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Self-Consumption and Net Balancing: Issues and solutions

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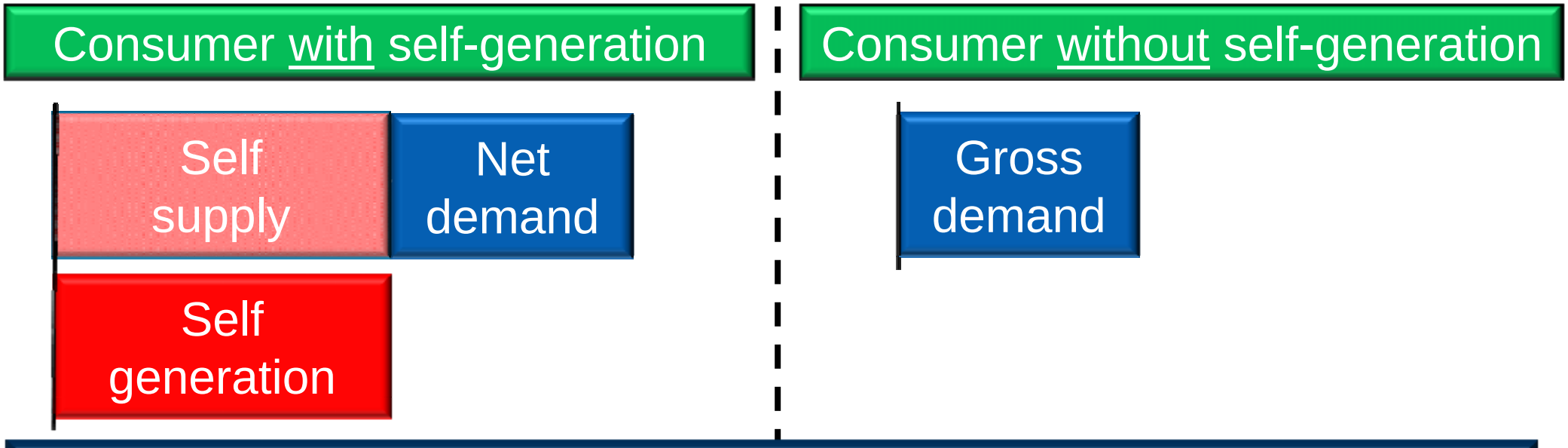
Insight in Economics™

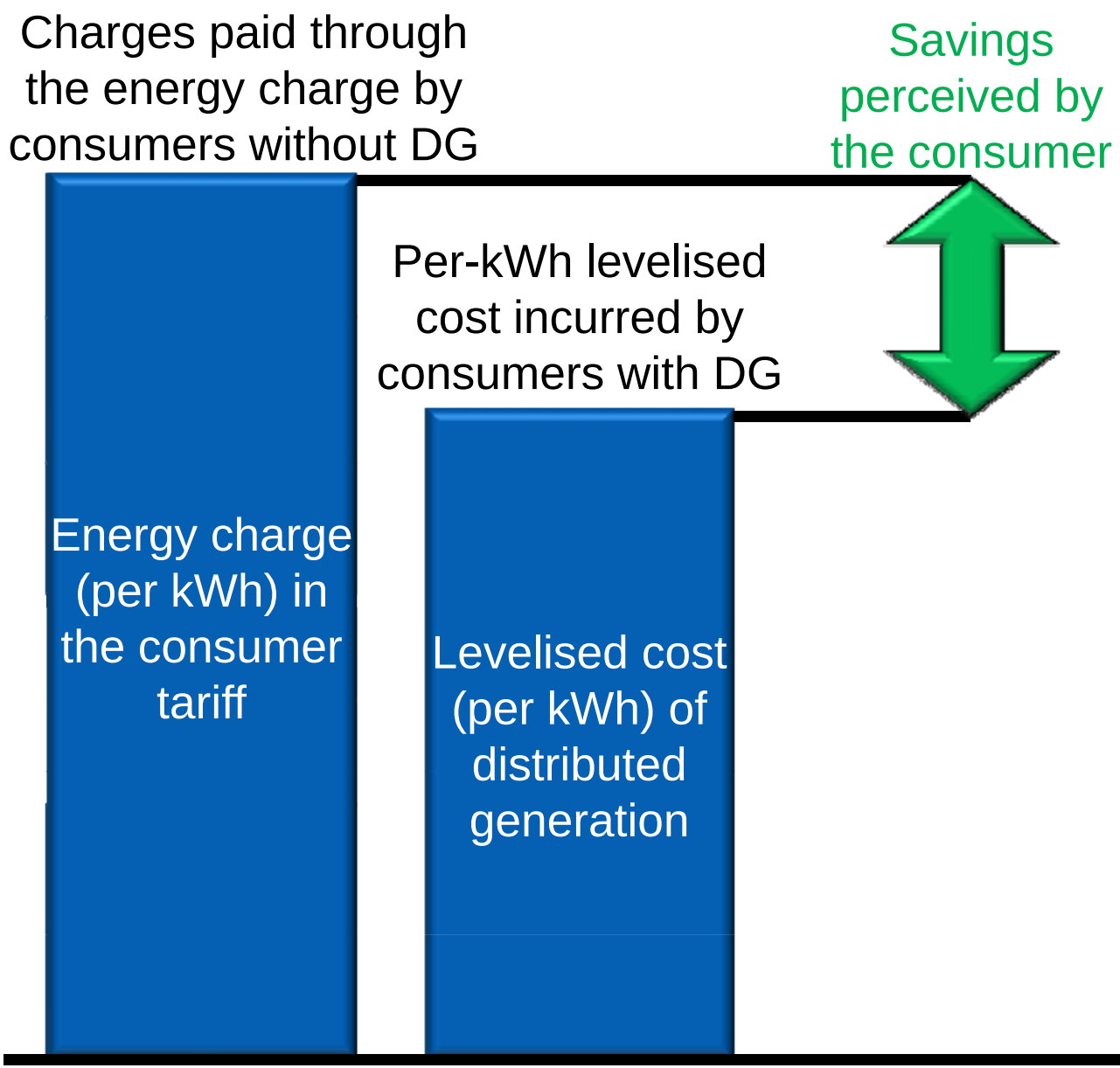
Why "net metering"?

- With "net metering", the electricity self-generated is subtracted from the consumer's gross demand, so that the consumer is only charged for the "net" demand he actually takes from the grid.

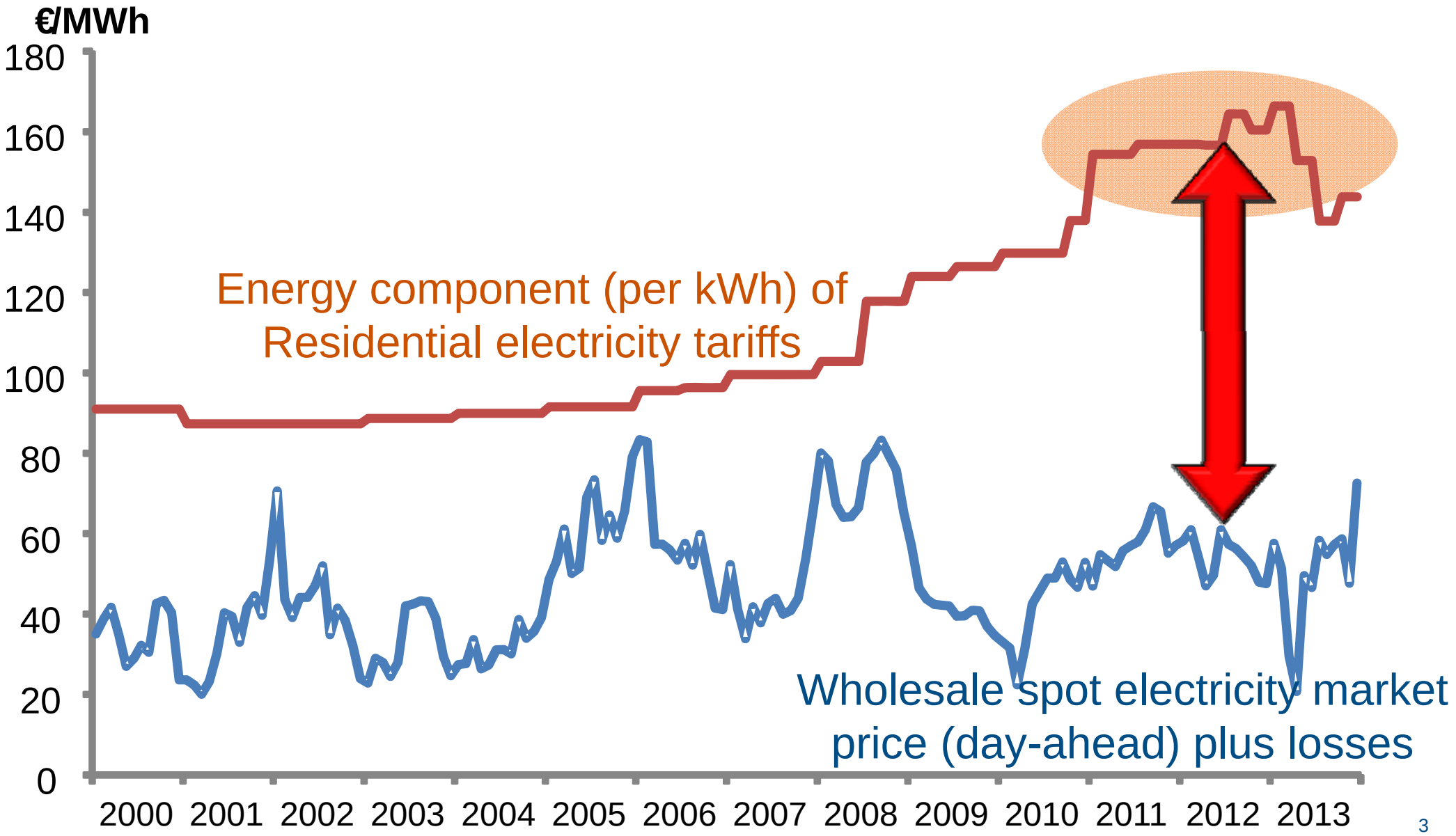


With "net metering", two consumers taking the same amount of electricity (kWh) from the grid pay the same for that electricity. (Whether they impose the same costs is a different question…)

"Net metering" savings for consumers are given by the per-kWh tariff charges



"Net metering" savings for consumers: The case of Spain



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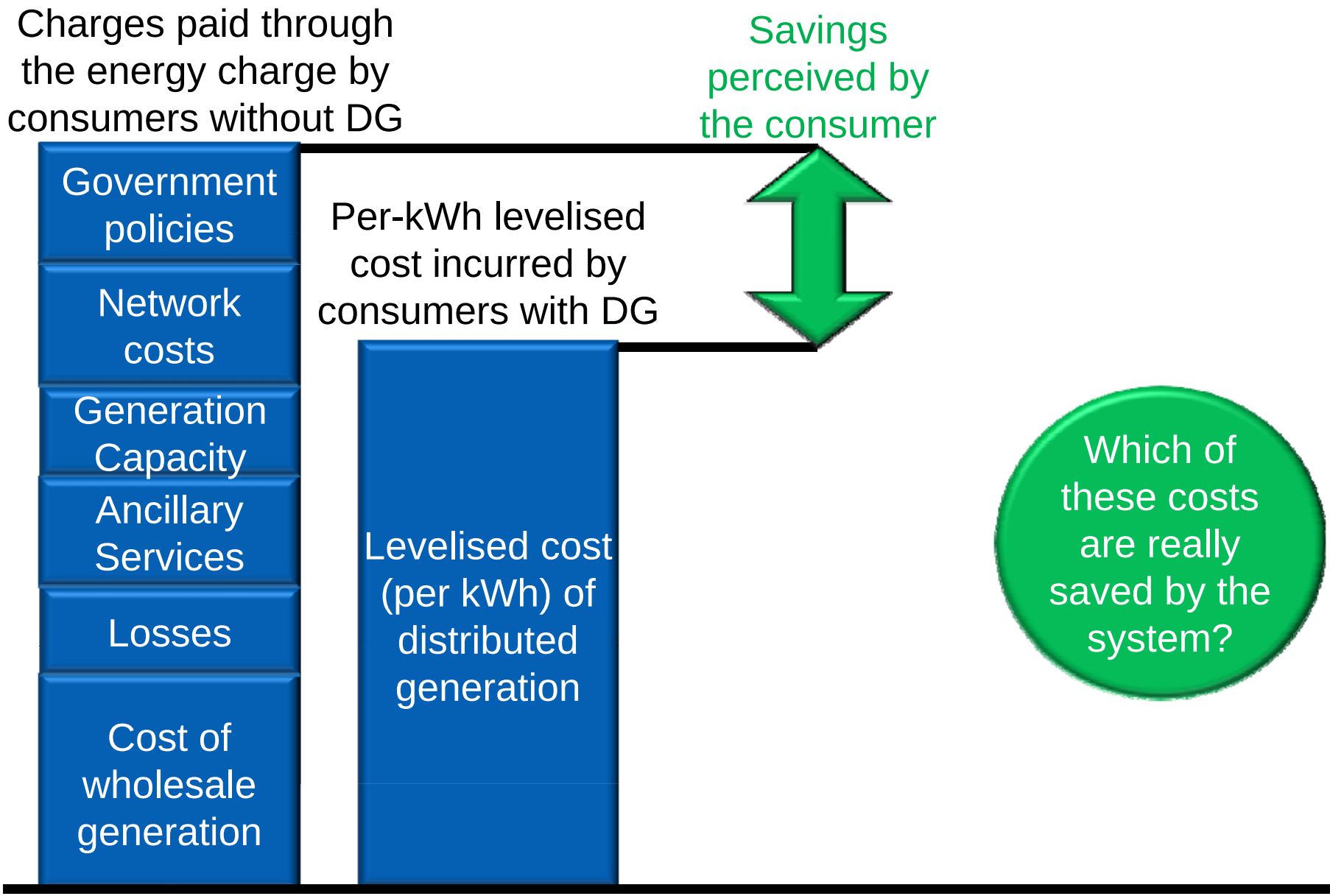
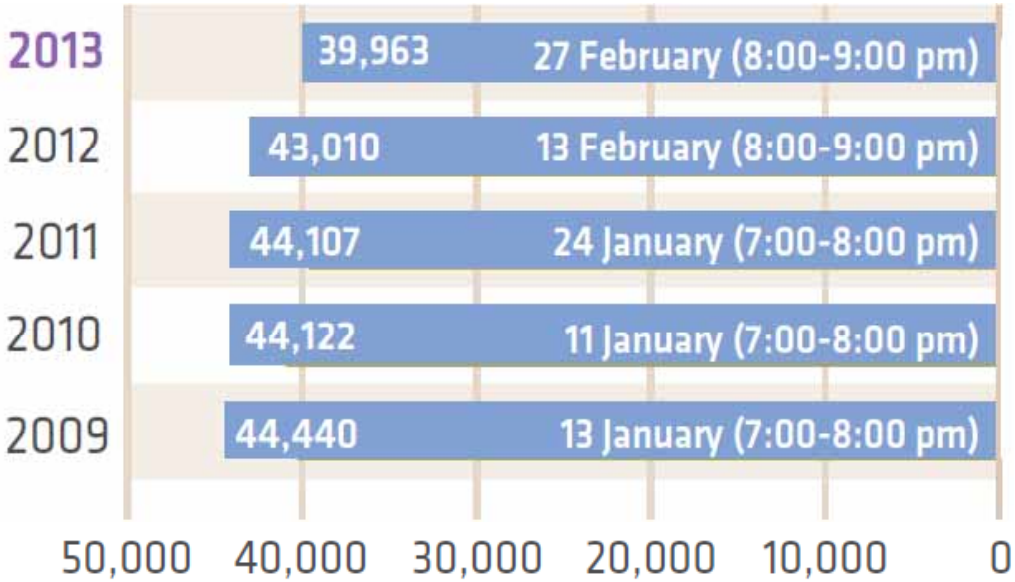
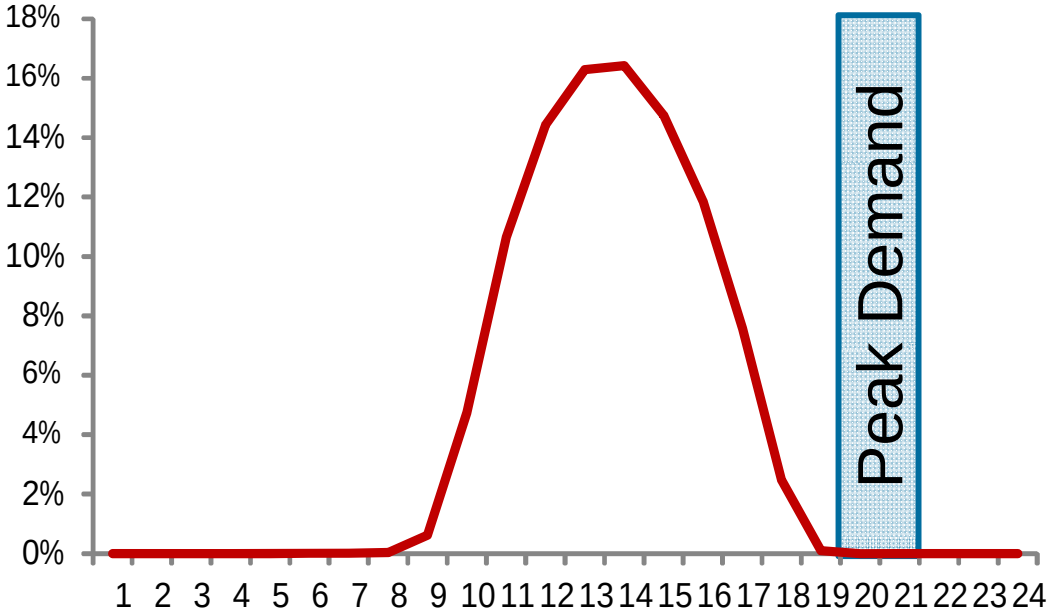


Does solar PV reduce the need for capacity in Spain?

Spain's Peak Demand



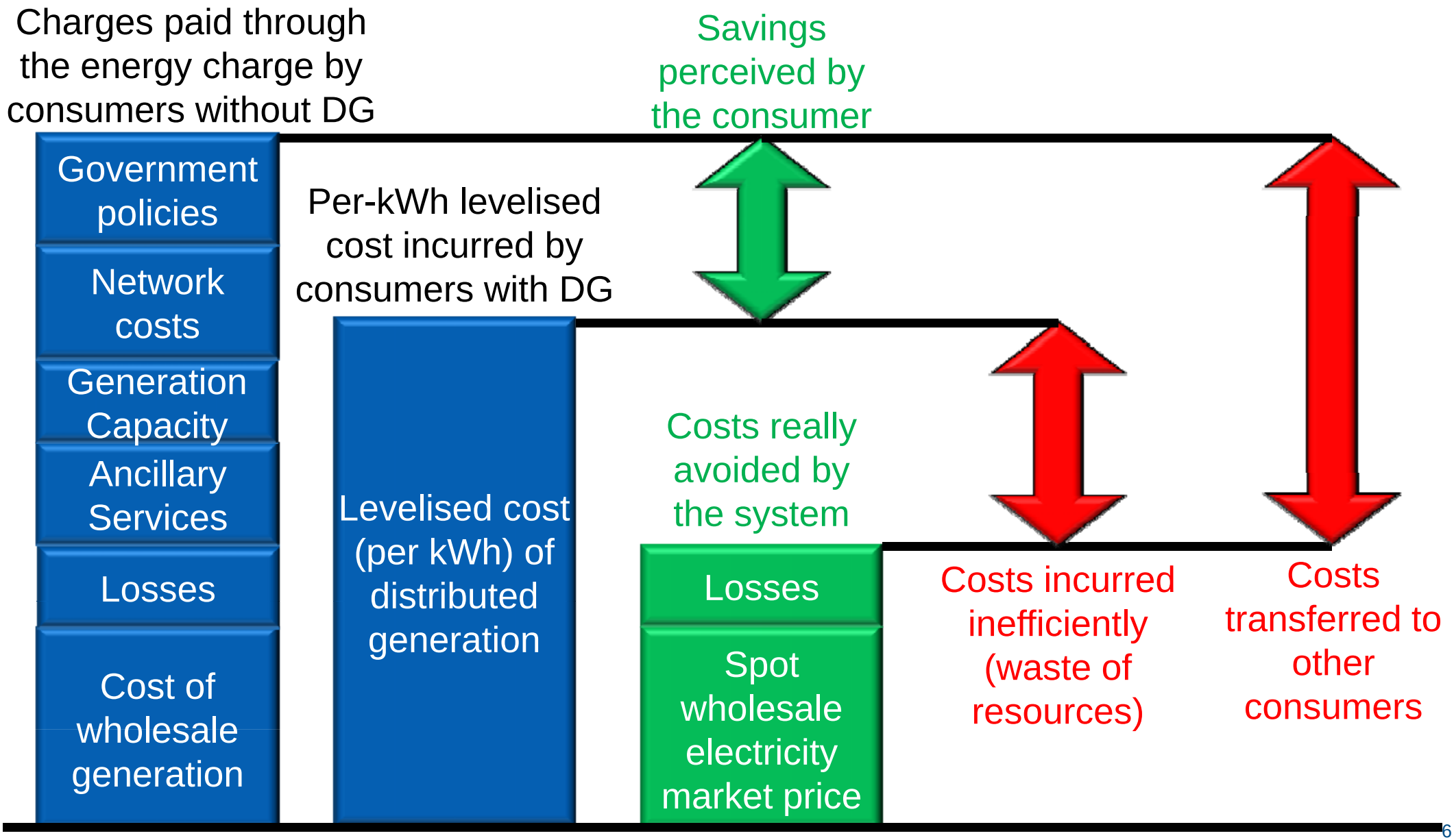
Spain's winter PV generation profile



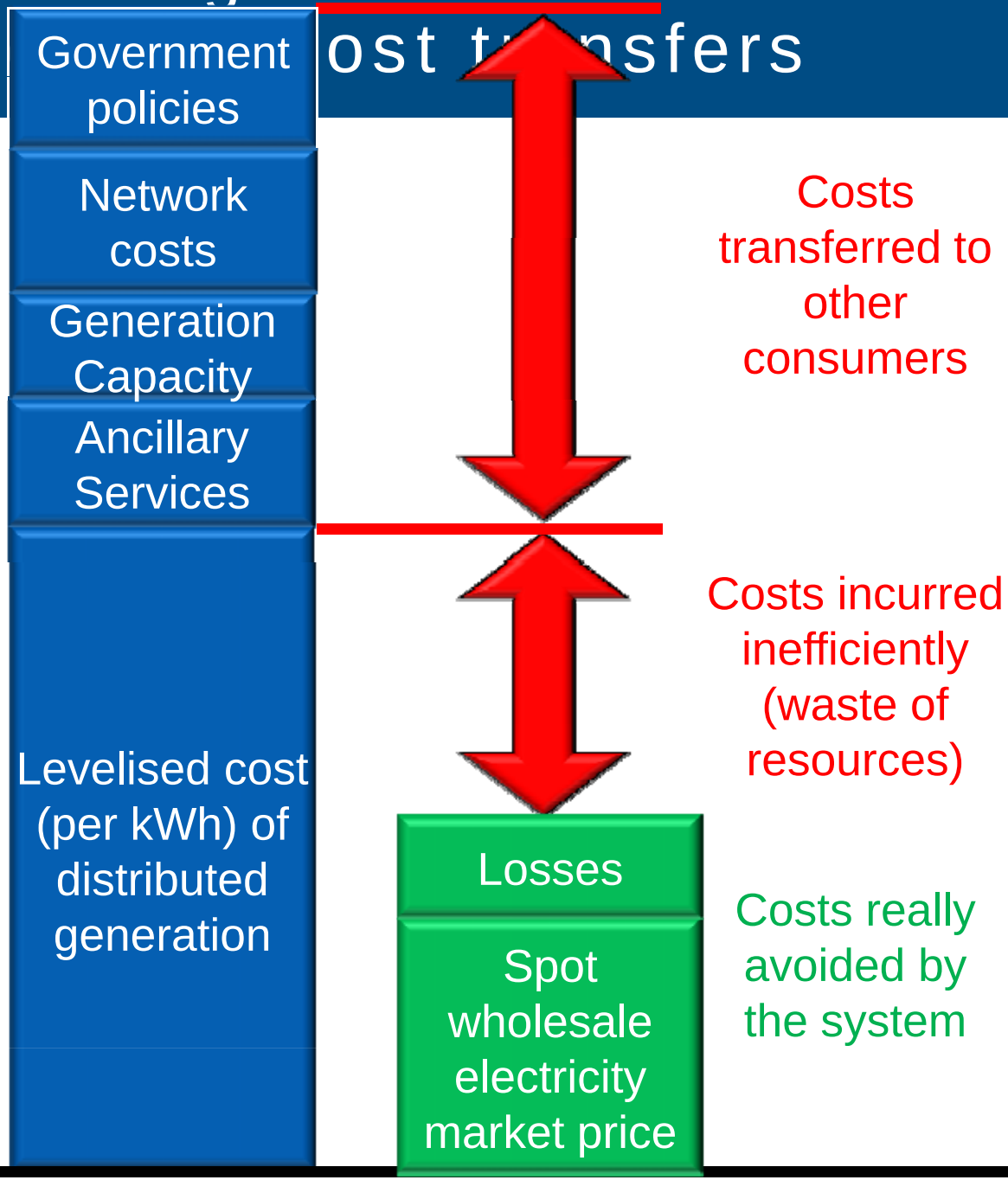
In Spain, solar PV generation does NOT reduce the need for distribution, transmission or generation capacity.

Source: REE

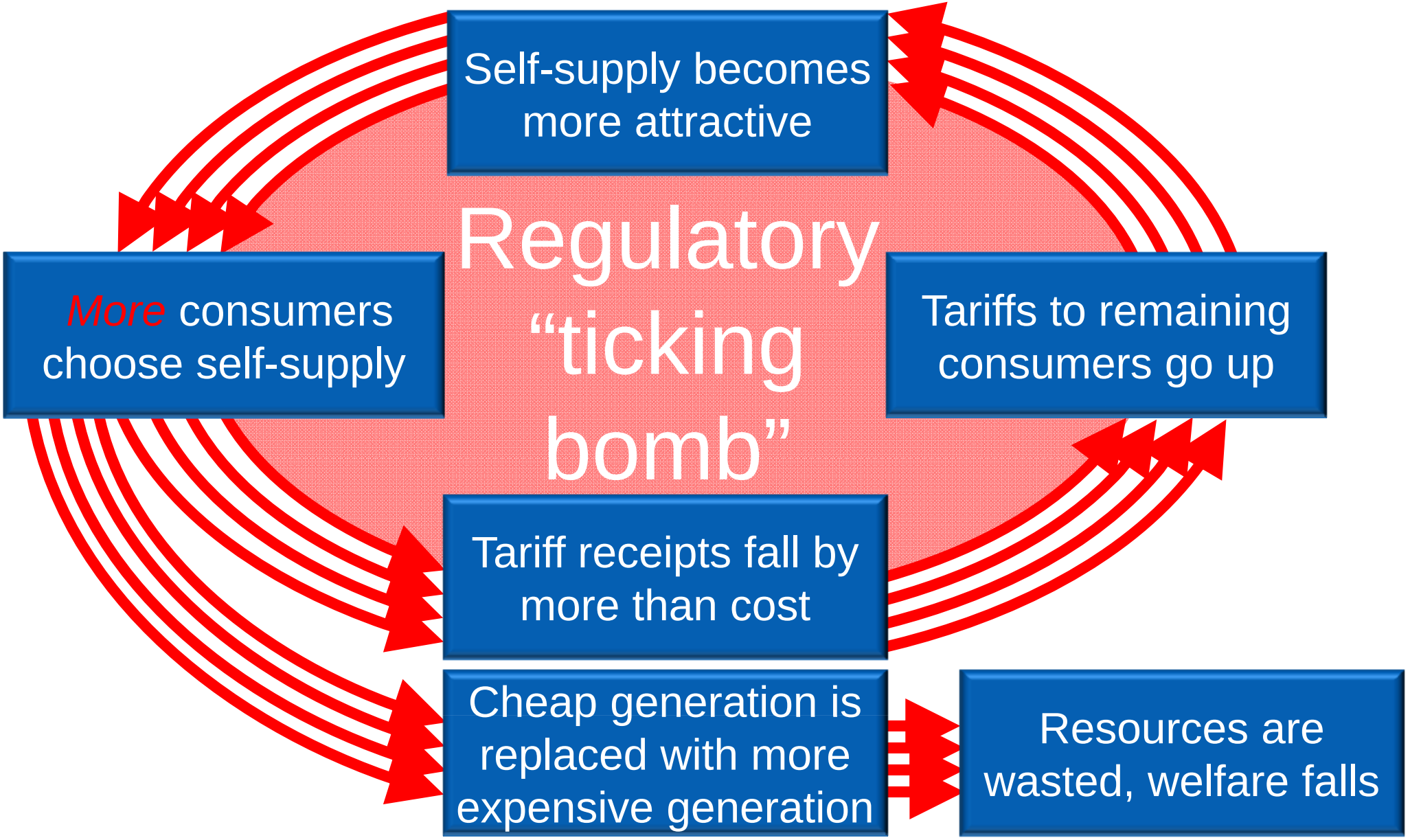
"Net metering" leads to waste of resources and cost transfers



"Net metering" leads to waste of resources and cost transfers



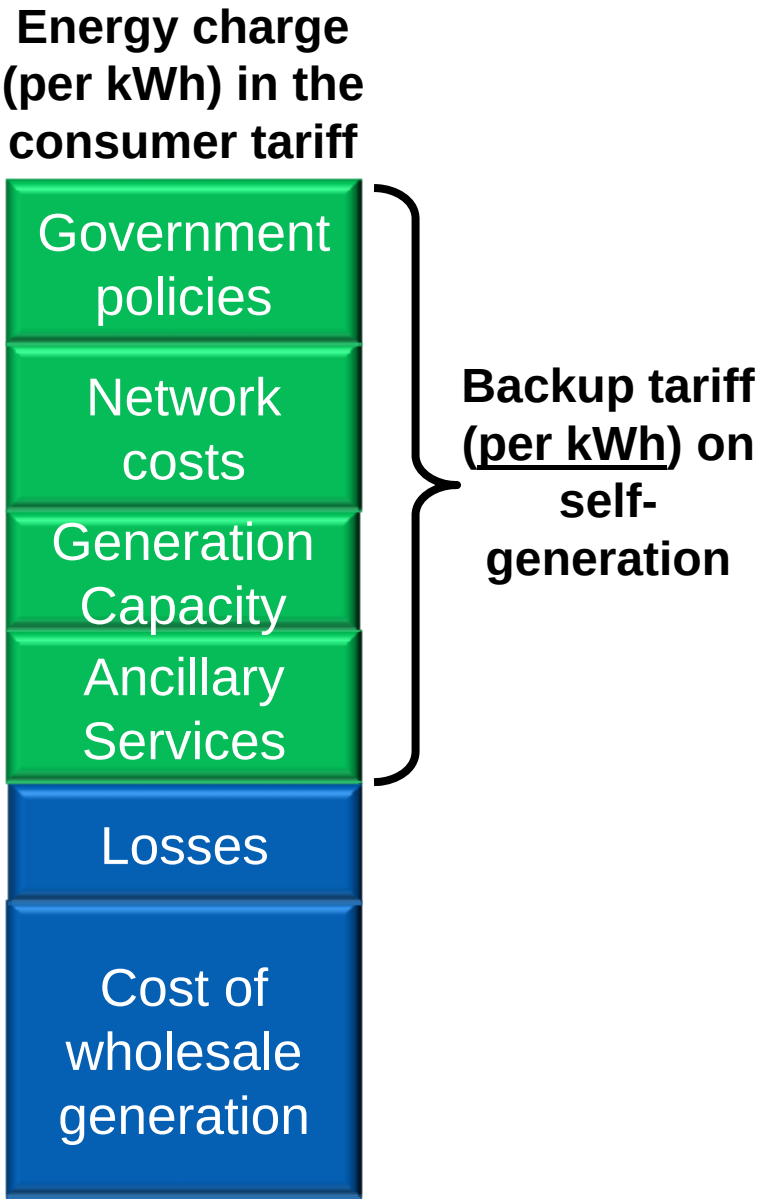
"Net metering" is not a sustainable policy



How can the regulator prevent this from blowing up in his hands?

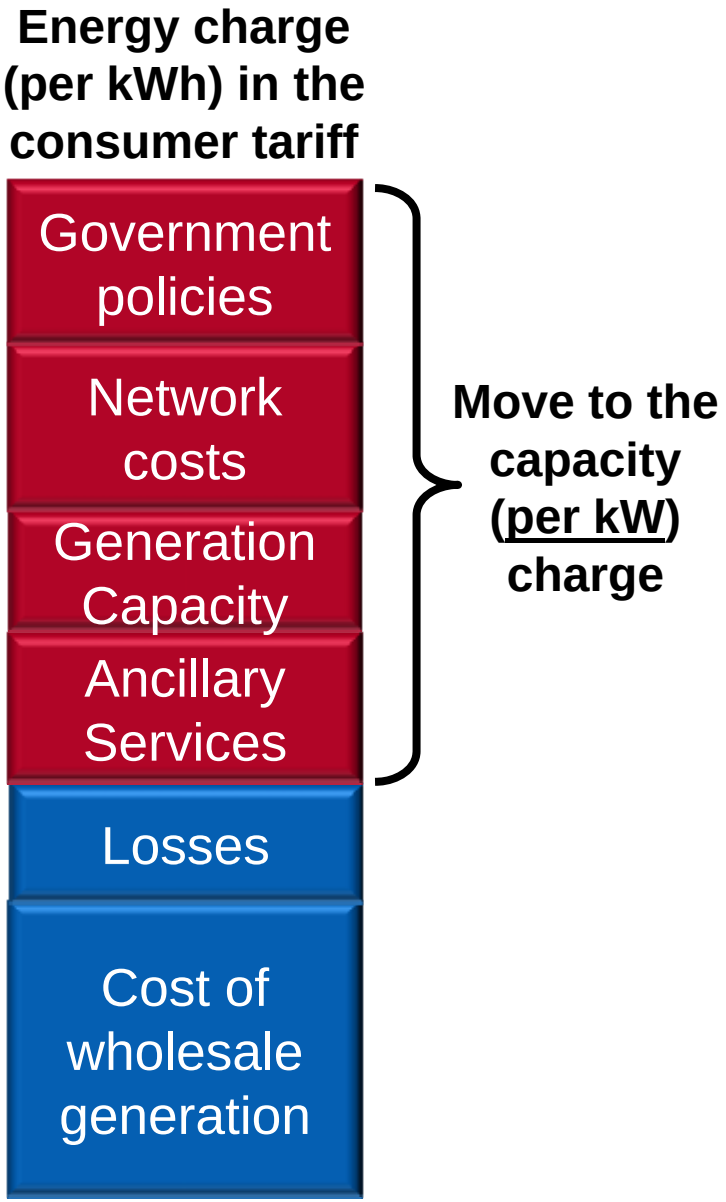
- One possibility is simply not to allow "net metering", so that:
  - consumers with DG continue to pay for their total electricity demand at the normal consumer tariff, but
  - they receive a payment for their total generation equal to the spot electricity market price plus losses
- However, if "net metering" is allowed:
  - the costs that the consumer avoids in his electricity supply invoice must be equal to
  - the costs that the system avoids when the consumer self-supplies.

1. Apply a "backup" tariff on self-generation



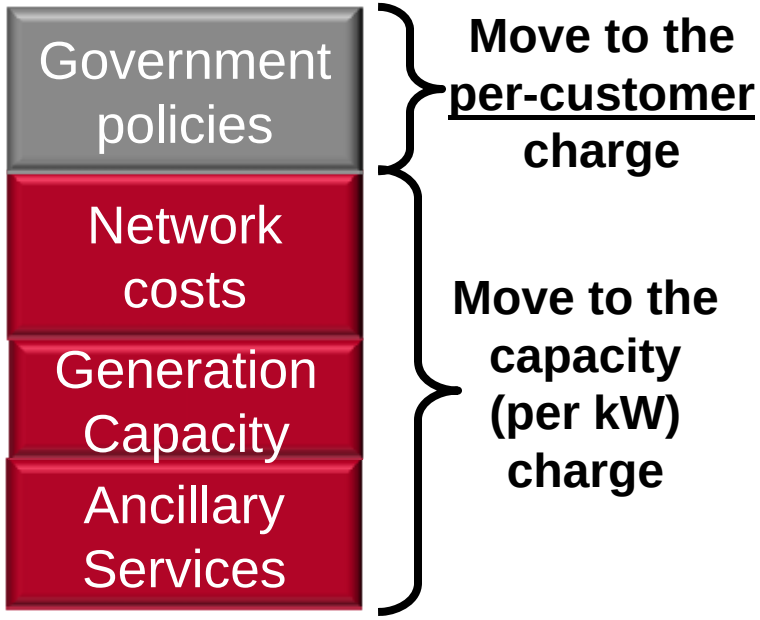
- Under this option, consumers pay a backup tariff on the energy they self-generate
  - The result is the same as with "no net metering"
  - Consumers who self-generate require distribution, transmission and generation capacity to continue to be available in case their equipment fails
- Decisions to self-generate will be efficient
  - BUT: risk of fraud (e.g. non-declaration of installations) creates need for policing and means that this solution is unlikely to be sustainable

2. Recover all the non-avoidable costs through the capacity (per kW) charge



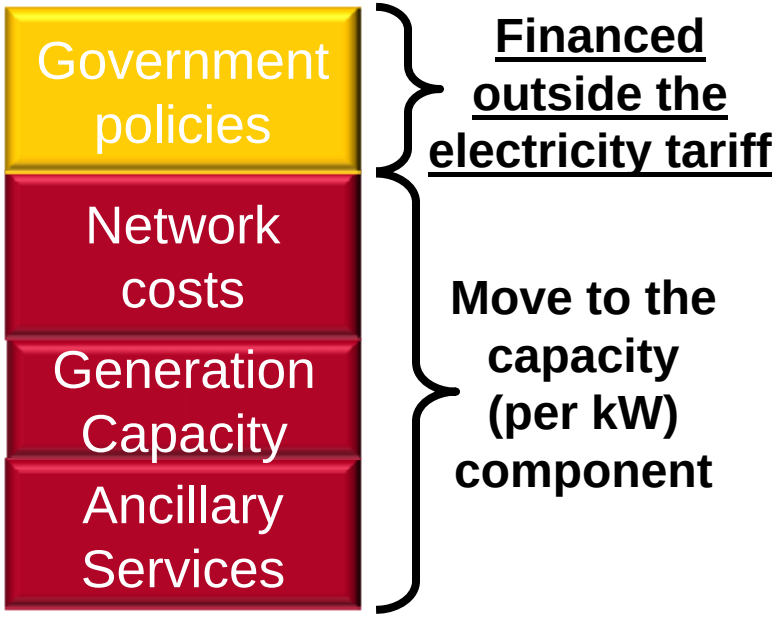
- Consumers who self-generate only cease to pay the costs that the system really avoids
- Consumers' decisions to self-generate will be efficient
  - BUT: allocating the costs of government policies to the capacity charge leads consumers to inefficiently reduce their capacity demand (e.g. installing batteries)

3. Move the costs of government policies to a per-customer charge



- Consumers' decisions to self-generate and their capacity demand will be efficient
  - BUT: if the per-customer charge is substantial, consumers would have incentives to:
    - aggregate loads (to pay the per-customer charge only once)
    - disconnect from the grid (e.g. using batteries, or micro CHP)

4. Take the costs of government policies out of the electricity tariff



- Consumers' decisions to self-generate, their capacity demand, and their decision as to whether to be connected to the system will all be efficient
- Cost recovery through the government budget (taxes on income, consumption, etc.) is the least distortionary

Summary of options

Option		Advantages	Disadvantages
No net metering		• Efficient installation of DG	• Risk of fraud, need for policing
If there is net metering	**Backup tariff on self-generation**	• Efficient installation of DG	• Risk of fraud, need for policing
	Non-avoidable costs in capacity charge	• Efficient installation of DG	• Inefficient capacity decisions and battery installation
	Extracosts in customer charge	• Efficient installation of DG • Efficient capacity decisions	• Aggregation of consumers • Consumers connect to "wrong" voltage level
	Extracosts recovered out of tariff	• Efficient installation of DG • Efficient capacity decisions • Efficient extracosts funding	

Is distributed generation efficient? Should it be subsidised?

- The cost of distributed generation is expected to fall, while wholesale electricity prices are expected to increase.
  - However, this does not mean that distributed generation will be efficient.

Technology	Advantages	Disadvantages
Distributed generation	• Reduction in energy losses	• Loss of economies of scale • Need to adapt distribution grid
Distributed solar PV	• Use of costless space (roof tops)	• Installation cost, lower efficiency • Distribution grid investments
Distributed micro CHP	• Higher efficiency (sometimes)	• Gas network investments • GHG emissions concerns
Isolated DG system	• Grid costs are avoided	• Suboptimal despatch/load factor • Batteries and limited supply (if PV)

Summary and conclusions

- On the surface, “net metering” seems to be “fair”. While DG was expensive and rarely adopted, this misperception was not a problem.
  - However, the fact that non-avoidable costs are recovered though the energy (per kWh) charge makes DG appear to efficient, even when it is not.
  - Electricity tariffs are often used to finance government policies, because electricity demand was “price inelastic” and the costs could be “hidden”.
- In reality, “net metering” is a “ticking bomb” leading to resources being wasted, lower social welfare, and cost transfers across consumers.
- Spain has moved in the right direction, by (a) shifting some costs from the energy (per kWh) to the capacity (per kW) charge, and (b) adopting a backup tariff. However, this solution is unlikely to be sustainable.
- The only efficient and sustainable option is:
  - to put all capacity costs in the capacity (per kW) charge and
  - to take any significant “political costs” out of the electricity tariff.

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