

The new Italian capacity remuneration mechanism

A deterministic modeling and simulation approach

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LACK OF REMUNERATION FOR GENERATION CAPACITY GENERATES ADEQUACY ISSUES

➤ CAUSES

- ✓ Lasting stagnation in the electricity demand which is still below the pre-crisis levels
- ✓ Strong increase in the subsidized intermittent RES generation with priority dispatch

➤ EFFECTS

- ✓ Several existing conventional power plants (especially CCGTs) are no longer able to cover capital and fixed costs through spot markets, resulting in decommissioning or mothballing plans

➤ THE ADEQUACY ISSUE

- ✓ The Italian NRA points out possible risks of reliability issues in the Italian mainland in the next future, as already occurred in the islands over the last 5 years
- ✓ The Italian NRA introduced a new market-based CRM in order to replace the current regulated CRM (targeted capacity payment)

EXTENSIVE LITERATURE, BUT NO EMPIRICAL SIMULATION

- There is an extensive theoretical literature concerning CRM...
 - ✓ Battle C. and Perez-Arriaga I. (2008)
 - ✓ Bidwell M. (2005)
 - ✓ Chao H. and Wilson R. (2004)
 - ✓ Cramton P. and Ockenfels A. (2012)
 - ✓ Cramton P., Ockenfels A. and Stoft S. (2013)
 - ✓ Cramton P. and Stoft S. (2005)
 - ✓ Cramton P. and Stoft S. (2008)
 - ✓ De Vries L. (2007)
 - ✓ Hogan W. (2005)
 - ✓ Joskow P. L. and Tirole J. (2007)
 - ✓ Joskow P. L. (2008)
 - ✓ Oren S. S. (2004)
 - ✓ Oren S. S. (2005)
 - ✓ Wolak F. (2004)

- ...but no attempt to model and simulate them from an empirical standpoint, at least regarding the new Italian market-based CRM

ELIGIBLE PARTICIPANTS

- Capacity market where so-called “reliability options” will be traded (mainly) through central auctions managed by the TSO

- DEMAND SIDE
 - ✓ The TSO will aim to procure the level of generation capacity required to ensure the generation adequacy target
 - ✓ The generation adequacy target will be set through capacity demand curves

- SUPPLY SIDE
 - ✓ Programmable existing and new generation capacity
 - ✓ Intermittent RES capacity after renouncing to GSE incentives
 - ✓ Consumption units that voluntarily qualify to ASM
 - ✓ Foreign capacity (only in the full implementation)

TRADING ARRANGEMENTS

➤ MAIN AUCTIONS

- ✓ Procurement of the capacity required to ensure the generation adequacy target:
 - planning period: less than 4 years (first implementation) and 4 years (full implementation)
 - delivery period: 1 year, with possibility of 15 years for new capacity upon request

➤ ADJUSTMENT AUCTIONS

- ✓ Adjustment of both generation adequacy target and contracted positions closer to the delivery period:
 - planning period: 1 to 3 years
 - delivery period: 1 year

➤ SECONDARY MARKET

- ✓ Adjustment of the contracted positions for short periods (monthly) through continuous trading

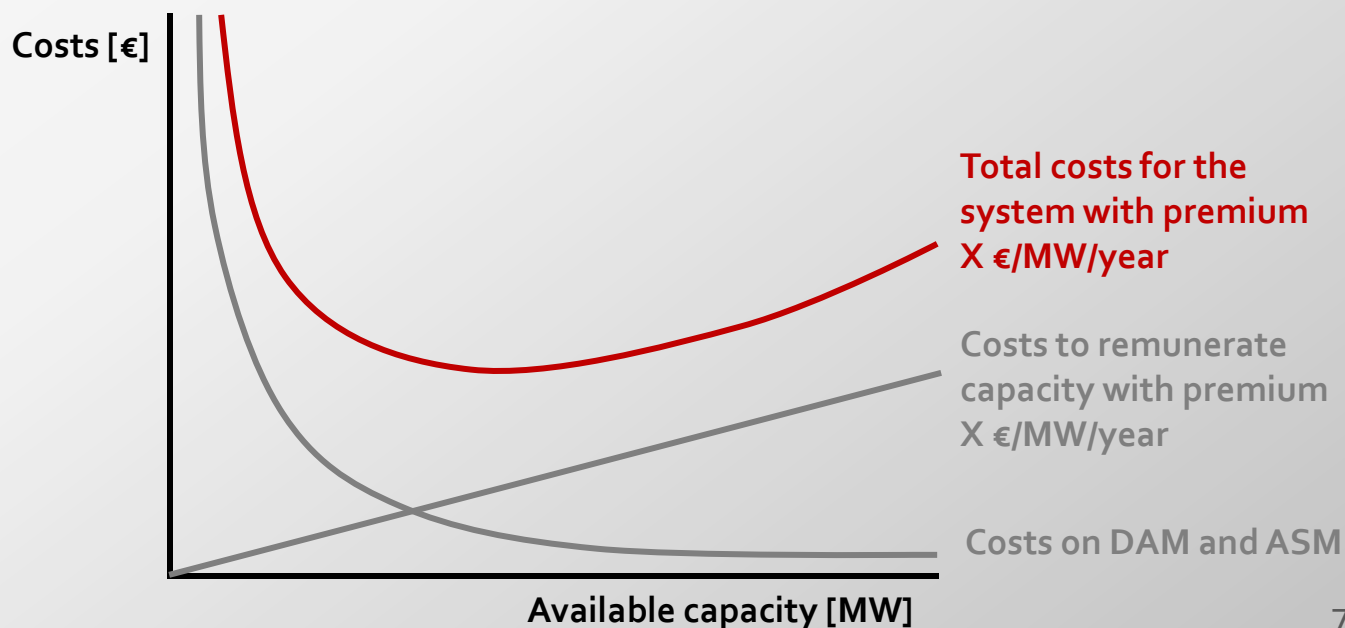
RIGHTS AND OBLIGATIONS

- Successful bidders receive a **yearly premium**, which is the marginal price resulting from the capacity auctions (subject to specific cap)
- Successful bidders commit to deliver capacity after the planning period and over the delivery period through **offers on DAM and ASM** (except in periods of planned maintenance previously agreed with the TSO)
- Successful bidders commit to transfer to the TSO the positive difference between DAM and ASM prices and the reliability options' **strike price** (corresponding to the standard variable costs of the "peak technology")
- Mechanism financed through a charge set by the NRA, levied on a monthly basis on dispatching users (mainly retailers) per electricity withdrawal point and collected by the TSO

ESTIMATION OF THE DEMAND CURVE

Estimation of system costs as a function of available generation capacity

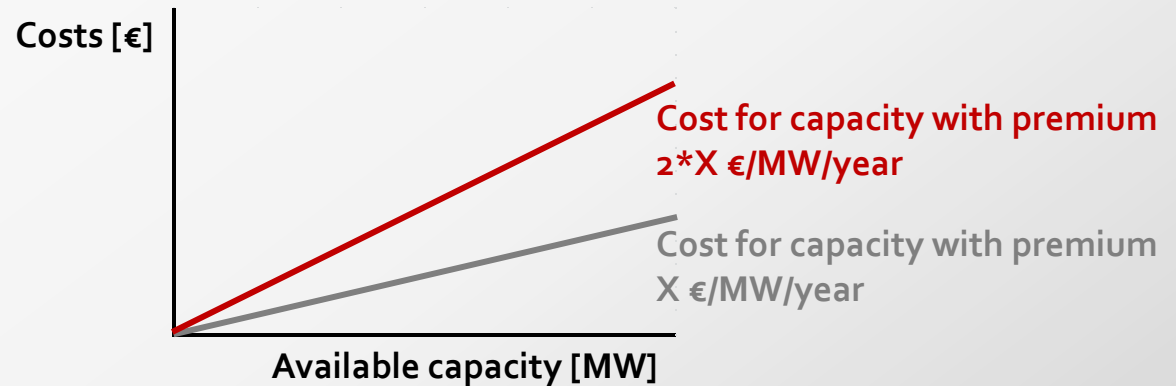
- Demand curve based on the estimation of the total system costs for different levels of available generation capacity
- Total costs for the system consist of:
 - ✓ costs on DAM and ASM (not dependent on the premium for capacity)
 - ✓ costs to remunerate capacity (function of the premium for capacity)



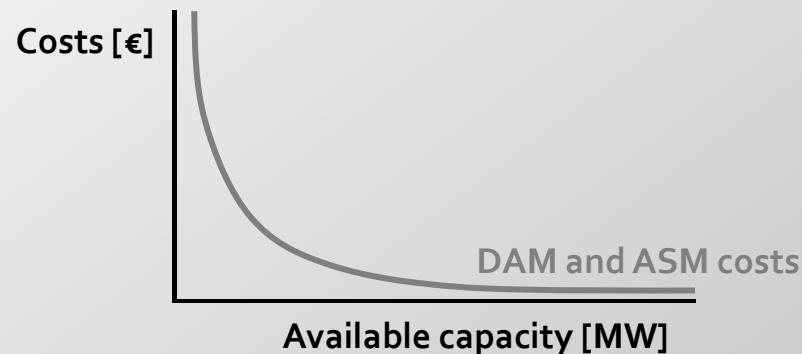
ESTIMATION OF THE DEMAND CURVE

Estimation of system costs as a function of available generation capacity (2)

- Costs to remunerate capacity will depend on levels of premium and contracted capacity



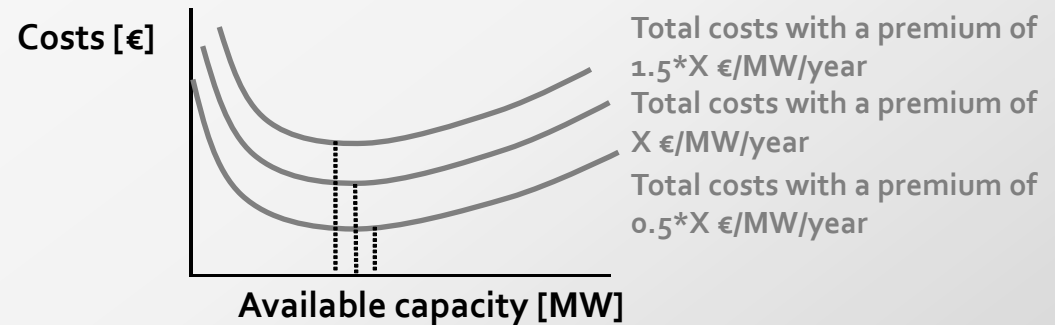
- DAM and ASM costs will depend from the level of available capacity because of:
 - ✓ paybacks to the TSO when the market prices are higher than the strike price
 - ✓ occurrence of Lost Load



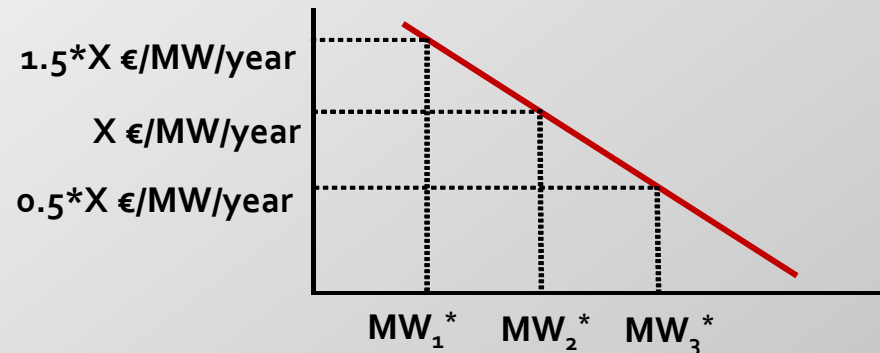
ESTIMATION OF THE DEMAND CURVE

Locus of minimum points of the family of curves

- Each cost curve has a minimum point which is the best level of capacity to be purchased corresponding to a certain premium for capacity



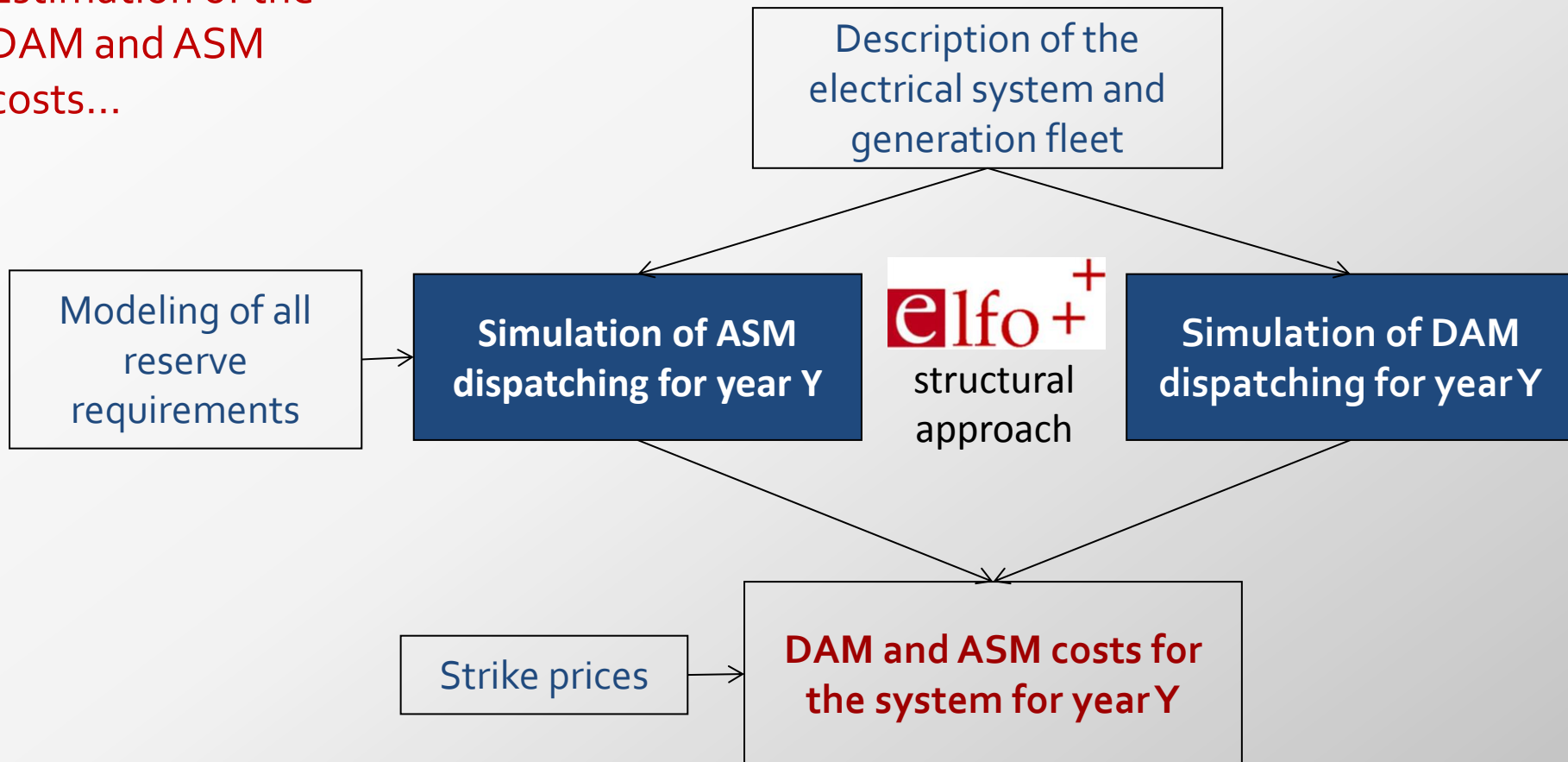
- The locus of the minimum points (couples «premium – best level of capacity») defines the demand curve for capacity



ESTIMATION OF THE DEMAND CURVE

Estimation of the DAM and ASM costs...

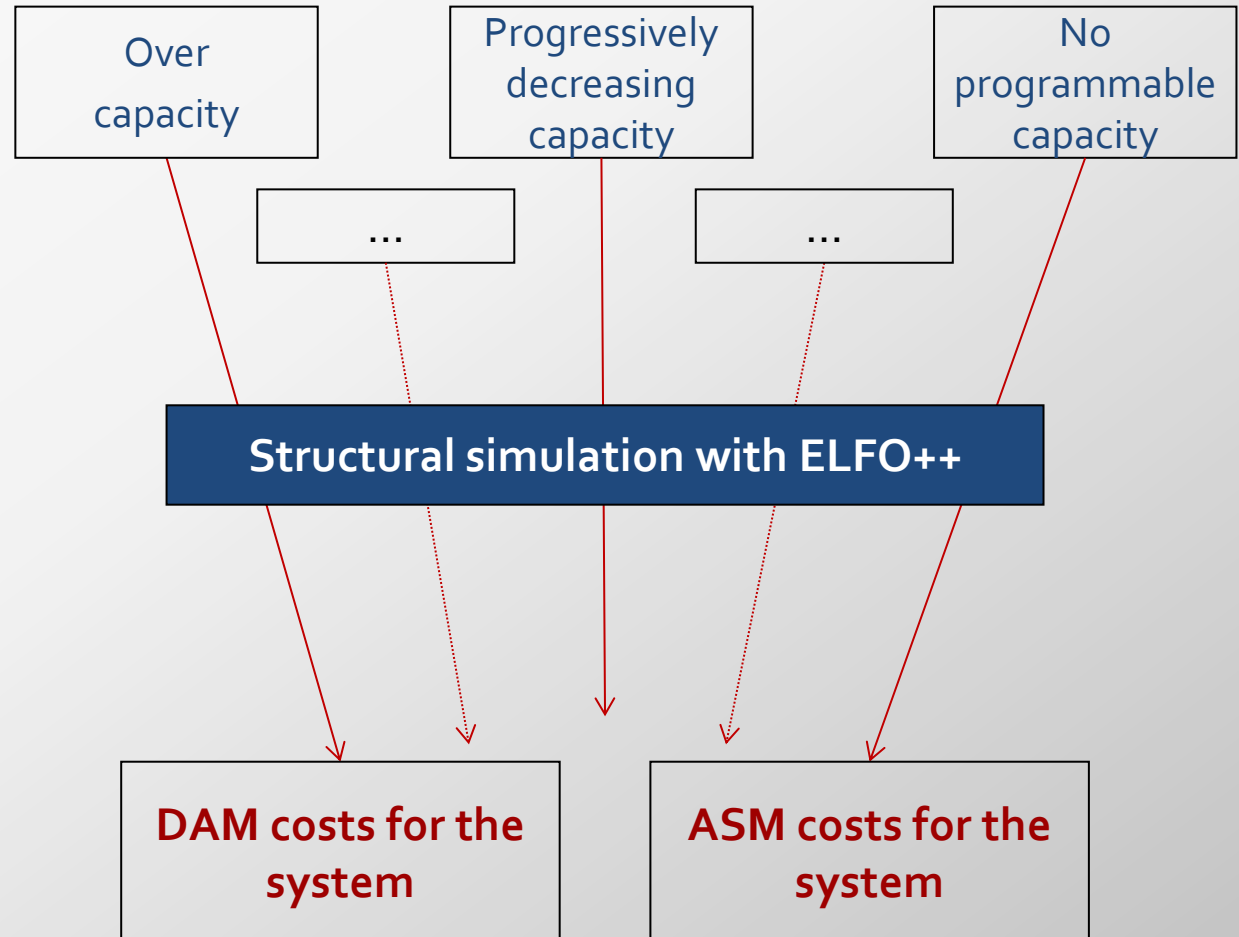
- The estimation of the DAM and ASM costs is performed through simulations of the system dispatching:



ESTIMATION OF THE DEMAND CURVE

...corresponding to different levels of available capacity

- The same approach is adopted to estimate DAM and ASM costs with different levels of available capacity

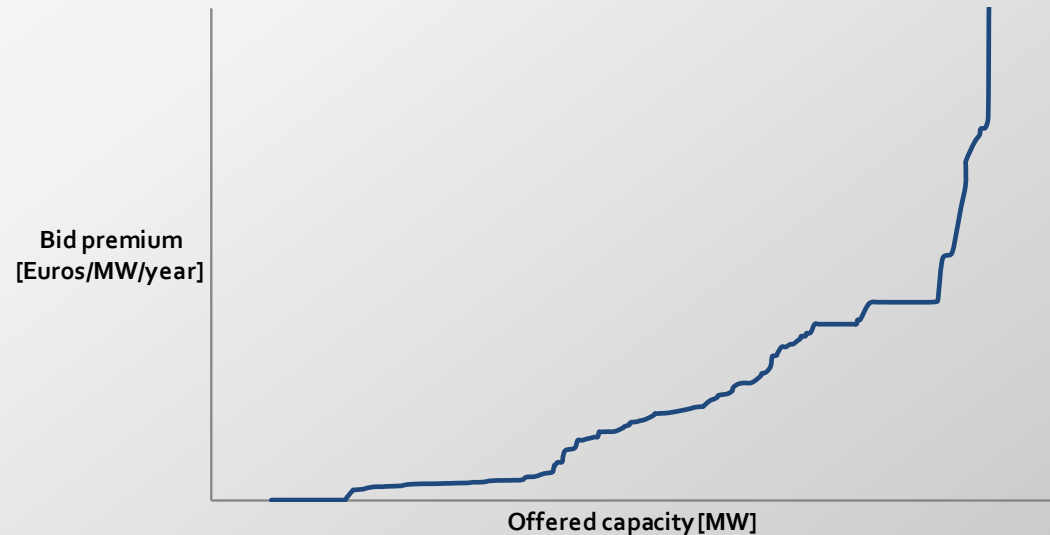


METHODOLOGY

ESTIMATION OF THE SUPPLY CURVE

First approach: full coverage of the fixed costs

- The bid premium is high enough to cover together with the spot markets' results the whole fixed and variable costs for power plants

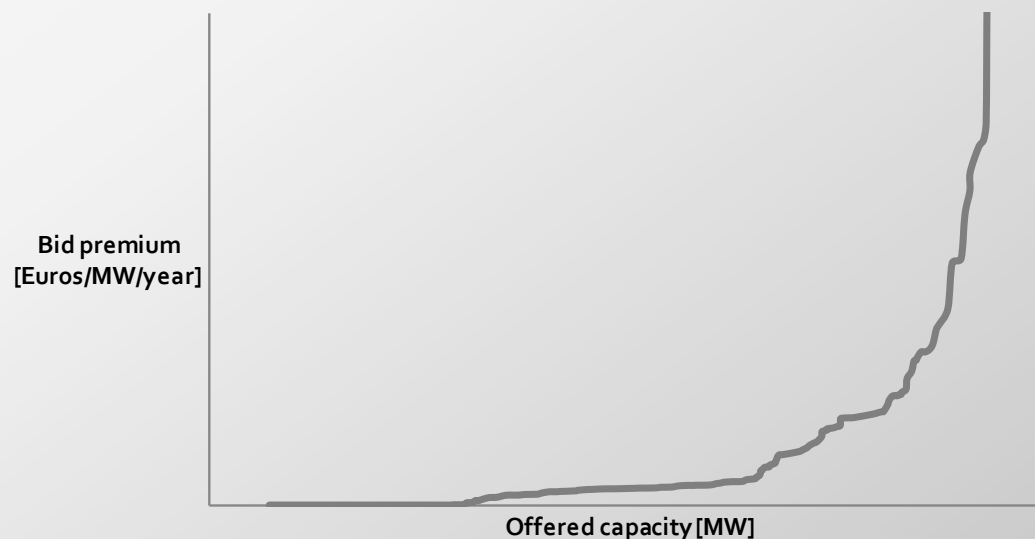


METHODOLOGY

ESTIMATION OF THE SUPPLY CURVE

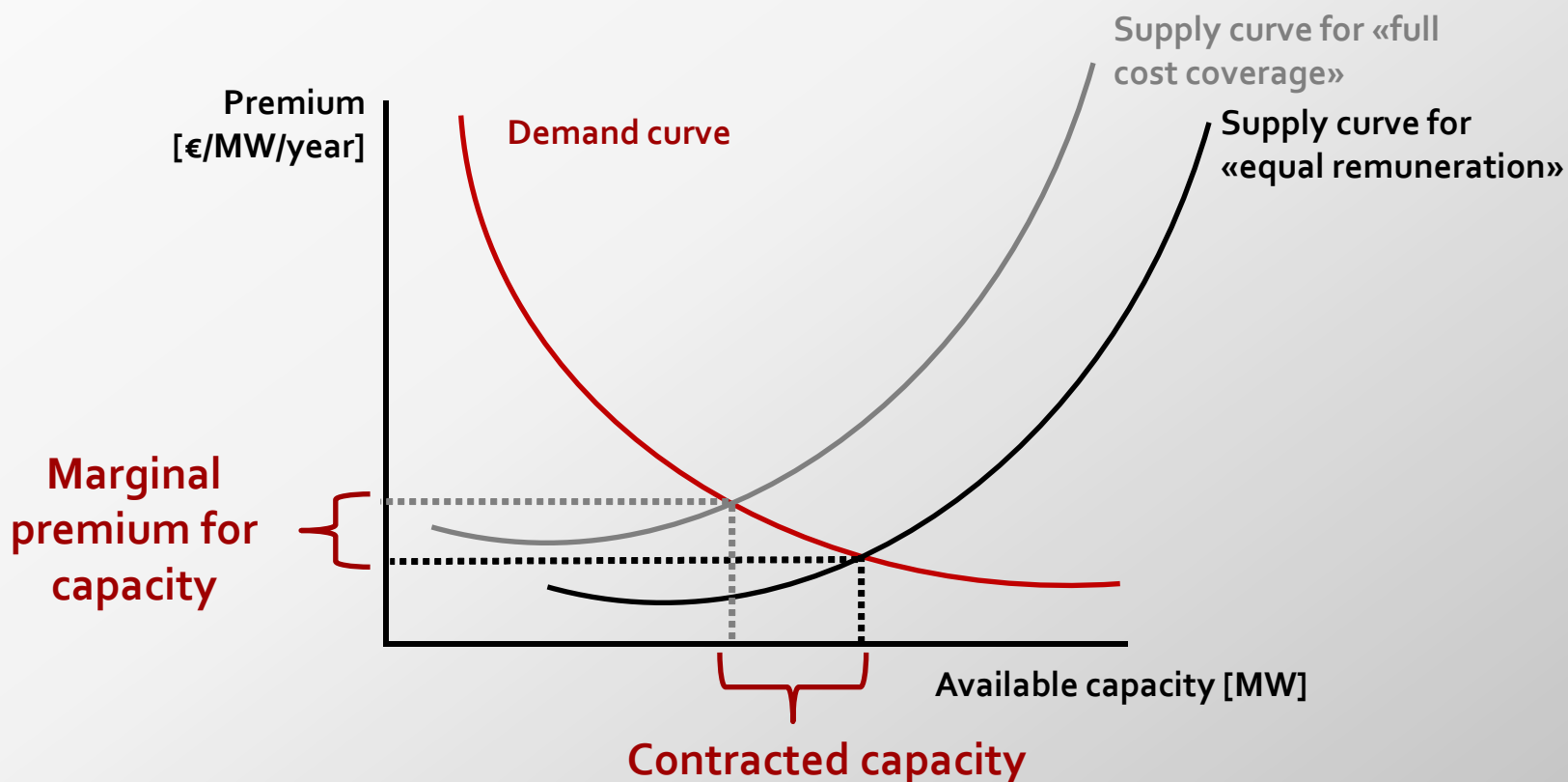
Second approach:
equal remuneration

- The supply curve «equal remuneration» allow market players to get at least the same results compared to an energy-only market



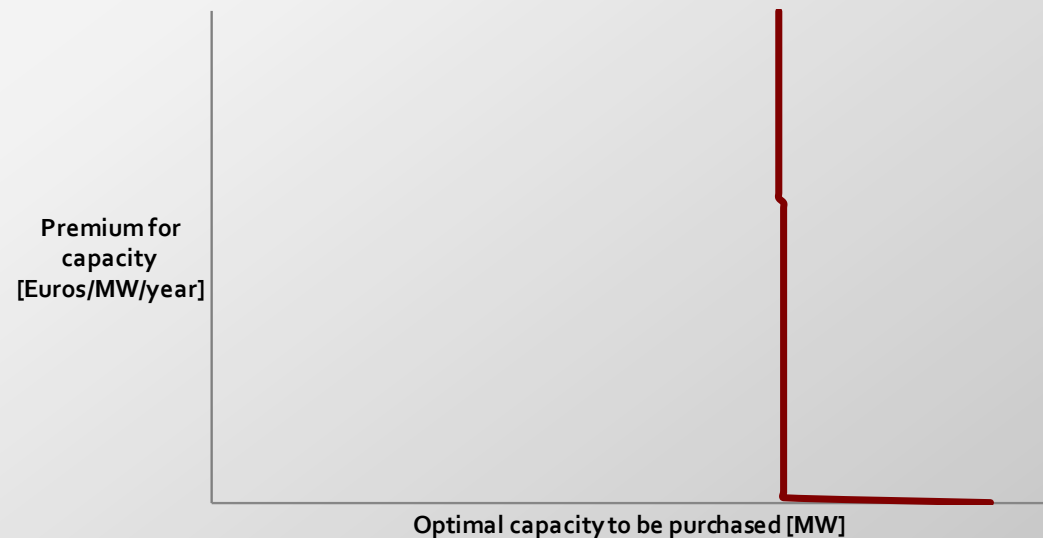
ESTIMATION OF THE EQUILIBRIUM

- The crossing between demand and supply curve defines a range of solutions for the Italian capacity market



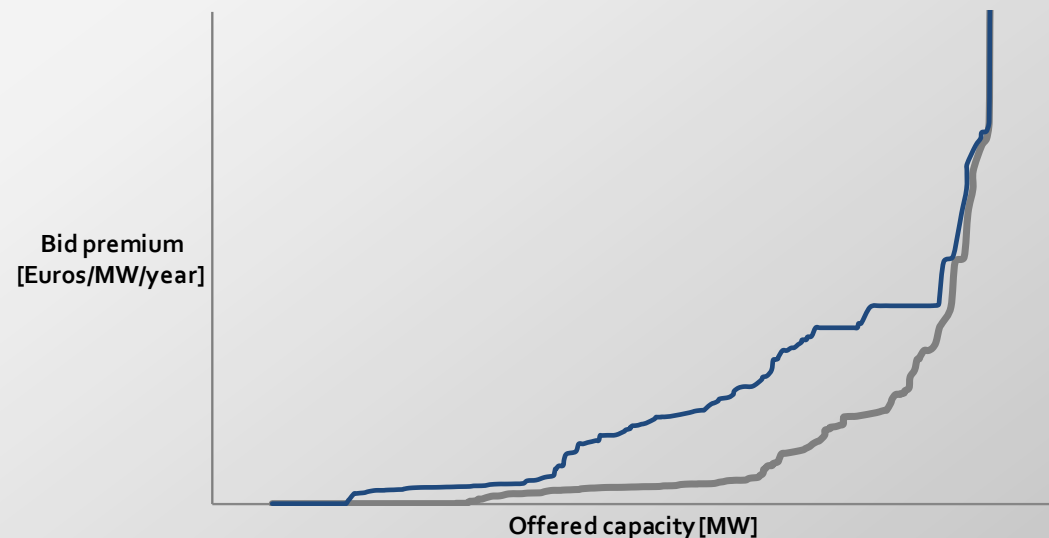
DEMAND CURVE

- Demand curve is very **inelastic**
 - ✓ Effect of VOLL
- It sets a optimal level of programmable capacity that is lower than the existing
 - ✓ It highlights the **overcapacity** of the Italian system



SUPPLY CURVE

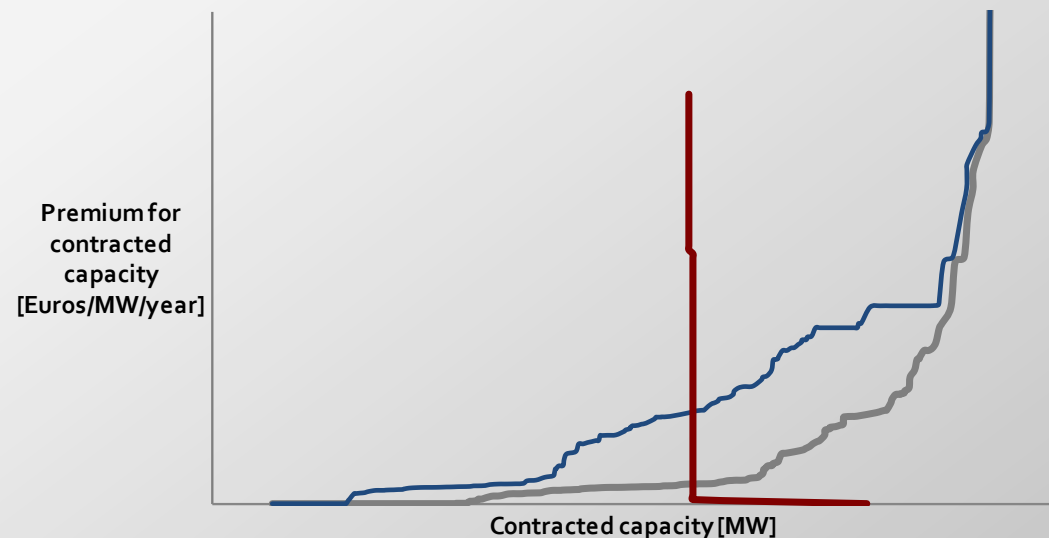
- Large portion of power plants bidding low premiums:
 - ✓ High competition on the auctions
- On the «full cost coverage» supply curve, the power plants with better position in the merit order have an advantage
- On the «equal remuneration» supply curve, the power plants with the worst position in the merit order have an advantage
- High elasticity to premium compared to the demand curve



MAIN RESULTS

EQUILIBRIUM

- The capacity level is set by demand curve, the premium level from the supply curve
- Low variability in the contracted capacity level, due to inelasticity in demand curve
- Strong variability in premium level due to high competition and overcapacity
 - ✓ The CCGT power plants can be the marginal ones in the auctions





Thank you for your attention!

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