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Review: Renewable Energy: A Primer for the Twenty-First Century
By B. Usher

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Usher, Bruce. *Renewable Energy: A Primer for the Twenty-First Century*. New York, New York, USA: Columbia University Press, 2019; ix+209 pp. ISBN: 9780231187855, paper, US \$20.00; ISBN: 9780231187848, hardcover, US \$60.00; ISBN: 978231547529, ebook, US \$19.99.

Renewable Energy by Bruce Usher was written so that others "... might understand the energy transition to renewables already underway: to set the record straight" (viii). Renewables include any source that is not depleted when used. This includes wind, sun, rivers, tides, waves, earth's internal heat, biomass and biofuels created from plant matter, and hydropower. The text focuses on wind and solar, the leading renewables that are unlimited, abundant, and cost effective.

The history of energy growth is expressed through energy transitions, for example, wood to coal and coal to natural gas. Transitions are slow but can eventually innovate to bigger projects. For example, hydropower dams evolved from the first hydroelectric power plant built in 1882, to the first very large hydroelectric project, the Hoover Dam in 1936, to the largest power generation dam to date, the Three Gorges Dam in China in 2012. The transition from fossil fuel vehicles to electric vehicles has been slowed by certain pressing issues such as overcoming consumer range anxiety, that is, uncertainty that the vehicle can reach the next recharging station, especially on longer trips. This requires that many more recharging stations be established. Transitions have also been constrained by regulations and unforeseen consequences and obstacles. Nevertheless, as constraints are worked out, growth becomes inevitable.

While innovations can accelerate transitions, cost is the main driver of transition. Renewables are only useful if they're cost competitive, that is, they must reach parity. Parity, though an imperfect concept, is reached, for example, when the price of electricity generated from renewable resources equals the price of electricity generated from fossil fuels. Reaching parity is expensive and risky. Yet, innovators and investors

have benefited from government incentives or are risking large sums of their own money on transition projects. Good news has come from undertaking risky projects. Wind energy prices have dropped sixty six percent in the past decade and the International Renewable Energy Agency projects that annual emissions of carbon dioxide will decline by 58 percent by 2050 due to the growth in electric vehicles.

Usher strongly believes that "... how we consume and produce energy is critical to our way of life" (p. viii), and concludes "what is lacking is the political will to ensure that the energy transition moves as quickly as possible" (p. 159). Renewable Energy is part of the Columbia University Earth Institute Sustainability Primer series. The book includes a glossary, bibliographical references and an index. Usher is professor in the Columbia Business School where he teaches on the intersection of financial, social and environmental issues. While there is no shortage of literature on renewable energy, regrettably many individuals know little about renewable energy. This primer stands out in the literature as a sound way to learn about the importance of renewable energy. Highly recommended for personal, public, academic, and special subject libraries.

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