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Peer reviewed

Review: Power Density: A Key to Understanding Energy Sources and Uses
By Vaclav Smil

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Smil, Vaclav. *Power Density: A Key to Understanding Energy Sources and Uses*. Cambridge, MA.: MIT Press, 2015. 320 pp. ISBN: 9780262029148, Hardcover. US\$ 32.00; Illustrated; includes appendix, references and index. Illustrated.

Vaclav Smil is an intellectual of Malcom Gladwell's ilk: someone capable of publishing reams and reams of books that purport to be counter-intuitive, but actually affirm the self-congratulatory leftish neo-liberal opinions of the current elite. Smil has written on average a book a year over the past quarter century, in addition to myriad articles, an achievement feasible due to writing the same book with minor variations (his books on energy fall into this category, and indeed, he has raised the idea of 'power density' since the 1980s) or venturing into new fields to express platitudes that fail to demand real effort on the part of the reader or society. Climate change is not the biggest problem—epidemics are. Renewable energy sources will not arrive in time, but methane is good enough. US manufacturing is in crisis, but Americans can learn from Germany. Smil has written on all these topics and more. Perhaps it is unfair to judge an author by his fans, unless those fans are Mark Zuckerberg and Bill Gates—if one's admirers include these pillars of wealth and smugness then one has failed as a critical scholar.¹

Despite these caveats, Smil's new book *Power Density: A Key to Understanding Energy Sources and Uses* is useful and should be read by a broad academic and lay public interested in energy debates. It is useful as a summary of a vast literature on the past and future of energy. For this alone it would be a worthwhile read, but the book's central concept, "power density," is a useful contribution. Smil argues that the scope of land-use is pertinent for judging various energy systems, and to do so, adopts the metric of watts produced per square meter. This is quite different than the similar sounding and better known metric "energy density." For instance, charcoal and coal have very similar energy densities—they are both more or less pure carbon—yet the space required in their respective commodity chains is quite different, as the collier needs only a few hectares for a mine's entrance and tailings, while a producer of charcoal needs massive tree plantations. As a result, coal has about *five thousand* times the power density of charcoal. Each chapter reconstructs the power density of energy systems, including nuclear, fossil fuels, hydro-electric, and a slew of renewable sources. Green sources like solar or wind have a low power density (about 5 W/m²), biofuel is much lower (less than 1 W/m²), hydropower and nuclear both tend to be around 200 W/m², while efficient coal or petroleum production varies between 1000-10,000 W/m².

Perhaps the most striking application of this eponymous concept in *Power Density* is Smil's attack on utopian notions of a quick transition to renewable energy. Simply because

renewables require so much space, it is difficult to foresee how they can replace the current fossil fuel regime. Smil works out the math to show that a solar-wind-biofuel regime would require *all* the land-area in the United Kingdom or Germany. Even in a large country like the United States it would engulf between one-quarter to one-half of its territory. Smil, a climate-change sceptic, clearly sees fossil fuels and nuclear power remaining dominant for some time.²

Admittedly, creating a renewable energy network will be difficult, but Smil does not countenance eco-austerity, such as mass vegetarianism or cutting US per capita energy consumption down to at least Western European levels (which are about half as much). Nor does Smil question how broader social and economic structures reproduce such wasteful and prodigious expenditures of energy. In contrast, Andreas Malm, a creative young Marxist energy historian, argues that globalization undermines environmentalist goals because capital heads not only where labour is cheap, but also energy. This is why carbon emissions have drastically increased as China transformed itself as the world's coal-hungry workshop.³ Such a technical field as energy history is deeply embedded in politics. In short, power density is a handy concept, but beware Smil's narrow-mindedness.

References

1. For a very different take on his *oeuvre* one can read *Bill Gates' blog*:
<http://www.gatesnotes.com/Books/Making-the-Modern-World>.

2. Indeed, Smil is sceptical of climate change. *The New York Times*, October 19, 2009
<http://dotearth.blogs.nytimes.com/2009/10/19/smil-on-hummers-hondas-meat-heat/>

3. Malm, A. (2012). China as chimney of the world: The fossil capital hypothesis. *Organization & Environment*, 25, 146-177. DOI: 10.1177/1086026612449338

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