A MULTI-CRITERIA, MULTI-ACTOR APPROACH TO GERMANY'S COAL PHASE OUT: CONTRASTING SHORT WITH LONG-TERM PHASE OUT OPTIONS

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Overview

In 2019, the Commission on "Growth, Structural Change and Employment", reporting to the German government, recommended that coal power generation be phased out at the latest by 2038 [1] . The comission emphasized the need to manage the economic impact of phasing out coal on regions in which coal mining activities are particularly important [1]. The Government could opt to follow this recommendation and aim to ensure an end to coal-fired power generation in the long-term (by 2038). However, there has been criticism that this target is not ambitious enough to meet climate goals as expressed in the Paris Agreement – the very prominent youth climate protest "Fridays for Future" demands a coal phase out by 2030 at the latest [2], for instance. In contrast, there are also suggestions that an option would be to focus on a CO_2 cap as opposed to specifically aiming for a phase out of coal,w ith this potentially involving lower system costs [3]. In the UK, for instance, the introduction of an enhanced carbon price, supplementing the EU ETS scheme, was a primary driver in driving out coal plants and shifting to gas-fired generation, incurring relatively low additional costs [4]. In this paper, we apply a multi-criteria decision analysis tool to evaluate the three different choices in relation to the phase out of coal-generated power in Germany, namely: (i) long-term phase out, (ii) short-term phase out and (iii) CO_2 cap instead of an explicit phase out from the point of view of different actors.

Methods

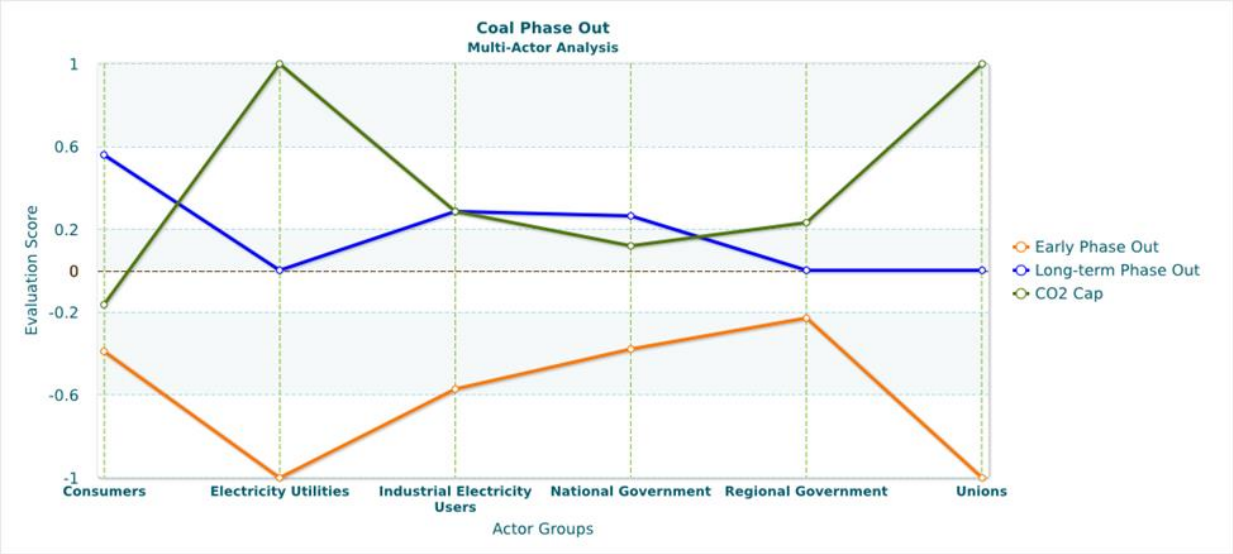
Multi-criteria decision making methods (MCDA) offer a strcutured approach to decisions which involve multiple (often conflicting) criteria and multiple actors, each with different sets of preferences [5]. A main advantage of MCDA techniques is that they simplify a complex problem into an easy to interpret set of outputs [6]. The MCDA tool used in this paper - PROMETHEE - was developed by [7] and, under this method, each decision alternative is associated with positive and negative outranking flows. The positive outranking flow is an expression of all of the instances in which an alternative performed better than another scenario, considering all of the criteria, and the extent of that superior performance. The negative outranking flow expresses the instances in which other alternatives outperformed the particular alternative and the extent of this inferior performance. The net preference flow is the positive flow minus the negative flow and is the overall score of the alternative(the higher the score, the better ranked the alternative). The alternatives for the German coal phase out are evaluated from the perspective of consumers, electricity utilities, industrial electricity users, national government, regional government and labour unions. For each stakeholder, the decision-relevant criteria relating to economics, social aspects, environmental factors etc. are allocated a specific weighting and this enables the assessment of the alternatives from the perspective of each stakeholder.

Results

Results indicate that, from the perspective of consumers and industrial electricity users, the option of a long-term phase out is, in fact, the preferred option, albeit only slightly beating the option of a CO_2 cap. This assumes that the coal phase out is accompanied by the growth in the share of renewables in power consumption to 65%, leading to suppressed wholesale electricity prices [8]. Electricity utilities and unions are the stakeholders most affected by a short-term phase out, this has to do with adverse effects for stranded assets, financial performance and employment. For governmental actors (national and regional), the environmental benefits of a coal phase are powerful counterweights to the economic implications. The disadvantages of a long-term phase out and even short-term phase

out on system reliability are being challenged by the dramatic drop in the LCOE of batteries, as noted by [9]. The major hinderances to the phase out are to do with economic issues for regional governments and for electricity utilities with a large fossil fuel fleet in addition to the social ramifications from job losses.

Figure 1: MCDA Results for German Coal Phase Out



Conclusions

The long-term phase out of coal, as agreed by the Commission for „Growth, Structural Change and Employment“ is ranked best for consumers, industrial users and the national government. However, there are significant welfare losses for regions, unions and utilities. The government must pay close attention to the economic restructuring processes, if it is to minimize opposition from regions and businesses which have links to coal. Whilst the long-term coal phase out is the preferred option under this analysis, should the price of batteries fall further, a short-term phase out may become possible, but this would require greater focus on the social ramifications and greater protection for affected electricity utilities.

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