European University Institute

ROBERT SCHUMAN CENTRE FOR ADVANCED STUDIES

Loyola de Palacio Chair

The (In)Achievements of the EU Internal Energy Market(s)

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(Florence School of Regulation)

@ EEM13 / KTH in Stockholm
29 May 2013

Agenda

- (1st Part)

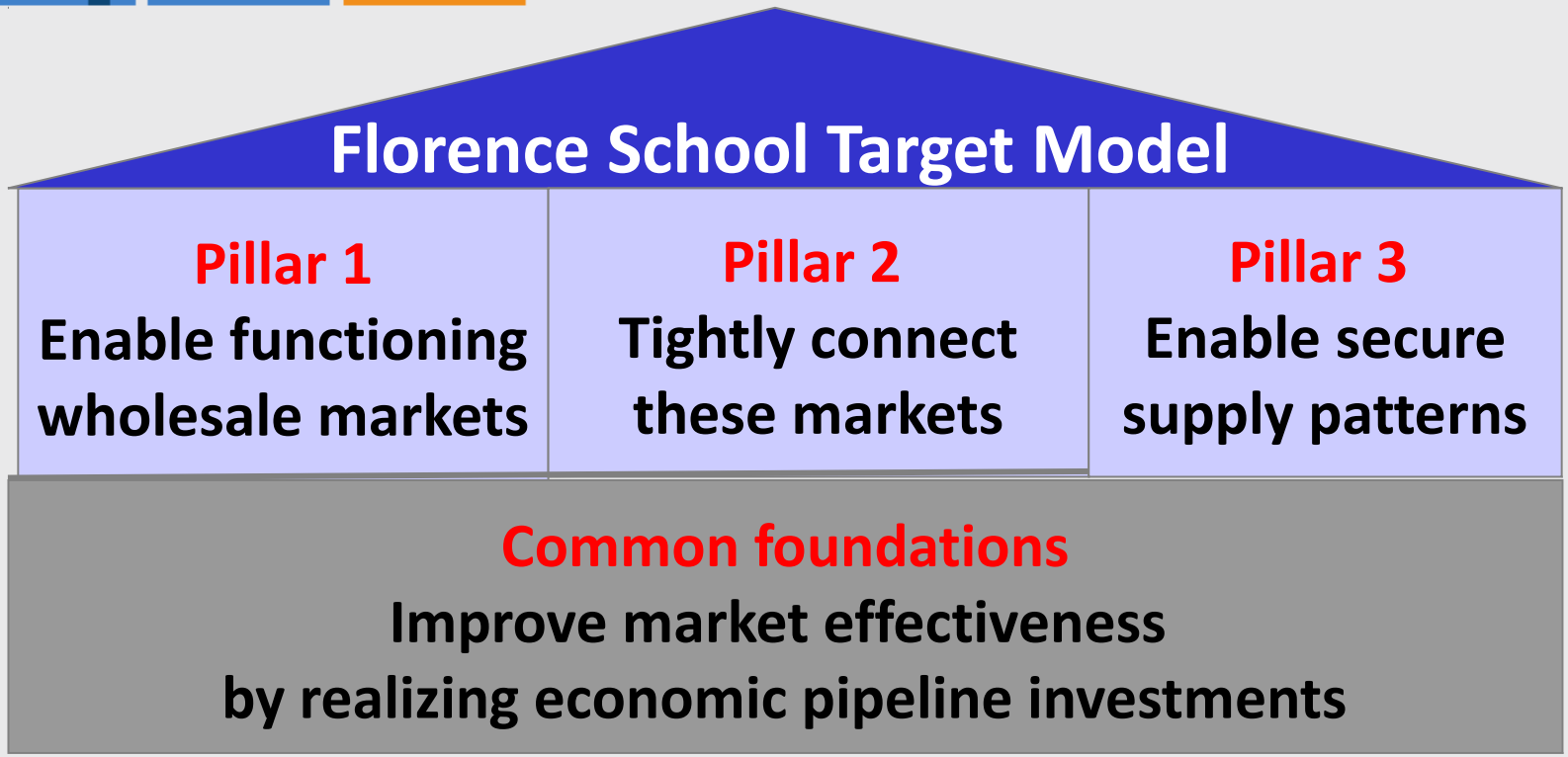
Starting point: EU Internal Market Design for Gas

- (2nd Part)

Is EU Electricity Market Design bringing another dimension(s) ?

- (3d Part)

Need to revisit our EU Gas Target Model?



1st Part - OVERVIEW OF THE FSR TARGET MODEL FOR EUROPEAN GAS MARKET INTEGRATION

EU Gas Architectures (To Enable Functioning Markets)

- Two architectures proposed by Florence School

(1). Market Areas (= complete market fusion)

  - single price zone (entry/exit) + single balancing zone from import points to end-users
  - either structured as:

*National (if "existing Wholesale markets" can function well alone); or

**Multi-national (if cross-border cooperation required to get "functioning Wholesale markets" as 20 Bcm + 3 different gas sources)

EU Gas Architectures (To Enable Functioning Markets)

(2). Trading Regions (Balancing arrangements are left apart)

- a single price zone (entry/exit) for wholesale markets with congestion-free interconnection
- BUT balancing zones are left to several national end-user zones.

To tightly connect the markets

- Harmonisation of trading conditions (ETC)
- They are measures to be implemented foremost in the ENTSOG network codes in the areas of:
  - Capacity Allocation Mechanism
  - Congestion Management Procedure
    - open seasons, VP2VP-products, coordinated auctions for longer term capacities, 1stC1stS for the intra-day market, harmonized contract start dates, standards for secondary capacity trading…

To tightly connect the markets

- Nomination and Balancing
  - common gas day, harmonized nomination schedules, limits on re-nomination, …
- Tariffs
  - harmonized date for change of tariffs, structure methodology, inter-TSO compensations within large zones

COMMON FOUNDATIONS: Coherent Transportation Investments

- Investments for market interconnections
  - Market based "open seasons" with pre-set evaluation criteria
  - regulatory authority could add capacity needed for security of supply or openness of markets (incl. for short term trade)
- Investment within the markets (inside pricing zones), to be evaluated against congestion costs

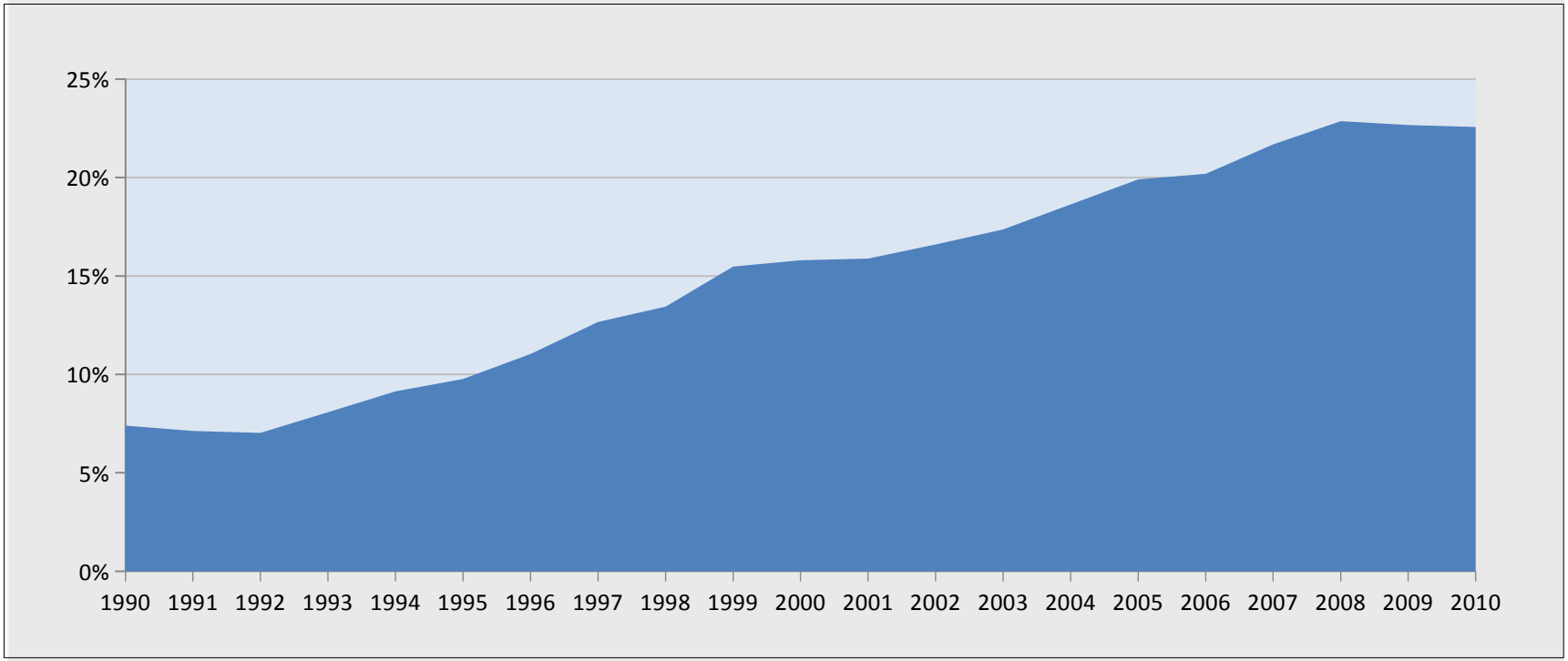
Is this gas target model enough?

- The ultimate European Union goal: a “unified enough” internal market
  - Hence a Gas target model
  - And a Electricity target model
- But increase interactions between both markets lead us (& me) to wonder…

How much do these two markets designs interact?

2nd Part: Increasing Gas / Electricity market interactions

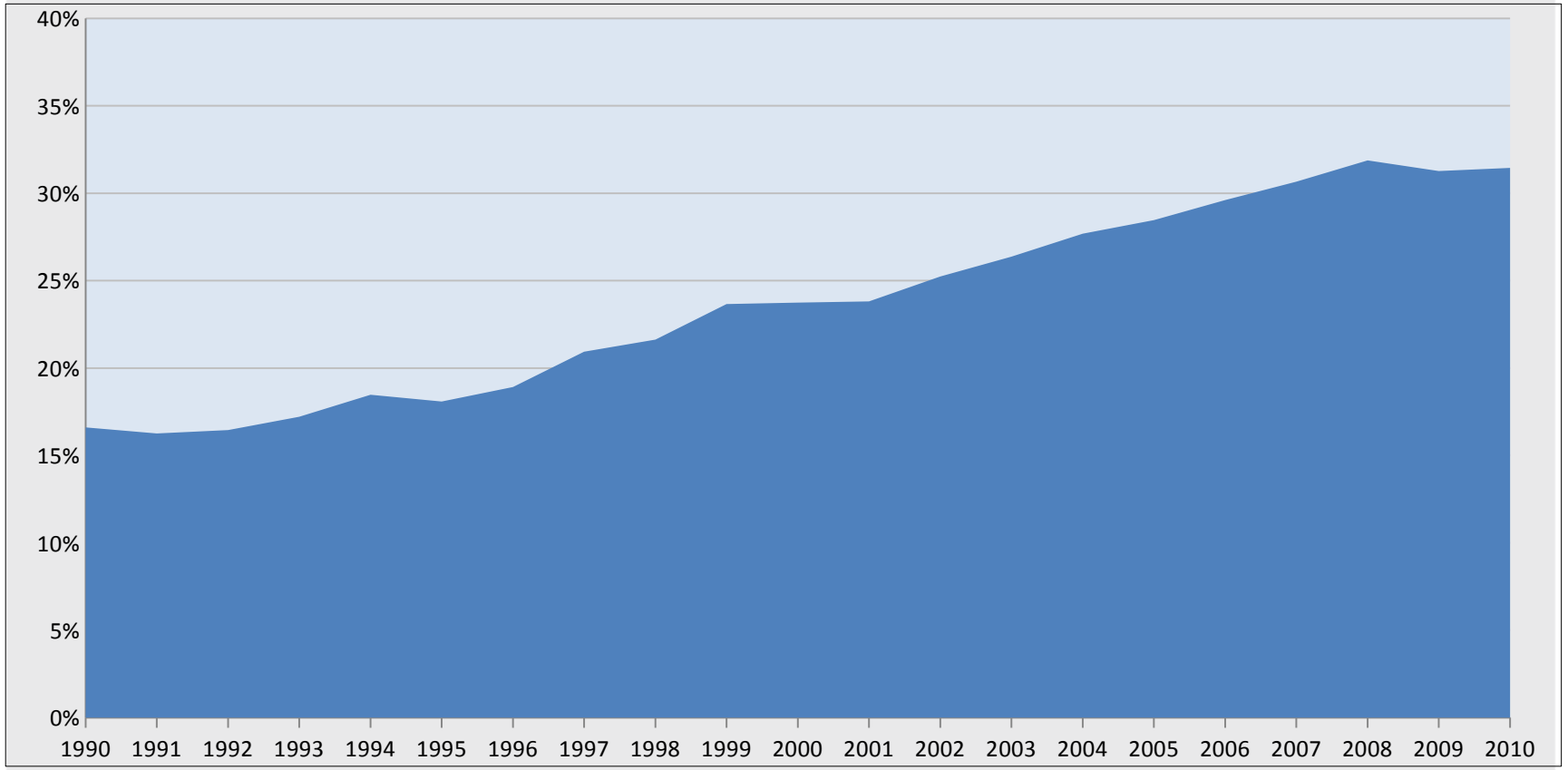
EU27/Share of electricity generated by GFPP in total electricity generation



Source: Author elaboration, data from Eurostat (accessed July 2012)

Increasing market interactions

EU27/Share of natural gas consumption used to generate electricity



Source: Author elaboration, data from Eurostat (accessed July 2012)

Increasing market interactions

Flexibility

Flexibility criteria for different power generation technologies

Flexibility dimensions	Natural gas		Coal	Nuclear
	OCGT	CCGT		
Start-up time	++	++	-	--
Start-up costs	++	+	-	--
Ramp rate	++	+	-	-
Minimum stable generation	++	+	-	

Source: IEA 2012

Design of trade for gas and elec.

- ***Both gas and electricity have strong time and spatial delivery specificities (no Dropbox!)***
  - Different economic values for time and space
- ***Design of trade might simplify the traded products***
  - First simplifying the commodity (to be traded)
    - Simplifying the products being sold
    - Simplifying the products being bought
  - Then defining a set of services complementary to the simplified trade (= the "ancillary services")

Trade designs

Simple Point-to-point

A **B** time

T=max

Point-to-point with time flexibility

A **B**

T=1

time

T=max

Entry-Exit with time flexibility

Bn
B4
B3
B2
B1

A

T=1

Simple Entry-Exit (without time flexibility)

Bn
B4
B3
B2
B1

A

T=1

We said "market areas & trading regions" (as EU gas pillar 1)...

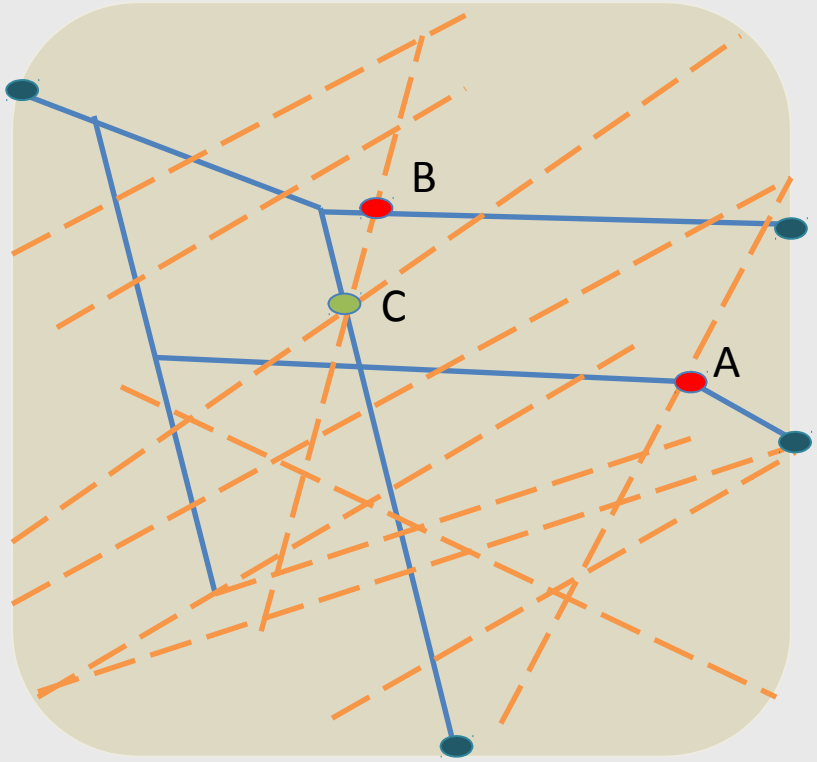
- What does it mean now?

Prices different at each trade point (nodal approach)	Price the same inside a trading zone (zonal approach)
• Transmission allocation enters into the market clearing	• Transmission allocation does not enter into the market clearing
• Need less transmission services complementary to trade	• Need more transmission services complementary to trade
• Lower price liquidity	• Higher price liquidity

...the length of balancing period is consequential too

Prices might differ at each time period (t)	Price the same within several periods (n t)
• Need less complementary transmission services	• Need more complementary transmission services
• Lower price liquidity	• Higher price liquidity

Networks and flows bring interactions between gas and power designs



Pipelines

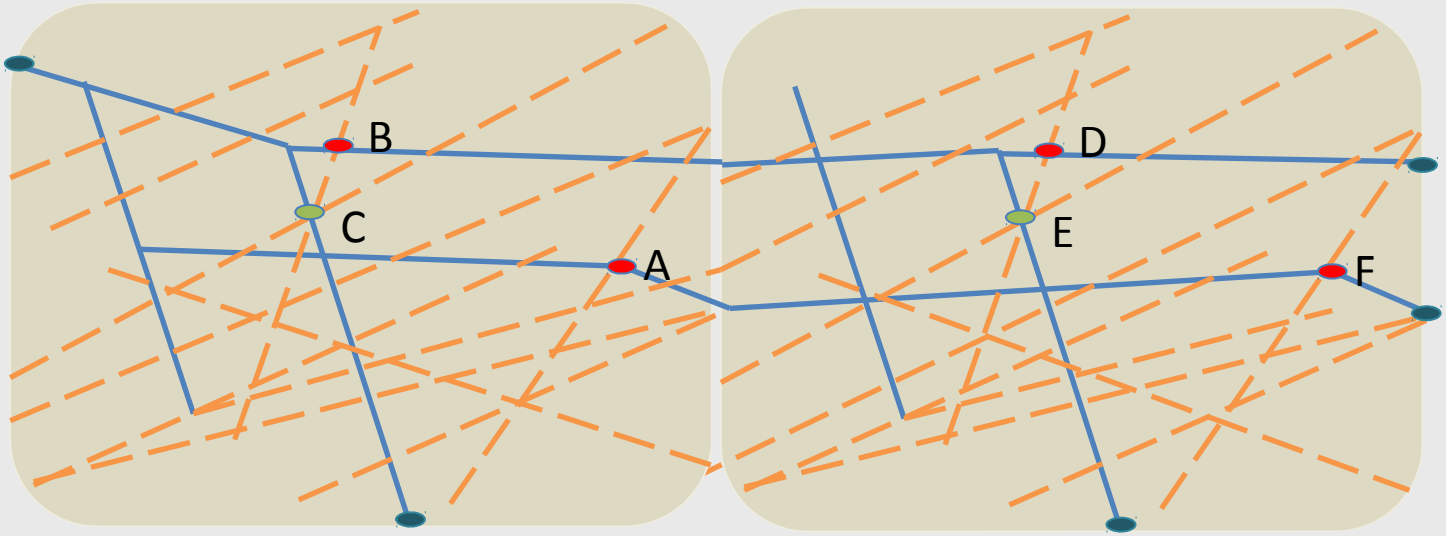
Electrical lines

Elec. Consumer

GFPP

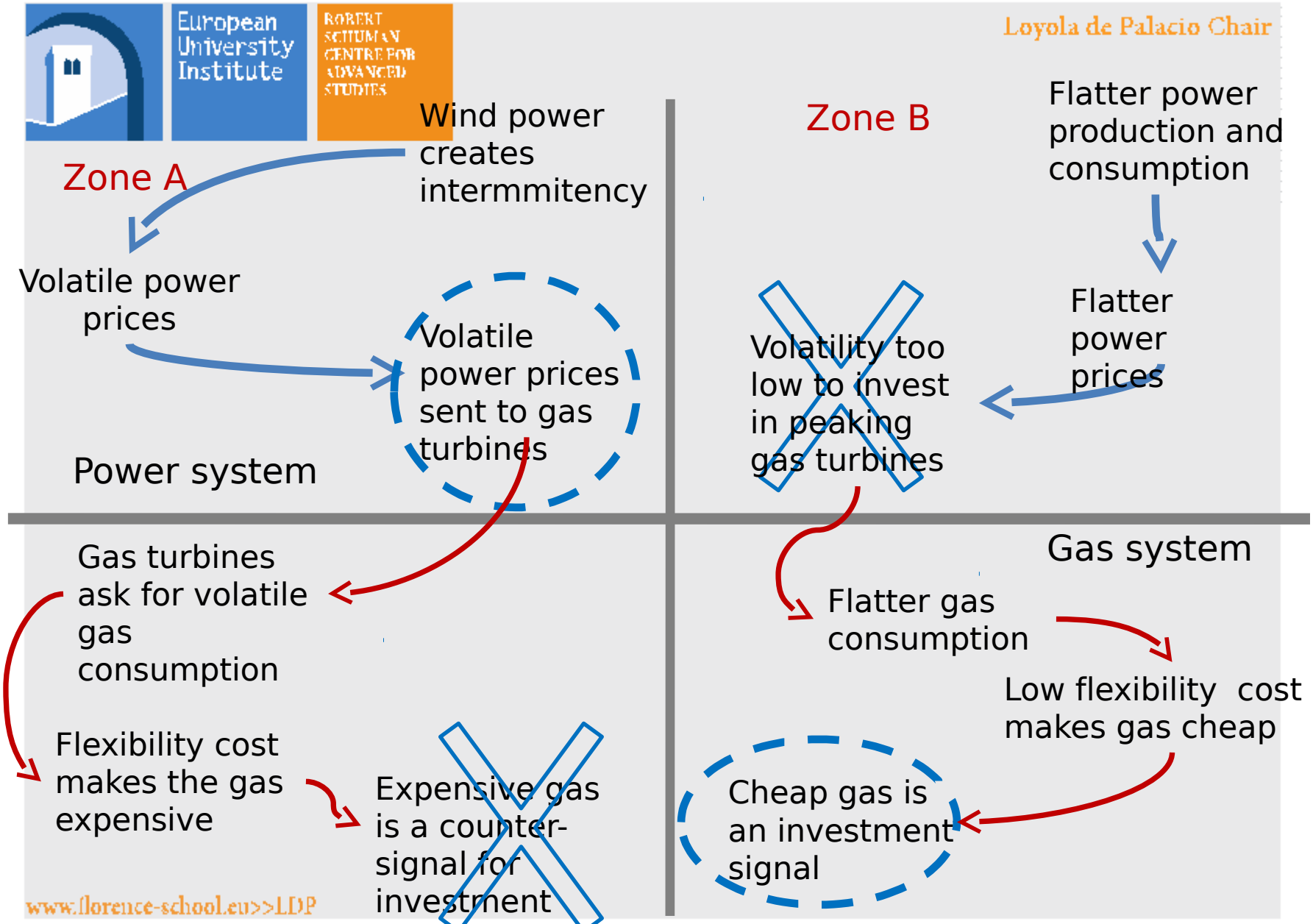
Gas supply points

They also bring interactions between adjacent market designs



A few examples...

(1) *the temporal design of gas & elec. trades*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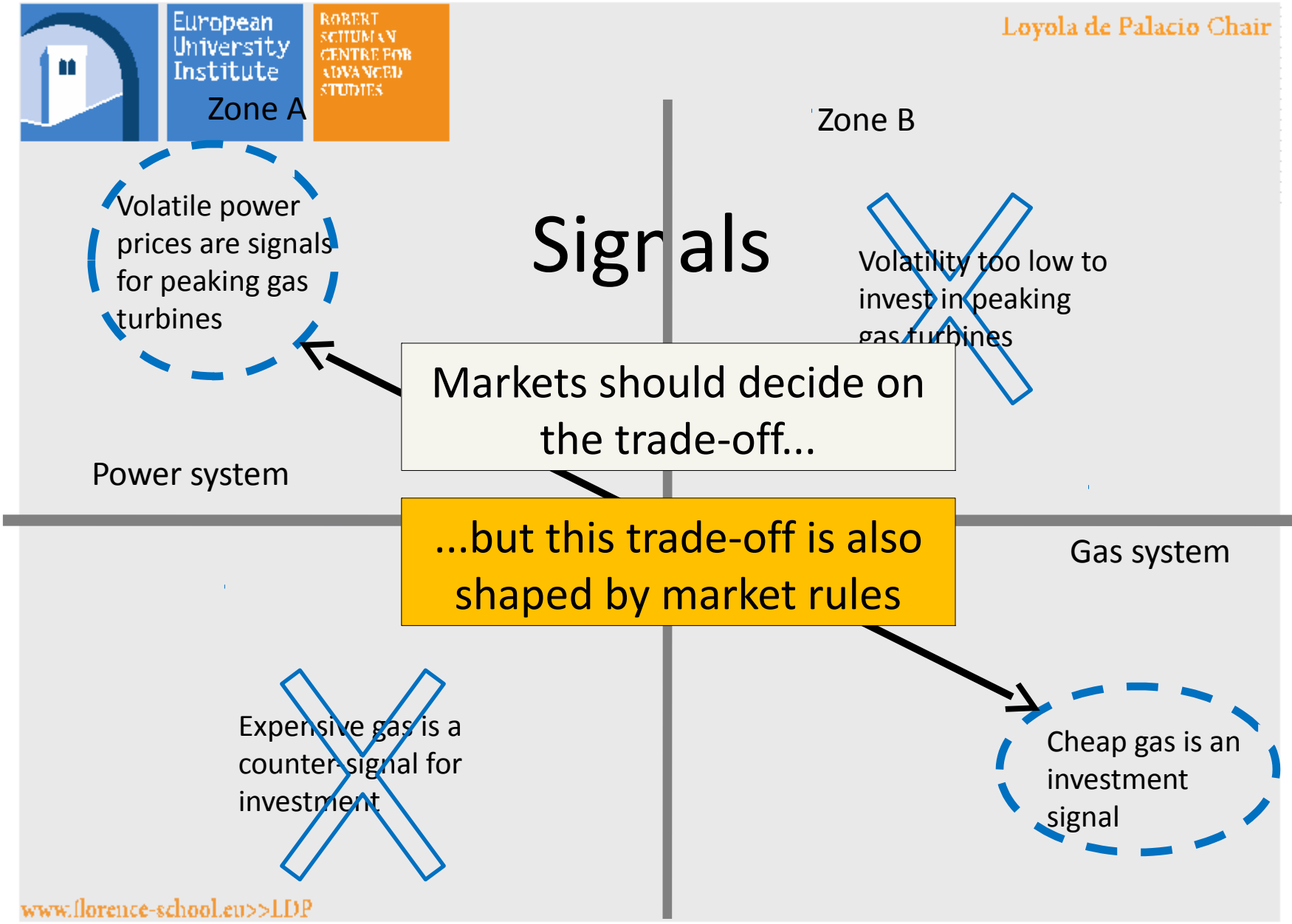
Zone A
Wind power creates intermmitency
Volatile power prices
Volatile power prices sent to gas turbines
Power system
Zone B
Flatter power production and consumption
Flatter power prices
Volatility too low to invest in peaking gas turbines
Gas system
Gas turbines ask for volatile gas consumption
Flexibility cost makes the gas expensive
Expensive gas is a counter-signal for investment
Flatter gas consumption
Low flexibility cost makes gas cheap
Cheap gas is an investment signal
www.florence-school.eu>>LDP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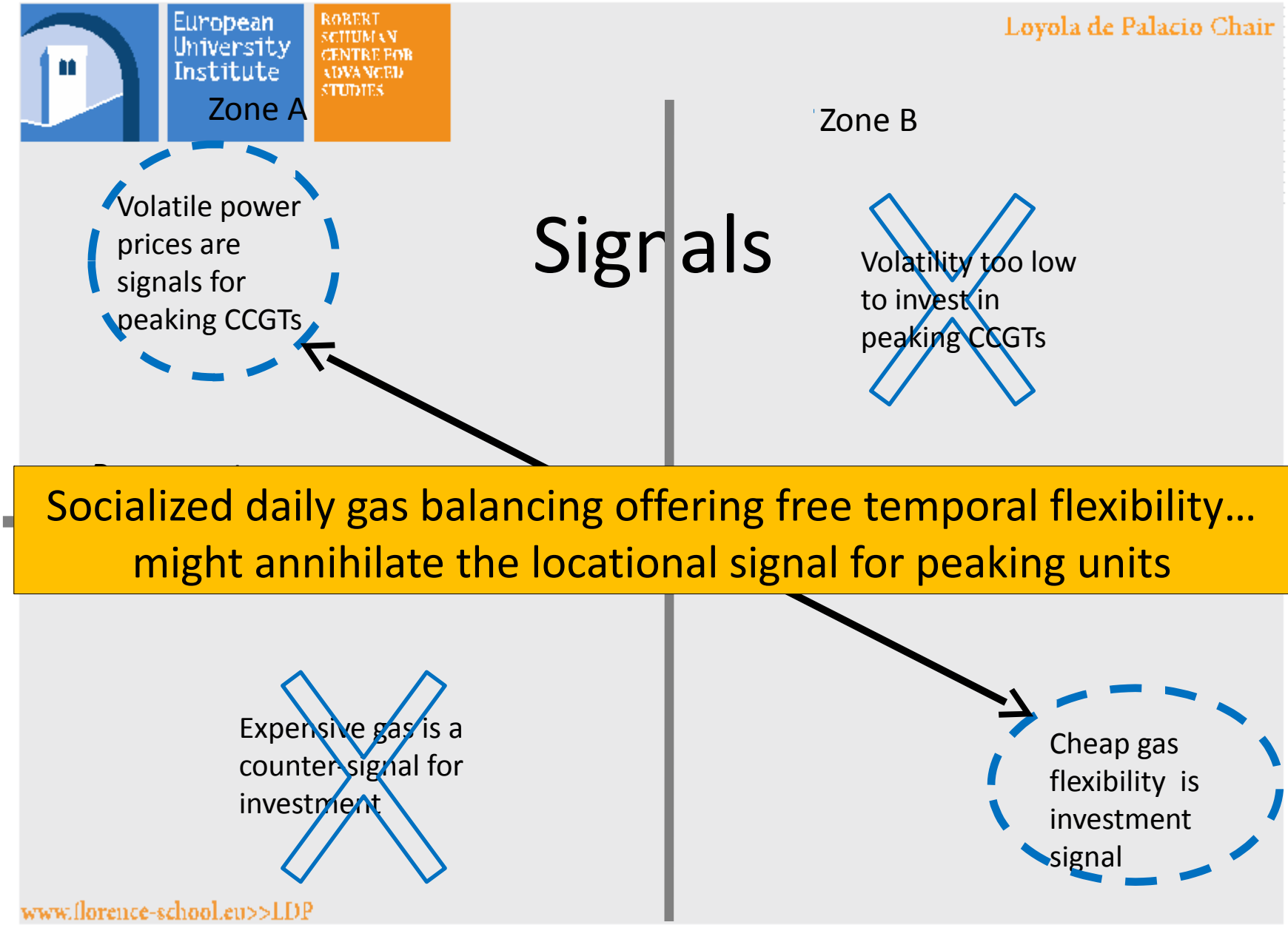
Zone A
Zone B
Signals
Volatile power prices are signals for peaking gas turbines
Volatility too low to invest in peaking gas turbines
Markets should decide on the trade-off...
Power system
...but this trade-off is also shaped by market rules
Gas system
Expensive gas is a counter-signal for investment
Cheap gas is an investment signal
www.florence-school.eu>>LDP

Missing signals

- Assume that to increase market liquidity, we socialize temporal flexibility
- Network tariffs do not reflect flexibility costs

- Signals coming from the gas system are weakened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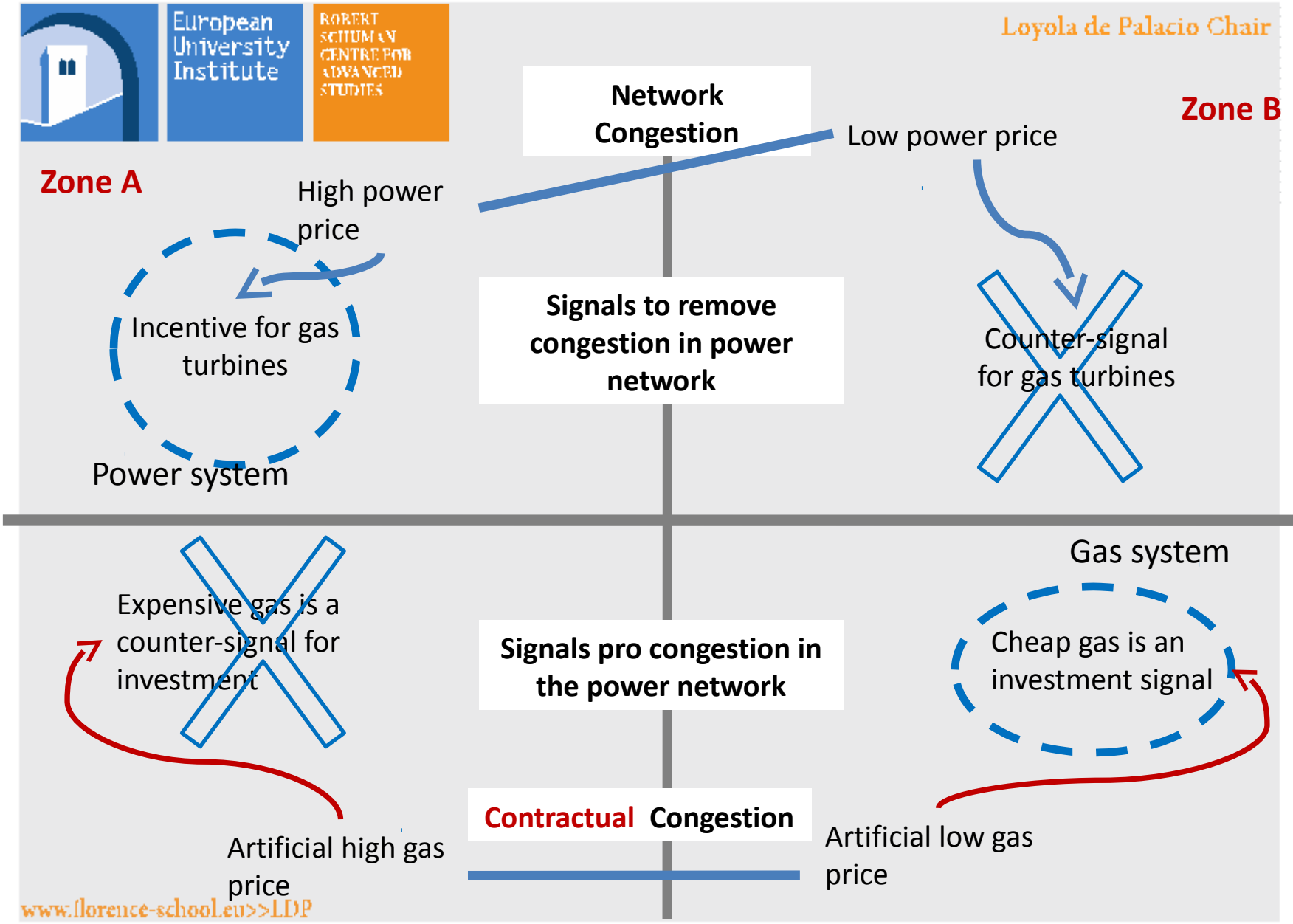
Zone A
Zone B
Signals
Volatile power prices are signals for peaking CCGTs
Volatility too low to invest in peaking CCGTs
Socialized daily gas balancing offering free temporal flexibility… might annihilate the locational signal for peaking units
Expensive gas is a counter-signal for investment
Cheap gas flexibility is investment signal
www.florence-school.eu>>LDP

A few examples...

(2) the spatial design of gas & elec. trades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Network Congestion
Zone A
Zone B
High power price
Low power price
Incentive for gas turbines
Signals to remove congestion in power network
Counter-signal for gas turbines
Power system
Gas system
Expensive gas is a counter-signal for investment
Signals pro congestion in the power network
Cheap gas is an investment signal
Contractual Congestion
Artificial high gas price
Artificial low gas price
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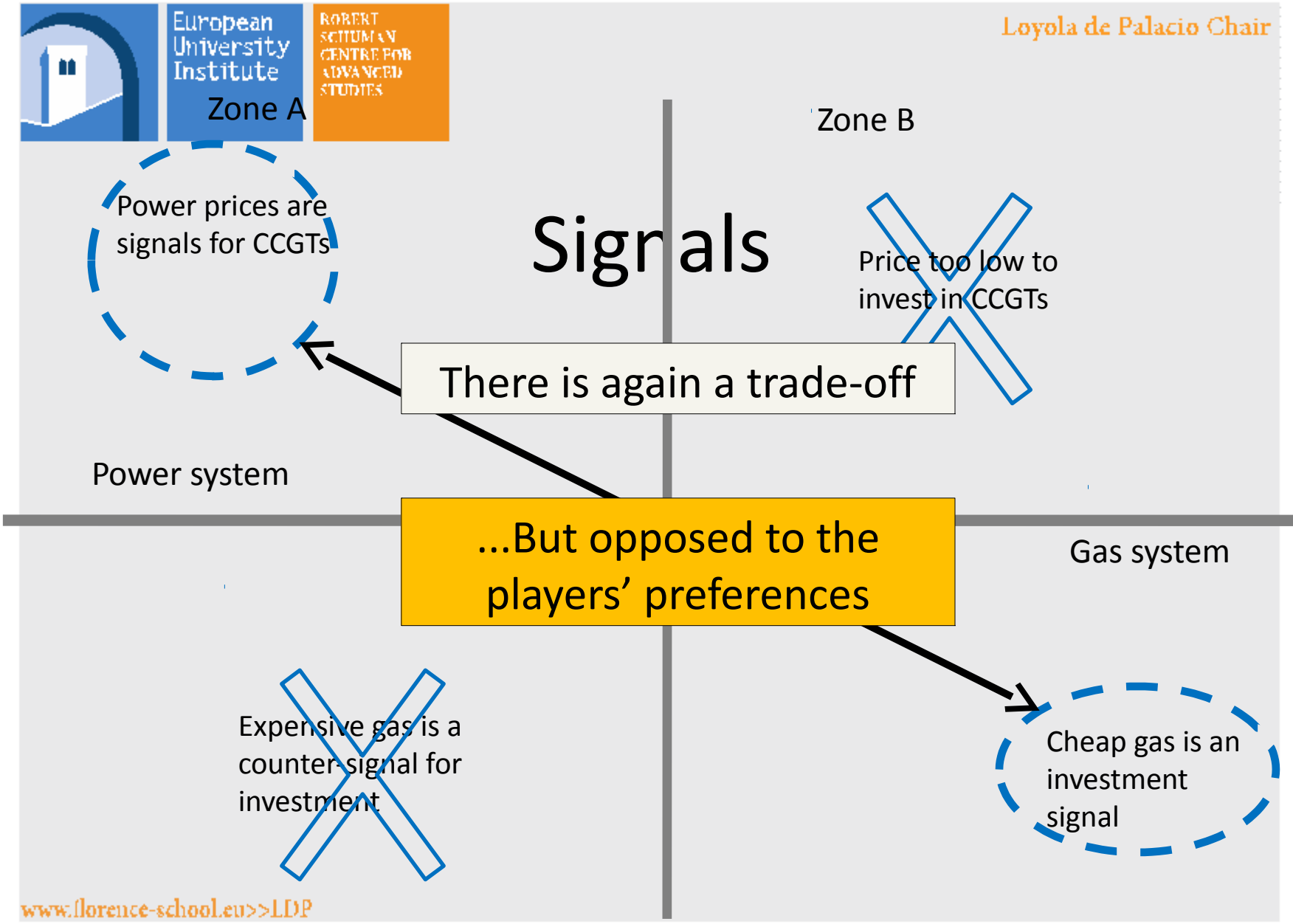
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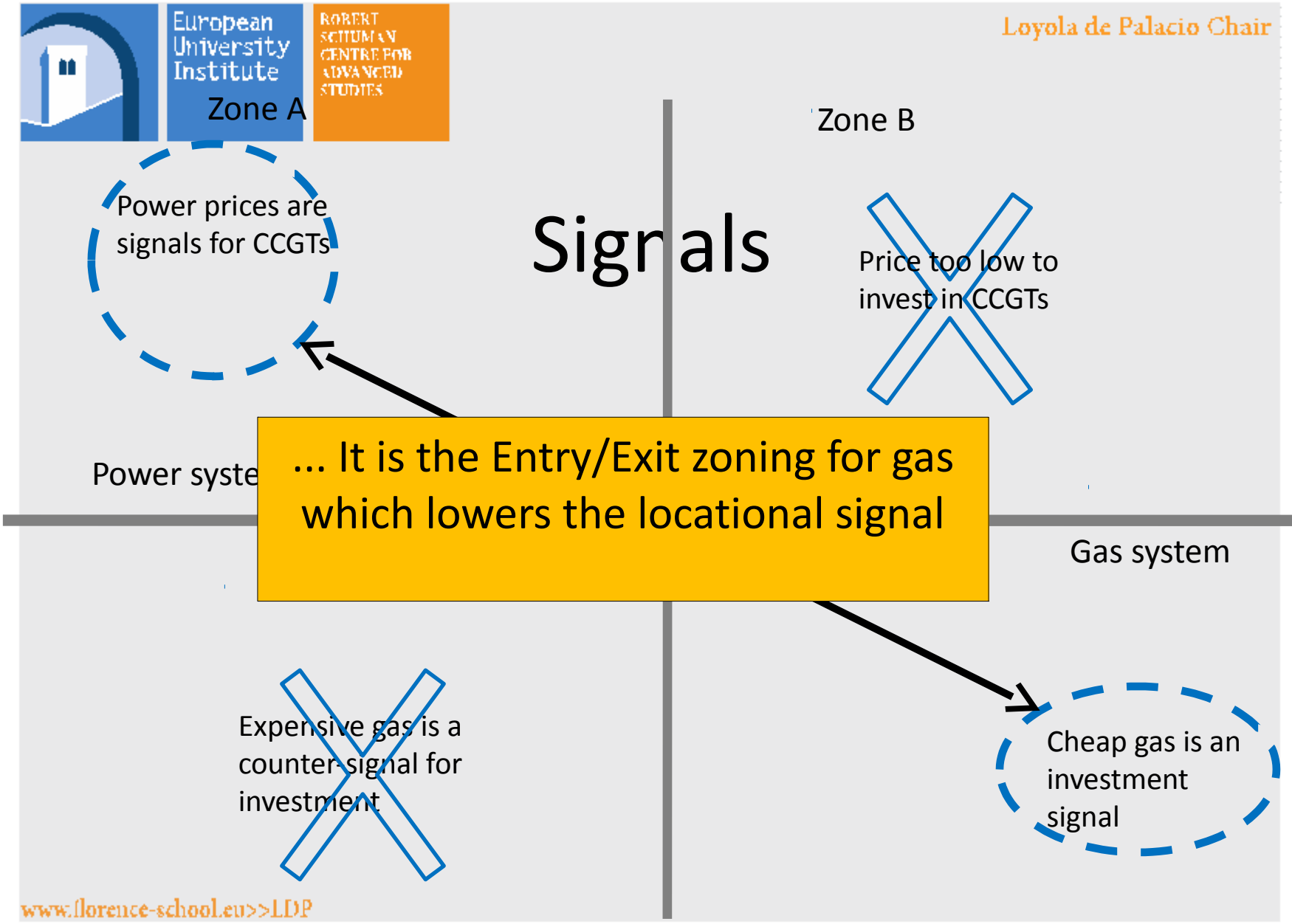
Zone A
Zone B
Power prices are signals for CCGTs
Signals
Price too low to invest in CCGTs
There is again a trade-off
Power system
...But opposed to the players' preferences
Gas system
Expensive gas is a counter-signal for investment
Cheap gas is an investment signal
www.florence-school.eu>>LDP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Zone A
Zone B
Power prices are signals for CCGTs
Signals
Price too low to invest in CCGTs
Power syste
... It is the Entry/Exit zoning for gas which lowers the locational signal
Gas system
Expensive gas is a counter-signal for investment
Cheap gas is an investment signal
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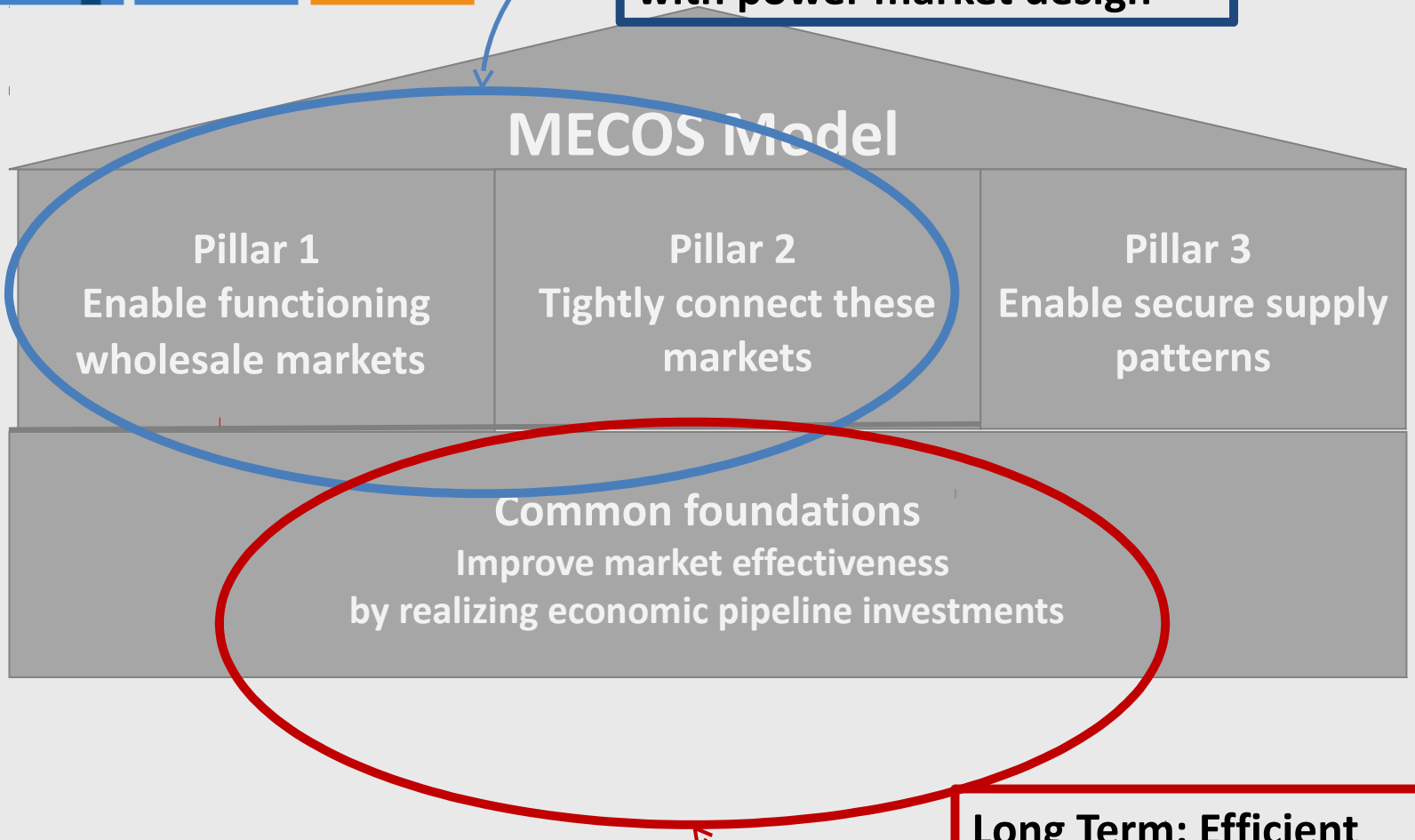
3d Part

Our FSR Gas Target Model revisited...

Short Term Interactions: Gas market design to coordinate with power market design



Long Term: Efficient investments constrained by market designs

Conclusions

- Basic design of trade (= defining spatial and temporal characteristics of the commodities) is key to efficiency and liquidity of markets
- Coordination of transmission services and market trading mechanisms is core of this key
- Interactions gas / elec. Networks and Markets are too dense to ignore. They have to be taken into account by the basic designs of trade >> redesign welcome?

Further reading...

- Vazquez, M. and M. Hallack, "*Interaction between gas and electricity market-based trading in the short run*“; "*Short-term allocation of gas networks in the EU and gas-electricity input foreclosure*”, both WPs on FSR website
- On Gas Market Designs in the US, the EU and Australia: special issue J. Makholm, L. Ruff, Vazquez-Hallack-Glachant in of EEEP “*Economics of Energy and Environmental Policy*” (Fall 2012).

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A "Replay" button?
At the IAEE journal
I am chief-editor of!!
Issue 3, Sept. 2012