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Proposing an evaluation framework for energy policy making incorporating equity: Applications in Australia

Andrew J. Chapman*, Benjamin McLellan, Tetsuo Tezuka

Graduate School of Energy Science, Kyoto University, Yoshida Honmachi, Sakyo-ku, Kyoto 606-8501, Japan

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ABSTRACT

The sustainability of energy policy performance is determined by a combination of environmental, economic and equity impacts on society. To date, analysis of the equity impacts of energy policy have been largely overlooked in favour of environmental and economic impacts. As equity is an important issue within sustainability and energy justice considerations, this paper sets out to provide a framework and methodology which allows an assessment of both policy effectiveness in terms of an environmental and economic evaluation, followed up by an assessment of resultant quantitative equity impacts on society, in order to engender a holistic policy sustainability evaluation. Following an investigation of prominent energy policy equity issues and Australian peoples preferences towards equity, multiple scenarios are evaluated for effectiveness within the Australian National Electricity Market. The results of this evaluation provide an evidence base for the development of an alternative energy scenario which addresses the identified equity issues whilst meeting policy goals. The equity evaluation demonstrates the comparative equity resultant from each scenario and identifies the apportioning of burden according to income level. The proposed evaluation processes allow the policy maker to develop policies sensitive to both effectiveness and equity, and can be applied in energy justice conscious jurisdictions.

1. Introduction

This research is concerned first and foremost with the sustainability of energy policy. Sustainability is elegantly described by [14] as a conflict between economic development, environmental protection and equity and social justice. It is further suggested that a balance of these three factors defines sustainability [70]. This research contends firstly, that each factor is critically important in the development of sustainable energy policy and, secondly, that social equity factors have been largely overlooked in renewable energy (RE) system and policy analysis to date.

"Sustainability of policy performance" in this research is defined as the degree to which policy can meet environmental and economic goals, without impairing societal equity. This definition is synonymous with the ideals of sustainability being a subset of economic, social and environmental factors. By incorporating equity alongside economic and environmental factors into policy efficacy (the ability of a policy to meet desired goals) and sustainability assessments, it is proposed that the impact of energy policy implementation on equity outcomes and overall sustainability performance can be determined.

The unique factor which will be applied to energy policy assessment in this study is equity, primarily concerned with the distribution of environmental and economic costs and benefits of a policy's implementation on society. For the purposes of this research, which considers the short-term impacts of policy decisions, equity issues are identified specific to the investigated jurisdiction and measured intra-generationally, focusing on the present policy scenario and projected outcomes to 2020 (a five-year period at the time of writing). In order to effect equal treatment across income levels within the examined jurisdiction in line with the distributional justice approach taken in this study (concerned with the distribution of the benefits and ills of energy policy outcomes across societal income levels), vertical equity is applied, so as to enforce a user-pays system, fair value of subsidisations and payments to participants, and to limit the burden on non-participants in subsidisation schemes; to improve equity between low and high income households.

In harmony with the ideal of maintaining balance between economy, environment and equity in order to determine holistic sustainability, each of these three key factors will be considered concurrently.

* Corresponding author.
E-mail address: chapman.john.27e@st.kyoto-u.ac.jp (A.J. Chapman).

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This paper builds on a review and analysis by the author of small scale RE policies which supported residential solar photovoltaic (PV) installation in Australia between 2001 and 2012 [15]. The proposed assessment framework methodology will utilize the economic and environmental outcomes of this research to measure both the sustainability and efficacy of energy policies, in addition to defining the role and quantification method of equity within these evaluations.

This paper uses the OECD nation of Australia as its case study in which the main stimulatory measures used to encourage RE deployment under the Renewable Energy Target (RET) are Renewable Energy Certificates (REC) and Feed-in tariffs (FiT). Many other OECD nations also use these stimulatory policy approaches and share common factors with regard to government structure. These commonalities suggest that the policy sustainability assessment framework proposed in this paper could be readily applied more broadly in nations that are concerned with injustices in energy and environmental matters.

The aim of this paper is to establish equity as a key consideration for energy policy development in order to provide a basis for the improvement of the future energy policy development process, with the aim of strong energy, environment and economic outcomes whilst decreasing inequity between societal income levels.

The key research themes relevant to the energy studies and social science field which are addressed in this paper are: (1) The appropriate distribution of the costs and benefits of energy production and its use; (2) Fairness issues for present generations due to disproportionate access to the benefits of, and disproportionate sharing of the burdens of energy; and, (3) A consideration of the energy technologies which may exacerbate inequality and concentrate wealth (adapted from [58]).

2. Sustainability of policy evaluation and equity in energy policy

To date, many scholars have assessed RE policies and technologies considering economic and environmental measures to determine their efficacy and contribution to sustainability outcomes. For example, Liu et al. [43] and Liu [42] propose a general sustainability indicator of RE systems, using Grey Relational Analysis and a triple bottom line approach. Whilst this work cites and recognizes the importance of the environmental, economic and social dimensions of sustainability in an energy system, the prioritization process gives precedence to environmental and economic factors, which both contain numerous (positive and negative) indicators. Social sustainability factors analysed include only two factors (both positive): the number of households benefited and new job numbers. In addition, these social factors are weighted overall at 0.0056 (less than 1%) of the overall sustainability index causing their impact to be insignificant on the final result.

Dombi et al. [21] also propose a method to assess the sustainability of renewable power and heat generation technologies using a multi criteria analysis and choice experiment to establish a priority for the technologies assessed. The use of qualitative measures across environmental, economic and social factors is laudable, however in this case study, social factors considered only include new jobs and local income, suggesting that social attributes of sustainability are only positive, do not contain equity measures, and are easily contrasted across scenarios. Although the joint use of techniques such as multi criteria analysis and choice experiment methods to determine systemic sustainability is well supported [52,10], it should also be recognized that multi criteria analysis such as the Analytical Hierarchy Process (AHP) [53] is said to produce the best results when a diverse range of stakeholders are engaged [73,19]. In Dombi et al.'s study, 172 Hungarian professionals associated with ecological economics or environmental policy were selected for the choice experiment to rank RE system scenarios. This selection method does not represent a diverse group of stakeholders, and therefore outcomes of sustainability priorities are skewed according to a single group's point of view.

Evans et al. [24] in their assessment of sustainability indicators for RE technologies propose that sustainability is equally influenced by environmental, economic and social impact indicators, and economic and environmental factors evaluated utilize quantitative, well referenced data. Social impacts, however are relatively arbitrary and represent only one seventh of the total sustainability score. The sub factors of social impact are qualitative, covering aspects of: amenity (noise, visual and odour), toxins, seismic activity, river damage, displacement, pollution and agricultural impact, all measured on a scale of minor to major. It could be argued that some of these sub factors are actually environmental concerns, and none of them are representative of equity. The technologies of wind, hydro, geothermal and solar PV are compared and ranked across seven factors of: price, emissions, limitations, efficiency, land use, water consumption and the combined factors grouped as social impacts. Notwithstanding the limitations of the methodology proposed, the results are not significantly influenced by social factors in the overall appraisal of sustainability across RE technologies.

The recent academic literature reviewed above is a representative selection of energy policy and technology sustainability assessment approaches. The literature review suggests that sustainability is predominantly assessed based on economic and environmental factors, with social factors, especially equity overlooked or undervalued. It is contended that the assessment of energy policy and technological approaches from the literature review represent a measurement of efficacy – the ability of an energy policy to achieve its economic and environmental goals, and efficiency – to achieve these goals at the best cost.

Although many authors use similar terms including sustainability, social impacts and equity, these words are often used inconsistently and conceptual confusion abounds [33]. Whilst there is general agreement that sustainability consists of interdependent economic, environmental and social factors [36,65,70,14]—equity (a key social consideration of sustainability) is the least understood, and given the least amount of attention [63]. This may be for a number of reasons, not least of which is that terms associated with equity, such as 'fairness' are too vague to be agreed upon by all stakeholders [9]. An examination of energy justice as a concept is helpful at this point in order to clarify the concept of equity within energy policy and to highlight the focus of this study.

Following on from the environmental and climate justice movements, energy justice has emerged as a concept which isolates energy issues from the wider range of topics examined within environmental and climate justice [27]. Energy justice is concerned with the three tenets of distributive justice, justice as recognition and procedural justice. Distributive justice, which is the main theme of this study (due to identified Australian equity preferences, described in detail in Section 3.2) is concerned with the distribution of benefits and ills, or burdens of energy projects and policy across society—including resources, wealth, pollution and poverty [30]. The study investigates equity issues associated with the energy system, along with the economic and environmental conditions which engender them [60]. Justice as recognition is concerned with the recognition of social, cultural, ethnic, racial and gender differences and to ensure that none of these groups are misrepresented, disrespected, degraded or devalued in comparison to others [30,40]. Section 3.2 of this study identifies some justice as recognition issues in Australia which require redress as part of an overall assessment of equity preferences, however the assessment tool only goes as far as the recognition of different income levels and