FOSSIL FUTURE

By Alex Epstein
Reviewed by Kenneth A. Barry[*]

I. INTRODUCTION

One thing you have to concede about self-described philosopher and energy expert Alex Epstein is that he's unafraid to buck the consensus. His latest opus, *Fossil Fuels*, subtitled "Why Global Human Flourishing Requires More Oil, Coal, and Natural Gas – Not Less," questions nearly every premise of the urgent campaign to replace conventional fuels with greener alternatives.[1] And those proclamations of alleged urgency confront the public continually. To take just one example out of today's headlines, the September 5, 2023 edition of *The Washington Post* blared: "*Climate-linked ills threaten humanity*."[2] The same edition's lead editorial blasted the Texas school board for considering a curriculum standard stipulating that "human activities *can* [rather than *do*] influence climate."[3] The editorial acknowledges that Texas "always gets hot in the summer," but then intones: "[T]he severity and frequency of extreme heat will only increase as the world warms, driven by burning fossil fuels."[4]

To Epstein, such stern mainstream media admonitions crystallize the problem of how the public is informed. To the author, fossil fuels aren't the menace – but rather the salvation – to human civilization. And not merely as a bridge to a carbon-free future: unlike the utility and even oil and gas industry spokespeople who

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1. Many of Epstein's core arguments in favor of fossil fuels or against renewables were advanced in his first book, The *Moral Case for Fossil* Fuels. ALEX EPSTEIN, THE MORAL CASE FOR FOSSIL FUELS (Portfolio 2014); *see* Jody Freeman, *A Critical Look at "The Moral Case for Fossil Fuels,"* 36 ENERGY L.J. 327 (2015), for a review of the book by Harvard Law professor, Jody Freeman; *see also* Alex Epstein, *A Straw Man Attack on the "The Moral Case for Fossil Fuels,"* 38 ENERGY L.J. 79 (2017), for a rebuttal to the Freeman review by Epstein himself.

2. Annie Gowe, et al., *Climate-Linked Ills Threaten Humanity*, WASH. POST (Sept. 5, 2023, 6:00 AM), https://www.washingtonpost.com/climate-environment/interactive/2023/pakistan-extreme-heat-health-impacts-death/?pwapi_token=eyJ0eXAiOiJKV1QiLCJhbGciOiJIUzI1NiJ9.eyJyZWFzb24iOiJnaWZ0IiwibmJmIjoxNjkzODg2NDAwLCJpc3MiOiJzdWJzY3JpcHRpb25zIiwiZXhwIjoxNjk1MjY4Nzk5LCJpYXQiOjE2OTM4ODY0MDAsImp0aSI6ImExNzYyOWM1LTRjOTAtNGNhOS04ODQzLWNlYTQzMzQyNjBjNCIsInVybCI6Imh0dHBzOi8vd3d3Lndhc2hpbmd0b25wb3N0LmNvbS9jbGltYXRlLWV-udmlyb25tZW50L2ludGVyYWN0aXZlLzIwMjMvcG-FraXN0YW4tZXh0cmVtZS1oZWF0LWhlYWx0aC1pbXBhY3RzLWRlYXRoLyJ9.yv46ZgrprAvESofGzi3MEG4NMvVZ7HDgrxmoX4_TPnQ&itid=gfta.

3. *School officials are still arguing about teaching climate change*, WASH. POST (Sept. 6, 2023, 7:03 PM) https://www.washingtonpost.com/opinions/2023/09/06/texas-climate-change-textbooks/.

4. *Id.*; The editorial also scolds certain Texas school board members for suggesting that school books should discuss the "benefits" of burning fossil fuels or that "naturally occurring climate change can lead to increasing temperatures," inasmuch as that would "downplay conclusive research showing fossil fuel use is rapidly warming the planet." *Id.*

embrace "net zero" goals for the longer term (while recognizing the need for hydrocarbons to fuel societies for a least a decade or two), Epstein argues, through the considerable length and breadth of *Fossil Future* (it runs 430 pages), that mankind will need a robust supply of fossil fuels indefinitely. Hence, while environmentalists might tag Epstein as an extreme climate denialist, he might turn the tables and label advocates of rapid fossil fuel elimination as energy deniers.

To be fair (and clear), Epstein does not deny that carbon emissions are contributing to the warming of the planet. Instead, in a one-hundred-page overture before the book gets down to brass tacks, Epstein develops his core thesis that the benefits bestowed by fossil fuels on economic development and basic human comfort far outweigh any environmental drawbacks; and besides, he insists, negative impacts are "masterable" through utilization of fossil fuels.

II. OPENING SHOTS

The one-hundred-page opening (Part I of *Fossil Future*) is essentially an elaboration of the book's not-so-succinct subtitle. Epstein starts out with reflections on how our "knowledge system" (a favorite Epstein phrase) works in practice. A chain of information on scientific matters begins with "experts," whose analysis is passed on to "disseminators" (e.g., mainstream newspaper reporters, educators, and spokespeople for scientific institutions), and ultimately extends to "evaluators" (editorial writers, other public commentators, and policymakers)."[5] Epstein repeatedly decries a "chain of distortions" in this knowledge system that works its way down from the experts through to the evaluators.[6]

The author goes on to note that "billions of people are suffering and dying for lack of cost-effective energy"[7] and to criticize "our designated experts" (individuals or institutions chosen by the "knowledge system" to opine on the implications of research in the climate field) for persistently ignoring the benefits of fossil fuels.[8] The passage proceeds to list a gallery of well-known "designated experts" (e.g., James Hansen, Michael Mann, Al Gore, Amory Lovins, and others) who have stressed the catastrophic consequences of continued reliance on fossil fuels while failing, says the author, in their "moral case" for *eliminating* these fuels to "incorporate . . . the unique, massive, and desperately needed benefits of fossil fuels."[9]

Adding to the perplexity of the designated experts' advice, Epstein injects, is the "fact that our knowledge system" (often led the same experts) "regularly supports the elimination of the two most cost-effective, non-CO_2-emitting alternatives

5. ALEX EPSTEIN, FOSSIL FUTURE: WHY GLOBAL HUMAN FLOURISHING REQUIRES MORE OIL, COAL, AND NATURAL GAS--NOT LESS, 16 (Portfolio, 2022) [hereinafter FOSSIL FUTURE].

6. Epstein joins the chorus of conservative critics in calling out the reports of the U.N.'s Intergovernmental Panel on Climate Change (IPCC) as a "chain of distortions" omitting "crucial facts (such as "climate-related deaths are plummeting." *Id.* at 15. The "distortions of evaluation," he goes on to insist, are "the worst and most damaging . . . with fossil fuels in particular." *Id.*

7. *Id.* at 26.

8. *Id.* at 29-30.

9. FOSSIL FUTURE, *supra* note 5, at 30.

to fossil fuels – alternatives you'd expect anyone concerned [about carbon emissions] to eagerly champion: nuclear energy and hydroelectric energy."[10] Moreover, while Epstein concedes the "knowledge system in theory" supports wind and solar energy, "in practice" these technologies "face widespread local opposition" because they require mining, the consumption of "huge amounts of space," and entail "unprecedented amounts of long-distance electric transmission lines."[11]

Another charge by Epstein is that disseminators and evaluators defer all too readily to "catastrophizers" of fossil fuels' "side effects" (two more of the book's favorite terms). In Part I,[12] the author condemns such "catastrophizing" while asserting that "Our knowledge system's real track record on climate change is 180 degrees wrong," guilty of "wildly overstating side-effects."[13]

To sum up, the book's opening sections indict a "knowledge system" writ large for painting a picture that, in the author's telling, privileges advice from the wrong experts and showcases leading voices that are not only anti-energy but, when it comes right down to it, anti-human.

III. WHY ARE ENVIRONMENTAL ADVOCATES SO "ANTI-HUMAN"?

Epstein does not pose this precise question. But that's the underlying quandary in an extended section labeled "The Anti-Impact Framework."[14] The discussion that ensues seems foundational to everything Epstein has to say about the energy choices before us and the force fields buffeting them. It's here that the author most conspicuously dons his philosopher's hat. His central – and unquestionably controversial – contention is that those advocating rapid eliminating fossil fuels are fundamentally "anti-human" regarding their "primary moral goal."[15]

Epstein spins this theory out by arguing that environmentalists[16] look at all energy development projects through an *anti-impact* prism. In his view, they portray a concept of nature that, undisturbed, maintains a "delicate balance" and, hence, that human interventions with a significant environmental impact threaten to topple that balance.[17] The author has so much to say on this topic that just to

10. *Id.* at 34.

11. *Id.* at 37.

12. Part I begins at page 42.

13. FOSSIL FUTURE, *supra* note 5, at 54 (noting that here, Epstein catalogs a series of dire predictions from well-known experts that have not been realized, at least in the timeframes originally predicted. He uses this material to undermine the credibility of climate change experts warning of doomsday scenarios. It seems fair to add that the headlines and reportage on certain extreme weather events in 2023 reinforce the notion that climate change is upon us, and the consequences are dire. Presumably, Epstein would reply that the reportage is hyperbolic and lacks context.).

14. *Id.* at 74-105.

15. *Id.* at 75.

16. In this review, the term "environmentalists" is used interchangeably with anti-fossil fuel advocates, although the latter may be best viewed as a major branch or offshoot of the environmental movement.

17. The book more expansively elaborates the "delicate balance" view with some of the clunkier terminology one encounters between its covers (see 92-95). Epstein refers to a "delicate nurturer assumption" employed by anti-impact advocates that, he contends, distorts the trade-offs between development and ecological preservation by implying an idealized harmony of nature and its creatures in its pristine state – which, in turn, is subverted by humans viewed under a "parasite-polluter assumption."

summarize it would take pages. But a couple of excerpts capture the flavor. Epstein quotes from a favorable review of *The End of Nature* (1989) by noted environmentalist Bill McKibben as follows:

> Human happiness, and certainly human fecundity, are not as important as a wild and healthy planet. . . . Until such time as *Homo sapiens* should decide to rejoin nature, some of us can only hope for the right virus to come along.[18]

Epstein quickly acknowledges that such naked examples of "explicitly naming our primary goal as eliminating human impact" are "relatively rare,"[19] but he offers up this tidbit as telling evidence of the real agenda of radical naturalists (and by extension the most outspoken anti-fossil fuel advocates). Vaguer exhortations such as "going green," Epstein asserts, cloak the more radical *no-impact* agenda but, in practice, "absolutely do mean eliminating all types of human impacts – including the vast majority of human impacts that are beneficial to human flourishing."[20]

Returning to the innate tension between environmental protection and energy resource development, Epstein underscores that *every* type of energy, whether conventional or renewable, entails significant impact on the natural world:

> All forms of cost-effective energy involve developing nature – transforming it in a significant way. . . . Crucially, even when the mainstream knowledge system doesn't actively support stopping some development, it is highly sympathetic to the people trying to stop it – because they are seeking to eliminate some form of human impact, which is considered to be the epitome of morality.[21]

Conversely, laments the author, the "knowledge system" views the "significant side effects of cost-effective energy as immoral and in need of elimination."[22] Epstein moreover portrays as disingenuous the contrast his adversaries draw between a benign, nurturing nature and detrimental human impacts. "They know," he claims, that "climate danger used to be a menace to human life that most of us in the 'empowered world' cannot imagine today" and "by the modern standard of living [unimpacted nature] is a barely livable place."[23]

Near the end of this discussion, the author exhorts us to discard the "anti-impact framework" that, he says, unduly shapes the discourse about climate change and the "side effects" of energy production and consumption. It should be replaced, he posits, with a "human flourishing framework" that considers the "full context" by "weighing the benefits and side-effects of different forms of energy in relation to human flourishing – neither ignoring nor catastrophizing anything."[24]

Epstein closes Part I of *Fossil Future* by finally unveiling his mission or "project," as he calls it. He relates that about 14 years earlier, he commenced a study of the energy choices facing society and came swiftly to the conclusions that (1) the future of fossil fuels in the energy mix is an extremely important issue, but (2)

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18. FOSSIL FUTURE, *supra* note 5, at 81.
19. *Id.*
20. *Id.*
21. *Id.* at 83-84.
22. FOSSIL FUTURE, *supra* note 5, at 87.
23. *Id.* at 94.
24. *Id.* at 100.

the "mainstream knowledge system," incorporating its "anti-impact framework [is] guaranteed to give us terrible, anti-human guidance and its prescription of rapidly eliminating fossil fuels could well be catastrophically bad."[25] He then looked for "some general expert" who could provide a more enlightened, "full-context evaluation" but found that specialists in the topics that matter most ("energy, economics, environmental science, climate science") were "operating on the anti-impact framework" Epstein so thoroughly distrusts.[26] It was at this point that he decided to add "general expert on fossil fuels" to his philosopher shingle, "drawing on the best sources and specialists I could find."[27] The result is *Fossil Future*, a "synthesis of everything that [Epstein] learned."[28]

IV. ABOUT THAT BOUNTY OF BENEFITS

Part II of *Fossil Fuels*[29] undertakes to educate the readers more broadly on the benefits of burning fossil fuels. There is nothing understated in Epstein's expository style. Although such "benefits" have been a regular drumbeat of the preceding pages,[30] the author confides that "Those benefits are far, far greater than I have been able to explain so far." Manifestly, Epstein isn't reluctant to raise the bar he's attempting to clear.

He begins with some reflections on the meaning of "livable planet" – a phrase he perceives as exemplifying "vague, confusing environmental terminology." The term intertwines two different things, he continues: a planet that is "highly livable for human beings" and an "unimpacted" planet that is "allegedly more livable" for a wide range of species.[31] It's the former version, with *human beings* and their flourishing at the epicenter, that Epstein prioritizes. The question of what defines a livable world and what is conducive to it occupies the next several pages. The qualities that serve as his measuring rods are (1) "*nourishing*"; (2) "*safe*"; and (3) "*opportunity-filled.*"[32] Not unexpectedly, Epstein views fossil fuel development and utilization as the portal to attaining these habitability goals.

The chapter places side-by-side graphs depicting life expectancy, world population, and GDP-per capita over the last two millennia and observes that they mirror a graph of carbon dioxide emissions, with "hockey stick" increases beginning around the late 19th Century.[33] These correlations, he concludes, reflect "an incredible improvement in Earth's livability," notwithstanding "a lot of [human] impact, which fossil fuel use certainly does . . . ."[34] Yet, to Epstein's dismay, the

25. *Id.* at 103-04.

26. FOSSIL FUTURE, *supra* note 5, at 104.

27. *Id.*

28. *Id.*

29. Part II beings at page 109 with "Sec. 4 – Our Unnaturally Livable Fossil-Fueled World."

30. The heading of a passage at 9 begins, "The Unique, Massive, and Desperately Needed Benefits of Fossil Fuels."

31. FOSSIL FUTURE, *supra* note 5, at 114.

32. *Id.* at 115.

33. *Id.* at 118.

34. *Id.* at 118-19.

"knowledge system and its designated experts" miss the salience of these parallels by doggedly sticking to their "anti-impact framework":

> [E]ven though Earth is more livable than ever, it's widely evaluated as "destroyed" because we've impacted it so much – even though that impact has brought billions of people out of poverty and made them far safer from climate danger.[35]

Returning to the correlation between rising CO_2 levels and his proxies for planetary "livability," Epstein first concedes that correlations don't necessarily *prove* causation,[36] but then submits they're "often reflections" of causation. "In this case," he proceeds, "the relationship is causal to a degree that almost no one appreciates: the ultra-cost-effective fossil fuel energy emitting the CO_2 is literally driving the world's unprecedented, increasing livability."[37] From there, *Fossil Future* enlarges on how the invention and innovation of machines has succeeded, in innumerable ways, in displacing manual labor, with humanity reaping the benefits of productivity. This march of progress, Epstein emphasizes, could not have taken place without fossil fuels to produce and then power the machines.[38]

V. STACKING UP THE BENEFITS AGAINST THE "SIDE-EFFECTS"

As has been seen, *Fossil Fuels* takes a dim view of the "knowledge system" that shapes the general public's impressions about thermal energy and its tradeoffs or drawbacks. Epstein's ideas on getting to a more balanced view occupy much of the second half of the book; but the closing pages of Chapter 4 ("Our Unnaturally Livable Fossil-Fueled World") soften the ground with some tough rhetoric on how that knowledge system portrays the benefits side of the equation.

In a discussion on human health impacts posed by fossil fuel combustion emissions, the author first points out that, apart from carbon dioxide, "air pollution in the U.S. has declined dramatically."[39] Another tack is the assertion that "fossil fuel energy's side-effects are increasingly neutralized by its benefits." The "neutralized" concept has multiple facets. One is that he doesn't necessarily mean *reducing "the effect itself"* but rather the negative consequences thereof.[40] Another is a reminder of benefits (e.g., to human health and well-being) enabled by fossil fuels. For example, he chafes at the studies claiming to show reduced life expectancy from coal emissions in China, insisting that "any accurate study" would show dramatic *increases* in life expectancy, adding:

> That we never hear this illustrates once again how worthless our anti-impact, anti-energy, and ultimately anti-human knowledge system is . . . .[41]

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35. FOSSIL FUTURE, *supra* note 5, at 118-19.

36. *Id.* at 120.

37. *Id.*; Answering the fact that improvements in life expectancy, etc. are "invariably ascribed to crucial factors . . . such as scientific discoveries, technological innovation, improved medical care, and improved sanitation," Epstein insists they have "overwhelming depended on and will continue to depend on ultra-cost-effective energy production from fossil fuels or their equal." *Id.*

38. This will seem uncontroversial to most readers; but presumably Epstein hammers home the point because fossil fuels have become such a flashpoint (and subject of denigration) in the current political discourse.

39. FOSSIL FUTURE, *supra* note 5, at 166.

40. *Id.* at 168.

41. *Id.* at 170.

Epstein similarly exhibits little patience for studies that assert fossil fuel prices fail to reflect negative "externalities." To be fair, he says, such studies should also take pains to reflect the *positive* externalities (in other words, the economic value provided by a given unit of oil, natural gas, or coal). If we paid for the positive externalities, he muses, "we would be giving significant chunks of our life savings to the fossil fuel industry."[42]

VI. "COST-EFFECTIVENESS" OF FOSSIL FUELS VS. ALTERNATIVES

Up to this point, Epstein has sprinkled his book generously with references to the "ultra" cost-effectiveness of fossil fuels. In Chapter 5,[43] he goes beyond the bare assertion and wades more deeply into this facet of his overall benefits argument. Necessarily, his cost-effectiveness stance must thwart the commonly heard claim from anti-fossil fuel advocates that renewables not only are ushering in a greener, cleaner future but are already *more* competitive than conventional fuels.[44] This economics debate may be of greater interest to energy professionals than Epstein's retrospective on the historic contributions of coal, oil, and natural gas to civilization.

Much of this section is devoted to the natural advantages of fossil fuels from a chemical and physics perspective. In contrast with the "intermittent flow" of sunlight and wind that requires conversion, transmission, and "massive" storage,[45] observes Epstein, fossil fuels already have "naturally stored energy of ancient organisms, which means that ultimately they are *naturally stored sunlight"* and provide a "mass-energy-storage system for us."[46] Another critical advantage is the "energy density" of fossil fuels, facilitating economical, global transportation.[47] Yet another leg up for fossil fuels is simply that, because they've been around for such a long time, an "unrivaled amount of economic innovation and achievement has gone into harnessing" their physical attributes, creating "an incredibly high bar for potential alternatives . . . ."[48] In other words, they have incumbency on their side.

Finally, these fuels (routinely referred to as "finite resources" twenty-five or more years ago) "exist in staggering amounts," the author insists.[49] Even though statements on current "reserves" may speak only of *decades* of availability, Ep-

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42. *Id.* at 172; At this point, Epstein expresses scorn for the "smug but inane refrain" that market prices for fossil fuels fail to reflect the negative externalities. FOSSIL FUTURE, *supra* note 5, at 172.

43. Chapter 5, "The Unique and Expanding Cost-Effectiveness of Fossil Fuels" begins on page 174.

44. In Chapter 6 ("Alternatives: Distortions versus Reality"), the book goes another round against renewables advocates contending that affordable, practical, and greener alternatives are already present and deployable *en masse.*

45. FOSSIL FUTURE, *supra* note 5, at 182-85.

46. *Id.* at 185.

47. *Id.* at 186-87.

48. *Id.* at 192.

49. FOSSIL FUTURE, *supra* note 5, at 192; The only other fuel with comparable attributes, says Epstein, is nuclear energy, but "it is strangled by governments to the point of near criminalization." *Id.* at 188.

stein distinguishes "reserves" from "deposits," with the latter being a better indicator of future abundance; and in that regard, *Fossil Future* assures us that "deposits . . . are absolutely huge" providing fuel for "centuries to come."[50]

The book cites the "shale energy revolution" as a vivid example of how technological advances have accelerated oil and natural gas production "in the last decade, especially in the United States."[51] This is certainly valid, but Epstein could be more nuanced when he asserts simply that "[i]n 2019, the U.S. was a net oil exporter."[52] The reality is more complicated. The Energy Information Administration (EIA) website (a source Epstein relies on) indicates that the U.S. was a net *overall energy* exporter that year, and in November 2019, was a net exporter of *petroleum products.* But it was still a net importer of *crude oil* (notwithstanding major strides in reducing the levels of imports since around 2005).[53]

VII. THE CASE AGAINST A HEAVY PUSH TOWARDS RENEWABLES

Chapter 6 ("Alternatives: Distortions versus Realities") tackles a related, no less pivotal subject: what is a *realistic* expectation for the penetration of renewables or "green" energy in the next ten years and beyond? *Fossil Future* goes up against the familiar battle cries of "green power" advocates: that the climate crisis is already upon us; that harm to the atmosphere from fossil fuel emissions is approaching an irreversible inflection point; that the only way out is a radical commitment to non-carbon-emitting alternatives; that the wind and solar energy – at least to power the grid – are more than equal to the task; and that a comparably aggressive commitment to electric vehicles (EVs) will speed the relegation of oil to a far lesser role in fueling mobility.

Epstein begins by deriding projections embraced by the "knowledge system" that green energy will *totally displace* conventional fuels in "less than thirty years"; and he is even more dumbfounded by "a group of prominent academics and other influential people" contending that the electric grid can be totally powered by renewables at the end of this decade.[54] Thus, a central aspect of the author's "project" is to debunk what he paints as "the incredible claims of our anti-energy knowledge system."[55]

To do so, Epstein points up an assortment of fallacies he alleges run through such predictions. One is that "efficiency" is the "lowest hanging fruit" that will result in reduced energy usage.[56] The author regards this as delusional because the third world has billions of people that are currently underserved or unserved by cost-effective fossil fuel-burning systems and can be expected to demand much

50. *Id.* at 199; This assertion comes with a caveat: Epstein acknowledges that the existence of "almost limitless deposits" doesn't necessarily mean they can be produced cost-effectively; but he is nonetheless confident that "unprecedented innovation and progress" in energy technology will enable their production. *Id.* at 200.

51. FOSSIL FUTURE, *supra* note 5, at 200.

52. *Id.*

53. *See Despite the U.S. becoming a net petroleum exporter, most regions are still net importers*, EIA (Feb. 6, 2020) https://www.eia.gov/todayinenergy/detail.php?id=42735. Therein, the EIA states that in November 2019, the nation imported 5.8 million b/d of crude oil, while exporting 3.0 million b/d – a net deficit.

54. FOSSIL FUTURE, *supra* note 5, at 204.

55. *Id.* at 205.

56. *Id.* at 206.

more conventional energy as they develop. Secondarily, Epstein finds it incongruous or worse that those insisting on advancing greener, low-carbon technologies (1) exclude nuclear and hydro power (presumably because they aren't "low-impact" resources); and (2) shrug off "global opposition" to solar and wind based on their total lifecycle impacts on nature.[57] Moreover, Epstein argues at length that wind and solar energy aren't nearly as competitive as they are cracked up to be.

The substance of Epstein's argument is probably familiar territory to longstanding students of energy physics and economics, but less so to readers who largely get their information on energy and the environment from the newspapers, political talk shows, and internet polemics. His chief points can be summarized as follows:

- Low current penetration. Despite "many decades on the market," wind and solar produce only around 3% of the world's energy. That contribution is almost entirely electricity, and with "no current competition with many of fossil fuels' mobility-related or industrial-related uses." To make headway in those applications and completely replace fossil fuels, generation at a "far, far lower cost" and the invention of cost-effective, low-carbon transportation machines would be necessary.[58]
- Rapid growth of wind and solar in context. While wind and solar power exponents boast of rapid expansion in their deployment, these double-digit annual growth rates are off a low base. Epstein notes: "[H]istory shows us that in business it's very common for something to have a temporarily rapid rate of growth when its base is small and then taper off as it grows."[59]
- Illusion of prices falling to levels below thermal generation. As to the "constant headlines about solar and wind already falling to prices that are cheaper than nuclear . . . coal . . . [or] gas," Epstein highlights several counterpoints. First, wind and solar are the beneficiaries of "massive government preferences" in the form of subsidies, as well as mandated incorporation in the form of renewable portfolio standards. Yet, he suggests, the leaders in wind and solar penetration – Germany and Denmark in Europe, California in the U.S. – have the highest retail electricity prices. "Why," he asks, "do solar and wind seem to always make electricity more expensive if they're actually so cheap?" The answer, he continues, lies in the "diluteness" and intermittency of wind and solar energy, entailing larger investments in transmission networks and the maintenance of fossil-fuel backup generation. There are three "approaches," the book claims, to working around the inherent shortcomings of wind and solar: relying on (1) "some controllable source of energy" (e.g.,

57. *Id.* at 206-07.

58. FOSSIL FUTURE, *supra* note 5, at 209; By "mobility-related" uses that aren't currently competitive running on electricity, Epstein apparently excludes most EVs (passenger vehicles and lighter-duty trucks).

59. *Id.* at 210.

fossil fuels); (2) a "diverse, distant, enormous" network of wind and solar generation; or (3) a "man-made storage system" holding enough renewable energy in reserve to meet demand. Of these, Epstein concludes, only the first approach "has been implemented at *any* cost."[60]

- Weather and sunlight match up poorly with end-use demand. Epstein anecdotally suggests that recent regional U.S. blackouts – for example, in Texas and California – can be traced to low outputs of wind or solar energy. He maintains that the wind doesn't blow very much when the weather is very cold or very hot, and notes that there isn't much sunshine in Germany at all in the cold winter months. As to the latter, he posits that "intermittent solar and wind can go to near zero for extended periods of time" with the consequence that they "do not replace existing, controllable energy infrastructure."[61]

Epstein's conclusions are severe. "Is it any wonder," he ponders, "that the more solar and wind a country uses, the higher its costs?"[62] Not only do such ventures entail "massive infrastructure duplication," he maintains, but also necessitate cycling thermal generation up or down to mirror the ebbs and flows of intermittent generation – "an efficiency killer, just like stop-and-go traffic kills your car's fuel efficiency."[63] A few pages later, he denounces wind and solar as "cost-adding, reliability-decreasing parasites" that aren't even close to having the ability to "power a grid on their own."[64] For good measure, he labels as a "fraud" the practice of large corporations such as Apple, Google, and Bank of America in asserting they're operating on 100% renewable energy, leading consumers to think a fossil-free energy reliance is actually achievable.[65]

An adjacent argument is Epstein's portrait of battery storage: this is no practical answer to wind and solar inherent intermittency, he contends, but rather a disingenuous myth. In theory, he explains, system designers could construct a tremendous amount of wind and solar generation – enough to meet not only current demands but also fill battery storage. But doing so is "completely cost-prohibitive" based on current know-how, "which is why no one has come close to even trying it."[66] After running through some figures to demonstrate the point, the author concludes:

> Thus, solar and wind replacing fuels isn't a fantastic breakthrough; it's a thoroughly dishonest fantasy – one that is used to advance anti-impact anti-energy policies.[67]

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60. *Id.* at 210-15.

61. *Id.* at 214-15.

62. FOSSIL FUTURE, *supra* note 5, at 216.

63. *Id.*

64. *Id.* at 219.

65. *Id.* at 219-20; Epstein claims that all Apple, et al. are doing is paying utilities extra to *credit* the portion of their generation that comes from renewables to customers willing to pay extra. He adds that corporate assertions of 100% renewable energy ignore, to take one example, Apple's use of large transport vehicles to ship parts and products around and their bulk of their manufacturing in China, where "64% of electricity is from coal." FOSSIL FUTURE, *supra* note 5, at 220.

66. *Id.* at 221.

67. *Id.* at 223.

In the concluding page of this section, Epstein cites examples of soured experiments in full-on reliance on solar generation in certain third-world countries, and contends that other modes of renewable energy – beyond wind and solar – either (1) can't realistically be expected to displace significant amounts of fossil fuels (biomass and geothermal);[68] or (2) have been wrongheadedly suppressed or dismissed by green power advocates (hydro-electricity, nuclear) because of their unacceptable human impact on nature.[69]

The author directs some vehemence particularly towards the green movement's anti-nuclear bias, since this is one technology that exploits abundant raw materials, taps into a very dense energy source, and doesn't emit greenhouse gases.[70] Moreover, Epstein insists, safety concerns are vastly overblown – labeling nuclear "the safest form of energy."[71] The real issue, he suggests, is that clean energy advocates, with only a few exceptions, dismiss nuclear as "morally unacceptable" because it tampers so profoundly with nature. Probing the practicality of nuclear further, the author submits that its operational costs have been needlessly ramped up because it's been swaddled in government regulations (due to the latter's "pseudoscientific opposition.")[72] Summing up this ideological logjam, Epstein does not mince words: "The anti-impact green energy movement is therefore a menace to our future, spreading deadly lies about energy to achieve deadly, anti-energy goals."[73]

As to the potential for carbon capture technology to turn fossil fuel combustion into "clean energy," it is somewhat surprising that Epstein sees scarcely a glimmer of hope in its economics. Large oil and gas companies and coal-burning utilities – not to mention various governments – have invested in R&D and test projects to make carbon capture and sequestration (CCS) commercially viable. But the author sees just limited scope for CCS, since it can be economical through the selling of CO_2 streams to oil producers for enhanced oil field recovery. While that can be cost-effective, he maintains that it can only work for a small amount of emissions (because the market is limited).[74] The economics of machines that suck CO_2 directly out of the atmosphere (i.e., "air capture") are far too expensive, he adds, to justify themselves.[75]

VIII. CLIMATE CHANGE: MENACE OR MANAGEABLE?

In its last three chapters, *Fossil Future* addresses three unquestionably important matters provoking the climate change debate. They all boil down, in one way or another, to how big a problem climate change really is. Is it an existential

68. There is an "advanced geothermal" concept, the book points out, that would drill very deep wells to access high-temperature, high-pressure water that could, in theory, drive generation. But it's yet to be commercialized, he notes, and – if it were shown to be practicable – would likely become the target of environmental advocates because it employs fracking and would thus arouse anti-impact sentiments. *Id.* at 230-31.

69. FOSSIL FUTURE, *supra* note 5, at 226-44.

70. *Id.* at 234.

71. *Id.* at 235.

72. *Id.* at 236.

73. FOSSIL FUTURE, *supra* note 5, at 237.

74. *Id.* at 239.

75. *Id.* at 240.

threat – a doomsday scenario for a habitable Planet Earth unless tackled decisively and pronto? Or is the threat exaggerated and, to the extent warmer temperatures are actually in store, technologically manageable and, for naturally colder regions, a blessing in disguise?

Epstein falls firmly into the latter camp. In Chapter 7 ("The Enormous Power of Fossil-Fueled Mastery"),[76] he suggests that we shouldn't refer to civilization's responses as "adaptation" (which sounds "trivial" or lame to his ears), but rather as "climate mastery," with its more emphatic, *we've-got-this* resonance.[77] He relates that climate and weather have always had their dangerous sides, but human ingenuity has enabled mankind, over time, to engineer more and better ways to cope with temperature extremes, storms, and droughts. The result has been a sharp reduction in the incidence of deaths from climate-related phenomena over the last hundred years (a period, he notes, where atmospheric concentrations of carbon dioxide have gone from purportedly "acceptable" to "unacceptable" levels).[78] The passage is buttressed with harrowing accounts of early 20th century hot and cold waves resulting in widespread death and environmental destruction – catastrophes that wouldn't occur in what the author likes to call our fossil-fueled modern world.[79]

Drought, wildfires, floods have likewise been "mastered," or at least mitigated, over the same period, Chapter 7 goes on to argue. And while property damage is up if measured in monetary terms (as property development – especially in zones more exposed to storms, floods, and fires – has rapidly expanded), the damages have remained low as a proportion of income or GDP, and hence not "a catastrophic, let alone apocalyptic, problem."[80] What especially irks Epstein is that the "knowledge system" and its disseminators refuse to acknowledge the "climate mastery abilities that will come with fossil fuels' climate side-effects."[81] As a result of this systematic "mastery denial," worries the author, the public gets only a partial (and hence misleading) view of what continued reliance on fossil fuels implicates.[82]

Passing that threshold, Epstein gets to the heart of the matter: his critique of the predominant narrative on the extent and impact of climate change. His first thrust, Chapter 8 ("The Problem of Systemic Climate Distortion"),[83] is a variation on the book's familiar theme – pushback to the narrative that virtually all scientists agree that unchecked greenhouse gas emissions present a dire threat to the environment and humanity. Since Epstein isn't a scientist himself, but rather an avid consumer of the relevant literature, he goes indirectly about the task of upending the premise that the "science is in," by citing comments of scientists who have challenged the consensus.

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76. Chapter 7 is contained in pages 247-289.
77. FOSSIL FUTURE, *supra* note 5, at 259, 285.
78. *Id.* at 260-65.
79. *Id.*
80. *Id.* at 270.
81. FOSSIL FUTURE, *supra* note 5, at 284.
82. *Id.* at 288-89.
83. Chapter 8 is contained in pages 290-318.

His first point repeats, with renewed emphasis, the fact that proponents of strong action to reduce use of fossil fuels accentuate the negative aspects of increased CO_2 emissions but ignore the "neutral and positive impacts."[84] The main "positive" for him is that the emissions are both a "warming gas" and a "fertilizing gas" (stimulating significantly more global plant growth).[85] For colder climates, incremental warming, suggests Epstein, will enhance comfort and add to the growing season. The chapter also underscores the uncertainty of how various factors impact weather and long-term climate trends, by themselves and in their interactions.[86] The author fumes at the persistence of governmental institutions in largely ignoring the benefits of increased greenhouse gas emissions, from research funding to the Intergovernmental Panel on Climate Change's (IPCC's) reports on climate change effects:

> The negatively distorted funding of research in the mainstream knowledge system leads to benefit denial, as well as overstatement of negatives . . . .And when research is distorted to ignore the benefits of fossil fuels, the rest of the knowledge system will follow – including synthesis where the IPCC downplays the extremely significant potential of global greening for human flourishing and dissemination, where the IPCC's latest Summary for Policymakers doesn't even mention the benefits of greening at all.[87]

In addition to citing the protests of eminent climate scientists who've dissented from the prevailing consensus,[88] Epstein takes issue with the frequently seen claim that "97 percent of scientists" concur that human activity is causing global warming (since such surveys lump together respondents who believe it's a huge problem with those who concede fossil fuel emissions increase warming but don't necessarily believe it is the major driver or a problem of unmanageable dimensions).[89] Finally, Epstein tears into the IPCC for its practice of writing up, with each report, a "Summary for Policymakers" that, in the author's view, is more a political document (hyping the severity of impending climate change) than an accurate distillation of the more measured committee assessments in the main body.[90] His verdict: "When our climate knowledge system summarizes the already-biased syntheses of already-biased research to become even more biased, it should lose all credibility."[91]

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84. FOSSIL FUTURE, *supra* note 5, at 291.

85. *Id.* at 297.

86. *Id.* at 292-93; Epstein also points up the spotty history of temperature data over long stretches of time: satellite data on atmospheric temperatures has only been available since 1979, and thermometer readings around the globe "for even the last hundred year" have been "limited." *Id.* at 293.

87. *Id.* at 300.

88. The notable dissenters primarily cited are Richard Lindzen, Judith Curry, and Patrick Michaels. Curry, a climate scientist at Georgia Tech before her retirement, parted with some shots (quoted in Epstein's book) on her frustration at figuring out "how to navigate the CRAZINESS in the field of climate science. Research and other professional activities are professionally rewarded only if they are channeled in certain directions approved by a politicized academic establishment" affecting receiving funding, getting papers published, getting prestigious jobs and committee appointments, etc. FOSSIL FUTURE, *supra* note 5, at 304.

89. *Id.* at 304-06.

90. *Id.* at 307-08.

91. *Id.*

But Epstein isn't quite as despairing in the quest for meaningful analysis as the above-quoted passage sounds. He maintains that by reading the underlying science assessments in the IPCC reports and "textbooks," he is able to get a handle on what the "mainstream institutions think – certainly incomparably better sense than the mainstream media institutions or IPCC summaries for policymakers."[92]

IX. RISING CO_2 LEVELS: IMPACTS FROM A "PRO-HUMAN" POINT OF VIEW

The book's culminating series of chapters begins with an extended take on projected carbon impacts from continued burning of fossil fuels, adopting a "full-context, pro-human" framework.[93] In about thirty pages, the reader is provided with the fruits of the author's examination, which he readily acknowledges must pass through "rigorous standards of assessment" to "overcome anti-impact distortions."[94] The resulting harvest, he says, picks up on the "least-distorted mainstream and nonmainstream expert sources."[95] It's indeed going to be a tall order for any theorized negative impacts to daunt the author; he declares that his inquiry "will focus above all on whether there are any impacts of rising CO_2 levels that could somehow overwhelm our enormous climate mastery abilities to the point of justifying any kind of restriction of the desperately needed value of continuing fossil fuel use."[96]

For starters, Epstein rejects out-of-hand the notion that emissions could make the Earth "unlivable," despite the alarms raised by "apocalyptic book titles."[97] His review of the scientific research on correlations between greenhouse gas emissions and warming temperatures veers away from the popular notion that the planet is heating up to unprecedented levels, chiefly by zooming out to the Earth's geological history (rather than confining himself to the 150 years or so that thermometers have been around).[98] His key takeaway is that, in the distant past, temperatures and CO_2 levels were far higher than they are today (or are likely to get), and yet "life on earth thrived."[99] Other salient points:

- The warming effect is more pronounced in the coldest regions, not so much in the temperate zones;[100]
- As carbon dioxide emissions increase, their warming or "greenhouse" effect is not linear, but rather diminishes; hence, the rate of warming will *decelerate*;[101]

92. FOSSIL FUTURE, *supra* note 5, at 312.

93. Chapter 9 begins on page 319.

94. FOSSIL FUTURE, *supra* note 5, at 320.

95. *Id.*

96. *Id.*

97. *Id.* at 321.

98. This is standard practice for books that take on the prevailing consensus that greenhouse gas emissions are damaging the climate; Epstein's book could have done a better job, however, of explaining the means by which geologists go about estimating temperatures and the presence of CO_2 in long-ago eras.

99. FOSSIL FUTURE, *supra* note 5, at 323.

100. *Id.* at 324.

101. *Id.* at 325-29.

- The long-term geological history of the planet shows "no direct correlation between temperature and CO_2," and indeed episodes of increasing emissions have *followed rather than preceded* temperature increases (calling into question that carbon dioxide increases are the main predicate for a warming climate);[102]
- Sea-level rises have been very slow and small; news stories about more dramatic rises have been cherrypicked to highlight certain locales where the phenomenon is happening for other reasons.[103]

Epstein reinforces these contentions with various charts. And, in a flourish of sharp rhetoric, he charges that such facts are "criminally" underdiscussed,[104] while noting that we'd have "plenty of time" to "decriminalize" nuclear energy, should the symptoms of planetary warming be greater than he anticipates.[105] His overarching conclusion is that – despite computer models predicting dramatic increases in warming (and associated side-effects like more severe storms, drought, etc.) – these predictions are unwarranted and in no small part driven by the incentive structure to issue "extreme warming predictions," the better to reap the rewards of "today's enormous amounts of climate funding."[106]

The author ends the chapter with guarded optimism that his insights about the underappreciated benefits and overstated detriments of fossil fuels may relieve humanity from the "pall of the belief that CO_2 emissions are causing climate catastrophe,"[107] so that, *inter alia*, "there is no need for murderous international treaties committing countries to CO_2 reductions; for national, state, and local restriction . . . preventing poor countries from developing to their full potential; [or] for mass blackouts in California and Texas . . . ."[108]

X. PARTING SHOTS

Although *Fossil Future* could have closed on that hopeful note, there is more. An extended "policy" coda unrolls a myriad of prescriptions with the common theme of liberating fossil fuels and nuclear energy from the hall of shame to which they've been consigned.[109] Epstein (1) calls upon readers, if inspired by his counter-consensus message, to join the fight against the misconceptions and fallacies he's outlined and (2) instructs governments on how to loosen up their regulatory policies to permit more efficient and expeditious development of energy and in-

102. *Id.* at 335.
103. FOSSIL FUTURE, *supra* note 5, at 340-44.
104. *Id.* at 324.
105. *Id.* at 331-32.
106. *Id.* at 336.
107. FOSSIL FUTURE, *supra* note 5, at 354.
108. *Id.*
109. *Id.* at 357; *see id.* at ch. 10 ("Maximizing Flourishing through Energy Freedom").

dustrial projects. The author also envisions, as an appealing "alternative" resource, nuclear "microreactors" that may be trucked around to remote locations or sent plying the seas to dock and serve coastal localities.[110]

In yet another epilogue-like chapter, "Reframing the Conversation and Arguing to 100,"[111] Epstein empties his barrels at an assortment of perceived nemeses to global, fossil-fueled progress. Most of these passages echo familiar refrains, inveighing against blinkered governments setting specific "net-zero" milestones;[112] mainstream media outlets purveying "distorted narratives" about purportedly catastrophic consequences from fossil fuels, or their rapid replacement by renewables;[113] educational systems devoted to climate change "indoctrination";[114] and the corporate world's embrace of the climate change mantra, coupled with voguish "ESG" movements.[115] As the title implies, Epstein offers advice on how to reframe the debate, fearing that the anti-fossil fuel legions have had the better of it to date.

XI. CONCLUSION

So, what to make of Epstein's *magnum opus?* Polemical tract? Or audacious *tour de force?* Is the author a prolific gadfly dabbling in complex technical issues, or an industrious and useful synthesizer of complex but critical scientific and philosophical issues, willing to stake out unpopular positions and absorb the inevitable incoming? I found myself going back and forth between these polarities. On the one hand, *Fossil Future* is a remarkable compendium of the many arguments launched by climate change activists against society's dependency on fossil fuels – juxtaposed with generally coherent refutations of each. On the other hand, it's dogmatically one-sided[116] and occasionally glib (e.g., in its bland assurance that nuclear energy is the safest of all energies and abhorred by environmental activists because it doesn't clear their hurdle for low impact on nature).[117] And to say the author's arguments are "coherent" doesn't necessarily mean they'll persuade most readers. Many, though, seem worthy of reflection, and *Fossil Fuel's* more controversial contentions can be a jumping off point for further exploration.

The book may be best understood as an advocacy piece, endeavoring to put the case for fossil fuels' continuing vitality in the most flattering light while

110. FOSSIL FUTURE, *supra* note 5, at 360; While the nuggets of counsel Epstein offers in this chapter are too numerous to summarize, one particularly stood out: a denunciation of the "sustainable development" movement, which the author dismisses as a "self-righteous plague" spreading "anti-impact, anti-development policies in the unempowered world." *Id.* at 372-73.

111. Chapter 11 begins on page 393.

112. FOSSIL FUTURE, *supra* note 5, at 394.

113. *Id.*

114. *Id.* at 395.

115. *Id.* at 395-96.

116. *See* Daniel Yergin, *The New Map*, 41 ENERGY L.J. 375 (2020) (reviewed by Kenneth A. Barry) (contrasting to Epstein's approach with the more balanced and objective analysis of many current energy-versus-environment issues).

117. Epstein goes a bit too far in implying that low-carbon alternatives such as nuclear and hydropower are pervasively rejected by the climate change community, although it's a fair point that a number of prominent environmental organizations disapprove of both technologies.

searching out weaknesses in narratives insisting that their emissions are ruining the habitable environment, and that renewables offer a ready alternative. Few of those who already support eliminating CO_2 emissions as thoroughly and quickly as possible will find much of *Fossil Future* convincing (or, for that matter, readable); but the volume can serve as an in-depth resource for those skeptical of the green movement, and – for the undecided – offers some provocative material for debates the mainstream media has, as Epstein notes, preferred to avoid.

For much of the book, Epstein seems like a Quixotic character tilting with windmills – and solar panels. The few actual climate scientists brave (or foolish) enough to challenge orthodoxy have largely been shamed or silenced. But at the end of the book, the author acknowledges he's gained a broad platform with his prior book,[118] videos, consultations with political offices, and even talks at "elite institutions" such as major universities.[119] And his trail may be getting a little less lonely. Of late, Europe has started to wobble in its march to rid its energy systems of fossil fuels and its roads of gas-powered vehicles.[120] Moreover, the British Prime Minister announced on July 31 that the North Sea would be opened to more oil and gas drilling (*id.*).[121] In the U.S., the candidates competing for the 2024 Republican nomination have all attacked the Democrats' energy transition policy, and newcomer Vivek Ramaswami in particular has echoed strains of *Fossil Future* (to the point of labeling the climate change "agenda" a "hoax").

Finally, something must be said about the author's writing style. While it is commendable in its grammatical correctness and general clarity, the reader may be struck by Epstein's habit of repeating, over and over, points he has already adequately made – like a college professor who frames his lectures with an assumption that the students remember little from previous sessions. This, plus the author's predilection for single-sentence paragraphs, may make his declarations seem individually more profound but inevitably add to the door-stopper thickness of *Fossil Future.* Epstein legitimately has a lot to say, but a tighter approach to drafting might help reach a wider audience of curious, but time-pressed, consumers.

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118. Epstein published *The Moral Case for Fossil Fuels* in 2014.

119. FOSSIL FUTURE, *supra* note 5, at 400.

120. *See*, William Booth & Anthony Faiola, *Europe blinks in its commitment to a great green transition*, Wash. Post (Aug. 6, 2023), https://www.washingtonpost.com/world/2023/08/06/europe-britain-carbon-cost/. "Europe gets cold feet on warming; Division on a great green transition," (Aug.7, 2023, *Washington Post,* p. 1*).* The article notes that "now the bill is coming due . . . governments are starting to blink at the cost – political and economic – needed to power the great transition away from fossil fuels and toward renewables."

121. *Id.*