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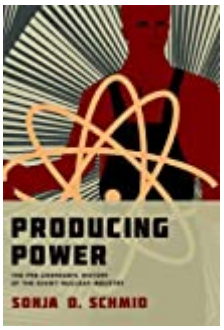


**Sonja D. Schmid.** *Producing Power: The Pre-Chernobyl History of the Soviet Nuclear Industry.* Cambridge: MIT Press, 2015. xxxi + 362 pp. $38.00 (cloth), ISBN 978-0-262-02827-1.

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Sonja Schmid offers timely and much-needed insights into the inner workings of the Soviet nuclear power program from its inception in 1950s to the late 1980s. This highly readable and meticulously documented book starts with the 1987 Soviet trial of Chernobyl nuclear plant operators deemed responsible for the accident and concludes with examination of still ongoing controversies over the accidentâs true causes. The accident indeed casts a long shadow on the entire history of nuclear power in the Soviet Union. Schmid acknowledges that everything about Chernobyl was Soviet, from a unique graphite water reactor design to operating and organizational structures. However, she rejects a simplistic analysis of the Soviet civil nuclear development as boiled down to a âChernobyl waiting to happenâ and warns against considering the disaster as due only to inherently Soviet causes. She mentions the Fukushima disaster in the epilogue as a tragic reminder that the international community failed to go beyond the simplistic explanation offered by some Western observers that Chernobyl was âtoo Soviet to happen elsewhereâ; accidents occur, unfortunately, in the nuclear industry, and the focus on Chernobyl has been misplaced. Schmidâs book in this sense is an attempt to give an unbiased account of the strengths and weaknesses of the Soviet nuclear system, its failings but also its achievements. Schmid succeeds in doing so while critically reviewing both Soviet and Western historiography on this subject. Schmid concludes that the Chernobyl disaster was a result of technical, economic, political, and social factors potentially present in all nuclear power production.

The first two chapters of *Producing Power* deal with the long and difficult establishment of the nuclear power program and its constantly changing organizational structure. Schmid explains the specificities of the context: the planned administrative economy (central planning with all of its inefficiencies) and the state-party system (top-heavy and redundant power structures) that made decision making in the Soviet nuclear program challenging. The author argues that the Soviet nuclear enterprise had dual origins, first in Leninâs ambitious electrification plan launched in the early 1920s and second in Stalinâs nuclear bomb project begun in 1943. The continuing pursuit of electrification helped justify the need to invest scarce human and material resources in nuclear power in a country that did not face an immediate energy crisis but rather had great hydroelectric power potential and plenty of cheap oil and gas in the 1950s. The bomb project allowed Soviet scientists to gain initial expertise in nuclear technology including reactors, and do-

mestic and international prestige. In addition to military factors, rapid developments in the civilian sector were crucial as well. After US president Dwight D. Eisenhowerâs âAtoms for Peaceâ speech at the United Nations in 1953, the USSR advanced a series of âpeacefulâ programs in competition with the United States to demonstrate that it was first in the world in nuclear technology.

Promoters of nuclear power faced significant obstacles in convincing state bureaucrats about the need to commit extensive resources to nuclear power and overcome existing industrial and financial limitations of a still recovering postwar economy. They did so by advancing arguments about the economic viability of nuclear power and its political, ideological, and social significance at home and abroad. They took advantage of connections with high officials. Despite these efforts, the development of the nuclear industry program proceeded in fits and starts until the mid-1960s, when the civil nuclear enterprise really took off because of successful operation of the first generation of power stations, the growing interest of the nation in using oil and gas for exports and nuclear power as a substitute at home, and the continued prestige of nuclear physicists.

Another important obstacle was constant organizational changes. The civilian and military origins of the nuclear program split responsibility for the management of the civil nuclear enterprise between the Ministry of Energy and Electrification (Minenergo) and the military-oriented Ministry of Medium Machine Building (Sdredmash). This double structure resulted in turf wars between the two ministries and the loss of valuable nuclear expertise when transferring some tasks from Sredmash to Minenergo. These losses, some observers in Russia and other countries argue, were one of the causes of the disaster at the Chernobyl nuclear power plant, managed by Minenergo.

As Schmid shows in chapter 3, the rapid expansion of the civil nuclear industry generated great demand for qualified cadres that took a long time to satisfy. Initial top candidates could be recruited from Sredmash, but for a number of managerial positions Minenergo had to recruit people who were not specialized in nuclear physics. University curricula for nuclear specialists did not include practical training, and many of them had to acquire it on the job. Communication of this valuable experience was slowed down between the different organizations and ministries, in part because of secrecy that prevailed in the nuclear domain.

Chapter 4 is dedicated to an analysis of reactor design. Of the dozen different designs that arose out of the poorly coordinated design efforts of the 1950s and 1960s, two emerged as the foundation for rapid nuclear expansion. The first, a uniquely Soviet graphite-moderated RBMK reactor adapted from military plutonium-producing reactors, was not totally satisfying from a safety point of view, but potentially very powerful and relatively easy to assemble. It suffered from a positive void coefficient, meaning it was unstable in various power regimes, especially at low power. The RBMK reactor also had no containment whatsoever, perhaps reflecting the belief that it could be operated so safely that no accident was conceivable. For these reasons, it could never serve as an export model. The second, the VVER, the Soviet variant of the widely internationally adopted Pressurized Water Reactor (PWR), was inherently more stable and could be built with a containment structure. Yet the Soviets built their first VVERs without containment vessels, and other nations would not buy them without this safety feature. When containment was adopted, several Eastern European countries and Finland bought the VVER. But the VVER could not be the only basis for Soviet nuclear program due to legendary bottlenecks and other production constraints in Soviet industry.

The final chapter returns to the controversies over the causes of the Chernobyl accident that became public in the late 1980s in the context of the liberalization of political life and weakening of the state and party censorship. Several dissident nuclear experts advanced their visions of what went wrong at the Ukrainian nuclear power plant and what was dysfunctional about the nuclear industry in general. Schmid insists that each expert offered only a partial perspective on the disaster and that one needs to consider many different factors that interacted simultaneously, such as the design weaknesses of the RBMK and failure to correct them, economic and political pressures leading to the sacrifices in safety, a lack of safety culture and independent oversight, and poor mechanisms for transfer of reactor-operating expertise.

Schmid used rare archival materials and conducted a series of interviews that enhance her book. She guides the reader through complicated technical details of reactor design and the confusing, constant reforms of organizational structures responsible for nuclear research, design, operation, and oversight. A number of figures, diagrams, and tables helps clarify difficult issues. Schmid includes methodological and biographical annexes. One of the consequences of the attempt to reconcile clarity in narration with the richness of the materials consulted is

numerous and extensive footnotes. The latter indeed take up half the volume, so that one ends up trying to read two books in parallel instead of one. This can be confusing, especially when the reader does not understand fully how a particular source relates to the text above.

Schmid masterfully avoids caricaturing Soviet nuclear power as the product of political, scientific, and engineering hubris. Instead she reveals the complex interconnections between economic, political, ideological, scientific, and educational factors. She notes, importantly, that the nuclear enterprise in the former Soviet Union and elsewhere âremains at best a high-stakes process of trial and errorâ (p. 164). Knowing about these complex interactions leads one to question whether we should pursue the nuclear enterprise at all, or at the very least with greater circumspection.