PREFACE

Preface

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The Middle East–North Africa (MENA) region, more than any other in the world, has been shaped directly and indirectly by the discovery of oil and gas, and the wealth creation it enabled, over the last 75 years. Ultimately, the immensity of resources held in the area transformed regional development and influenced the global markets created by the trade of oil and gas.

In today's context of worldwide concern about climate change and the environment, MENA countries face an urgent dilemma. While enormous oil and gas reserves remain in the ground, the confluence of several factors is prompting each country to strategize on how to transition toward a carbon light—or carbon-free—domestic energy economy. Thus, it is timely to address the relative scarcity of academic research focused on these transitions in the MENA region through the launch of *Energy Transitions*. This new journal will deliver multidisciplinary, international perspectives on the policy, economic, and technical challenges and opportunities facing these countries as they move toward more sustainable and less carbon-intensive energy sources and systems.

Five main factors combine to drive this change: demographic trends, the quest for added value from their resources, efficient pricing of their resources, global policy interactions, and technology developments (both as

competitors to oil and gas and securing sustainable uses for carbon-based energy sources).

First, the aggregate population of MENA countries is projected by some to more than double between 2000 and 2050 (Fig. 1). This could drive total final consumption (TFC) of energy, measured in million tonnes of oil equivalent (Mtoe), to rise rapidly from the levels shown by the gradient color scheme mapping levels of current energy consumption in Fig. 2. Absent an energy transition, this steep increase in population and energy demand creates a credible risk that continued reliance on carbon-based energy for domestic use will rapidly deplete resources. A transition to alternative sources of energy is necessary to ensure that domestic demand is met without MENA countries jeopardizing their role in the global oil and gas market.

Second, sustained downward pressure on the price of oil and gas prompts stronger focus on higher value-added uses of oil and gas (e.g., in domestic petrochemical industries) that can be considered as alternatives for domestic power generation. Third, as oil- and gas-rich countries in the MENA region seek to diversify and strengthen their economies, bringing domestic pricing of energy in line with global prices can be an important incentive for more efficient use of energy. While not all MENA countries have an issue with disproportionately large incentive-distorting energy subsidies, most (and particularly the largest economies) continue to struggle to address this issue. Figure 3 shows subsidies aggregated across key energy sources in 2011. While some progress has been made in the intervening years, there is still much to achieve.

Fourth, in light of the risks associated with climate change, the twenty-first session of the Council of the Parties (COP21) and the twenty-second session of the Council

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Fig. 1 Probabilistic population projections for MENA countries from 2000 to 2050 (in thousands). *Source* United Nations Population Division [6]

of the Parties (COP22) stimulated a concerted global push to reduce greenhouse gas (GHG) emissions. As shown in Fig. 4, which paints a similar picture to many other projections of GHG emissions through 2100, the continued commitment by policymakers globally, culminating in the COP21 pledges and subsequent National Determined Contributions (NDCs), points to an increasing curtailment of emissions. The important point to take away is the stated desire to accelerate the reduction in global emissions.

Finally, recent technological advances increasingly make alternative sources of energy (i.e., renewables and nuclear) credible and cost-effective at utility scale at the same time as research into low cost decarbonization competes to retain a role for oil and gas. For example, Fig. 5 shows that the cost of solar modules (measured in U.S. dollars) has steadily declined for the past four decades. These cost reductions have been driven by learning, expanding supply chains within the solar industry, and generous global policy support. As deployment of renewable sources increases, the competition with conventional energy sources intensifies, and ample research opportunities exist to study the dynamics of this competition from various standpoints.

Energy Transitions will include articles that directly describe energy transitions underway in MENA countries and that provide insights and lessons learned from the experiences of other countries. The journal will bring together articles from six thematic areas.

Energy markets, economics, and policy: The functioning and adjustment of energy markets, and the degree of government control over them in the form of price and subsidy interventions, play a key role in the success of an energy transition process. This theme will provide economic and systems analysis that explores the interaction of these elements as related to energy transitions, including how changes in one element of a system create consequences in others.

Energy efficiency and conservation measures, impacts, and platforms: Relative abundance of energy resources in many MENA countries has led to widespread inefficiency and waste in their consumption and utilization. With this history in mind, and recognizing more efficient use of energy as well as systematic means of improving energy productivity, articles will focus on energy efficiency and conservation measures, impacts, and platforms. Methods to evaluate the consequences of such changes will also be highlighted.

Renewable resource challenges, and deployment-related matters: While MENA countries have great potential to tap into renewable energy as a substitute and supplement to carbon-based energy sources, unique challenges must be overcome. Articles under this theme will focus on matters related to deployment, installation, and grid integration of renewable energy technologies, covering both region-specific issues and experience gained in other parts of the world.

Fig. 2 Total final consumption (TFC) (Mtoe) of energy for countries in MENA Region, 2014; figure derived from data from the International Energy Agency [4]

Nuclear energy challenges, and deployment-related matters: Deployment or installation of nuclear energy could make a positive contribution to a low-carbon future in the MENA region. After the Fukushima Daiichi nuclear disaster in Japan, some may now view the role of nuclear in the fuel mix through the lens of emotion rather than objective reason. Articles will investigate opportunities and challenges that nuclear energy may face over the lifecycle of plants, including operations and maintenance.

Planning, social, behavioral, and environmental/climate aspects of energy transitions: Experience shows that the most economically efficient and carefully planned policy choices for an energy transition do not guarantee the expected outcome—in the MENA region or anywhere else in the world. The social response to changes in electricity or fuel prices, or policies that impact something as fundamental as energy, often disrupt the best-laid plans. Debates regarding climate change, for example, can result in a behavioral response that can impede the implementation of carefully considered policy choices.

Enabling technologies, case studies/models, and implementation methods/challenges: Successful energy transitions require a combination of rigorous planning and analysis, development of the appropriate technologies, and

careful monitoring and execution as changes are implemented. This stream of articles will describe the potential impact and efficacy of enabling technologies and the implementation of plans for energy transitions. Published work will be grounded in rigorous, transparent, scientific research, especially using case studies, mathematical models, and empirical methods. There is an opportunity for a wide spectrum of innovative approaches, whether top-down or bottom-up technical and empirical analyses. In addition, a focus purely on technical requirements, with research into the requisite equipment, systems, and simulation capabilities needed for successful transitions, is within this journal's scope.

The editors of *Energy Transitions* are pleased to offer this published research in an open access form, so that any interested reader can benefit from the work without financial cost. The journal will include original research articles, reviews, rapid communications, commentaries, and technical policy notes. To ensure research of the highest quality, each topic described above will be managed by one or more of the journal's associate editors, an outstanding network of international, multidisciplinary, and geographically diverse experts, who together will direct and shape the launch and evolution of the journal. All articles will be

Fig. 3 Pre-tax subsidies for energy (total for petroleum products, electricity, natural gas, and coal) for countries in MENA region, percent of GDP, 2011; figure derived from data in Clements et al. [1]

Fig. 4 Three scenarios for projected global greenhouse emissions, 2010–2100; figure derived from data in Climate Action Tracker [2] and Intergovernmental Panel on Climate Change [3]

Fig. 5 Cost of solar cell modules and global cumulative produced capacity over time; figure derived from data in International Renewable Energy Agency [5] and Wirth [7]

subject to a strict peer-review process, with reviewers recruited to provide the appropriate technical and professional backgrounds. In the future, the editors anticipate adding special issues, workshops, conferences, symposia, dialogues, seminars, and other types of technical gatherings concerning energy transitions in the MENA region. When appropriate, these activities may be sponsored or co-produced with partners that derive mutual benefit from the journal.

Energy Transitions aims to become a critical hub for developing new research insights for the process of energy transitions in the MENA region. We look forward to working with specialists and researchers from around the world who have a strong interest in the region, and through publication of their insightful work, stimulating both discussion and action for the region.

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