THE BELGIAN CAPACITY MARKET: NUCLEAR PHASE-OUT, RELIABILITY OPTIONS AND THE CLEAN ENERGY PACKAGE

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Nuclear in Belgium
Belgium: 7 reactors, ~6GW

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<tr>
<th>Reactor</th>
<th>Net capacity (MW)</th>
<th>Start</th>
<th>Off-line</th>
<th>Lifetime</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doel 1</td>
<td>433</td>
<td>1975</td>
<td>2025</td>
<td>50</td>
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<tr>
<td>Doel 2</td>
<td>433</td>
<td>1975</td>
<td>2025</td>
<td>50</td>
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<tr>
<td>Doel 3</td>
<td>1006</td>
<td>1982</td>
<td>2022</td>
<td>40</td>
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<tr>
<td>Doel 4</td>
<td>1033</td>
<td>1985</td>
<td>2025</td>
<td>40</td>
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<tr>
<td>Tihange 1</td>
<td>962</td>
<td>1975</td>
<td>2025</td>
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<td>1983</td>
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<td>1038</td>
<td>1985</td>
<td>2025</td>
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</tbody>
</table>

Source: World Nuclear Association
Belgium: ~ 80 TWh, 50 % Nuclear
2030: A lot of RES + Gas

ELECTRICITY GENERATION PER FUEL TYPE IN BELGIUM FOR A GIVEN FUTURE CAPACITY MIX [FIGURE 4-40]

Historical

10 years without thermal investment

2 GW ~ 14 TWh

Coal Phase out

New CCGT/OCGT

△ 2003

« Nuclear Phase out starts in 2015 to 2025 »

△ 2012 & 2015

« Let’s extend some units »

△ 2019

« We need a CRM to address nuclear phase out »

△ 2022-2025

« Nuclear phase out as planned »

2 units could be extended?
Legal nuclear phase out scenario: 7 units to be closed by 2025
"Belgium must commit to a gradual nuclear phase-out"

→ limit operating lifetime of nuclear reactors to 40 years…

→ however security of supply is the absolute priority = temporary derogations are possible

No economic, ecological nor technical?

Key reasons:
— risk of nuclear accident,
— nuclear weapon proliferation
— waste management

No comprehensive plan to replace nuclear led to 2 LTO:
— 2012: Tihange 1
— 2015: Doel 1 & 2
— 2021: ????
Reliability options and CRM « taxonomy »

Source: Capacity remuneration mechanisms and the internal market for electricity, ACER, July 2013.
Reliability options

- Capacity remuneration scheme (MW), which is:
  - Volume-based (MW) & Market-wide
  - Technology neutral
  - Centralized
- Capacity price determined in a competitive process
- Excessive profits are limited with a pay-back obligation

KEY MOTIVATION FOR POLICY MAKERS!
Ensuring adequacy, keeping cost under control beyond competition

Source: Elia
How much volume? A difficult balance to find

Too much capacity
High societal cost (over insured)
Depressed energy prices

Too little capacity
Adequacy not insured (despite insurance cost!)
High energy prices & load shedding…

Negative impact on CRM cost!
Volumes: Defining « ABC »…

B: Volume we need to meet “Reliability standard”
Which level? (LOLE < 3h & LOLE95 < 20h → the Belgian law)
What is the Best New Entrant?
How much volume? Battle of assumptions…

Peak Demand?
(COVID & climate changes vs heat pumps & Evs/5G?)

Cross border? \( \rightarrow \) T-1

< 200 h? \( \rightarrow \) T-1

Current proposal BE
~25% (<5% in EU)
No time in T-1 for new capacity

How much can we rely on FR, NL, DE and UK (Brexit)?

Share of DSM? How much? What happens if not there?

Existing capacity?

How much will still be there by 2025?

By how much new capacity do we replace 6 GW of nuclear? 3.9 GW? 2GW?
Share of DSM?

Others*?

New capacity? \( \rightarrow \) T-4

* e.g. non eligible capacity (PV, wind, CHP, below 1 MW…etc)
Keep costs under control? Several design elements

Pay-Back obligation

Pay-as-bid

Intermediate price cap

200 hours

"volume to be reserved [in T-1] is at least equal to the capacity having, on average, less than 200 operating hours per year in order to cover the total peak capacity"
Auction format: Pay-as-bid

“It is proposed to apply a pay-as-bid pricing rule for the first two Auctions (Y-4 Auctions for the first two Delivery Periods) and switch towards a pay-as-cleared pricing rule afterwards as this allows to limit windfall profits”

Source: Elia

Kahn et al (2001): "The critical assumption is that generators will bid just as they had before. They will not".
200h rules, when do we Auction **How Much?**

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<th>2021</th>
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<td>T-1</td>
<td>Delivery 2025</td>
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→ **Simple**

**T-4 needed for new built**

"volume to be reserved [in T-1] is at least equal to the capacity having, on average, less than 200 operating hours per year in order to cover the total peak capacity"

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity reserved for T-1 auction</th>
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<tbody>
<tr>
<td><strong>UK</strong></td>
<td>95% confidence interval around T-4 (i.e. around 5% of T-4 auction volume)</td>
</tr>
<tr>
<td><strong>IE</strong></td>
<td>2-5% of capacity requirement</td>
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<tr>
<td><strong>PL</strong></td>
<td>1.160MW out of ca. 22.000MW (i.e. approximately 5% of mainauction)</td>
</tr>
<tr>
<td><strong>IT</strong></td>
<td>At least 1% of expected capacity demand</td>
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→ ~25% in T-1 for Belgium?
Intermediate price cap - IPC

- Objective: limit the cost of the CRM
- Issues:
  - Pay-as-bid + IPC → unique
  - Reduce competition between old and new assets
  - No incentive to offer below the IPC
  - What if too low? → exit?
  - Impact investment decision taken before the CRM (state aid guideline)
- Proposal: Derogation
  - How to give derogation? Based on missing money computation? → impossible task
  - Why a rule if everyone apply for derogation?
  - If you one can compute the missing money in the first place- Why A CRM: simply regulate!
Conclusion
An ambitious planning

- The CRM is behind schedule...5 months before the auction (Oct 2021), a lot remains to be done...
A lot of debates in the Belgium CRM

- Needs are overestimated?
- Pay-as-bid = cheaper
- 50% in T-1?
- Investment thresholds high?
- We can rely on them!
- Too expensive! Keep it low
- No exemption
- Pancake of penalties?

Source: Elia
Lessons? next?

Some early lessons?

- Nuclear phase out needs a comprehensive replacement plan
- A CRM should be a competitive, clear and transparent mechanism: additional rules to “control” competition can hamper competition?
- Decarbonization creates an additional challenge
- Clean Energy package provides a rather robust framework but no standard market design
- Careful monitoring of the first results needed to address potential flaws

Next?

Optimistic scenario: DG comp approve the CRM, players able to compete on a level playing field, sufficient capacity at the lowest cost, CO2 emissions under control.

Pessimistic scenario: Delayed DG comp approval, the nuclear option re-open (feasibility?), several players bring to court legal actions against the CRM, further delay implementation security of supply 2025 at risk….
Thanks you