

# Better Markets: Exposing Variable Generation to Markets and Internalizing Their System Costs



Julián Barquín



# Integrating RES

➤ Neither living in a ghetto ....



# Integrating RES

➤ ... nor in a haven ....



# Integrating RES

➤ ... but with everybody else.





# How “normal” agents make a living

“Bulk”  
energy

- Two-sides markets
- Day-ahead, intraday, forward, ...

Flexibility

- One-side markets/mechanisms
- Reserve, balancing, ...

Adequacy

- One-side markets/mechanisms
- CRMs (including “energy-only” mkts.)



**Coherent design:**  
All price signals have to  
be coherent

# Efficiency is balance



# Efficiency is balance

E.g. low energy prices and high reserve prices signal that energy generation must be reduced in order to provide reserves.



# Efficiency is balance

E.g. balancing costs  
incentivize real-time  
forecasting and control.





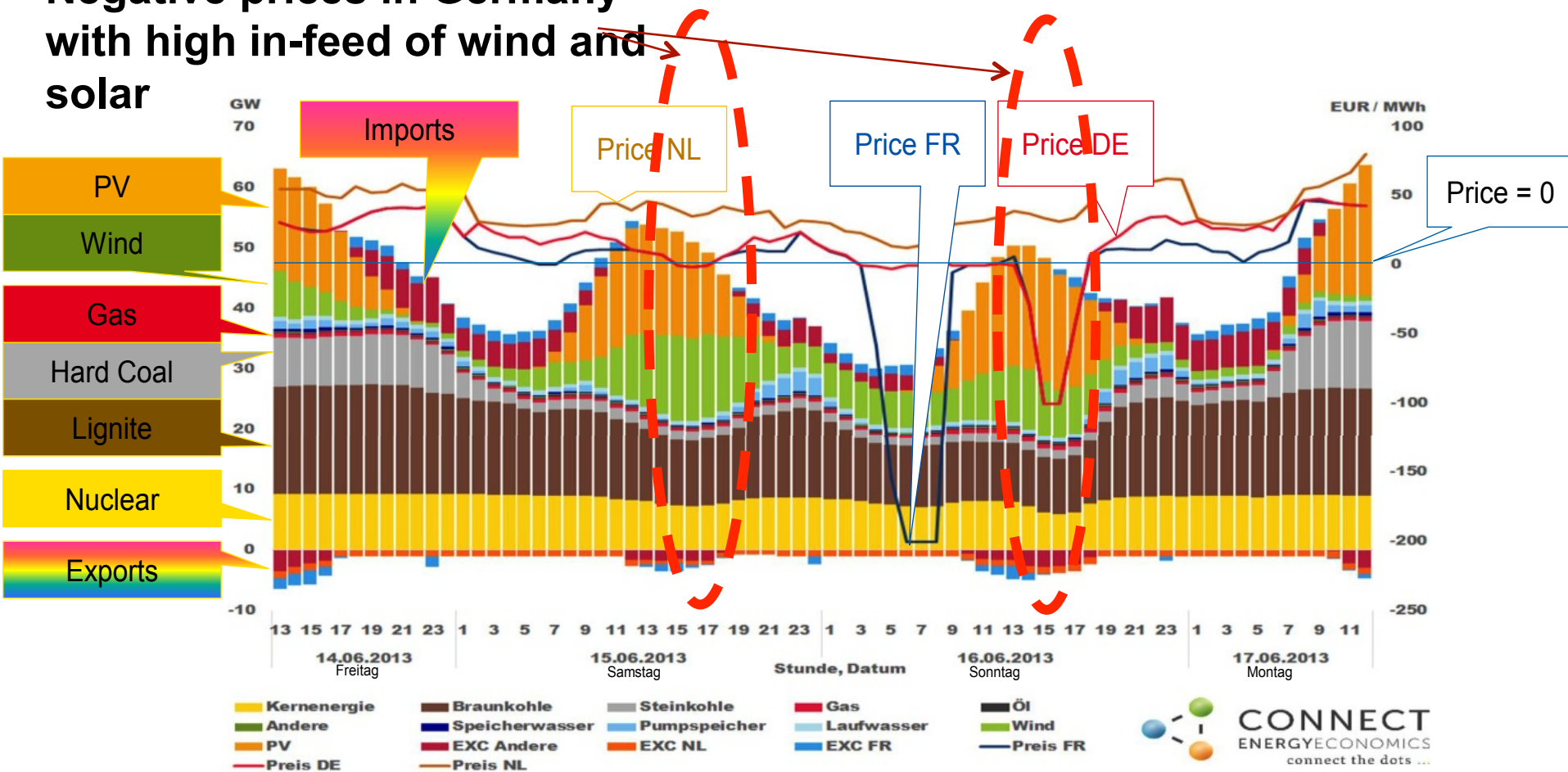
# Distorting prices is inefficiency

- **E.g. heavily subsidizing day-ahead energy as exempting from balancing costs.**



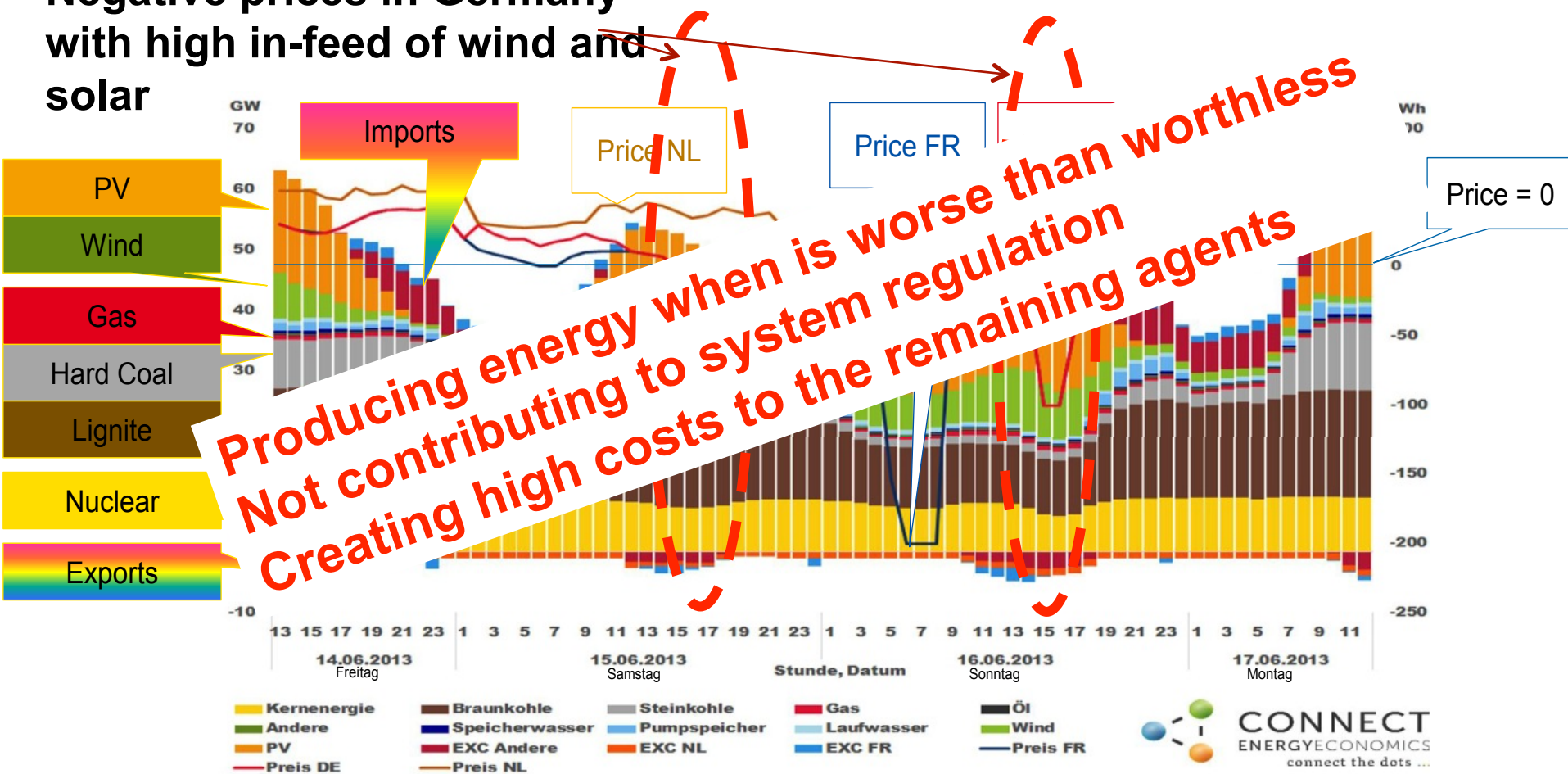
# Distorting prices is inefficiency

**Negative prices in Germany  
with high in-feed of wind and  
solar**



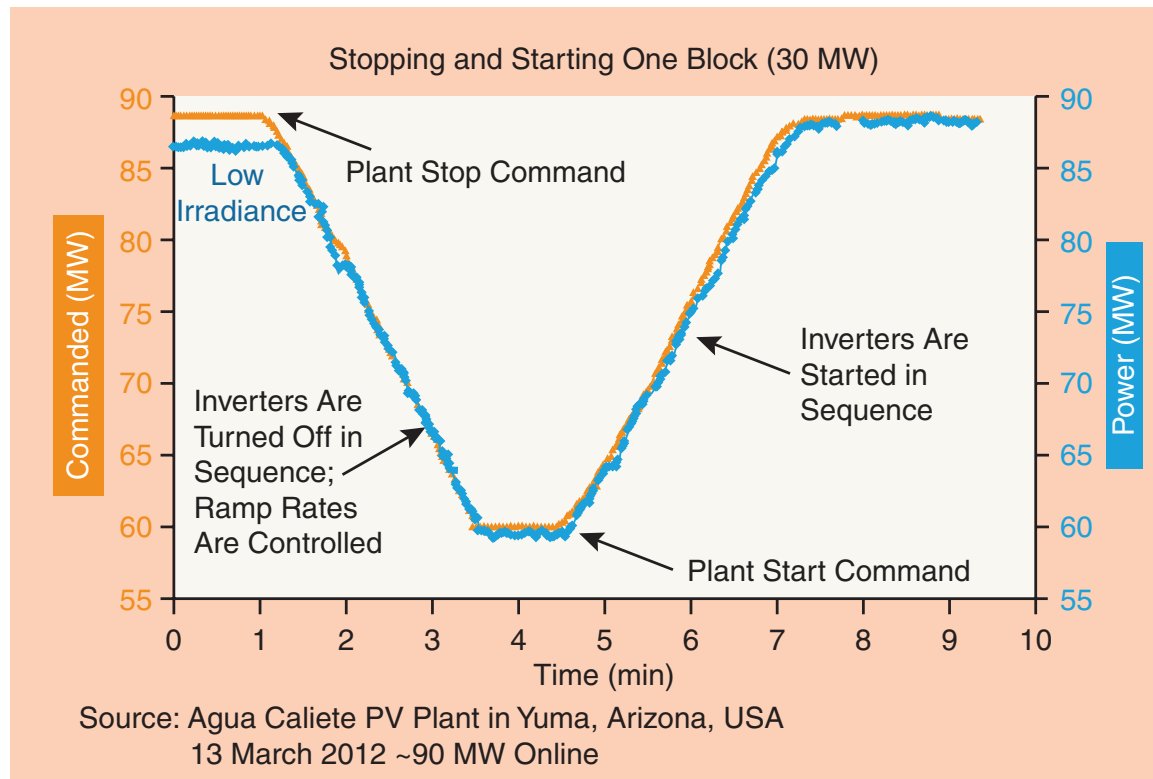
# Distorting prices is inefficiency

**Negative prices in Germany  
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# RES can do better than just making energy

- It is easy to control reserves, ramps, et caetera.
- But it requires energy spillage.
- It is efficient when energy price is low.

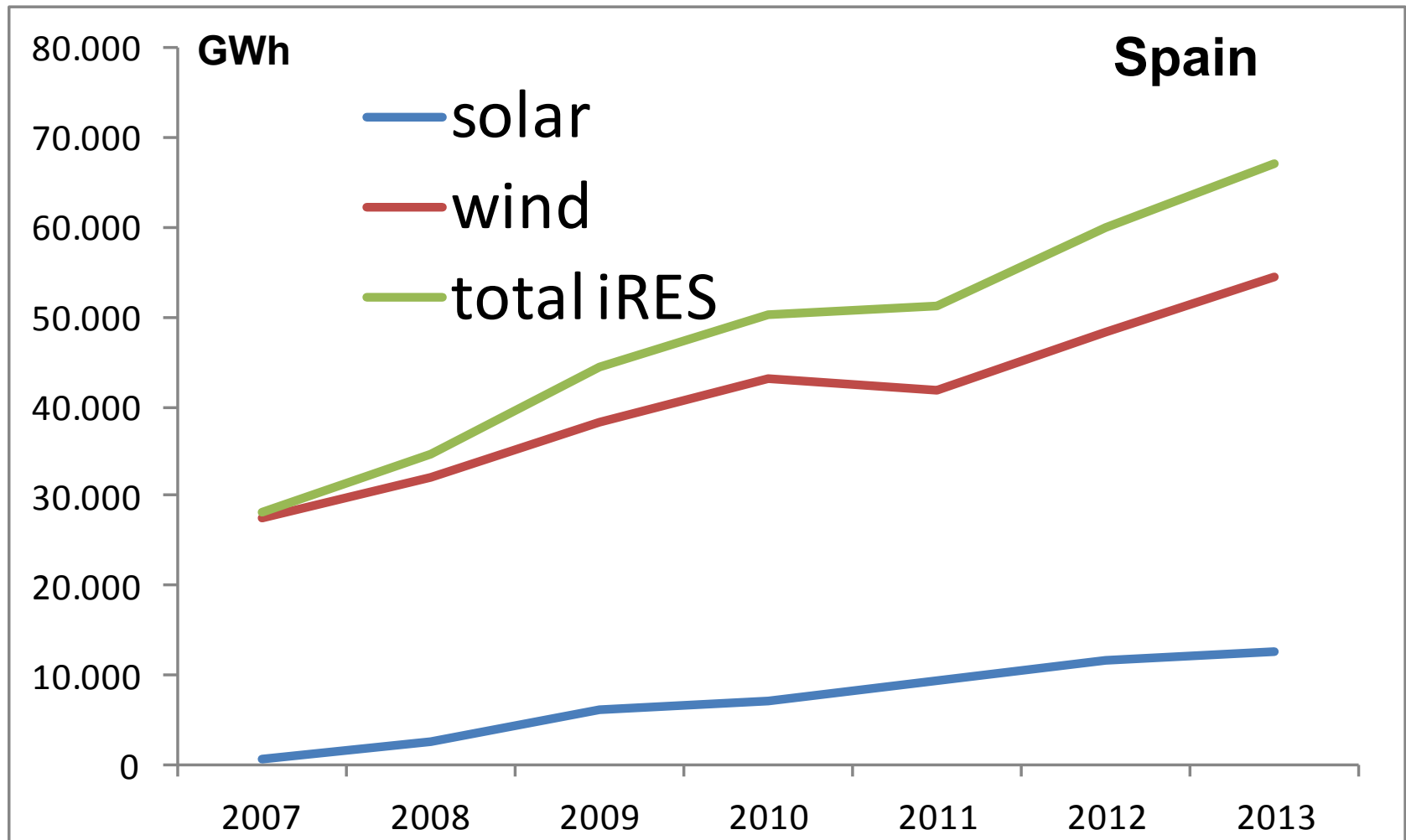


# RES can do better than just making energy

- **Even moderate obligations significantly enhance welfare.**
- **Example: Spain's wind generators under FiT or FiP schemes have been for years subject to balancing obligations.**

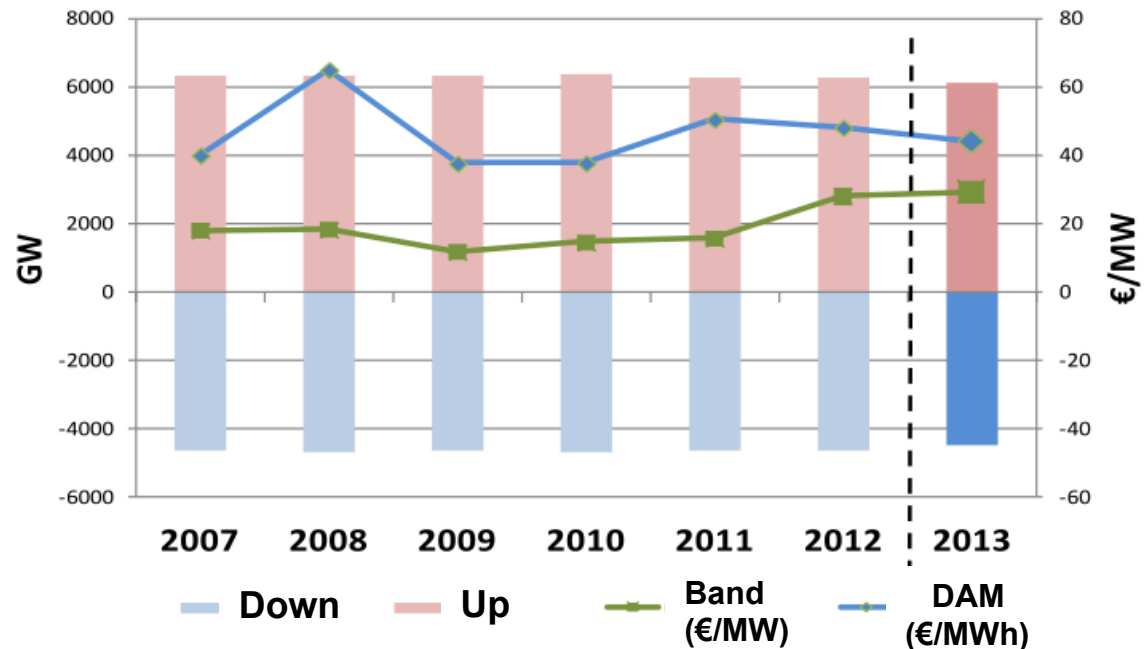


# RES can do better than just making energy



# RES can do better than just making energy

Upwards and  
downwards  
band needs  
and prices



➤ **No increase** in band prices and quantities.

➤ Increasing forecasting accuracy.

➤ Possibility of TSO curtailments of iRES.

# RES can do better than just making energy

➤ Engaging iRES can  
make flexibility  
costs low.



# Integrating RES-E

- **No more subsidies for mature RES after 2020.**
- **Move to more efficient RES support.**
  - **No-volumetric support**

# Efficient iRES support

“Bulk” energy

Flexibility

Adequacy



**RES support**  
**€/MW**



# Efficient iRES support

- E.g. 1,000 €/kW  
investment support can be  
paid as 80 = 20 times 4  
“Pull” energy  
quarterly instalments of 20  
€/kW (discounting @ 5%/yr) during 20 years
- reminiscent of T&D assets remuneration



**RES support**  
**€/MW**

Adequacy

# Efficient iRES support

➤ No operational distortions.

➤ Possible investment distortions can be controlled by smart adequacy

(CRM) mechanism.

➤ RES support to be granted by periodic auctions.

➤ Volume and budget control.



**RES support**  
**€/MW**

# Efficient iRES support

“Bulk” energy

Flexibility

Adequacy

➤ No trash investments  
because of **market**  
**revenues.**



# Efficient iRES support

- No trash investments  
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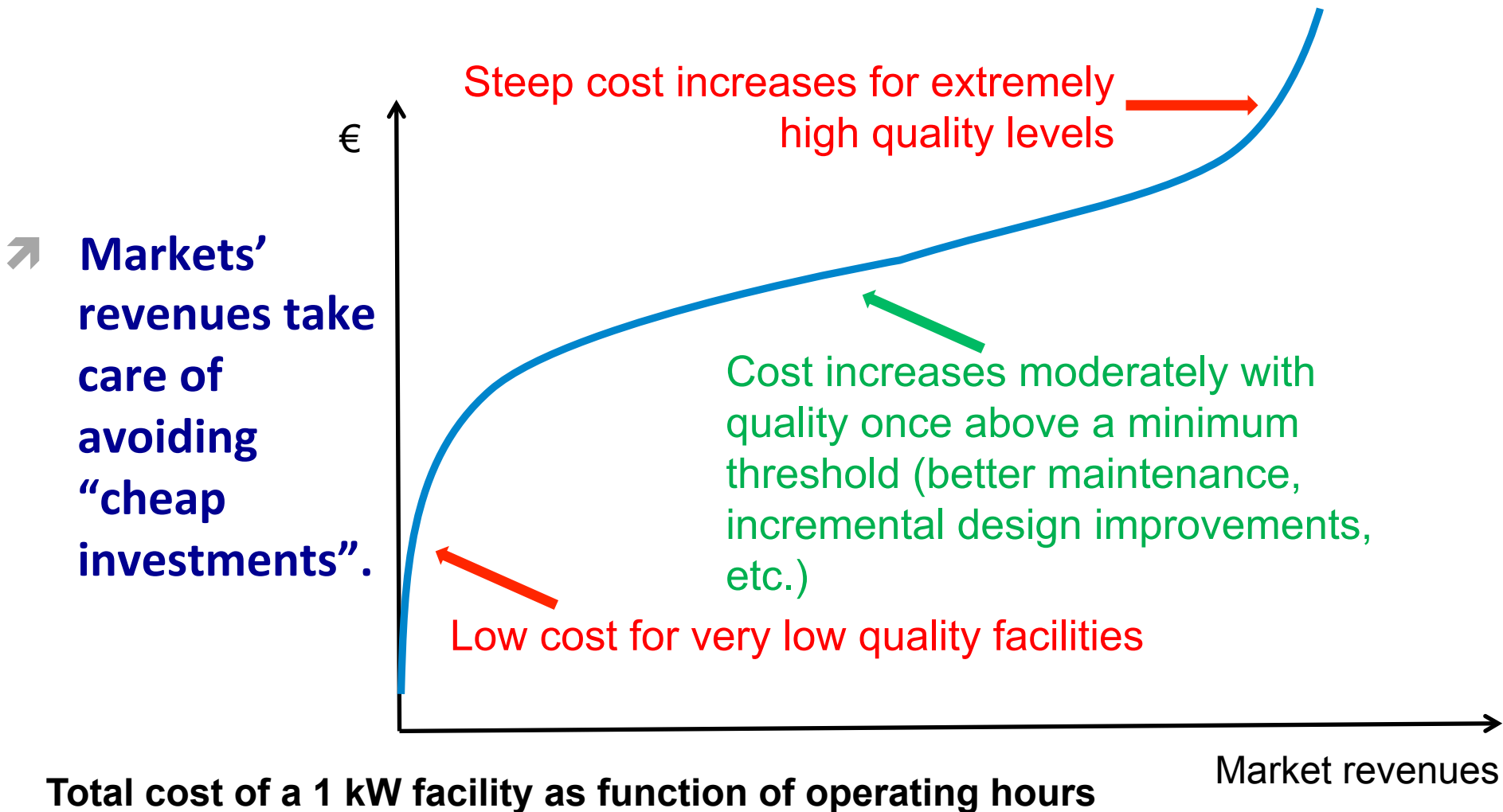
“Bulk” energy

Flexibility

Adequacy



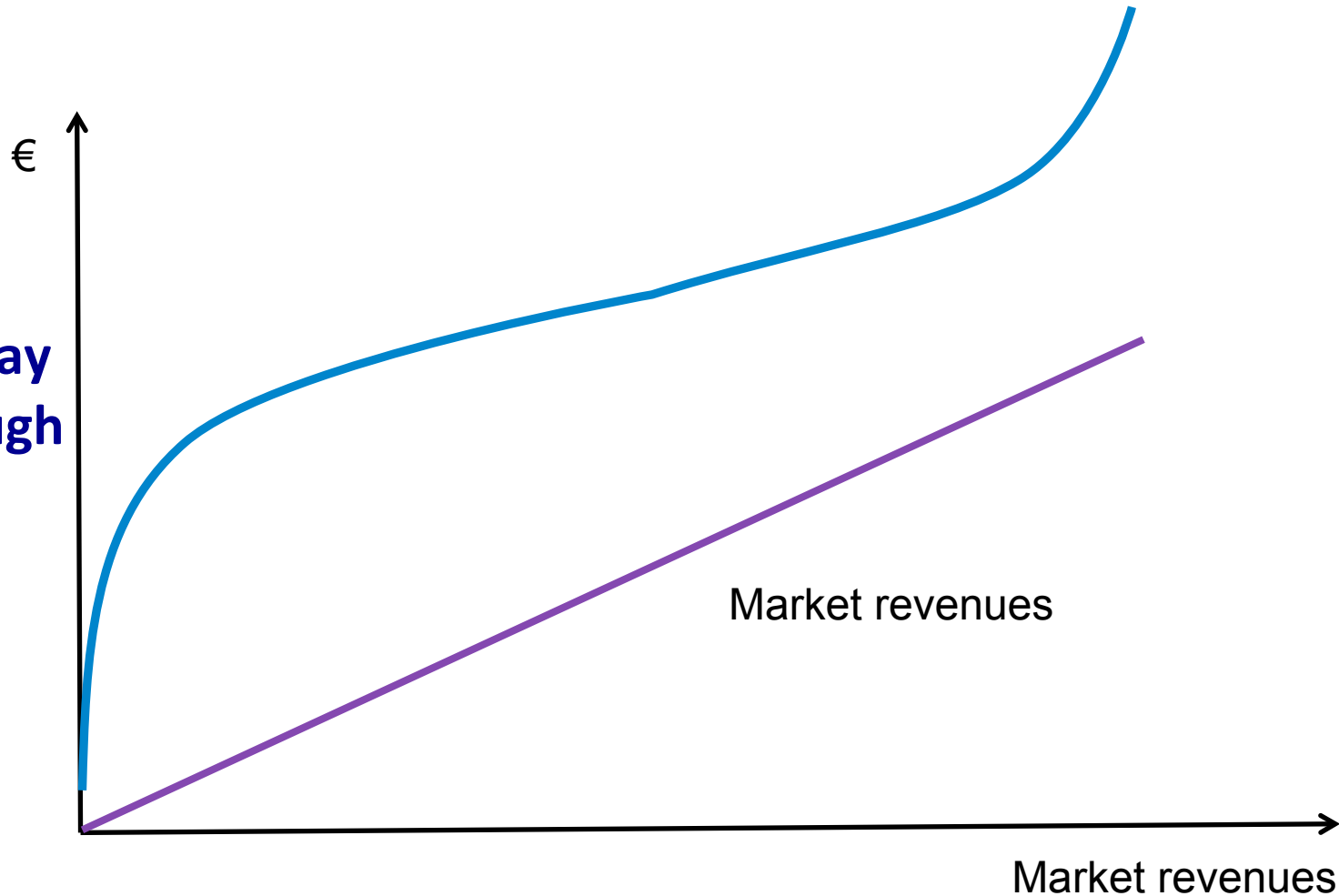
# Efficient iRES support





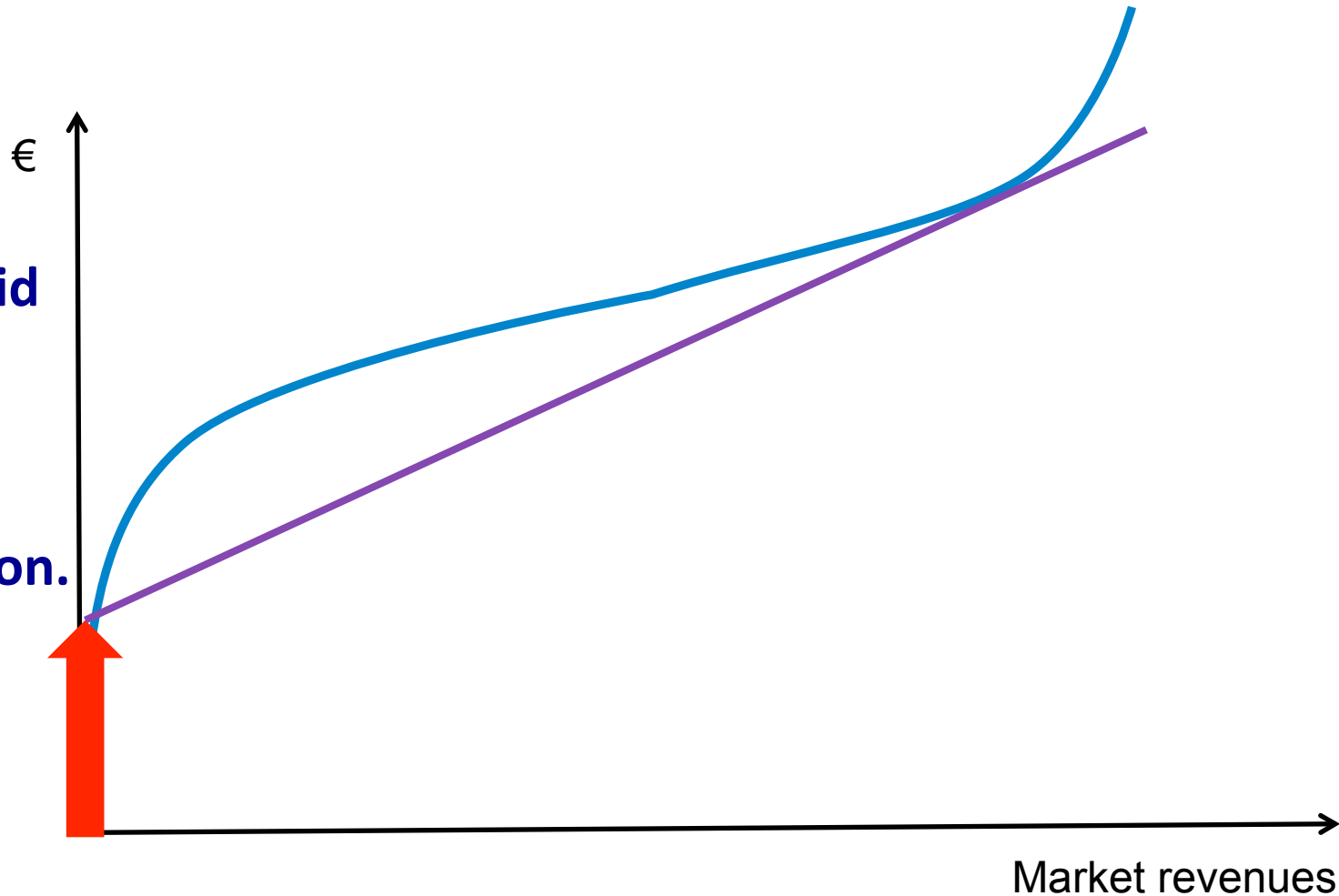
# Efficient iRES support

➤ **Market revenues may be not enough to recover costs.**



# Efficient iRES support

➤ An €/MW aid may drive optimal investment and operation.

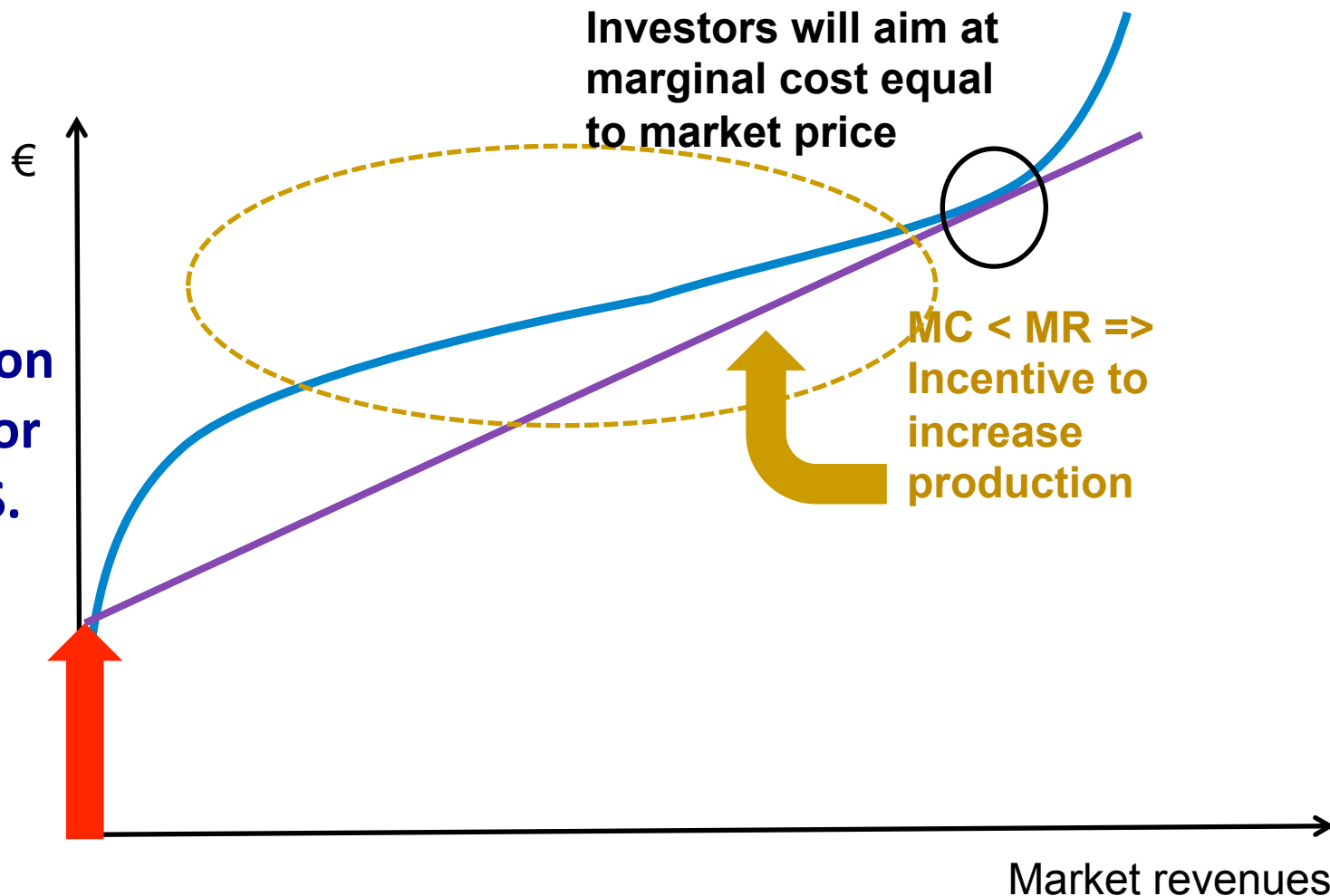


# Efficient iRES support

Investors will aim at  
marginal cost equal  
to market price

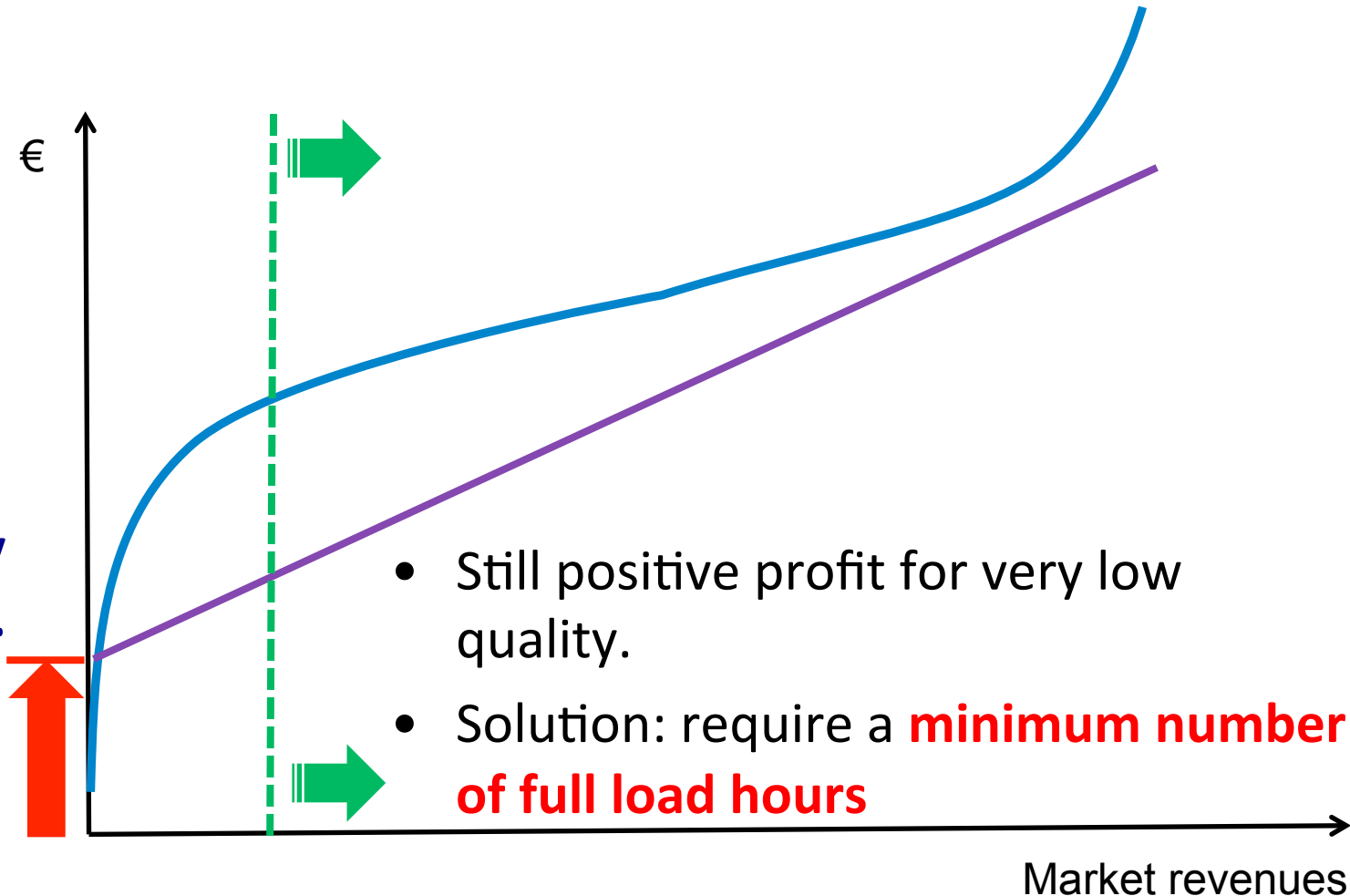
$MC < MR \Rightarrow$   
Incentive to  
increase  
production

➤ Investment  
and operation  
incentives for  
mature iRES.



# Efficient iRES support

➔ Too low investment aid might lead to inefficiently low quality.



# Efficient iRES support

➔ Too high investment aid might lead to overcompensation.

