Session E1

Governing Energy Policy – value driven or smart choices?

Chair: Peta Ashworth (University of Queensland)

The recent IPCC report (2018)[1] which examined the impacts of global warming at 1.5C clearly highlighted the slow progress of the world in reducing our global emissions. Critical to achieving such goals is the need for a range of carbon dioxide removal technologies as a way of managing the transition to a sustainable energy future. At the same time while the number of people without access to reliable energy hit its lowest record of less than 1 billion people, carbon dioxide emissions have been rising. Many attribute this to policy decisions that while seemingly popular with the general public, are not necessarily motivated by climate mitigation goals or other rational decision points.

For example, the reduction in use of nuclear power in Japan and Germany has resulted in an increased reliance on more fossil fuels and a subsequent rise in their emissions. Australia chose to do away with their carbon pricing scheme and is in the process of ramping up their coal production through an international agreement with Adani in India. Conversely, America has reduced their overall carbon dioxide emissions based on their booming gas business while moving away from their commitment to the Paris agreement. Meanwhile Japan and South Korea have committed to transitioning to a hydrogen based economy to help them meet their Paris objectives which has created a flurry of activity around the world. It appears that most of these decisions around energy policy are being influenced by populous values rather than informed by more rigorous science and technology assessment.

This session is seeking papers from those working across the energy policy arena. It would be made most interesting if a cross section of countries with varying strategies can be represented (not just those in Europe) where their energy strategies and decision points and how they were informed can be highlighted.

Governing the Internet of Energy. On handling the societal, ethical and political impact of a digitalized energy system

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The Dutch energy system has been in an ongoing transition for the past decades (Verbong & Geels 2006). With Europeanization, liberalization and privatization the Dutch government has established an energy supply that warrants the main goals of Dutch energy policy namely: affordability, security and striving for 'cleanness'. The Paris agreement and the nation's ambitions to come to a 49% $CO2$ reduction by 2030 are drivers for another energy transition towards a more clean, decentralized energy supply. This calls for new ways of producing and consuming (renewable) energy. Digitalization, with technologies such as Internet of Things, Artificial Intelligence and Big Data, is necessary to integrate decentralized renewables into the energy system and to facilitate new market

[1] IPCC (Intergovernmental Panel on Climate Change)(2018). Global warming of 1.5 °C: An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty. Summary for policy makers. Geneva, Switzerland: IPCC. Retrieved from http://www.ipcc.ch/report/sr15/ and http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf

roles, products and services. The energy and digital domain are converging and leading the way to an Internet of Energy (IoE). Although the potential of an IoE is increasingly acknowledged (for example: Weforum 2018, Post & Aazami 2017), we argue that the challenges caused by digitalization for the energy policy objectives are underexposed in the current public and political debate. Additionally, digitalization could also lead to other ethical and societal issues (Kool et al., 2017). Therefore, in this paper we investigate through a literature review, a governance system analysis and a case study analysis the ways in which the governance system of the Dutch energy supply is being challenged by digitalization. Also, we provide a framework that can be used to understand the governance system and the ways in which it should be upgraded to, on the one hand keep ensuring the main energy policy goals and on the other hand to ensure that public values such as privacy, autonomy and justice are safeguarded.

References:

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Kool, L., J. Timmer, L. Royakkers en R. van Est (2017) Opwaarderen: Borgen van publieke waarden in de digitale samenleving. Den Haag, Rathenau Instituut

Neike, C. (2018) Here are 5 Reasons Why We Need an 'Internet of Energy'. Weforum. https://www.weforum.org/agenda/2018/02/here-are-5-reasons-why-we-need-an-internet-of-energy/ Accessed: 28-05-2019.

Verbong, G. & Geels, F. (2007) The ongoing energy transition: Lessons from a socio-technical, multi-level analysis of the Dutch electricity system (1960–2004). Energy Policy 35: pp 1025–1037.

Energy scenario modelling and media coverage in the light of German nuclear policy: Reflecting evidenced-based or value-based policy approaches?

Author: Dirk Scheer (Institute of Technology Assessment and Systems Analysis)

The study researched communication of energy scenario modelling to the wider public by means of a media coverage analysis in Germany. Media coverage is interpreted as an indicator to what extent energy scenarios are a matter of public debate and deliberation. A total of 155 articles covering the time period 1992–2013 were considered for both structural and content media analysis. Communication on energy scenarios strikingly peaked in 2007 and 2010-12 covering 87% of the whole sample. As became clear from the empirical findings energy scenarios were present in media when pulled on stage by policy-makers themselves. As such, taking the 2007 and 2010 German energy policy events the framework setting were favorable to put energy scenario center stage in the media notwithstanding the tool itself seems not to be qualified for easy media communication. In case distinguished policy-makers and adequate media requirement settings reference energy scenarios they find their way into the media. Patterns of media representation embed the tool in public and/or politics controversy and play around the tensions between "generic factual knowledge claim" and "selective (in)consistency claim". To conclude, energy scenario seem to be vulnerable for strategic and tactical use in press reporting. However, in case high media coverage is given, chances arise for niches of transparent and objective science communication on modelling.

Estimation and use of altruistic benefits of GHG emission reduction for low carbon technology evaluation

Author: Kenshi Itaoka (Kyushu University)

Energy technology deployment is often evaluated via cost-benefit comparison. Apart from the main benefit of original utility to use energy, other key benefit of low carbon technologies is GHG emission reduction. When quantifying the GHG emission reduction benefit to compare the cost in policy analyses, usually some value of Social Cost of Carbon (SCC) is equated. SCCs have been calculated by aggregation of various monetized damages of climate change in various fields or by assuming damage functions by many researchers[2]. The magnetization method is essentially based on willingness to pay (WTP) to obtain utilities people appreciate under the assumption of rational individual seeking selfish benefit, which traditional economics has adopted. Under the assumption, people pay money only for personal benefit. For example, human health damage consist in a large part of SCC and traditional Value of Statistical Life (VSL) is used to monetize benefit of avoid human health damage (mainly mortality risk increase) of climate change. VSL is estimated based on the question “how much would you like to pay to reduce your own mortality risk”[3]. Therefore, there is not much room that SCC reflect altruistic benefits people can appreciate.

Meanwhile, as for the actual and foreseeable benefit of low carbon energy technology, it is realized the large part to benefit (avoidance of damage) would happen in the future generation and /or in different countries from the county where the technology is used in spite that emission is reduced in the current generation and the cost of low carbon energy technologies is paid by current generation. This means that the large part of emission reduction benefit for current generation by choosing low carbon energy technologies is altruistic. Therefore, the author considers the altruistic benefit should be monetary quantified and be included in energy technology assessment.

To evaluate altruistic benefits of GHG emission reduction, a social survey was conducted in three countries, Japan, the United States and Indonesia using choice experiment format in November 2018 to March 2019 via Internet. A sample with 1000 respondents was extracted for the survey of each country. In the choice experiment, WTP for risk reduction of human health damage, property damage and ecosystem damage for future generation as well as current generation was evaluated. Furthermore, WTP for risk reduction of human health damage in the countries different from the county where respondents lived was evaluated. The estimated WTP for the risk reduction of different type of goods in future generation were aggregated as an altruistic benefit of current generation for climate risk reduction of future generation.

This study found that estimate amount of altruistic benefit was different among three countries but the inclusion of altruistic benefit into benefit evaluation generally increased the amount of the total benefit of low carbon technology and tended to make it easier to justify new low carbon technologies via cost benefit comparison.

[2] Interagency Working Group on Social Cost of Carbon, United States Government (2016). Technical Support Document: -Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis -Under Executive Order 12866

[3] Krupnick, A., Alberini, A., Cropper, M., Simon, N., O'Brien, B., Goeree, R., & Heintzelman, M. (2002). Age, health and the willingness to pay for mortality risk reductions: a contingent valuation survey of Ontario residents. Journal of risk and Uncertainty, 24(2), 161-186.

Type of damage	Period of the damage	No measures	Measure portfolio A	Measure portfolio B
		Amount of damage	Amount of damage (Reduction of damage)	Amount of damage (Reduction of damage)
Human health damage (Annual deaths)	Annually from now until 2050 (per 100,000 people)	8 people	8 people (No reduction)	6 people (Reduction of 2 deaths)
	Annually from 2050 to 2100 (per 100,000 people)	24 people	18 people (Reduction of 6 deaths)	24 people (Reduction of 0 deaths)
Property damage (Annual property damage)	Annually from now until 2050	3.0% of GDP	3.0% of GDP (Reduction of x%)	2.0% of GDP (Reduction of x%)
	Annually from 2050 to 2100	7.5% of GDP	6.0% of GDP (Reduction of 1.5%)	7.5% of GDP (Reduction of 0%)
Ecological damage (Long-term species extinction)	Gradually between now and 2100 (Proportion of extinction amongst 80,000 species of flora and fauna in regions of high importance for global conservation*)	50% extinction	50% extinction (Reduction of 0%)	30% extinction (Reduction of 20%)
Annual tax burden per household	Annually from now on	$0	$12 hundred	$3 hundred
	Please select one option to support.	□	□	□

Figure: an example of choice experiment question asking WTP for the program to reduce risk of human health damage, property damage and ecosystem damage for future generation as well as current generation.

Moving towards sustainable energy communities: An Investigation of the Irish Landscape and its transition to an energy conscious society

Author: Wendy Rowan (University College Cork)

Project Ireland 2040 is planning to invest heavily into upgrading Irish homes to renewable energy sources. From 2021, 45,000 homes per year will be using renewable heat via government driven support schemes. But how is the Irish landscape currently placed in terms of energy consumption and consumer energy consciousness? In this review, energy consumption, the segmentation of energy use and energy consciousness will be framed against Ireland's unique environmental conditions – climate, population demographics, types of dwellings and use of smart technologies – and the Irish stakeholders currently targeting energy issues. The use of smart technologies is worthy of further consideration here, as they enable (i) suppliers to manage consumer demand, (ii) consumers to leverage information to adjust their usage and (iii) governments to implement energy-based regulations to conserve energy use. From the literature review, initial findings suggest there is a growing awareness of energy related issues among consumers, as reflected in the improvements made to properties to enhance the Building Efficiency Ratings (BER), and the adoption of smart technologies. However, energy poverty is reported to still exist for more than a quarter of Irish households (SEAI, 2017). This points to a need for new interventions to improve energy efficiency, and energy education, particularly for those at risk of energy poverty. Thus, education, and transformational smart learning platforms on energy efficient options are essential. Opportunities also exist for increasing the promotion and use of smart home equipment in Irish homes. Becoming an energy conscious consumer means investing in energy solutions that not only save one money but also makes for sustainable living in the wider community. Moving forward there is clear indication that IS energy informatics focused on energy consciousness – targeting local communities, energy providers and public bodies - are vital for change.

Ref: SEAI (2017) Energy in Ireland 1990-2016. https://www.seai.ie/resources/publications/Energy-in-Ireland-1990-2016-Full-report.pdf

Application of multi-criteria decision-making approach for sustainability assessment of chosen photovoltaic modules

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concern about the current state of relations between industry and the environment is often neglected. However, it is important to underline that industry and sustainable development are not mutually exclusive. There are many industrial processes to blame when analyzing the negative impact on current socio-ecological environment. The emerging question is whether companies nowadays are ready to face challenges in the name of sustainability, the future of our planet and generations to come. In addition, an assessment of industrial processes may be very time-consuming and costly in financial terms.

This fact allows developing sustainability assessment approach and its measures for keeping track on to evaluate scale of environmental, social and economic changes.

The aim of a paper is to provide a multi-criteria decision-making framework for sustainability assessment of photovoltaic modules. The framework combines life cycle sustainability assessment and multi-criteria decision-making approach based on analytical hierarchy process. Even though provided framework aims to make this whole procedure easier and structured, it still requires considerable amount of effort and motivation to apply.

To demonstrate the applicability and usability method, selected photovoltaic panels made out of multicrystalline silicon, singlecrystalline silicon or string ribbon solar cells are assessed.

The results show that string ribbon technology is the most sustainable along its life cycle. Moreover, the paper proves that a proper sustainability analysis, that covers the full life cycle of given modules, requires a broad area of activities involving gathering and normalizing data, engaging numerous experts, calculations and results interpretation.

This sustainability assessment approach may serve as a useful foundation for industrial companies to make viable multi-criteria decisions regarding selection of photovoltaic modules, whilst considering environmentally beneficial technologies and greater financial and social benefits at the same time. This approach seems particularly useful when comparing and selecting different technologies. It makes applicable for various industries and might be a challenge to derive priorities for systematic assessment.

The paper is also to provide businesses and industrial organizations with a tool aimed at enhancing their commitment to sustainability.