



# Adapting electricity markets to decarbonisation and security of supply objectives: Toward a hybrid regime?



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## ABSTRACT

The policy objectives of decarbonisation of the electricity sector whilst maintaining security of supply have led to a new wave of market reforms in many jurisdictions which liberalised their industry. There is a wide range of models under this new hybrid regime which essentially combine the energy market with planning and long-term risk transfer arrangements. This paper takes an institutionalist approach in terms of modularity of the market design, and reviews the issues with the standard historical market model which led to the introduction of additional long term “modules”. We then study the interactions between the existing and new “modules” and identify ways in which the initial market modules can be improved to address inconsistencies with the new modules. We conclude by discussing the conditions under which the various changes in market architectures could converge toward a hybrid regime structured around a “two step competition”, with a “competition for the market” via the auctioning of long-term contracts to support investment, followed by “competition in the market” for short term system optimisation via the energy market.

## 1. Introduction

Twenty-five years after the reforms were initiated to liberalise the electricity industry, many electricity markets around the globe are ‘hybridised’ with various forms of regulatory intervention, with a significant role for the state in planning and auctioning long-term contracts. In this paper, we argue that the revival of public interventions in electricity markets is driving a transformation of the standard historical approach of competitive market design towards a hybrid regime that combines planning and long-term arrangements established with public or regulated entities on one side, and short term “organised markets” on the other side.<sup>1</sup>

This marks a significant shift away from the initial theoretical textbook electricity market design, in which investment decisions are made by market participants based solely on price expectations. In other words the initial reforms were based on the belief that the market is able to assume both the short-term coordination between market players for the economic dispatching and the long-term coordination

function between them for investing in generation so that an optimal mix and capacity adequacy can be achieved in a timely way. These new long-term ‘out-of-market’ building blocks are designed to add a remuneration to the revenues from the energy markets, to guarantee the recovery of fixed costs and to de-risk investment *via* some risk-sharing arrangements between producers and consumers, while some of them make it also possible to subsidise production in the long-run for the new technologies. However, this raises the issue of the consistency of these new elements with the initial wholesale market building blocks, and their subsequent evolution.

These drivers of policy intervention resonate in the OECD countries within a context that is characterised by the resurgence of government interventions aimed at guaranteeing security of supply (SoS) through the introduction of capacity mechanisms, and decarbonising through the support of clean technologies – decentralised renewable energy sources (RES), as well as centralised low-carbon technologies (LCTs) – and the growing challenges of network planning in the context of the development of decentralised and variable RES generation. In the

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<sup>1</sup> We use here the concept of long term arrangements in a restrictive sense to designate bilateral inter-agent coordination, ranging from public-private cooperation to contracting schemes, including public support mechanisms and public-private partnership, but not in the wider sense of the institutionalist theory covering multi-agent organisations, networking and policy arrangements. When an arrangement is in fact a contract, we explicitly use the concept of contract. For instance a feed-in-tariff is a long-term arrangement between private players and the government, to be distinguished from long-term contracts which are auctioned and signed with non-governmental parties, as regulated and private entities.

emerging economies, the need for investment in capacity is more acute than in the OECD countries, given that the former are experiencing more significant growth in demand, causing them to be the forerunners of market hybridisation with planning and long-term arrangements.

These policy and regulatory interventions, in particular those that are aimed at promoting large scale investment in generation in emerging countries, and deployment of high-upfront-cost and low-variable-cost technologies (RES, LCTs) in advanced economies, can have significant impacts on electricity markets and undermine the ability of energy market prices to provide adequate coordination signals to market participants. This can create fundamental inconsistencies with the current market arrangements, e.g. merit-order effects, limits on system balancing constrained by the rigidity of existing resources, poor market valuation of the flexibility of resources that are increasingly needed, and lack of locational signals to coordinate generation and transmission system development.

These inconsistencies, in turn, can lead to the adaptation of the former set of market rules, such that there is a switch from the initial “market regime” to a new “hybrid regime”.<sup>2</sup> We argue that, beyond the various patches of ‘out-of-market’ mechanisms that have already been added and that are being adopted in these countries, the underlying logic leads to a combination of modules of short-term markets, improved modules of networks access and development, and long-term coordination mechanisms, from the moment that the SoS or/and the decarbonisation objectives are prioritised. The novelty lies in the fact that recent developments have demonstrated the strength of this logic in moving towards a regime that is articulated around two clear principles: short term coordination by markets idealized by the so-called economic dispatching, and long-term coordination by a combination of planning and auctioning of long-term arrangements between producers, investors and regulated entities.

This paper analyses the dynamics of change in the market design and investigates the issues associated with their mutation into a ‘hybrid regime’ that combines a role for market coordination with strong public governance.<sup>3</sup> Our objectives are:

- To analyse the evolution of market design in the context of the new decarbonisation and security of supply objectives introduced, by using a functional approach that belongs to rational choice institutionalism and that builds on the literature that identifies a number of “modules” in the standard electricity market design;
- To investigate the issues associated with the combination of short-term coordination by the market and long-term coordination by planning and auctioning long-term contracts – referred to as a “hybrid regime” – by drawing from the experience of a number of countries in particular in Europe and Latin America;
- More specifically, to explore two types of inconsistencies: those stemming from these overlapping coordination approaches and those altering the functions of some elements of the initial market architectures.

In [Section 2](#), we present the literature to which our methodological approach belongs, and the related conceptualisation of market design in terms of modules (i.e., blocks of operational and transactional rules), as well as the dynamics of change of this design in functional terms. We

<sup>2</sup> In an institutionalist perspective, the general concept of regime in a sector is a set of institutional forms to govern the interactions between players, in particular between private entities, public entities (among which regulators) and government, including market rules, laws, policies and regulations.

<sup>3</sup> In the new regime, there is a hybrid form of markets, with two steps competition, first the competition “for the market” through the auctioning of long-term contracts; second, the competition “in the market”, where existing generators compete in supplying energy to the spot market. Occasionally this is referred to in the paper as a hybrid market, not to be confused with the hybrid regime which combines planning and market principles.

identify the drivers of the “reforms of the reforms”, namely market failures in current markets in the first stage, and thereafter, the inconsistencies that arise between the initial modules and those introduced subsequently to correct market failures. [Section 3](#) concentrates on the modules that provide the long-term signals that usher in a new hybrid regime, namely the “Long-Term Contracts” module; the “Capacity Mechanism” module; and the “RES-Decarbonisation” module. International experiences in combining these modules with the initial market architecture draw attention to different issues with the articulation of planning and market coordination principles. [Section 4](#) deals with the inconsistencies between these new “long-term” modules and the initial modules, and the remedial measures that are needed to ensure an efficient interplay between the market signals and these “long-term” modules in order to reach a stabilised regime after the hybridisation of the market regime.

## 2. An institutional framework to analyse the “reforms of the reforms”

Since the initial wave of reforms in the 1980s and 1990s, liberalised electricity markets have continued to evolve around the globe. There are several strands in the literature that focus on explaining the drivers and dynamics of this evolution. These are considered below.

### 2.1. The institutionalist perspective on reforming industrial organisation and regulation

Three parallel strands of neo-institutionalism have become established in the analysis of regulation or socio-technical regimes ([Hall and Taylor, 1996](#)):

- (i) the “rational choice” institutionalism which emphasizes economic gains in terms of social efficiency (including the so-called transaction costs in their different meanings) which was initially developed by [Williamson \(1996\)](#) at the level of industrial and services activities and by [North \(1990\)](#) at the broader historical level of the societies, followed by numerous scholars;
- (ii) the “historical institutionalism” which focuses on power asymmetries and the general features of the prevailing political and economic system in the concerned sectors and countries; and
- (iii) the “sociological or organisational institutionalism” which highlights the importance of culture.

The two last institutionalist streams have coped with the analysis of the initial electricity industry reforms by focusing primarily on explaining the variety of liberalisation reforms. Indeed the implementation of reforms has followed different institutional trajectories and trial and error processes involving experiments with different elements of the market designs (see for instance: [Newbery, 2002](#); [Glachant and Finon, 2003](#); [Jamasb, Pollitt, 2005](#); [Joskow, 2008a](#); [Pollitt, 2008](#); [Corrélje and De Vries, 2008](#); [Borenstein and Bushnell, 2014](#)). They explain the variety of liberalisation reforms in terms of the differences of institutions and development policies between countries, as well as the steps to establish the initial structures and regulation of the electricity industry. These have served to separate, in a timely way, the natural monopolistic activities and competitive activities, so as to establish a regulatory authority, and thereafter to enable privatisation ([Newbery, 2002](#)).

[Hollburn and Spiller \(2002\)](#), [Spiller \(2009\)](#), and [Henisz and Zellner \(2010\)](#) focused on the “reforms of the reforms” that have been implemented in emerging economies that are confronted with the challenge of attracting investment. They have insisted on the importance of the credibility of public governance (referred to as the “public contract”) in facing this challenge. They have also shown how the roles of interest groups, the pressure exerted by public opinion, and common beliefs interfere with more objective drivers of market reform. [Corrélje](#)

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