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Evaluating the energy security of electricity interdependence: Perspectives from Morocco

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ABSTRACT

Much focus has been placed in public policy discourses on defining energy security as independence from reliance on external hydrocarbon fuels. This definition provides little guidance about the benefits and risks to energy security from the integration of electrical power systems across nation-state lines. Instead of assuming energy independence is intrinsically more secure, this paper argues for utilizing a multi-dimensional energy security framework for evaluating electricity integration by evaluating perceptions of the energy security for shallow and deep electricity integration for Morocco. It argues that conceiving of Moroccan policymaker's energy security goals only in terms of energy independence misunderstands the broader sustainable development and human security context of Morocco's renewable electricity plans and overlooks its motivations for increasing electricity interdependence. The paper concludes with policy recommendations for global governance geared toward improving the security of transnational grids. First, electricity integration offers numerous energy security benefits, but these benefits could be negated if technological integration lacks a strong political foundation. Second, policymakers should distinguish between dependence and interdependence and prioritize the latter. Third, given the urgency of climate change, pollution, and energy poverty challenges, decision-makers should approach energy security, human security, and sustainable development as inseparable challenges.

1. Introduction

Lesage et al. [1] state that "perhaps no single issue in the modern world economy illustrates so well the state of far-reaching interdependence and intervulnerability as energy" (p. 4). Despite political rhetoric about achieving energy independence to end such vulnerabilities, there exists a growing trend toward electricity *inter*dependence worldwide. Examples of this can be found across the globe including both existing and planned projects. For example, the South African Power Pool connects 12 countries in southern Africa, with plans for significant expansion and a regional-scale electricity market [2]. Additionally, Ethiopia aims to become a major electricity exporter, starting with the Eastern Electricity Highway to Kenya [3]. In the Middle East, the Gulf Cooperation Council Interconnection Authority connects Saudi Arabia, Kuwait, Qatar, Oman, and United Arab Emirates, with plans for expanded integration [4]. In Southeast Asia, the ASEAN Power Cooperation seeks to integrate the grids of 10 countries [5]. In Europe, Nordpool is arguably the world's most advanced transnational market for electricity, connecting Nordic countries and the Baltic States, along with some interconnection with Germany and the UK [6]. In Central America, the Electrical Interconnection System project connects transmission lines among six countries [7]. Additionally, the U.S. State Department has supported further grid integration in Central America, South America, and Mexico, as well as Puerto Rico and the U.S. Virgin Islands through the "Connecting the Americas 2022" plan [8]. The World Bank and other multilateral development banks are funding many of the existing projects, with many more in the planning stages.[1]

Although this list is not comprehensive, it illustrates that electricity integration is being pursued in most regions of the globe and in nation-states at different stages of economic development. It suggests that future electricity systems could be on a trajectory of increasing interdependency. Improving understanding of the policy implications of electricity integration is therefore crucial for energy decision-makers in both developed and developing countries. Development banks, governments, and private industry are investing substantially in these electricity integration projects, and planning should be guided by a better understanding of the energy

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[1] For a review of additional power sector integration projects see [32].

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security and human security dimensions of electricity integration and export.

Discussions of energy security and geopolitics in the academic literature and policy discourse have largely overlooked the security dimensions of electricity integration. This is due, in part, to a rather narrow framing of energy geopolitics and the conflation of energy security with energy independence. Klare [9] views the geopolitics of energy as the uneven geographical distribution of energy reserves, such as oil and natural gas, with financial ramifications and undue power and influence for countries possessing these resources. Overall, the Realist school of thought in International Relations tends to see the "global energy landscape" as comprised of "a world divided in rival blocs competing for resources" (as described by Dyer & Trombetta [10], p. 4; see also [11–14]). This spatial framing of nation-states competing over scarce and unevenly distributed resources waned with a neoliberal focus on free energy markets in the 1980s and 1990s but saw a resurgence in the past decade [15]. Today, policymakers in industrialized energy consuming nations largely view external energy dependency as a key contributor to energy security vulnerability [16].

These conceptualizations of security and geopolitics focus on dependencies on primary energy fuels, such as hydrocarbons, coal, and biomass, and the potential for sabotage of these primary fuels. Risk of sabotage is also reflected in the policy discourse on energy security as independence from reliance on other states for primary fuels. This paper illustrates that "secondary energy" dependence—or electricity dependence—poses a somewhat distinct set of challenges from primary fuel dependency. The risk of sabotage remains relevant but is alone an insufficient metric for evaluating energy security. Growth in secondary energy dependence, especially that spurred by increasing renewable electricity portfolios, demands more nuanced thinking on energy security than simply defining it as a zero-sum game in which independence is the most desirable policy goal. Expanding the framing of energy security could also aid in understanding the interlinkages among security, sustainable development, and climate change.

A growing number of scholars from the Liberalism and Constructivism schools of thought in International Relations argue that energy security is not a zero-sum game (see, for example, [17,1,10,18]). The more recent conceptualization of energy security from these schools of thought illustrates that energy security goes beyond independence. However, scholars are divided upon whether the definition of energy security should be narrowed to make it easier to conceptualize and quantify, or whether energy security should be evaluated utilizing a multi-dimensional and holistic framework. Winzer [19] recommends that analysts more narrowly define energy security as security of supply and then evaluate it against other concepts, such as economic efficiency and sustainability. Luft et al. [20] argue that the conflation of climate change and energy security can be manipulative and that the two discourses should be separated. In contrast, other scholars recommend a multidimensional framework for evaluating energy security that weighs trade-offs across different elements framed under the umbrella of security. For example, Sovacool [21] defines energy security based upon four components and threats: availability, reliability, affordability, and sustainability, adopted from [22], as well as four criteria including availability, affordability, energy efficiency, and social and environmental stewardship. Because this definition accounts for a variety of elements, it illustrates the scope and complexity of the energy security challenge, as trade-offs are likely necessary among the elements, and prioritizing one element can lead to the neglect of others. Within a trade-off calculus that views energy as a strategic resource, and energy security as a national security issue, the human security and sustainable development aspects of energy security are often those that are neglected [23].

To address this challenge, several scholars have added the concepts of sustainable development and human security to energy security to develop a holistic and "deep" understanding of energy security [23]. Indriyanto et al. [24] brought together a similar framework to Sovacool's with the concept of sustainable development to emphasize the "essential linkages" and the "slightly different emphasis" between security and sustainable development (p. 96). The addition of sustainable development to energy security aids in improving long-term thinking, which is lacking in energy security analysis, and provides added attention to issues of energy poverty and energy inequity that disproportionately affect developing countries [24,25]. Additionally, Karlsson-Vinkhuyzen and Jollands [23] critique the conflation of energy security with national security for impeding progress on alleviating energy poverty and mitigating climate change. In contrast, "deep energy security" is "energy security that contributes to human security over space (from the local to the global) and time (that is, now and for future generations)" ([23], p. 513–14). This definition opens up the possibility of energy interdependence and collaboration enhancing global energy security under certain constraints. More importantly, it views sustainable energy as a public good rather than viewing energy as a commodity [23,26].

In contrast, a narrower definition of energy security poses ethical challenges in a world in which many policymakers view energy narrowly in terms of a zero-sum game, or a commodity to be provided by the market, because human security and sustainable development are likely to be left out of the equation. Policy framing typically serves to establish certain priorities at the exclusion of others [27], so restricting the definition does not guarantee that additional concepts will be weighed fairly, and concerns framed under the security umbrella often trump all others. While I agree with Luft et al. [20] that the conflation of climate change and energy security can be manipulative, it is also ethically problematic on the global stage to extract energy security from sustainable development and human security in a world with gross energy inequity. As Dyer [28] stated, "it seems clear enough that the pursuit of any meaningful energy security policy will require anticipation of future post-carbon scenarios" (p. 443). Moreover, the vulnerability of energy infrastructure itself to climate change could have the effect of "washing away" energy security ([29], p. 386), and the African continent, where electricity interdependence is being explored, is particularly vulnerable to climate change [30]. The infusion of energy security with human security and sustainable development is admittedly normative in its conviction that the losers of mercantilist, nation-specific energy strategies should not be those in society with the least access to energy and the greatest vulnerability to climate change.

Sovacool's diverse metrics, paired with the holistic concept of deep energy security, opens up the question of whether it would be possible to structure energy dependence in a way that improves energy security and increases access to sustainable energy as a public good. Could an electricity system satisfy all elements *and* be dependent? Could a transnational electricity system be deeply secure? What challenges and benefits not observed in cases of primary energy dependency does electricity dependency pose for security? Electricity integration is an interesting emerging challenge for energy security for multiple reasons. First, these projects facilitate new opportunities for international energy collaboration and increased renewable electricity generation, as well as risks for disruption of electricity supply. While the discourse related to renewable energy development has often centered on independence, many electricity integration projects are being pursued in order to scale up intermittent renewable energy into the grid, interweaving human security and environmental concerns with security of supply concerns. Second, even though electricity integration increases dependency, proponents have touted its benefits