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Introducing the Delphi Method into China Electricity Market Reform

"Ensure access to affordable, reliable, sustainable and modern energy for all"

---- Sustainable Development Goal 7

China's electricity market is facing a pressing demand to reduce system costs and optimize efficiency with the steering of "invisible hand", especially under the economic slowdown. Besides, how to transform from the coal-dominated generation to a sustainable energy mix is a key issue for Chinese leadership to fulfil the Paris Agreement Nationally Determined Contribution (Wu, Fan, & Xia, 2017). The electricity market-oriented reform in China has been continuously discussed and implemented since 1985 and evolved from "absolute monopoly" to "state relative monopoly" (Wang & Chen, 2012). However, the achievements are constrained while the market is still distorted with chronic challenges. The national authority requires the involvement and contribution of various actors, including provincial-level authorities, state-owned generators and grid operators, private sector and academia, into the decision-making process of electricity market reform.

This abovementioned process is characterized as interdependent actors, unstructured problems and dynamic, where command and control by the certain party do not work but only exacerbate the resistance (H. de Bruijn & Heuvelhof, 2018). What's more, based on the power sector reforms in 88 developing countries since the 1990s, the World Bank Group concluded that a progressive and effective reform usually demands decentralized decision-making power and wider stakeholder alignment to break up national monopolies and allow new players (Foster & Rana, 2019). Therefore, in this essay, the Delphi Method is introduced to organize a multi-actor decision-making process and explored for potential adaptions to China's electricity market reform. This choice of the design principle is inspired by its successful application during the negotiation of The Digital Agenda for Latin America and the Caribbean (eLAC Action Plans).

The Delphi Method and Its Application on the eLAC Action Plans

The Delphi Method represents a structured communication process among a heterogeneous group of individuals (Linstone & Turoff, 1975) and the fundamental characteristics are anonymity, iteration, controlled feedback and statistical group response (Heiko & change, 2012). Specifically, the results from individuals are only accessed by the facilitator to analyse and summarize using statistical measures. Then the summarised results of previous rounds are introduced to subsequent rounds as feedback for the participators to change or remain their decisions. This procedure is reiterated in several rounds to seek consensus and foresight. Since the 1950s, the Delphi has been spread into various areas all over the world, one of which is government planning, namely Policy Delphi (Linstone & Turoff, 1975). The philosophy behind that is the exploitation of participatory policymaking towards a stronger commitment and a more stable consensus regarding all the stakeholders (Martin Hilbert, 2007). An extensive exercise of Policy Delphi is the eLAC Policy Priorities Delphi.

The eLAC Action Plans is a regional vision and intergovernmental commitment focusing on the Information and Communications Technology (ICTs) infrastructure. The mission is to promote the development of the digital ecosystem as instruments of economic growth and social inclusion in Latin America and the Caribbean (R. C. Williams, 2015), which is consistent with the 2015 Millennium Development Goals, and now, 2030 Sustainable Development Goals (Hilbert, Miles, & Othmer, 2009). The negotiation process was initiated from 2000 till now, along with several revisions, i.e. eLAC 2007/2010/2015/2018. The Delphi Method was utilized between April 2006 and September 2007 to identify public policy priorities and options for the implementation of eLAC 2007. Three online questionnaires (1&2&4rounds) and two face-to-face consultations (3&5 rounds) were carried out with 1454 contributions in total from the public and private sectors, academia, and citizens. This five-round participatory policymaking was respectively designed for broadening the scope of thematic areas, consolidating priority thematic areas, elaboration of policy potions, consolidating policy options and fine-tune policy options (Martin Hilbert, 2007). The outcomes of 63 goals were compared with the 70 goals in eLAC 2007 and adjusted into draft eLAC 2010. It showed that around 50% of 83 goals in eLAC 2010 literally derived from the Delphi results, which proved the usefulness of the Delphi Method and the governmental policy-makers' respect for the collective contributions (Hilbert et al., 2009).

The eLAC Policy Priorities Delphi demonstrated an effective and efficient combination of decentralized intelligence from the bottom up and democratically legitimized representatives from the top down in the digital era (Martin Hilbert, 2007). The questionnaires were designed as an open-ended opinion poll and diffused through the networks of over 10 regional organizations. The total 1274 online contributions demonstrated active participation from the private sector (39%), academia (24%), civil society (12%) and public sector (25%). After the first round, 14 new issues identified from the questionnaire results are added to the initial 37 issues. In the next round, each participant could claim his/her own priority on 51 issues. This represented the openness of both participants selection and agenda proposal (Hans De Bruijn & Ten Heuvelhof, 2010). Besides the openness, the principle of substance was addressed through the face-to-face consultations in the third and fifth round. 180 experts were selected to formulate policy actions across intergovernmental organizations, public and private sector agencies, civil society institutions and NGOs, and academic networks active in the region (Martin Hilbert, 2007). In addition, two rules were set up to maintain certain substance quality standards: Goals need to be quantifiable and measurable (results-oriented) or need to rely on existing international mechanisms (action-oriented). Meanwhile, in the fourth round, another questionnaire allowed the public to review the policy actions by choosing the target value of results-oriented goals and evaluate the importance qualitatively of action-oriented goals. The method contributed to a transparent and interactive multi-actor policymaking process that was vital for the formulation and implementation of the ICT policy agenda across Latin America and the Caribbean.

The Electricity Market Reform in China and Case Comparison

In Mar. 2015, the central government of China published the document "Further strengthening the institutional reform of electric power industry", which was recognized as a start of the second-round market-oriented reforms in the power sector, followed by the first round from 2003 (Lin & Purra, 2019). The four focuses of the 2015

reform are market-based trading mechanism, liberalization of the wholesale and retail market, deregulation of distribution and promotion of renewable energy (Lei, Chen, Sun, & Tao, 2018). However, the 2015 document is only a generic plan while more detailed goals and strategies are needed to identify for facilitating the progress.

International experience of electricity market reforms suggests that context dependence, outcome orientation and pluralist approaches are the major policy implications (Foster & Rana, 2019). In contrast, the 1990s process-oriented model out of the "Washington Consensus" comprises a standard package of regulation, restructuring, private sector participation and competition (J. H. Williams & Ghanadan, 2006). However, the past reform efforts and performance shows that the approaches should be tailored to both political & economic preconditions and desired policy outcomes in each country. The outcome-oriented reform demands the identification of the most critical policy goals as a cornerstone to derive measures reversely. It exactly lies in the application scope of the Delphi Method to connect wider stakeholders, incentivize various opinion, prioritize identified issues, and then formulate policy actions and converge on a common policy agenda.

Furthermore, comparing the eLAC Action Plans and China Electricity Market Reform cases, three similar particularities are highlighted to support the applicability of the Delphi Methods. The first is the multisectoral nature of general-purpose technologies like ICTs and electricity, which means the transformations affect the entire society and contract the centralized behaviours. Therefore, an open process is critical to incorporate and balance different actors' interests and resources for a wider alignment. The second is the inherent uncertainty of rapid technological progress. As ICTs are subject to Moore's law, the emerging renewable energy, battery storage and digitalization are continuously reshaping the power sector, which indicates the importance of substance and expertise within an evolving policymaking process. The third is the demographic and socio-economic heterogeneity within the concerned region. While Latin America and the Caribbean is comprised of 20 countries, the 34 provincial-level administrative divisions in China have distinct economic development levels and geographical conditions with a mismatch of fuel resource and electricity consumption. What's more, the grid systems are separated into seven regions without sufficient exchange capacity (Wang & Chen, 2012). That also implicates different levels of agendas and activities should be carried out aiming for regional and local opportunities and threats. Again, this reality amplifies the request for openness and substance that is fully met by the Delphi Method.

Discussion and Suggestion

The Delphi Method has certain advantages to address the electricity market reform issues, especially under the Chinese context. The Policy Delphi is defined as a policy-analysis tool to generate all the opinions and supporting evidence for the decision-maker (Linstone & Turoff, 1975). Although it seems inconsistent with the multi-actor decision-making process, this feature fits well with the fact that a national regulator is widely created to lead the electricity market reform in most of developing countries (Foster & Rana, 2019). The participatory policy-making process under the Delphi Method eliminates the risks of both suboptimal selections of representatives and uninformed decisions of open-ended discussion (Martin Hilbert, 2007). Thus, the balance between the centralized technocrats and decentralized intelligence showcases the applicable possibility in the Chinese-characteristics political system, namely

Socialist Consultative Democracy. Meanwhile, in the view of the central government, a wider stakeholder alignment is crucial to sustain the power sector reform in line with the economic transition (State Council, 2015). Currently, the policymaking in China is relatively closed and obscure process although technically there are drafting, commenting and reviewing periods for the public to engage (Trivium, 2019). Thus the Delphi Method can be an effective complement to freely express and change opinions, reduce dominant persuasion and avoid socio-psychological pressure (Heiko & change, 2012). Last but not the least, the participatory process could raise the comprehension and promote the behavioural changes of involved stakeholders towards the market reform.

To apply the Delphi Method into the target case, tailor-made efforts are needed according to the specificities and realities in the China power sector. The role of National Energy Administration under National Development and Reform Commission should be constrained as the process facilitator to involve all the actors and stimulate orchestrating interaction. Especially, it is important to incentivize the incumbent state-owned players, protect private investors' value, coordinate inter-provincial conflicts and guarantee the substantive feasibility. The participators should include the stakeholders within the power sector such as generators, network operators, retailers and wholesalers, experts from academia, industry associations and international institutes as well as individuals. In practice, the participatory network could be constructed as a mix of self-selected diffusion for questionnaire through email, website and social media and structured panellists for consultation in terms of region, sector, specialization and standing. Referring to the eLAC Policy Priorities Delphi (Martin Hilbert, 2007), five rounds of negotiation are proposed as followed:

- The starting point could be the 28 tasks under 7 categories listed in the 2015 document [Appendix 1] for reviewing and prioritizing considering economic, social and political impact. More importantly, the proposal of new policy issues is encouraged to enlarger the scope and solution space.
- After a detailed review of the first-round results, it is possible to merge, subdivide or generate the tasks to obtain a delineated list for the questionnaire. At the same time, the statistical results are provided for participators to rethink their responses.
- After two-round ranking and analysis, the identified tasks are consolidated and ready for the formulation of concrete policy options. This round is to organize the individual interview with selected panellists to elaborate the measures regarding the tasks.
- The summarized results from the last round are a series of quantitative result-oriented goals and qualitative action-oriented goals. Another questionnaire is formulated and distributed to evaluate and consolidate those policy options. Subsequently, the evaluation results are analysed to revise the goals.
- The last round is face-to-face multi-stakeholder consultation among the panellists to coordinate interests and fine-tune policy options. The final outcome is represented to the national authority for a revised and detailed electricity market reform agenda.

In summary, the utilization of the Delphi Method into the multi-actor policy-making process stands for a democratic practice incorporating interest groups and public opinions concerning the electricity market reform in China. Despite the demanding nature for both the design team and respondents, the Delphi Method exerts collective

intelligence into the decision-making of complex socio-technical problems. What's more, the application on the target case corresponds to the outcome-oriented power sector reform model suggested by the World Bank Group (Foster & Rana, 2019). The Delphi Method contributes to common policy goals and then identify backwards the measures to remove key bottlenecks. For a further step, the design principle could also be adapted into a lower-administrative-level market reform or deeper sub-issue policymaking under the framework of national agenda.

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Appendix 1: 7 categories--28 tasks listed in the 2015 document[1]

(I) Promote the reform of electricity prices in an orderly manner, and rationalize the formation mechanism of electricity prices
1. Separately approve transmission and distribution prices
2. The step-by-step realization of electricity price for sale other than public welfare is formed by the market
3. Properly handle cross subsidies for electricity prices

(II) Promote the reform of the power trading system and improve the market-based trading mechanism
4. Standardize the entry standards of market entities
5. Guide market entities to conduct multi-party direct transaction
6. Encourage the establishment of long-term and stable trading mechanisms
7. Establish a new mechanism for sharing auxiliary services
8. Improve the inter-provincial and inter-regional power trading mechanism

(III) Establishing a relatively independent power trading institution to form a fair and standardized market trading platform
9. Position the functions of power grid enterprises in accordance with the laws of the market economy and the characteristics of power technology
10. Reform and standardize the operation mode of power grid enterprises
11. Establish and standardize electricity trading institutions.
12. Improve the market function of power trading institutions

(IV) Promote the reform of power generation and utilization plans and give more play to the role of market mechanisms
13. Orderly reduction of power generation planning
14. Improve the government's public welfare regulatory services
15. Further improve the level of supply and demand balance protection mainly focused on demand-side management

(V) Steady progress in the reform of the electricity sales side and the orderly release of electricity sales to social capital
16. Encourage social capital to invest in power distribution business
17. Establish market entry and exit mechanism
18. Multi-channel cultivation of market players
19. Give market entities corresponding rights and responsibilities

(VI) Open access to the grid and establish a new mechanism for distributed power development
20. Actively develop distributed power sources.
21. Improve grid connection service
22. Strengthen and standardize the supervision and management of self-owned power plants
23. Fully liberalize the user-side distributed power market

(VII) Strengthening overall power planning and scientific supervision to improve the level of power safety and reliability
24. Effectively strengthen the overall planning of the power industry, especially the power grid
25. Effectively strengthen scientific supervision in the power industry and related fields
26. Reduce and standardize administrative approvals in the power industry
27. Establish and improve market credit system
28. Quickly amend power laws and regulations

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[1] Translated from the original copy in Chinese: 中发〔2015〕9号《中共中央国务院关于进一步深化电力体制改革的若干意见》