



POLICY BRIEF  
**SECTOR COUPLING,  
REGULATORY CONVERGENCE  
AND CLIMATE CHANGE**



Task Force 10  
**SUSTAINABLE ENERGY, WATER, AND FOOD  
SYSTEMS**

Authors

**ROLANDO FUENTES, MATTHIAS FINGER, LESTER C. HUNT,  
BALTASAR MANZANO, JUAN JOSE MONTERO, NORA NEZAMUDDIN**

# موجز السياسة الاقتران القطاعي والتقارب التنظيمي والتغير المناخي

فريق العمل العاشر  
نُظُم الطاقة المستدامة والمياه والغذاء



المؤلفون  
رولاندو فوينتيس، ماتياس فنجر، ليستر سي هانت، بالتاسار مانزانو، خوان خوسيه مونتيرو،  
نورا نظام الدين



## ABSTRACT

Climate change goals can be met through both the decarbonization of the electricity sector and the electrification of sectors that now use other fuels. However, the electricity sector is navigating major technological disruptions that are changing the essence of its regulatory and business landscape. Similarly, other sectors that are good candidates for electrification, like transportation, are witnessing further technological disruptions, leading to paradigm shifts. New business models in electricity and transportation might converge, with both sectors focusing on services traded on a digital platform, leading to their horizontal integration. A side effect of this process would be an increase in electricity use and mobility—achieved through a reduction of emissions, if electricity is generated from carbon-free sources. Governments, both individually and collectively, should ensure the removal of barriers to the convergence of these sectors, avoiding inadvertently delaying the horizontal integration of the sectors with fragmented approaches.

يمكن تحقيق أهداف التغير المناخي من خلال إزالة الكربون من قطاع الكهرباء وكهربة القطاعات التي تستخدم حالياً أنواع وقود أخرى. يعاني قطاع الكهرباء من عقبات تقنية رئيسية يلزم فيها تغيير جوهر طابعه التنظيمي والتجاري. وبالمثل، تشهد قطاعات أخرى مرشحة للكهربة بشكل جيد، كقطاع النقل، المزيد من العقبات التقنية؛ مما يؤدي إلى تحول نموذجي.

قد تتوافق نماذج الأعمال الجديدة في الكهرباء والنقل مع القطاعات التي تركز على الخدمات المتداولة على المنصة الرقمية؛ مما يؤدي إلى تكاملها الأفقي. سيكون للزيادة في استخدام الكهرباء والنقل أثر جانبي لهذه العملية، وهو ما يتم تحقيقه عبر تخفيض الانبعاثات، إذا كانت مولدة من مصادر خالية من الكربون. ينبغي للحكومات، فرادى ومجموعة، أن تتأكد من إزالة العقبات أمام توافق هذه القطاعات؛ مما يؤدي إلى تجنب التأخير غير المقصود في الدمج الأفقي للقطاعات عوضاً عن التشتت الحالي.



## CHALLENGE

The decarbonization of the electricity sector and the electrification of other sectors of the economy that currently use other fuels could contribute to meeting climate change goals. However, the electricity sector is experiencing technological disruptions that have the potential to change the business and regulatory landscapes. Other sectors that could potentially transit to the use of electricity, like transportation, are also experiencing technological disruptions leading to paradigm shifts. Whether these technological changes help or hinder electrification depends on the potential synergies forged between these disruptive technologies. For instance, in the case of transportation, if firms can find secondary revenue streams through these synergies, the economic and business incentives can lead to the electrification of the sector. In this hypothetical scenario, if electricity is generated from renewable or carbon-free sources, emissions reductions would be an unplanned benefit of new business models.

Fuentes et al. (2020a) analyzes the coupling of electricity and transportation into a single overarching platform and argues that this would allow companies to achieve economies of scale, lower transaction costs, and obtain complementary data sets, potentially producing a rebound effect that could lead to increased demand for mobility and electrification. While the coupling of electricity and transportation is one scenario that can grow organically and has the potential to benefit market participants, consumers, society, and others, it is not an inevitable result. Rather than suggesting policy intervention that may hinder the role of the “free market,” our general recommendation is that governments should be aware of this and think about how they can support the organic coupling of the sectors. Therefore, the policy should focus on reducing barriers (if any exist) that would prevent the sector coupling (if any are possible). Technological developments are often associated with specific policy measures, which leads to creating heterogeneous, potentially conflicting, sets of policy measures. Given that technology advances faster than regulations, policymakers should be anticipating the type of regulation implemented to avoid unwanted effects such as market power or manipulation of information, and ensure that the right balance would be struck between commercial and consumer interests.

As these technologies operate at the global scale, their potential benefit is global, but their implementation is local (e.g., UBER). Without coordination, countries could ultimately have approaches that are fragmented and miscommunicated with each other that would once again deter obtaining the full impact on emissions reductions. The G20 is therefore an ideal forum to discuss a common approach.



# PROPOSAL

## **1. Design individual policies for the electricity and transportation sectors to prepare them for change and avoid inefficiencies in the transition.**

The power industry faces major technological, economic, and institutional challenges. Combining PV panels with batteries and demand appliances (DERs) can help reduce the reliance on the grid and the utilities' generation capacity. However, since electricity systems were built to meet total demand, behind-the-meter investments could lead to the duplication of some generation capacity and the reduced use of networks. On the upside, this would also lead to the phasing out of the most inefficient incumbent generation capacity. The downside would be that fixed assets, like transmission or distribution, would be used less, increasing the cost per unit of consumption. Some households using DERs may get reductions in their electricity bill, but these savings would not necessarily be translated into system costs because of rate design issues where part of the fixed cost is recovered with variable costs (Borenstein 2016). Utilities would see a decrease in electricity demand, resulting in lower prices and in a mismatch between electricity rates and utility costs, ultimately threatening the utilities' financial viability (Houghton, Salovaara, and Humayun 2019). Utilities could remedy the discrepancy by matching a fixed-charge component (a set monthly fee) and a demand-charge component (a payment per kilowatt peak) to actual grid costs. However, by doing so, they might not be able to recover their costs as the rate components do not reflect their costs to the system. This is because utilities made capital investments on the expectation of cost recovery from assumed patterns of network use by consumers.

### **Policy action 1.1**

- Re-define electricity tariffs to enhance the benefits of new distributed energy resources technologies in the power sector.

Three revolutions are underway in the transport sector: electric vehicles (EVs), automation/ride-hailing online platforms, and digitalization; together, they have helped to create the concept of Mobility as a Service (MaaS). Similar to the changes to the electricity sector outlined above, the combination of these technologies threatens the dominant form of transport, car ownership. MaaS allows the creation of an integrated transport system platform, with the optimized coordination of all kinds of vehicles (cars, micro-mobility, mass-transit, etc.).

In contrast to the technological innovations in the electricity sector, new transport technologies could lead to supply shocks and, consequently, to a decrease in the implicit price of mobility. The logic of this impact is as follows: A shared car can service more rides during its lifetime than one owned by an individual. This more frequent

use decreases the average cost per trip. Meanwhile, EVs have higher upfront costs but lower maintenance costs than a combustion engine car. This means that, at a certain threshold of use, an electric car has a lower cost per trip than a combustion engine car. Sharing technologies would allow electric cars to pass this threshold. Moreover, in contrast to the technological innovations in the electricity sector, this trend does not decentralize a centralized system, but rather centralizes a very fragmented system (car fleets managed by third parties, more collective transport, etc.). Connectivity and automatization would increase this effect for individual cars and, more significantly, across a fleet of cars. It would also be possible to optimize these technologies based on demand flow, traffic patterns and utilization.

### **Policy action 1.2**

- To prepare the transport sector by promoting public–private partnerships to develop the necessary physical and digital infrastructure for sustainable e-vehicle growth, in a coherent mobility policy framework.

Batteries are necessary for households to become energy independent and for EVs to be viable. As such, the more storage technologies improve, the more they enable a virtuous power–transport circle. Improving battery storage capacities would allow EVs to travel longer distances with a single charge, and would allow more households to become independent from a utility. Reducing the cost of batteries would be welfare enhancing since it would also reduce the total cost of providing services in the transport and power sectors. Storage brings an additional mutual benefit between electricity and transport. EVs can also contribute to the development of the smart grid by charging during off-peak hours, and thus provide back-up power to the grid and help incorporate other clean, renewable, zero-marginal-cost technologies. We thus propose the following.

### **Policy action 1.3**

- Design policies that improve the efficiency of storage and batteries for electricity and transportation to reduce costs and which allow them to be produced at scale.
- Allow market-based rate-making for storage services to incentivize the use and adoption of storage and batteries for electricity and transportation.

## **2. Align policies that facilitate the coupling of markets and identify and remove non-market barriers that might hinder the horizontal integration of electricity and transportation.**

Electricity and transportation business models could converge as a result of technological disruptions. These services could ultimately be traded on platforms and offered as bundled subscriptions. Transportation ride-sharing mobility apps, like Uber or Lyft, already operate on digital platforms. On the electricity side, DERs can transform power markets into a series of nested markets connected through different platforms as if they were multi-sided markets: a meeting place for a number of agents that interact through an intermediary or platform (Rochet and Tirole 2003). However, this convergence in their business models would likely create synergies (network effects) that might eventually lead to more vehicle miles traveled and more electricity consumed than if the services were offered independent of one another.

There is a tendency for traditional service providers (electricity utilities, transport service providers) to be “platformed” (Montero and Finger 2017). When anticipating that electricity and transportation will be traded on platforms, a distinction must be made between the physical networks in which electricity is delivered (the transmission and distribution network), the physical networks through which transportation is “consumed” (road, rail, etc.), and data networks (the digital platforms where supply and demand connect). Digital platforms will have an increasing role as coordinators of multisided markets, in addition to the traditional and new service providers.

Physical networks can become congested or stop taking new users after a certain point; in contrast, digital platforms have greater capacity as the marginal cost of adding one more user can be close to zero, and the fuel that is used to run these platforms, data, is a non-rival good. Therefore, this horizontal integration could leverage the sunk costs of these platforms and, by adding services to them, they could be traded with lower overheads and lower transaction costs. A platform revenue model would charge users a commission for connecting them with providers, or vice versa. To be competitive, providers would need to operate at low margins. However, to be sustainable, this would require a large number of transactions. Therefore, providers need to become a one-stop shop where consumers and producers can transact all their services to gain scale and compensate for the low margins per transaction. Platforms can create demand-side economies of scope, known as network externalities. Network externalities occur when the value of a product or service increases according to the number of people using it (Katz and Shapiro 1985). Coupling transportation and power services in one platform could generate synergies between the two.

### Policy action 2.1

- Avoid fragmentation of local regulation of aggregated service providers to avoid fragmentation of different sectors within jurisdictions and across different countries.

Multilateralism is key to continued cooperation, growth, and development globally. Nations should avoid protectionist policies that lead to barriers on trade and reduced benefits from the free flow of physical and digital goods and services. Policymakers should not push for legislation that defies internationally accepted free trade agreements as it creates barriers for the further development and dispersion of future technologies. For example, limiting the advancement of key technologies, such as 5G, could curtail the development of the digital platform on which both electricity and transportation sectors could converge. Ultimately, given the current global uncertainty, continued cooperation amongst G20 nations and other world leaders allows for the creation of internationally agreed-upon standards.

### Policy action 2.2

- Enhance communication between local and national regulators to set a standard framework to maximize the benefits of economies of scope by increasing the potential size of the market of integrated services.
- Avoid protectionist policies that can create barriers for technological innovation and advancement and which can deter the established internationally agreed-upon systems of operating.

An increase in electricity consumption from a new source like EVs would help utilities to recover the revenue lost from households generating their own electricity through DERs, as described earlier. In such a scenario, utilities would be in a position to offer long-term contracts to electric mobility service companies. Many retail electricity companies have reshaped themselves into “energy service providers” and become responsive to consumer demands for efficient services and green energy options, among other things. However, the pace at which this is occurring is linked to the regulatory architecture. Both parties would benefit from this policy action: utilities would have more stability in their revenues and MaaS companies would reduce the supply risk of a key input. Other arrangements may also be possible:



- MaaS companies could be large consumers of electricity and could produce their own power. (i.e., apps like UBER could even become electricity firms).
- Households provide home-generated electricity to transport companies in exchange for transport services.

### Policy action 2.3

- Facilitate the cross-sectoral integration of aggregated services in digital platforms and update regulations so that firms in either sector could participate in the other.

Another consideration is the geographical aspect of new technologies. On the one hand, new electricity technologies blur the boundaries between transmission-distribution, distribution-commercialization, and generation, as these processes would occur more often in the same local area, or even at the same point (household or other premises). On the other hand, the transport revolution discussed here is, in essence, an urban phenomenon (Fulton, Mason, and Meroux 2017). As such, policies at the municipal or metropolitan level could gain relative preponderance on the development of these two sectors.

Local authorities can facilitate these synergies because they can greatly influence the intersection between the physical and digital worlds. The public space is the local authorities' eminent domain. They can thus regulate the use of public space, the construction of new electricity systems, private and collective transport, and increasingly, the coordination of the different sub-systems. For example, firms could obtain concessions or authorizations as long as they share activities that have thus far been exclusive to the data layer. Platforms could be required to share information in real time with local authorities and players. The changing business models surrounding transportation might also affect urban design and encourage municipalities to repurpose areas. Therefore, local authorities need guidance to implement the most effective regulation in this regard.

#### Policy action 2.4

- Develop and share knowledge that informs local authorities on how they can use their prerogative over the public space to develop these coupled markets to its full extent.
- Develop best practices so that local authorities within and across countries follow the same standard.

### **3. Design regulations that prevent the development of monopoly power in the new coupled markets and manipulative information tweaking that nudges user's behavior.**

How digital platforms infrastructure should be regulated is an open question that would require innovative approaches to answer. Local and even national authorities often lack the scale to regulate platforms, as platforms operate at a global scale. International cooperation is therefore necessary to develop regional and global standards and rules. These rules must be based on the right understanding of the role of platforms in multisided markets.

The coordination of increasingly fragmented DERs and the coupling with the very fragmented transport system is only possible thanks to the new digital technologies (new sensors, new connectivity [5G], inexpensive communications, Artificial Intelligence, etc.). Therefore, a new feature that requires regulation is the ability of platforms to influence consumer decisions in one way or another, through the results of their own algorithms.

For example, users increasingly rely on information from such routing services. If repetitive routines are formed through positive user experiences, information made available could quickly come to be no longer questioned (Canzler, Kauffman, and Kesselring 2016). This creates the potential for manipulative tweaking, which is difficult or nearly impossible to detect with conventional methods. A routing service company could thus systematically influence policy objectives such as the use of public transportation versus the use of a private cars without the public directly noticing this (Bock et al. 2019). These decisions can have an impact on policy objectives such as the environment. We therefore argue that the way algorithms are produced requires oversight so that they may meet policy objectives. In other words, regulation should protect consumers against abuses of algorithm design under which people make decisions. This goes beyond the pure efficiency focus of antitrust regulation.

### Policy action 3.1

- Ensure that the efficiencies derived from network effects are compatible with general-interest objectives such as the resilience, safety, continuity in supply, and universality in the underlying electricity and transport services.

Data generation from these digital platforms can provide additional revenue streams for horizontally-integrated firms, with the potential to generate more revenue than the actual revenue from the sale of electricity or rides (The Economist 2017). For example, the consumption of electricity and transportation is highly habit dependent and therefore predictable, particularly the more this data is accumulated and aggregated. It would ultimately be possible to link information from a consumer's daily departure time to the approximate time of their arrival at home, and the sequence of appliances they use when they arrive. This could help transport and electricity companies to plan for capacity expansion and utilization. Transacting these services on digital platforms and via subscriptions would generate behavioral data. Such data could help companies predict the aggregate household demand for power and transportation more accurately, which could lead to operational cost savings.

Currently, there is a debate about privacy and personal data protection. However, here we are not referring to personal data, but the power of aggregated data, like traffic flows, trip generation and distribution, electricity charges, and so on. Therefore, personal data becomes less relevant as it starts to disappear in the big numbers. The IoT is not about personal data, but about what is done with the data. It is important to make inferences, profiles, and target people. There is, however, a risk that granular consumer data generates asymmetric information between firms and consumers. This informational advantage gives the companies an accurate description of an individual customer's willingness to pay, which can be used to implement quasi-perfect price discrimination. Thus, companies could potentially extract a large part of the consumer's surplus by charging prices equal to their respective willingness to pay for a package of bundled services.

### **Policy action 3.2**

- Empower consumers and protect them from potentially abusive behavior from platforms by establishing regulations on transparency.
- Focus on regulations that monitor and prevent the use of informational asymmetries to discriminate prices for coupled services, and take strict measures for cybersecurity.

### **Policy action 3.3**

- Develop and share knowledge to establish a national authority/commission that sets the protocols and enforces standards for data usage, which is key for consumer protection.

The network effects of digital platforms create substantial efficiencies, but also have downsides. It is well known that system-builders tend to build centralized systems to monopolize the efficiency gains created by network effects (Huges 1987). Network effects always create concentrated markets, and oligopolies and even monopolies can therefore emerge as the efficiencies cannot be replicated by competitors who do not reach the necessary critical mass. Market dominance can be increased by behaviors such as exclusivity clauses, lock-ins, acquisitions, and so on. Also, the more a system is centralized, the higher is the impact of a destabilizing event.

### **Policy action 3.4**

- Incentivize a market structure where there are several horizontally-integrated electricity/transportation companies competing against each other without being “centralized” to protect consumers.

### **Policy action 3.5**

- Monitor tradeoffs between the efficiency of centralization and the risk of the resilience of the underlying physical systems. Resilience, safety, and continuity in the provision of the service are paramount in the electricity and transport sectors.

#### **4. In light of the COVID-19 pandemic, facilitate financing of innovation that allow the coupling of these sectors by pursuing a green economy recovery program.**

The COVID-19 pandemic will have long-lasting consequences in the organization of the entire world economy. The prime objective is now to reduce the risk of infection. Therefore, activities that reduce physical interaction or are considered as safe, will flourish while others will not. Under this new normal, digitalization, which is the bedrock of the coupling of these sectors, can do well. However, the impact on the deployment of individual electricity and transport technologies that can enable traditional sectors to be “platformed” differ. For example, ride-sharing applications are suffering, at least at the early stages of the pandemic, considering that the concept of sharing is contrary to the concept of physical distancing. The future deployment of these technologies will depend to a large extent on the length of the quarantine (and subsequent quarantines) and whether or not they have lasting impacts on the organization of work and on commuting behavior.

Longer stays at home impact both electricity and transport demand. In general, there is less need for travel which makes car ownership, including EVs, less attractive. Paradoxically, lower incentives to buy cars improves the chances for using MaaS. Furthermore, although it may sound counterintuitive, less congested roads are an ideal scenario to start automated vehicles. For electricity, the impact is at least twofold (Fuentes, et al. 2020b). First, longer stays at home increase domestic demand as more people occupy the home, refrigerators work overtime because there is more food to keep cool, and home cooling systems are probably less efficient than office cooling. An offer from DERs with the possibility of reducing home bills would therefore be attractive to consumers. Second, there is an increase of homemade goods, since home production avoids interaction and physical contact. Preferences for homemade electricity might be included in this trend as well. In both cases, there could be increased demand for batteries and storage from the electricity sector that would indirectly benefit EVs.

Given the uncertainties surrounding the pandemic, there is a strong preference for liquidity. Moreover, funds for research and development are being allocated to medical research. In general, this might hurt financing innovation in the two sectors considered here. However, if these technologies can be made more hygienic with small adjustments, or with less face-to-face interaction, they would be attractive to new investors – although regulations would have a big influence on the final outcome. If emissions regulations are relaxed to facilitate the recovery, and norms regarding the use of cars in cities relaxed—because this reduces the risk of infection—these actions could slow down the potential benefits of the sector coupling. However, if govern-

ments encourage green recovery, then the deployment of these technologies might well gain momentum.

**Policy action 4.1**

- Facilitate the financing of post-pandemic green recovery to allow for further innovation in these sectors.
- Conduct research and case studies of countries/cities that have applied green policies for post-pandemic recovery that allows the showcasing of “success” stories

**Disclaimer**

This policy brief was developed and written by the authors and has undergone a peer review process. The views and opinions expressed in this policy brief are those of the authors and do not necessarily reflect the official policy or position of the authors' organizations or the T20 Secretariat.



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## **AUTHORS**

**Rolando Fuentes**

EGADE Business School–Tec de Monterrey

**Matthias Finger**

Ecole Polytechnique Fédérale de Lausanne

**Lester C. Hunt**

University of Portsmouth

**Baltasar Manzano**

University of Vigo

**Juan Jose Montero**

Universidad Nacional de Educación a Distancia

**Nora Nezamuddin**

King Abdullah Petroleum Studies and Research Center (KAPSARC)

