenkinsop> (ulařım 09.05.16)
- [107] Britannica Encyclopedia, George Stephenson. <http://www.britannica.com/biography/George-Stephenson> (ulařım 09.05.16)
- [108] New World Encyclopedia, Internal Combustion Engine. http://www.newworldencyclopedia.org/entry/Internal_combustion_engine (ulařım 04.05.16)
- [109] B. Ghobadian, H. Rahimi, Biofuels-past, present and future perspective, International Iran and Russian Congress of Agricultural and Natural Science, Shahre-Kord University, Shahre Kord, Iran, 2004.
- [110] M. Abebe, History of Ethanol, 2008
- [111] M. MacRae, Karl Benz, The American Society of Mechanical Engineers, 2012
- [112] K.H. Dietsche, D. Kuhlertz, History of the automobile, Gasoline Engine Management, 2015, Springer, Fachmedien Wiesbaden, pp. 2-7.
- [113] <http://rabia-hattusas.blogspot.ca/2011/04/musulman-bilim-adamlarindan-birkaci.html> (ulařım 04/10/18)
- [114] <http://blog.milliyet.com.tr/turk-ve-islam-uygarliginin--bilim-ve-teknolojiye-olan-katkilari/Blog?BlogNo=340043> (ulařım 04/10/18)
- [115] R.S. Woodbury, The legend of Eli Whitney and interchangeable parts, Technology and Culture 1(3) (1960) 235-53.
- [116] M.L. Berger, The automobile in American history and culture: a reference guide, Greenwood Publishing Group, 2001.
- [117] R. Muhutdinova-Foroughi, Industrial Revolution and Assembly Line Work, 2015.
- [118] American Society of Mechanical Engineers, Model T. <https://www.asme.org/about-asme/who-we-are/engineering-history/landmarks/233-model-t> (ulařım 05.05.16)
- [119] Britannica Encyclopedia, Model T. <http://www.britannica.com/technology/Model-T> (ulařım 05.05.16)
- [120] <https://tr.wikipedia.org/wiki/Parasut> (ulařım 04/10/18)
- [121] Evliya Çelebi Seyahatnamesi. Cilt 1, Sayfa 67
- [122] https://tr.wikipedia.org/wiki/Havacilik_tarihi (ulařım 04/10/18)
- [123] https://en.wikipedia.org/wiki/Lagari_Hasan_Celebi (ulařım 04/10/18)
- [124] G. Pfozter G, History of the use of balloons in scientific experiments, Space Science Reviews 13(2) (1972) 199-242.
- [125] NASA 2, History of flight. <https://www.grc.nasa.gov/www/k-12/UEET/StudentSite/historyofflight.html> (ulařım 09.05.16)
- [126] E. Torenbeek, H. Wittenberg, Flight Physics: Essentials of Aeronautical Disciplines and Technology, with Historical Notes, Springer Science & Business Media, 2009.
- [127] NASA, Wright Brothers Aircraft. <http://wright.nasa.gov/airplane/powered.html> (ulařım 05.05.16)
- [128] H.H. Maşjuki, M.A. Kalam, M. Mofijur, M. Shahabuddin, Biofuel: policy, standardization and recommendation for sustainable future energy supply, Energy Procedia 42 (2013) 577-86.
- [129] E.M. Shahid, Y. Jamal, Production of biodiesel: A technical review, Renewable and Sustainable Energy Reviews 15(9) (2011) 4732-45.
- [130] Britttish Petroleum, BP Statistical Review of World Energy, 2010
- [131] Y.C. Sharma, B. Singh, Development of biodiesel: current scenario, Renewable and Sustainable Energy Reviews 13(6) (2009) 1646-51.
- [132] A.L. Ahmad, N.M. Yasin, C.J. Derek, J.K. Lim, Microalgae as a sustainable energy source for biodiesel production: a review, Renewable and Sustainable Energy Reviews 15(1) (2011) 584-93.

- [133] G. Kafuku, M. Mbarawa, Biodiesel production from Croton megalocarpus oil and its process optimization, *Fuel* 89(9) (2010) 2556-60.
- [134] V. Smil, *Energy transitions: history, requirements, prospects*, ABC-CLIO, 2010.
- [135] J.R. Harris, *Iron Production and Markets Before 1800*. In: *The British Iron Industry 1700–1850*, Macmillan Education, UK, 1988, pp. 48-53.
- [136] P. Brimblecombe, *The big smoke*, London; New York: Methuen, 1987.
- [137] P. Warde, *Energy Consumption in England & Wales, 1560-2000*, A. Marra (Ed.) Consiglio nazionale delle ricerche, Istituto di studi sulle società del Mediterraneo, 2007.
- [138] A.B. Hargadon, Y. Douglas, When innovations meet institutions: Edison and the design of the electric light, *Administrative Science Quarterly* 46(3) (2001) 476-501.
- [139] F. Wicks, The oil age, *Mechanical Engineering* 131(8) (2009) 42.
- [140] D.C. Barton, *Mechanics of formation of salt domes with special reference to Gulf Coast salt domes of Texas and Louisiana*, *AAPG Bulletin* 17(9) 1933) 1025-83.
- [141] T.C. Jones, America, oil, and war in the Middle East, *Journal of American History* 99(1) (2012) 208-18.
- [142] D. Little, *American orientalism: the United States and the Middle East since 1945*, Univ. of North Carolina Press, 2008.
- [143] T. Mitchell T, McJihad: Islam in the US global order, *Social Text*. 20(4) (2002) 1-8.
- [144] International Energy Agency, Oil. <https://www.iea.org/aboutus/faqs/oil/> (ulařım 20.06.16)
- [145] A.R. Brandt, A. Millard-Ball, M. Ganser, S.M. Gorelick, Peak oil demand: the role of fuel efficiency and alternative fuels in a global oil production decline, *Environmental Science & Technology* 47(14) (2013) 8031-41.
- [146] J.G. Speight, *Natural gas: a basic handbook*, Elsevier, 2007.
- [147] United States Department of Energy, *Modern shale gas development in the United States: a primer*, 2009
- [148] D.T. Allen, V.M. Torres, J. Thomas, D.W. Sullivan, M. Harrison, A. Hendler, S.C. Herndon, C.E. Kolb, M.P. Fraser, A.D. Hill, B.K. Lamb, Measurements of methane emissions at natural gas production sites in the United States, *Proceedings of the National Academy of Sciences* 110(44) (2013) 17768-73.
- [149] M.M. Abu-Khader, Recent advances in nuclear power: A review, *Progress in Nuclear Energy* 51(2) (2009) 225-235.
- [150] D.Y. Goswami, F. Kreith, *Global Energy Systems, Energy Efficiency and Renewable Energy Handbook*, 2002.
- [151] G.M. Crawley, *The world scientific handbook of energy*, World Scientific, 2013.
- [152] J.C. Williams, D. Hay, *Hydroelectric Development in the United States, 1880-1940*.
- [153] The Institute of Electrical and Electronics Engineers Inc., Vulcan street plant. <https://www.asme.org/getmedia/c0b5b641-34df-46a5-aa22-c847b42084b4/29-Vulcan-Street-Power-Plant.aspx>, 1977.
- [154] A.J. Dunar, D. McBride, *Building Hoover Dam: An Oral History of the Great Depression*, University of Nevada Press, 1993.
- [155] O. Paish, Small hydro power: technology and current status, *Renewable and Sustainable Energy Reviews*, 6(6) (2002) 537-556.
- [156] United States Department of Energy, *Large scale hydro power basics*, 2013.
- [157] Y. Wang, Z. Fu, *Three Gorges Dam and the electric power systems in China [Thesis]*, Karlskrona (SWE), Blekinge Institute of Technology, 2015.
- [158] M.O. Hansen, *Aerodynamics of wind turbines*, Routledge, 2015.
- [159] J.F. Manwell, J.G. McGowan, A.L. Rogers, *Wind energy explained: theory, design and application*, John Wiley & Sons, 2010.
- [160] R. DiPippo, *Geothermal power plants: principles, applications, case studies and environmental impact*, Butterworth-Heinemann, 2012.
- [161] M.H. Dickson, M. Fanelli, *Geothermal energy: utilization and technology*, Routledge, 2013.
- [162] A. Goetzberger, J. Luther, G. Willeke, *Solar cells: past, present, future*, *Solar Energy Materials and Solar Cells* 74(1) (2002) 1-1.
- [163] M.S. Guney, *Solar power and application methods*, *Renewable and Sustainable Energy Reviews* 57 (2016) 776-85.

- [164] M. Mayer, Why are solar cells made of silicon. Berkley Energy and Resource Collaborative, http://berc.berkeley.edu/why-are-solar-cells-made-of-silicon_1/ (ulaşım 09.06.16)
- [165] J.T. Pytilinski, Solar energy installations for pumping irrigation water, *Solar Energy* 21(4) (1978) 255-62.
- [166] H.P. Garg, *Advances in Solar Energy Technology: Volume 2: Industrial Applications of Solar Energy*, Springer Science & Business Media, 2012.
- [167] Y. Tian, C.Y. Zhao, A review of solar collectors and thermal energy storage in solar thermal applications, *Applied Energy* 104 (2013) 538-53.
- [168] C.B. Field, J.E. Campbell, D.B. Lobell, Biomass energy: the scale of the potential resource, *Trends in Ecology & Evolution* 23(2) (2008) 65-72.
- [169] F. Reißner, J. Schafer J, Inventors: Siemens Aktiengesellschaft, assignee. Cogeneration power plant and method for operating a cogeneration power plant. United States patent application US 14/430,351, Sept. 12, 2013.
- [170] T. Abbasi, S.M. Tauseef, S.A. Abbasi, A brief history of anaerobic digestion and “biogas”. In: *Biogas Energy*, Springer New York, 2012, pp. 11-23.
- [171] U. Marchaim, *Biogas processes for sustainable development*, Food & Agriculture Org., 1992.
- [172] P.L. McCarty, One hundred years of anaerobic treatment. *Anaerobic digestion 1981: Proceedings of the second international symposium on anaerobic digestion*. Elsevier Biomedical, Amsterdam, 1982, pp. 3-22.
- [173] O.P. Chawla, *Advances in biogas technology*, Advances in biogas technology, 1986.
- [174] A. Webb, D. Coates, *Biofuels and biodiversity*, CBD Technical Series 65 (2012) 69.
- [175] M. Karakaş, *Müsbet İlimde Müslüman Âlimler*, Kültür Bakanlığı (1991) 151.
- [176] F. Harris, Catching the tide: a review of tidal energy systems, *School Science Review* 353 (2014) 123.
- [177] S. Waters, G. Aggidis, Tidal range technologies and state of the art in review, *Renewable and Sustainable Energy Reviews* 59 (2016) 514-29.
- [178] M. Lewis, S.P. Neill, P.E. Robins, M.R. Hashemi, Resource assessment for future generations of tidal-stream energy arrays, *Energy* 83 (2015) 403-415.
- [179] Saidak T. History and current state of pyrolysis. http://www.magnumgroup.org/images/History_and_current_state_of_Pyrolysis.pdf (ulaşım 15.06.16)
- [180] D. Radlein, A. Quignard, A short historical review of fast pyrolysis of biomass, *Oil & Gas Science and Technology-Revue d'IFP Energies nouvelles* 68(4) (2013) 765-83.
- [181] A. Hepbasli, Y. Kalinci, A review of heat pump water heating systems, *Renewable and Sustainable Energy Reviews* 13(6) (2009) 1211-29.
- [182] M. Zogg, *History of heat pumps, Swiss Contributions and International Milestones*, Oberburg: Process and Energy Engineering CH-3414, Switzerland, 2008, p. 114.
- [183] P. Jaffe, J. McSpadden, Energy conversion and transmission modules for space solar power, *Proceedings of the IEEE*, 101(6) (2013) 1424-37.
- [184] S.J. Zinkle, G.S. Was, Materials challenges in nuclear energy, *Acta Materialia*, 61(3) (2013) 735-58.
- [185] S.J. Zinkle, L.L. Snead, Designing radiation resistance in materials for fusion energy, *Annual Review of Materials Research* 44 (2014) 241-67.
- [186] M. Laberge, Inventor. Apparatus and method for fusion reactor. United States patent application US 10/507,323, Mar 12, 2003.
- [187] D. Kim, K.K. Sakimoto, D. Hong, P. Yang, Artificial photosynthesis for sustainable fuel and chemical production, *Angewandte Chemie International Edition* 54(11) (2015) 3259-66.
- [188] K.L. Lim, H. Kazemian, Z. Yaakob, W.W. Daud, *Solid-state Materials and Methods for Hydrogen Storage: A Critical Review*, *Chemical Engineering & Technology* (2) (2010) 213-26.
- [189] S.F. Yin, B.Q. Xu, X.P. Zhou, C.T. Au, A mini-review on ammonia decomposition catalysts for on-site generation of hydrogen for fuel cell applications, *Applied Catalysis A: General* 277(1) (2004) 1-9.
- [190] Y. Yamada, C.K. Tsung, W. Huang, Z. Huo, S.E. Habas, T. Soejima, C.E. Aliaga, G.A. Somorjai, P. Yang, Nanocrystal bilayer for tandem catalysis, *Nature Chemistry* 3(5) (2011) 372-376.
- [191] R.S. Disselkamp, Can aqueous hydrogen peroxide be used as a stand-alone energy source? *International Journal of Hydrogen Energy* 35(3) (2010) 1049-53.

Önerilen Kaynaklar

- 1001 İcat: Dünyamızda İslam Mirası (2010) Salim TS Al-Hassani (Editör), Foundation for Science, Technology & Civilisation
- The Book of Knowledge of Ingenious Mechanical Devices: (Kitāb fī ma ‘rifat al-hiyal al-handasiyya) (Aralık 31, 1973) Ibn al-Razzaz al-Jazari (Yazar), Donald R. Hill (Çevirmen), Springer

Önerilen Websayfaları

- <https://www.britannica.com/event/Industrial-Revolution>
Britannica Encyclopedia.
- http://www.britishmuseum.org/research/publications/online_research_catalogues/paper_money/paper_money_of_england__wales/the_industrial_revolution.aspx
British Museum.
- <http://www.fas.harvard.edu/~histecon/energyhistory/>
Harvard University.
- <http://www.History-Science-Technology.com>
History of Science and Technology in Islam.
- <http://www.muslimheritage.com>
Muslim Heritage.
- <http://www.nrcan.gc.ca/energy/renewable-electricity/7295>
NRCAN.
- <http://alternativeenergy.procon.org/view.timeline.php?timelineID=000015>
ProCon.org – History of Energy Timeline.
- <https://energy.gov/science-innovation/clean-energy>
USDOE.
- https://www.eia.gov/energyexplained/?page=renewable_home
USEIA.
- <https://www.eia.gov/todayinenergy/detail.php?id=10>
USEIA.
- <http://teachersinstitute.yale.edu/curriculum/units/1981/2/81.02.06.x.html>
Yale-New Haven Teachers Institute.