A Framework for Designing and Categorising Capacity Markets

*Insights from an Application to Europe*

Regina Betz, Jenny Riesz, Greg Thorpe, Johanna Cludius

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IAEE, Antalya, Turkey
Introduction

- **Resource Adequacy:**
  - Mechanisms to manage capacity of installed generation, and adequacy to meet demand
- **Becoming more challenging**

Plateauing demand → Depressed market prices → Stalled investment → Resource adequacy issues

Many jurisdictions moving towards explicit capacity remuneration mechanisms
Capacity markets vs Energy-only Markets

Capacity markets may be necessary where it is politically (or otherwise) not possible to allow sufficiently high scarcity prices.
Many different kinds of capacity mechanisms

- A plethora of different capacity mechanism designs have been explored and implemented.
- Can be challenging to compare between jurisdictions:
  - Terminology differences
  - Lack of common framework
- Developed a 2-tier framework for categorising capacity mechanism designs:
  - Useful framework for comparing and considering designs
2 Tier Design Framework for capacity market design

First Tier Design Choices
- What is the capacity product to be traded?
- Who determines the amount of capacity to be procured?
- What is the procurement process?

Second Tier Design Choices
- All other significant design choices

Capacity Remuneration Mechanisms
## Common Terminology

<table>
<thead>
<tr>
<th>Product Description</th>
<th>Who determines how much is procured?</th>
<th>Procurement process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Centralised capacity market</strong></td>
<td>Physical Capacity</td>
<td>Central Authority</td>
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<tr>
<td><strong>Capacity Obligation (France)</strong></td>
<td>Physical Capacity</td>
<td>Central Authority</td>
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<td><strong>Decentralised capacity market</strong></td>
<td>Physical Capacity</td>
<td>LSEs</td>
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<td><strong>Capacity Subscription</strong></td>
<td>Physical Capacity</td>
<td>Customers</td>
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<td><strong>Reliability Options (Italy)</strong></td>
<td>Financial Instrument</td>
<td>Central Authority (usually)</td>
</tr>
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</table>
Current developments in Europe

- existing capacity mechanisms
- some elements of a capacity mechanism in place (types of strategic reserves)
- implementation of a capacity mechanism or its revision in progress
- capacity mechanism under consideration

Source: EUI webinar “Capacity mechanisms: legal issues” by Malgorzata Sadowska
(http://fsr.eui.eu/Publications/WEBINAR/2014/141217-WR-Sadowska.aspx)
The French capacity mechanism: Type, Status, Aim

Type:
- Capacity Obligation
- Physical Capacity is set by central authority and traded bilateral

Status:
- Decree in 2012 contained the main principles
- ACER report April 2014 explained market rules
- Decree signed January 2015
- First delivery year: January 2017 to end of December 2017

Aim: Security of Supply
- Tackle the peak load issue (especially in Winter)
- Boost Demand Side Management (DSM)
The French capacity mechanism: Design

Minister of Environment
- Defines Security of Supply

ACRE
- Oversight Transparency

TSO (RTE)
- Issues certificates

Retailer Obligation (Demand certificates)

Capacity operators (Provide certificates)

Bilateral trade of certificates

Price of certificates reveals value of Security of Supply
Price is zero if there is no risk on Security of Supply
The Italian capacity mechanism: Type, Status, Aim

Type:
- Reliability Option
- Adequacy target is set by TSO (Terna) and reliability option contract is the product which is bought through a central auction in each region

Status:
- Law has been approved by Ministry of Economic Development in 2014
- First auctions in 2015
- First delivery period: 2019 or 2020

Aim: System Adequacy
- No capacity problem, aim to ensure that not too much of the overcapacity (mainly gas) is retired
- Long-term price signals to support coordinated development
The Italian capacity mechanism: Design

- Regional auction, on grid area where the resources are located
- Adequacy target is a yearly elastic function of volume, loss of load probability and variable costs of marginal technologies

TERNA
organises

- New and existing programmable generation (e.g. fossil, solar thermal, biomass, pump storage..) not subject to other incentive schemes or dismanteling measures
- 4 years planning period
- 3 years

Descending clock
Premium payment
If P(strike) < P(spot), option executed (difference paid)

Buyer
TSO (Terna)

Seller
awarded producers

- Reliability option contract
- Strike price is set at variable costs of an efficient peak plant
- → Penalty if no delivery in peak periods
Cross-border participation

Source: Eurelectric 2015
Summary

- Plethora of different capacity mechanism designs have been explored and implemented
- Usually the design choice is purpose driven
- Cross-border participation in EU mandated by EU Commission to ensure functioning of IEM
- Different capacity market designs may make linking difficult and lead to distortions in the IEM
- Depending on design different impacts on electricity price: short term and long term impacts to be distinguished
Thank-you

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