The Brattle Group

Gas Storage Regulation and Security of Supply

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Summary

Do we have enough storage, and how should we regulate it?

1. There is no good rule of thumb for the optimal “number of days” storage. Benchmarking is difficult.
2. Storage is just one way of satisfying demand. An analysis of security should consider all supply measures together.
3. There is a BIG difference between imposing storage requirements on the market and sponsoring the construction of new infrastructure.

Benchmarking

General Practice

- Common practice is to measure the "number of days storage" across countries and markets:

Others have 60 days gas

✓60 days

Oil markets 60 days

Problems:

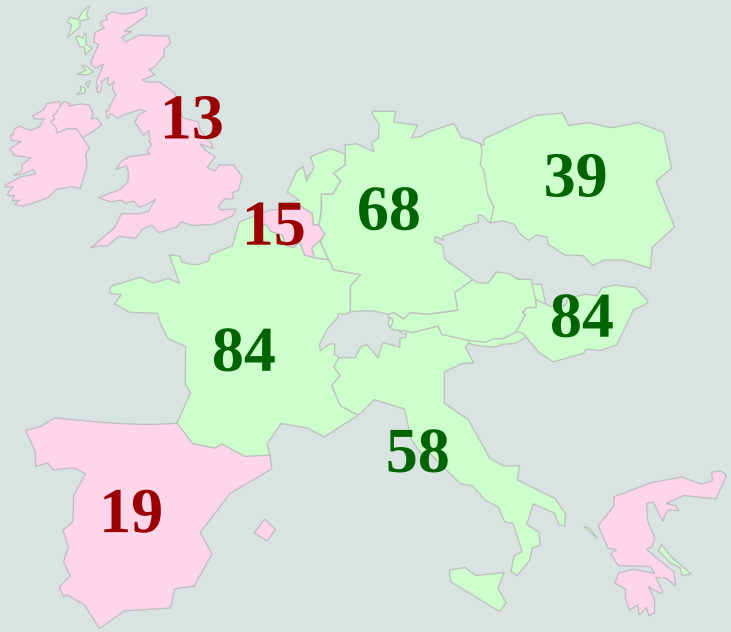
- Gas ≠ oil.
- Some countries have just copied oil, may be "wasting money" on gas storage
- All countries are different

Benchmarking

Differences Among Countries

Simple benchmarking produces two groups:

- > 30 days, avg = 68
- < 30 days, avg = 16



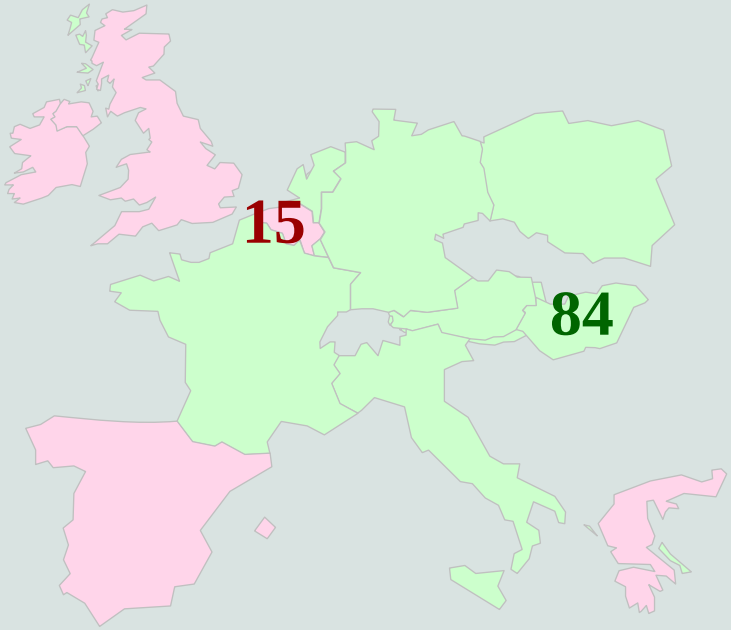
Differences are remarkable, but…does Belgium need as much storage as Hungary?

Benchmarking

Belgium and Hungary

Factors to consider:

- Belgium has higher daily deliverability than Hungary: 3.76 days vs. 1.12.
- Hungary relies 80% on Russian gas, while Belgium gets gas from the UK, NL, Norway, Russia, Algeria, Qatar
- Belgium has a lot of gas-fired power stations with dual fuel capability.
- Fluxys books storage in neighbouring countries.



Belgium could use more,
but does *not*
need 4X-5X more.

Benchmarking — Refinements

- More refined benchmarking should distinguish between two concerns:

Short-term Emergencies

- Consider peak, not average day.
- Add *transport* capacity to storage daily deliverability.
- Include interruptible contracts.
- Estimate total daily deliverability.
- "Working volume" only becomes important at *end* of winter.
- Consider "1 in 20" winter.

Prolonged Interruption

- Diversity is critical
- "N-1" concept more suitable.
- Look at off-peak as well.
- Working volume more important.

Reserve Margin Concept

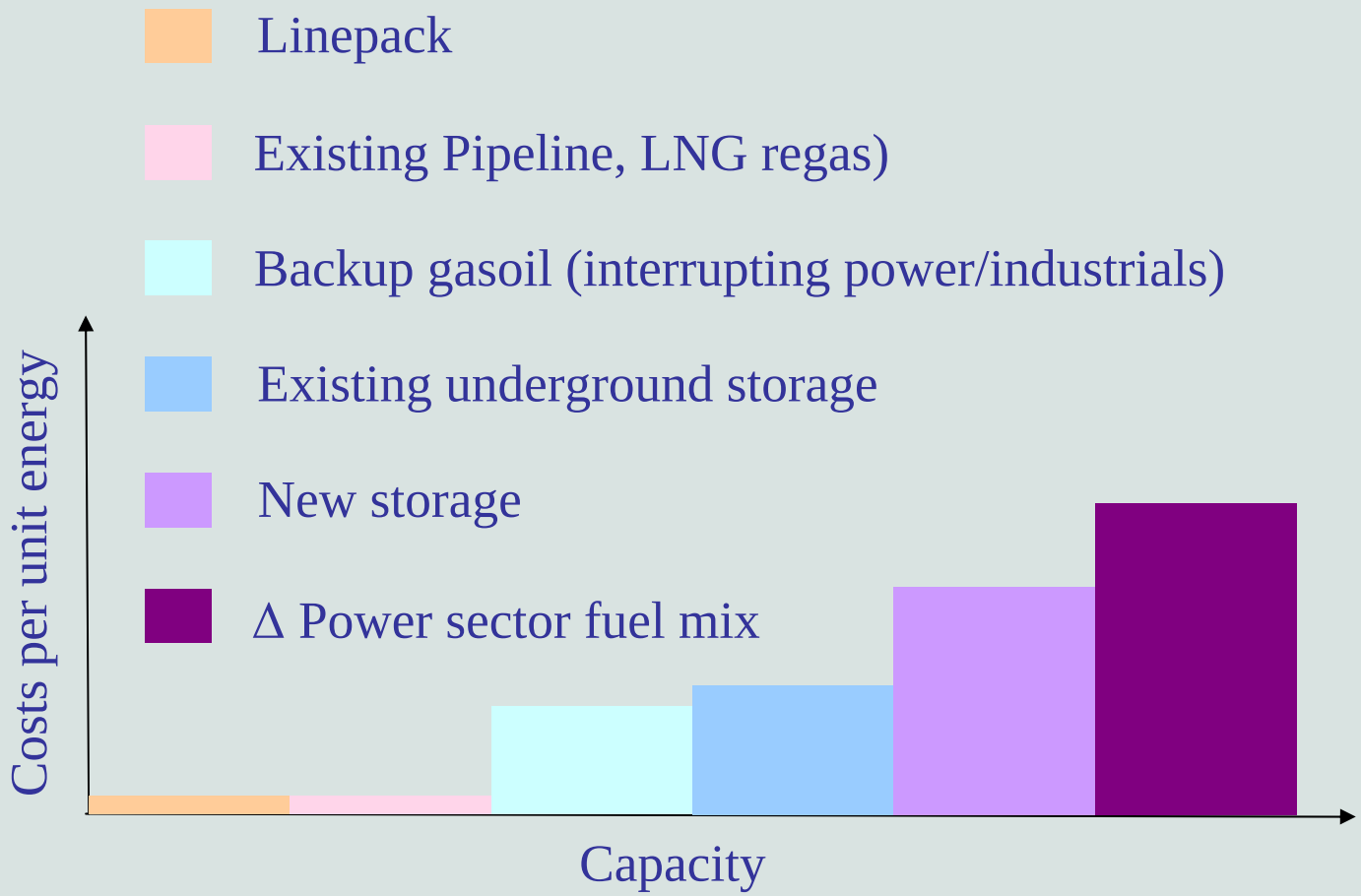
- Benchmarking the “reserve margins” across countries and checking who can cover an “N-1” contingency is more interesting.
  - Belgium looks great on “reserve margin” but suffers from N-1: great reliance on Zeebrugge LNG terminal. Issue is not so much capacity as diversity.
  - Hungary “needs” lots of storage because its N-1 is an interruption of Russian gas supplies: approximately 80% of total.
  - UK has few days’ storage, but reserve margin now looks great.
- However, “better” benchmarking still does not provide all the answers:

Maybe some countries do stupid things:
waste money on strategic stocks or take imprudent risks.

Optimal Storage Levels

Supply Curve for Security

- Need to look at a "supply curve" for security



Challenge is to determine relative heights

Answers will vary but we have found:

expensive,

≈

Optimal Storage Levels

Back-up Gasoil

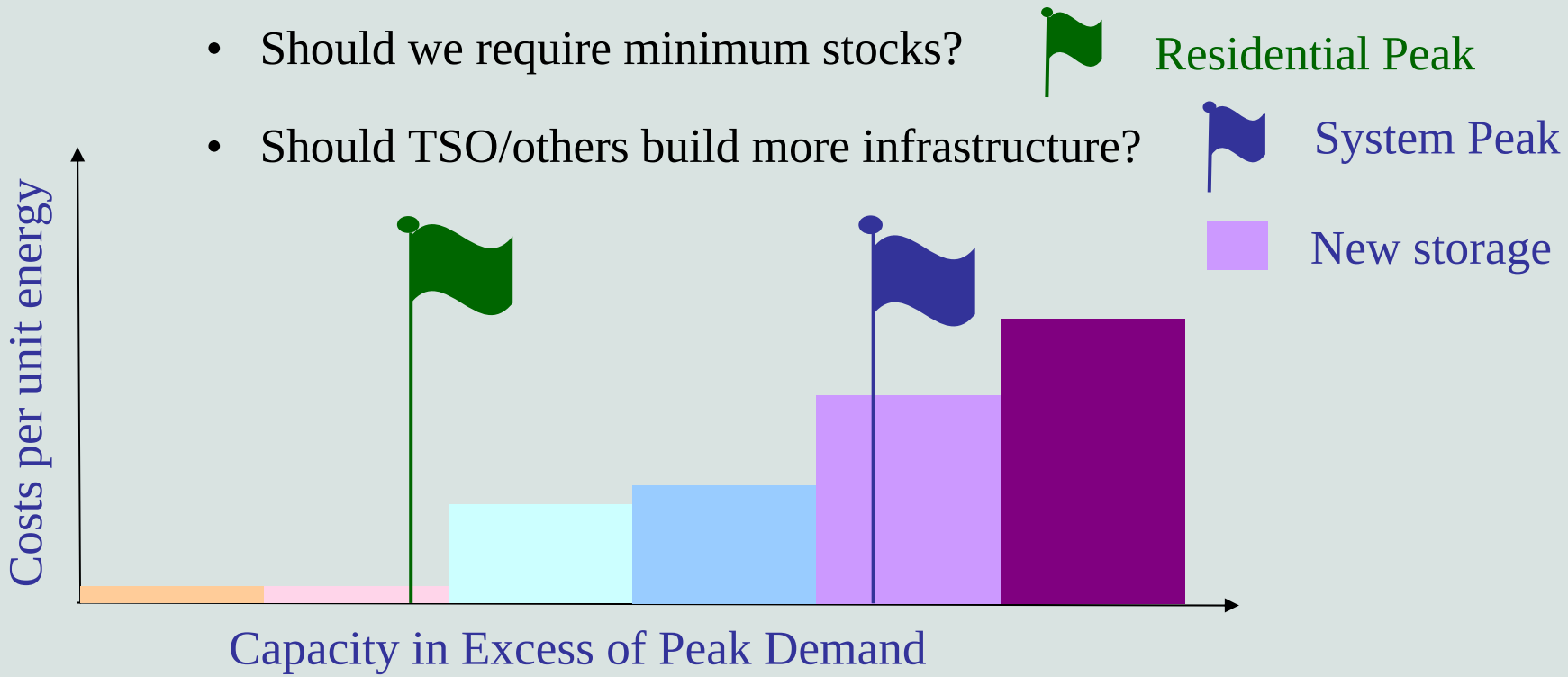
There seems to be no consensus on back-up gasoil:

- Generators in UK and elsewhere claim it is impractical/infeasible.
- However, they do it in Singapore, Spain, United Arab Emirates, Ireland
- Provides better security compared to underground storage.
- There may be a serious “grandfathering problem” for existing CCGTs built far away from refineries/supply points– but that is a separate issue.
- Interesting to consider “option contracts” with gasoil suppliers.
- Consensus is that > a few weeks will degrade equipment, but can rotate obligations among power stations: daily interruption capacity / 4 can extend for 60 days.

Optimal Storage Levels

Two Questions

- Once you have the “supply curve”, measure incremental benefit of additional security.
- Consider two different points for two questions:
  - Should we require minimum stocks?
  - Should TSO/others build more infrastructure?



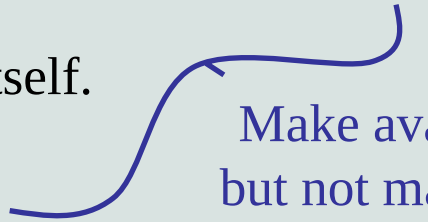
Optimal Storage Levels — Residential Customers

Relevance of residential peak:

- Residences cannot make optimal cost/benefit trade-offs themselves.
- Government should stipulate emergency procedures where residences are the “last to interrupt”.
- Industrials/power stations will know “they are the first to go”, can purchase any additional security they feel necessary.
- To cover the residential peak, a country like Spain might not need ANY new storage.

Optimal Storage Levels — Covering System Needs

- DIFFERENT issue is deciding whether to build new storage. Can imagine:
  - No new storage necessary to protect residential customers, but
  - *Some* industrial customers would find it worthwhile to finance new storage.
  - Cannot trust market to respond by itself.
- Possible market failures:
  - Co-ordination among industrial customers.
  - Regulation of existing storage prevents emergence of market signals.
  - Low tariffs on existing storage threaten economics of new storage.
  - Private parties exposed to subsequent construction of competing regulated infrastructure.

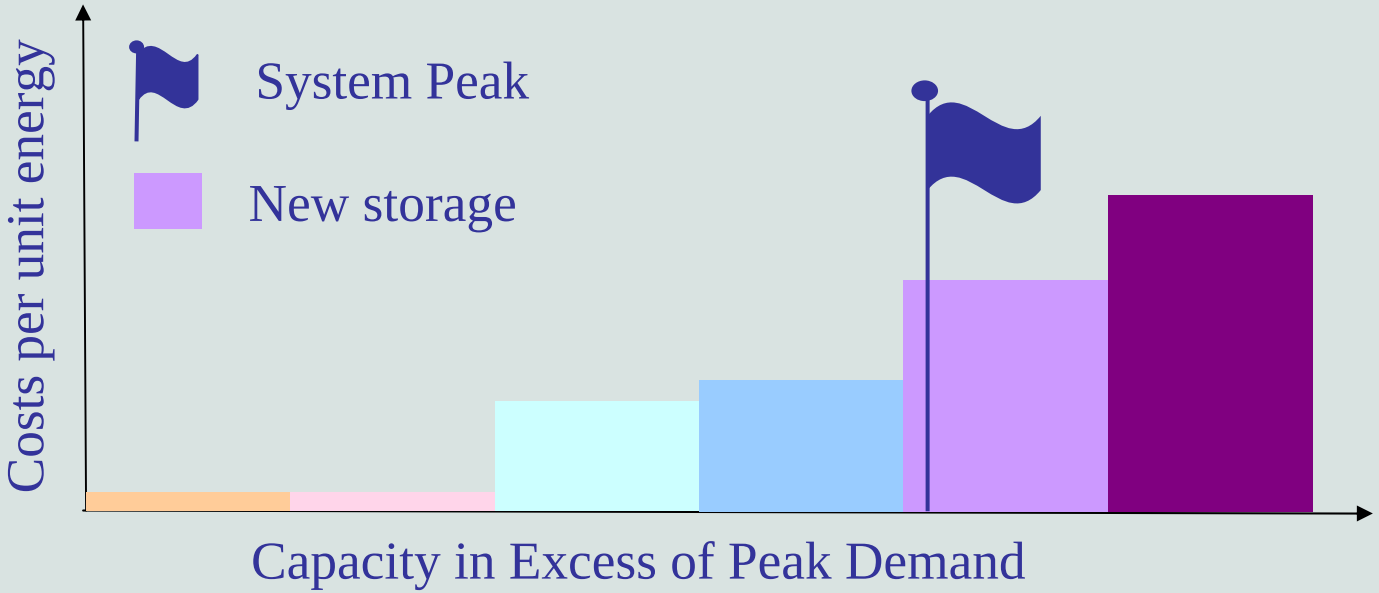


- In Spain, France, Italy and Greece, there are good arguments to support centralized planning of storage.
- The UK is different: the move to storage auctions and entry capacity auctions helped pave the way for the market to add new infrastructure.
- In a sense, a country's existing regulatory regime can "trap" it into further central planning.
- However, ending regulated storage and creating market signals are bold and difficult moves.
- Until then, cost/benefit analyses of new storage are better than "rules of thumb" or benchmarking the number of days.

Optimal Storage Levels

UK vs. Other Markets

- If the regulator wants to assess merits of new storage, should consider system peak.
- Should assess how expected cost of interruption would fall.
- Requires estimates of VOLL and likelihood of interruption.



Conclusions

- Storage is just one way of supplying a market. The number of days storage is a poor indicator of security.
- For some reason backup gasoil is not considered sufficiently.
- Minimum storage stocks can be justified to protect residential customers, but in many cases are not needed or would be small.
- A different question is whether to finance additional security.
  - The need for regulatory involvement depends on “market failures”– perhaps created by the existing regulatory system itself.
  - Cost/benefit analyses of new storage are better than rules of thumb or simple benchmarking.