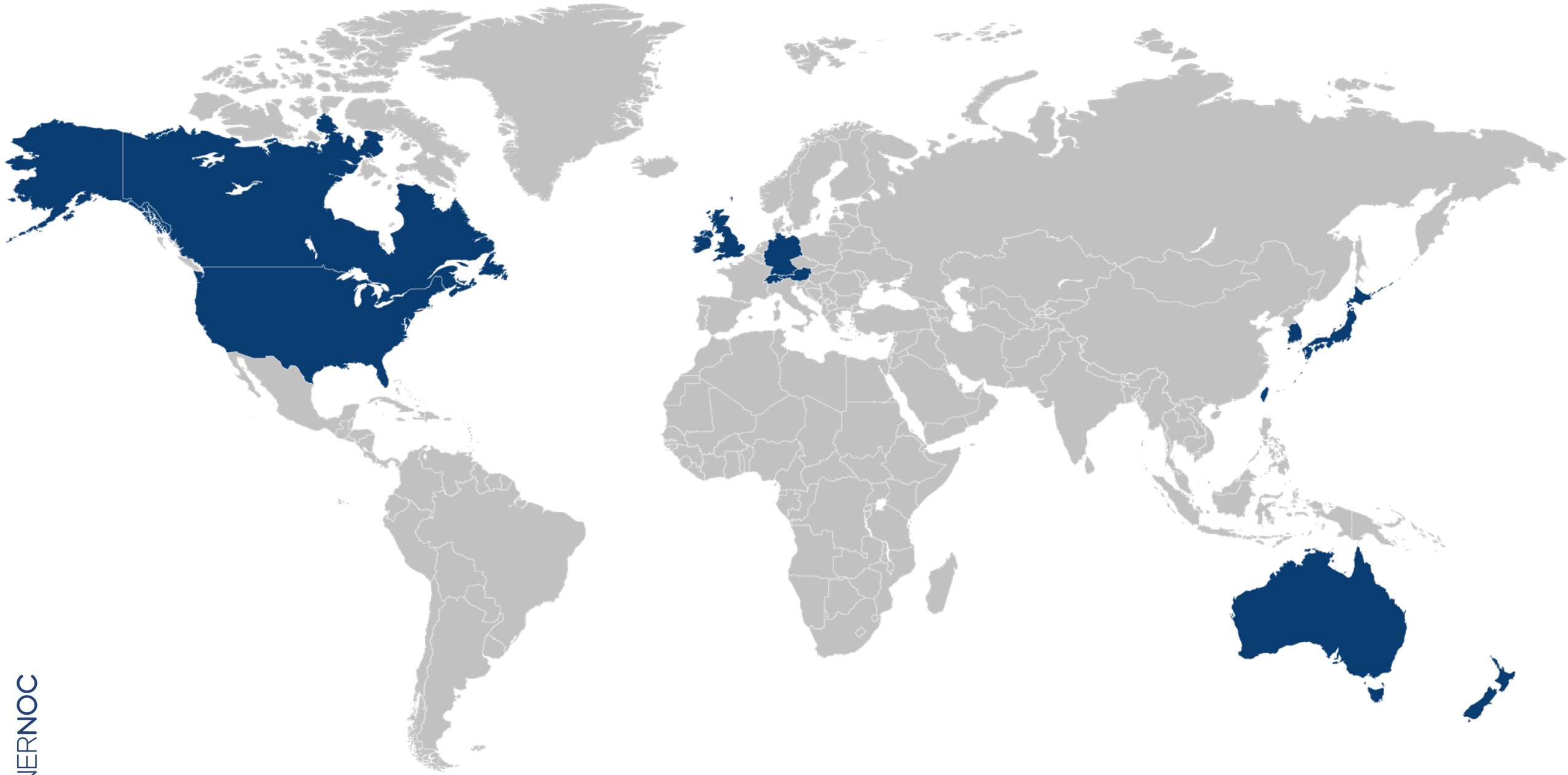
ENERNOC

Using customer flexibility to defer or avoid network capital works

IEA Smart Networks workshop — Paris, 29 February 2016

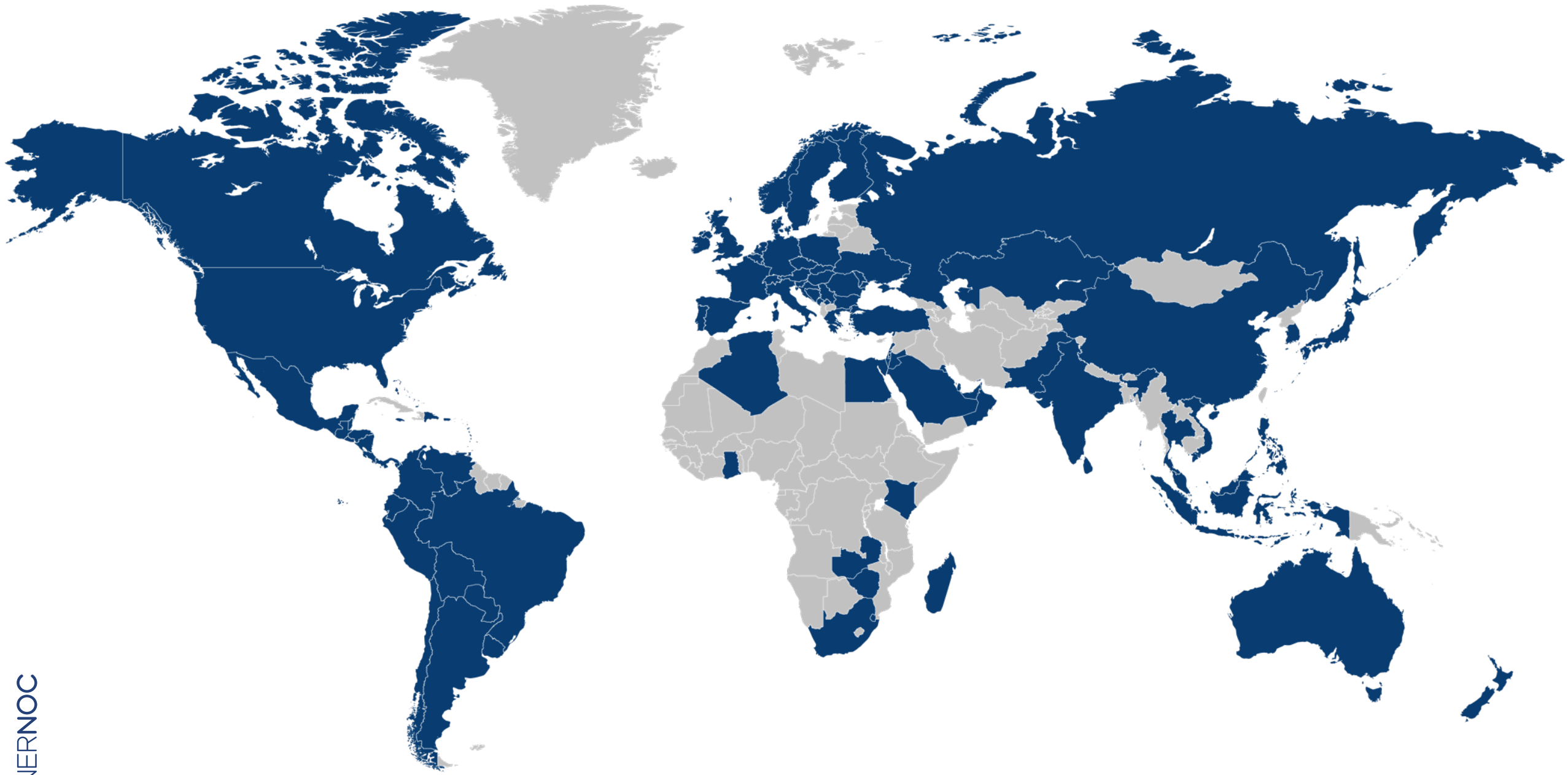
Who is EnerNOC?

EnerNOC: 50+ markets & programmes in 12 countries



Countries with active EnerNOC DR programmes

EnerNOC: Working with customers in 104 countries



Countries with EnerNOC software customer sites

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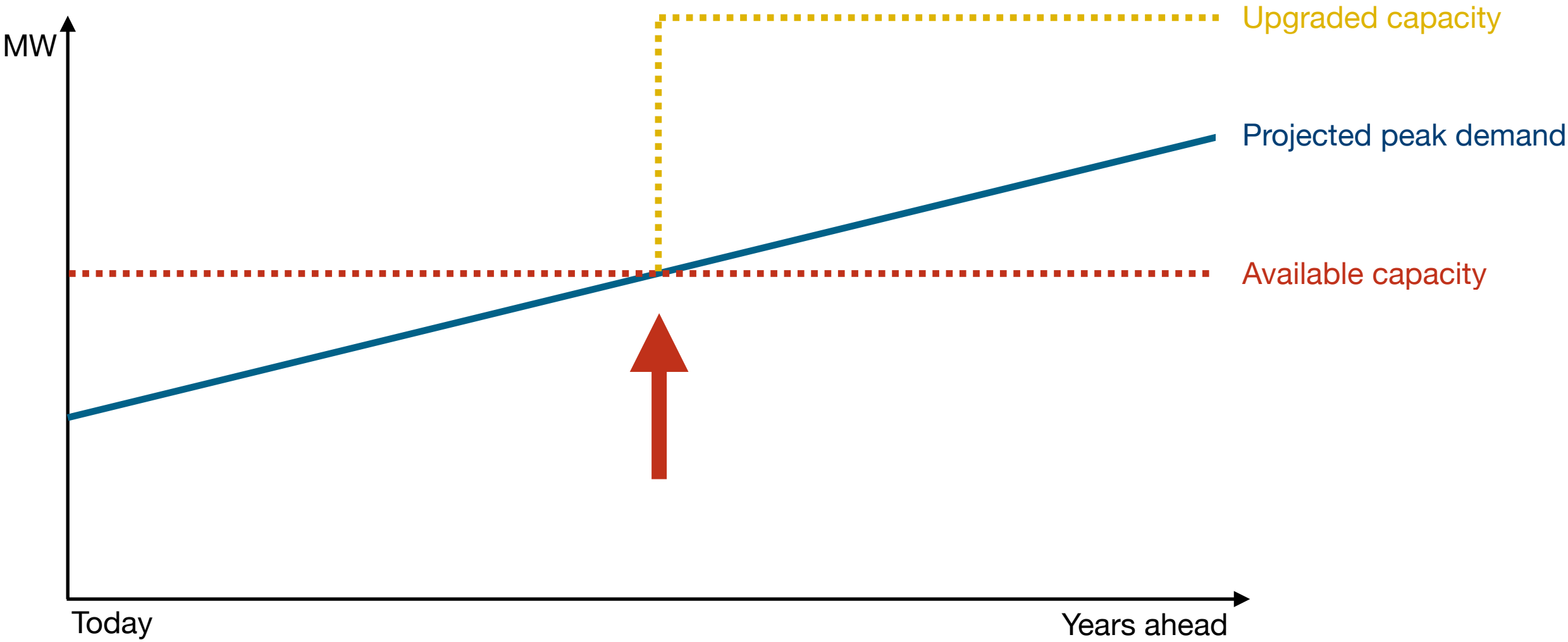
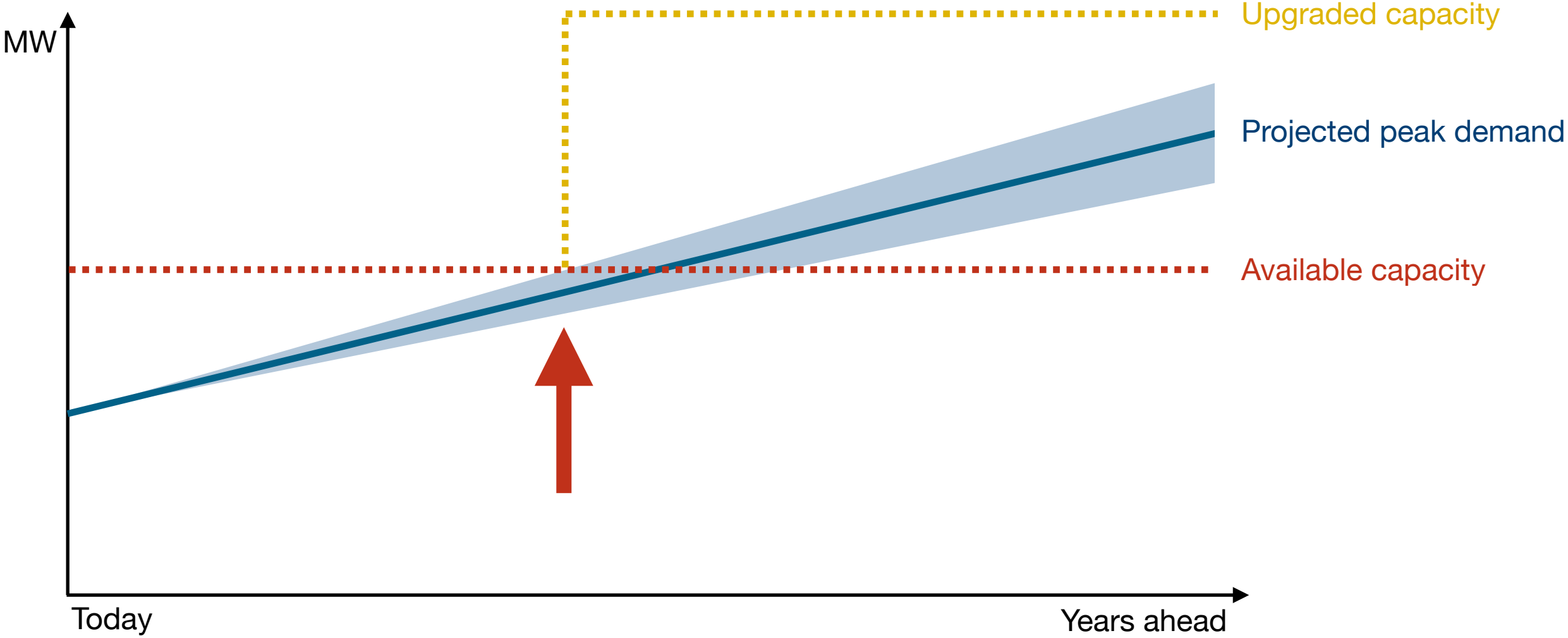
Network investment decisions

How to plan a network augmentation



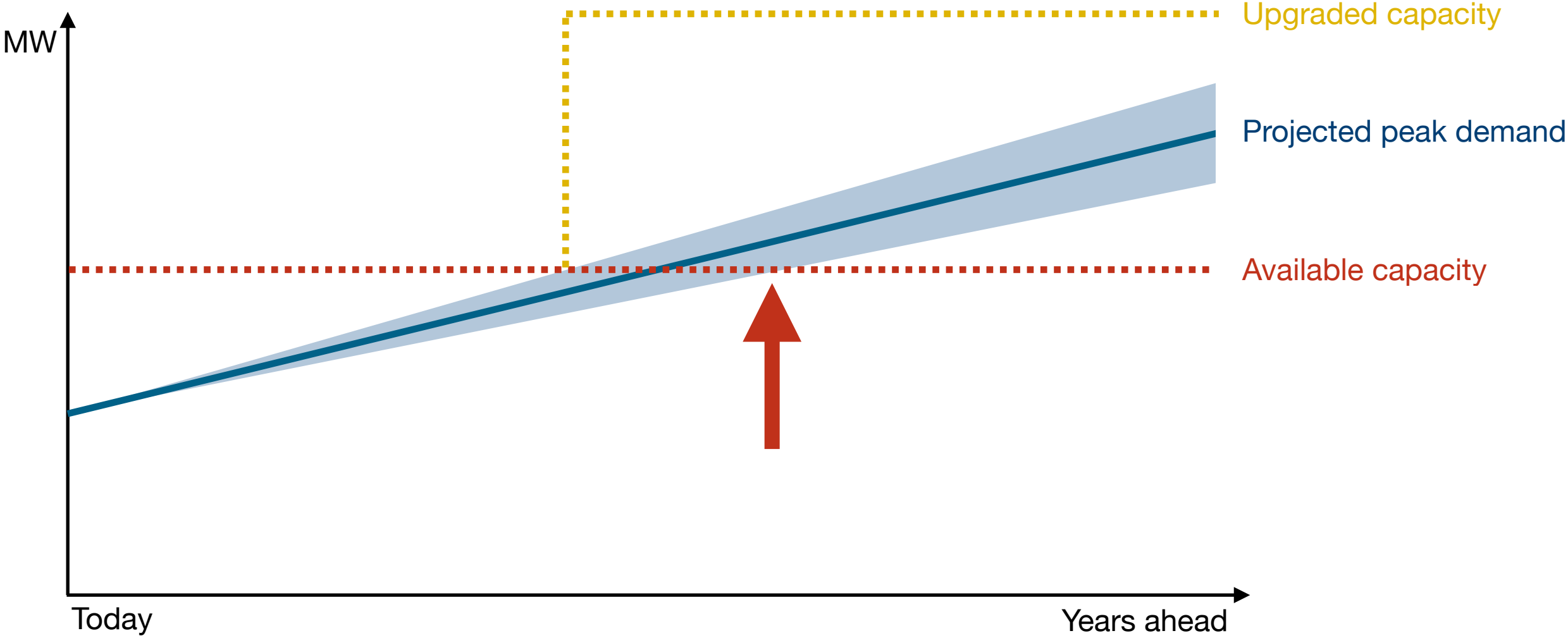
This is a ludicrously simplified example of what a distribution system operator (DSO) might consider when deciding if and when to augment its network to cope with an expected rise in peak demand. In this simple world, it's very obvious when the new capacity is needed.

The effect of uncertainty



Due to uncertainty in the forecast, the DSO has to augment its network sooner — so that it will be ready in case peak demand tracks the high range of the forecast.

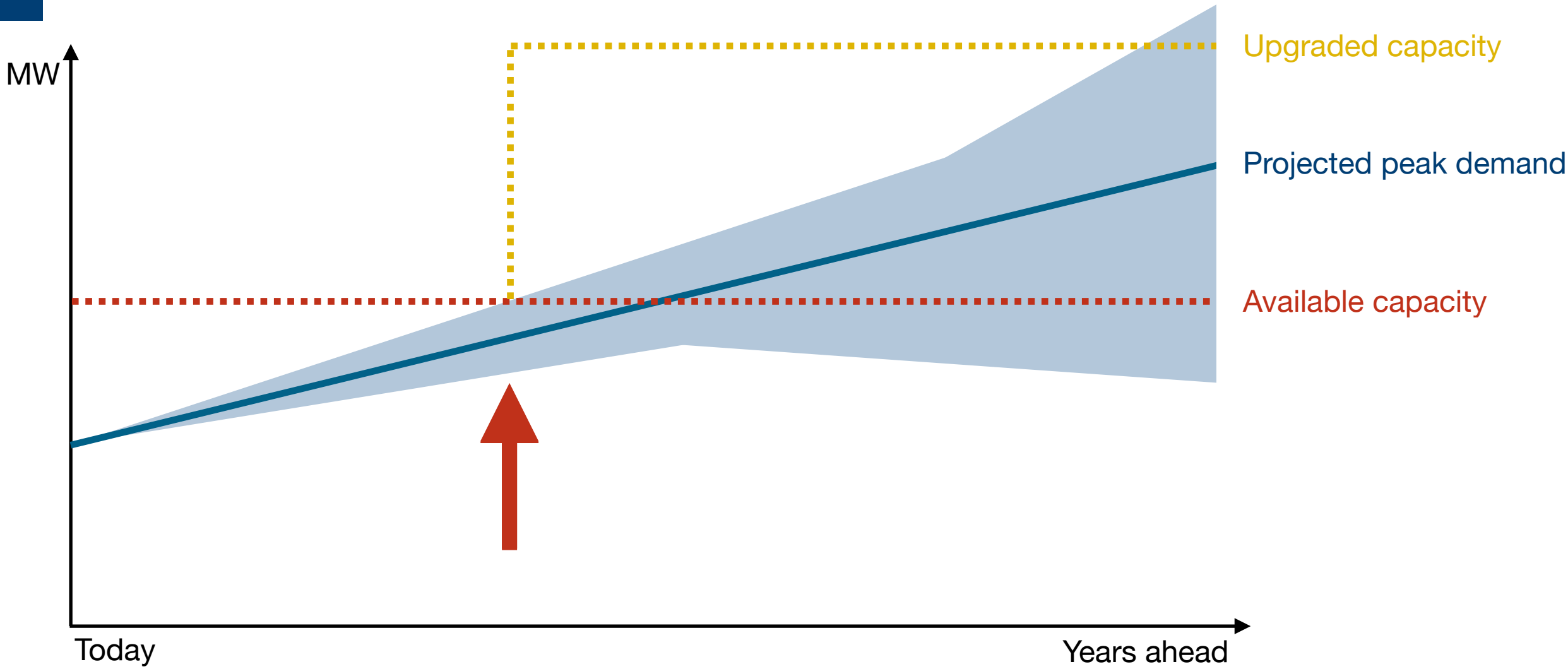
The effect of uncertainty



If demand happens to track towards the low end of the forecast, then the DSO will have built the augmentation a few years before it was actually needed.

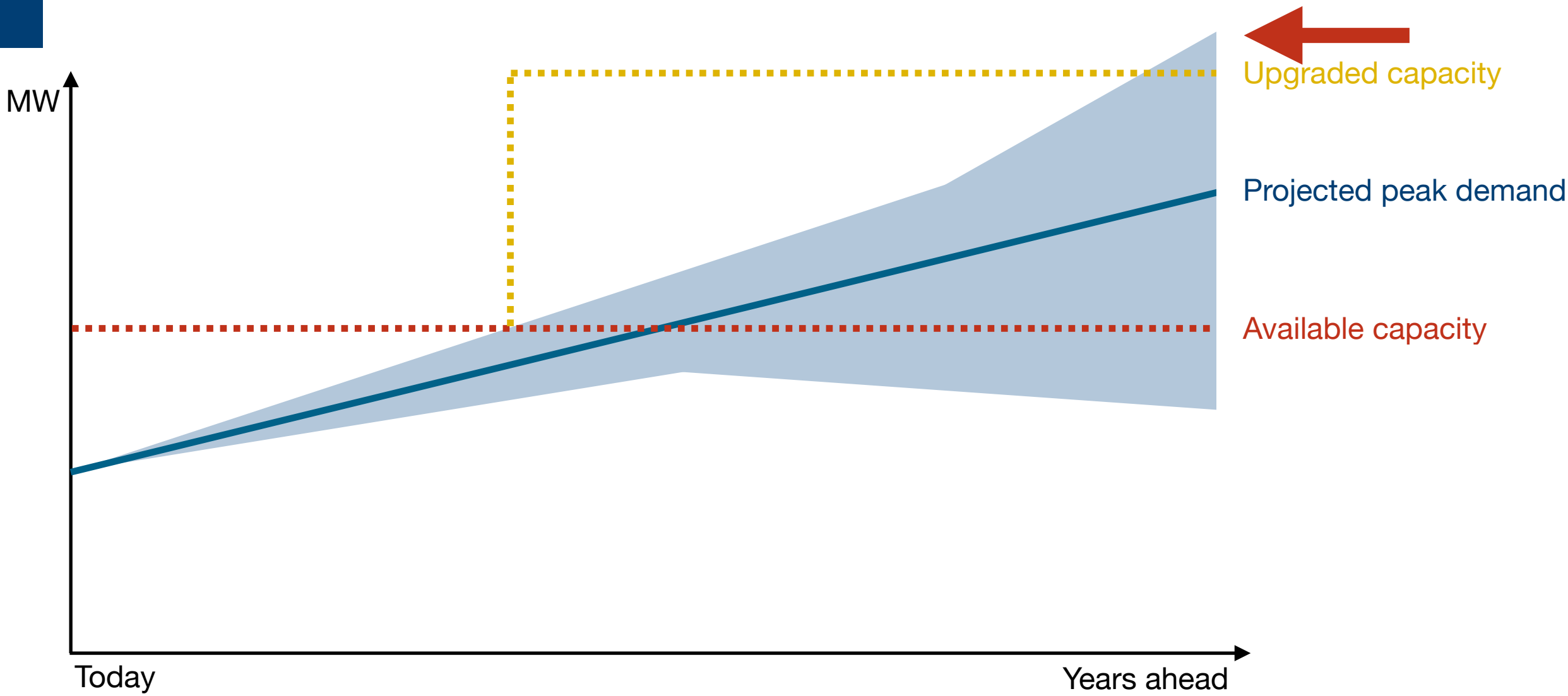
Historically, this hasn't been too much of a concern as it's been inevitable that the extra capacity would be needed eventually.

The effect of greater uncertainty



If the forecast is still more uncertain, the augmentation has to happen sooner still.

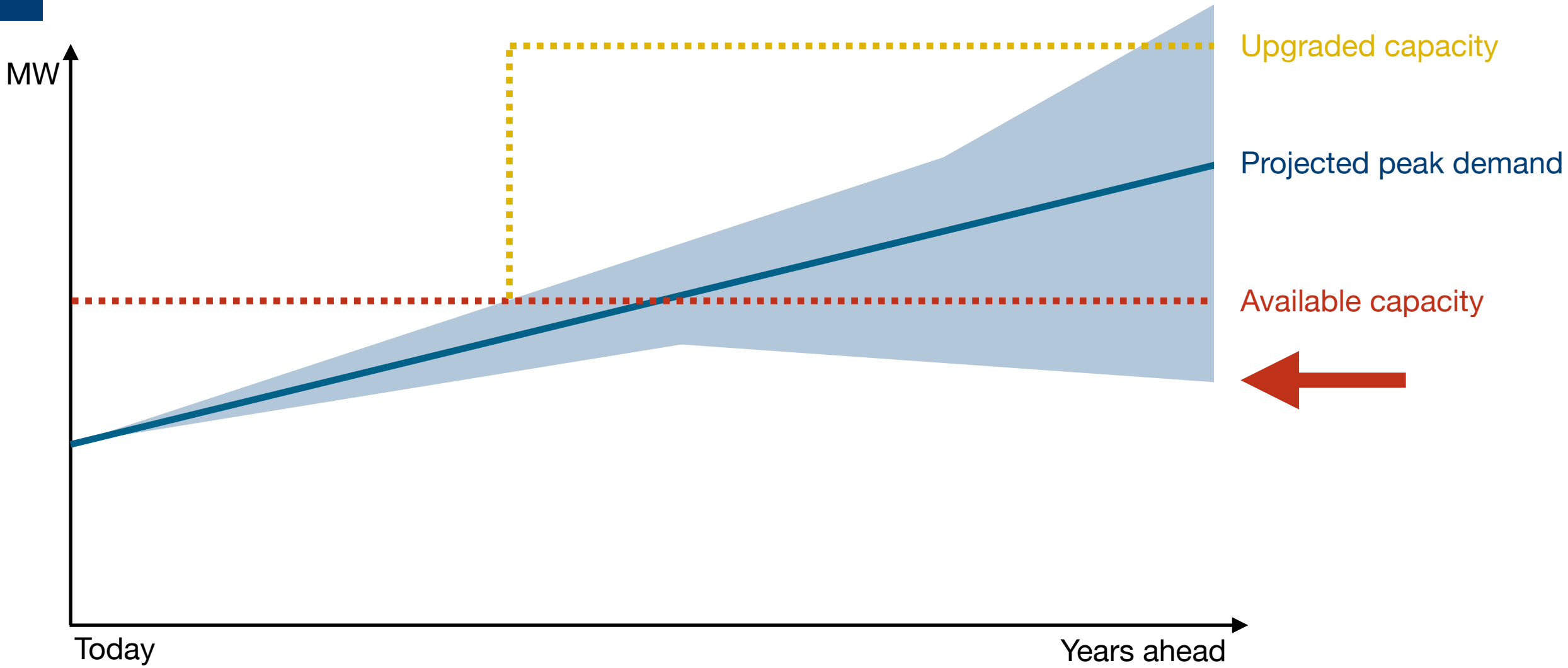
The effect of greater uncertainty



If the high range of the forecast turns out to be accurate, then the DSO will need to upgrade again soon.

If they had known this was likely, it may have been cheaper to do a single upgrade of a greater size.

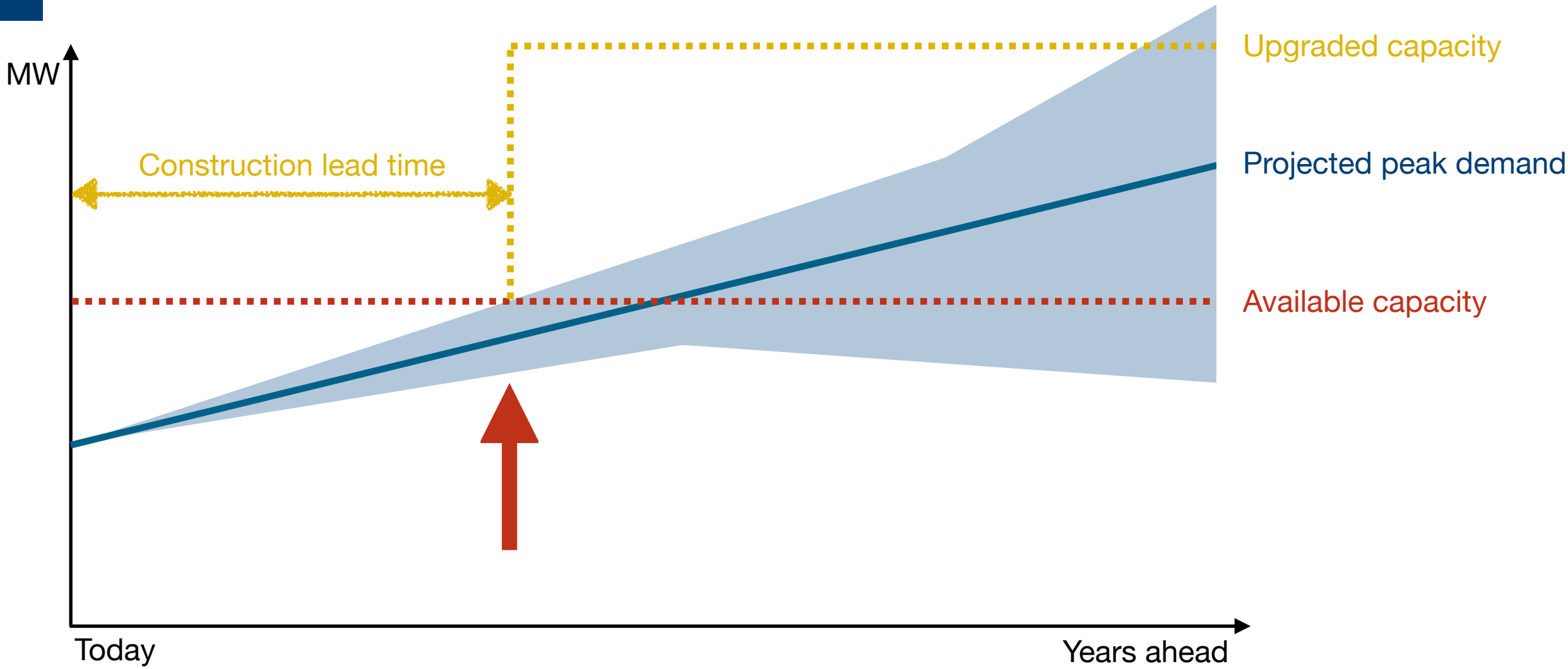
The effect of greater uncertainty



If demand happens to track the low end of the forecast, then there was no need to upgrade at all.

The DSO is then in the awkward position of trying to persuade the regulator to let them recover from consumers the cost of an asset they never needed.

The effect of greater uncertainty



The DSO is forced to make an investment decision today, on the basis of a very uncertain forecast, due to the construction lead time. If they don't start building something now, they can't be sure that they'll be able to cope if the demand happens to follow the upper bound on the forecasts.

Why is uncertainty increasing?

Demand has been falling due to:

- More efficient lighting
- Insulation initiatives
- More efficient appliances
- Distributed renewables

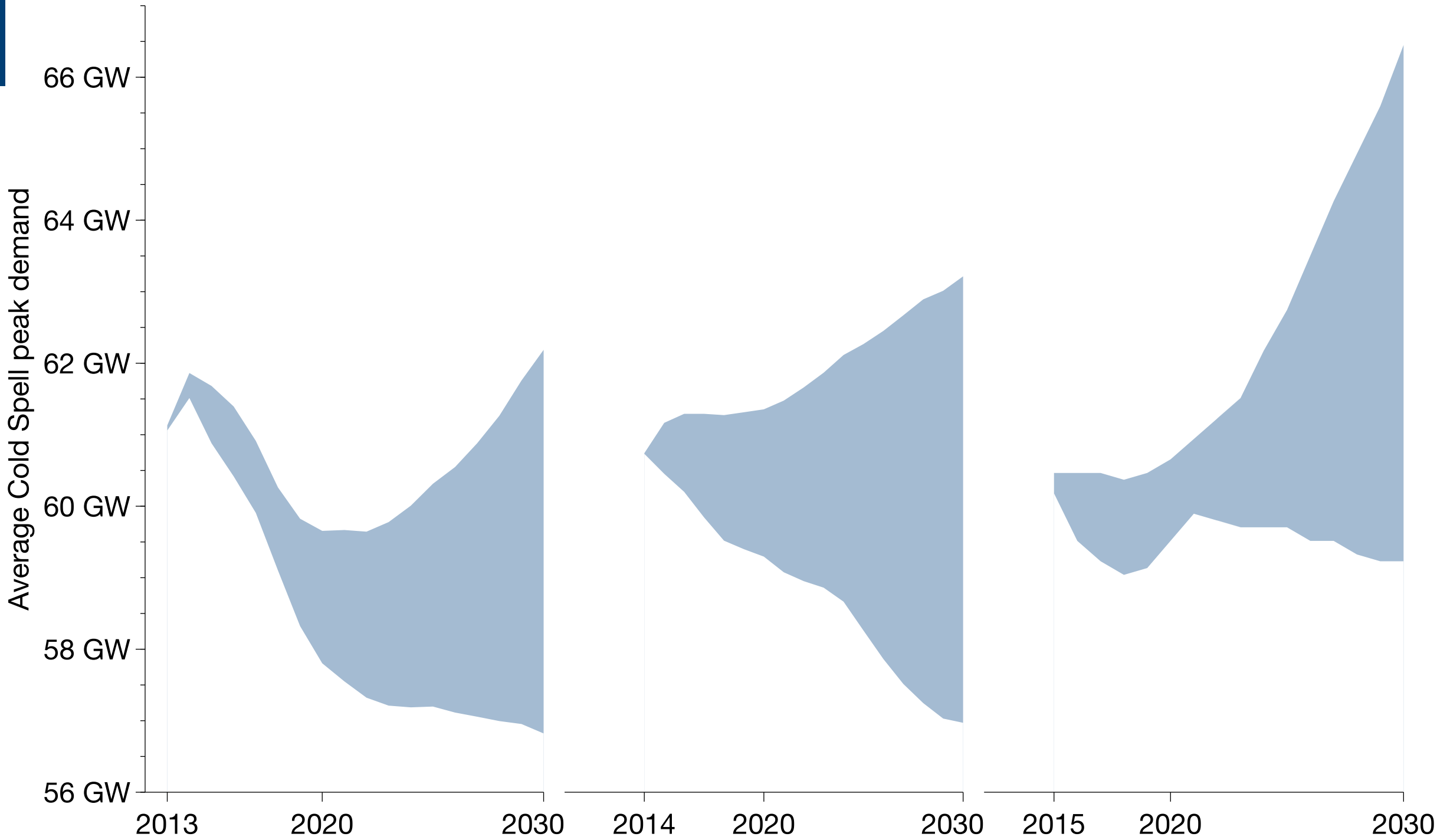
Some of these factors are driven by technological progress, and some by government policy. Neither can be predicted with much certainty.

But demand might increase due to:

- Electrification of heating
- Electric vehicles

… and storage could change things either way

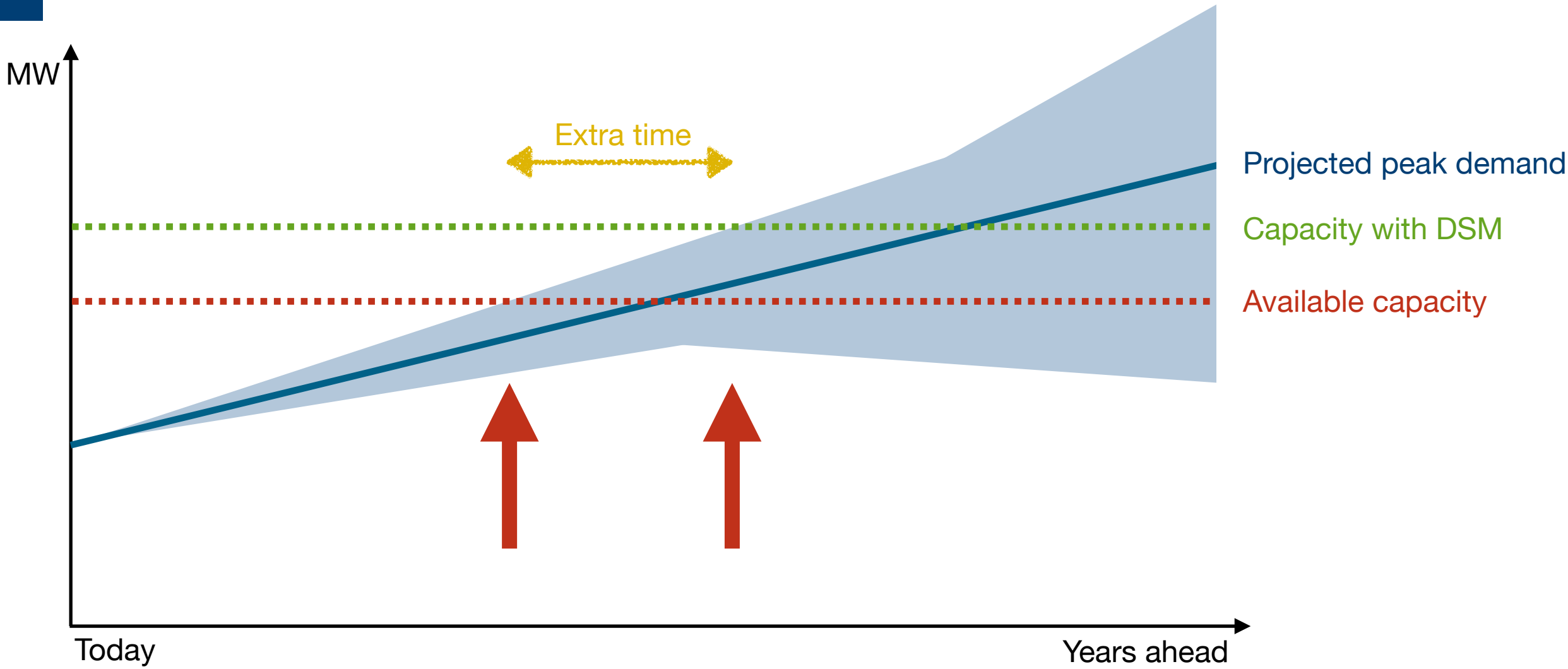
Forecast ranges from GB Future Energy Scenarios



The 2013, 2014, and 2015 versions of the forecasts of GB demand out to 2030 are strikingly different. It's not that they're bad forecasts. It's because there's a great deal of irreducible uncertainty, and new information each year leads to quite a different view of the future. This makes it even more important to avoid making any irrevocable investment decisions earlier than absolutely necessary.

National Grid, *Future Energy Scenarios 2013-2015*, showing lowest and highest forecast ACS peak demand across all scenarios.

Peak demand management can reduce risks

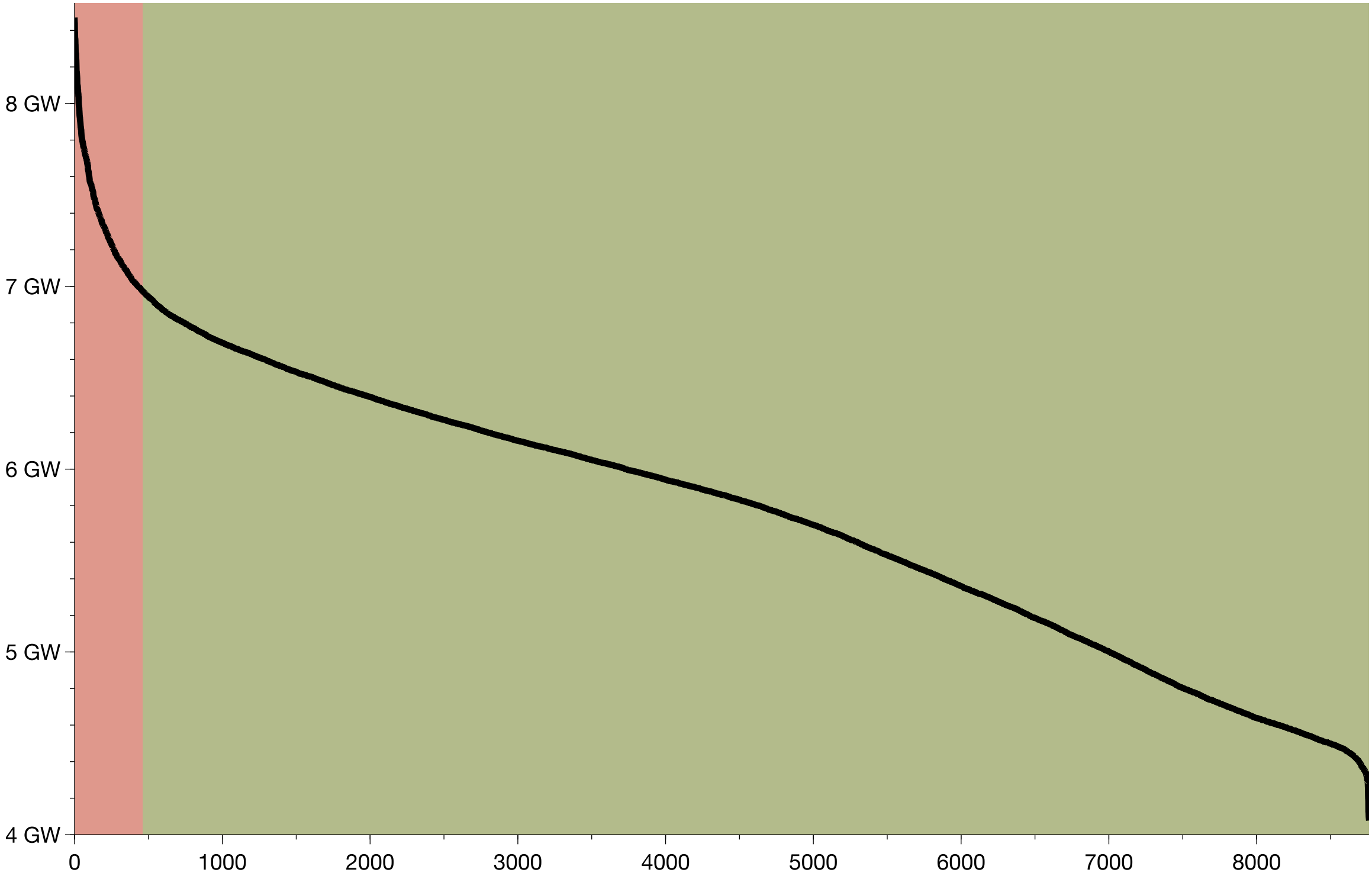


Using some form of DR to cope in case demand turns out to follow the high end of the forecast range allows the DSO to delay committing to constructing the augmentation. This means: (1) They can make a better decision about what and when to build in the light of newer information and more up-to-date forecasts; and (2) Even if they end up building the same thing as they originally thought they would have to, they're doing it a few years later, and so the time value of money may well pay for the DR programme.

How to manage peak demand?

When does the DSO need to manage demand?

Only the few hours which place the highest demand on the constrained asset actually affect the investment decision. An efficient intervention is one that targets that area, without unnecessarily making customers incur costs or inconvenience at times when there is no need to change their behaviour.



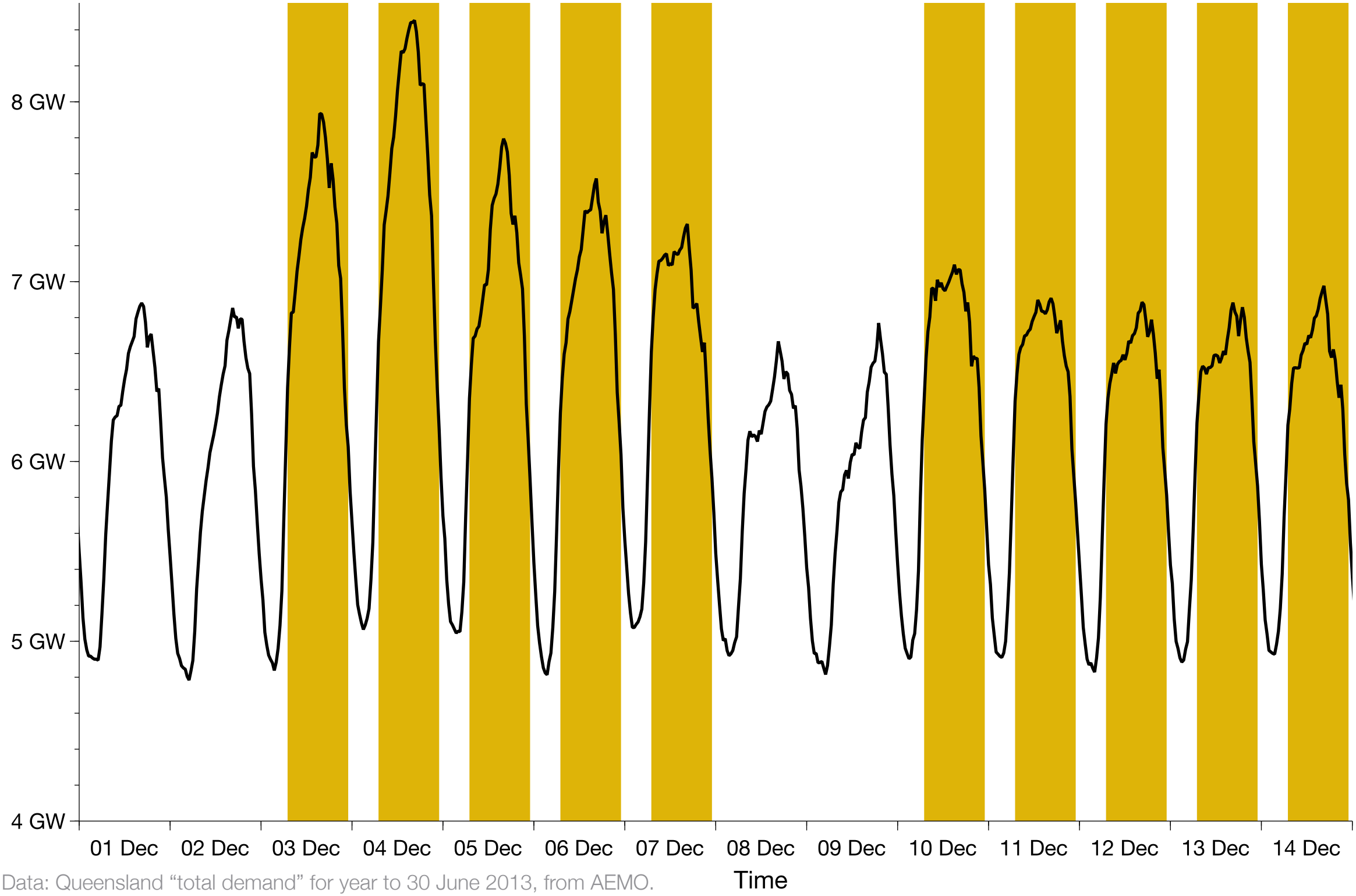
Data: Queensland “total demand” for year to 30 June 2013, from AEMO.

Are distribution tariffs a useful tool for this?

When do time-of-use tariffs apply?

Peak of a 2 part tariff

The shaded areas show the times that the peak component of a peak/off-peak tariff applies in South East Queensland.



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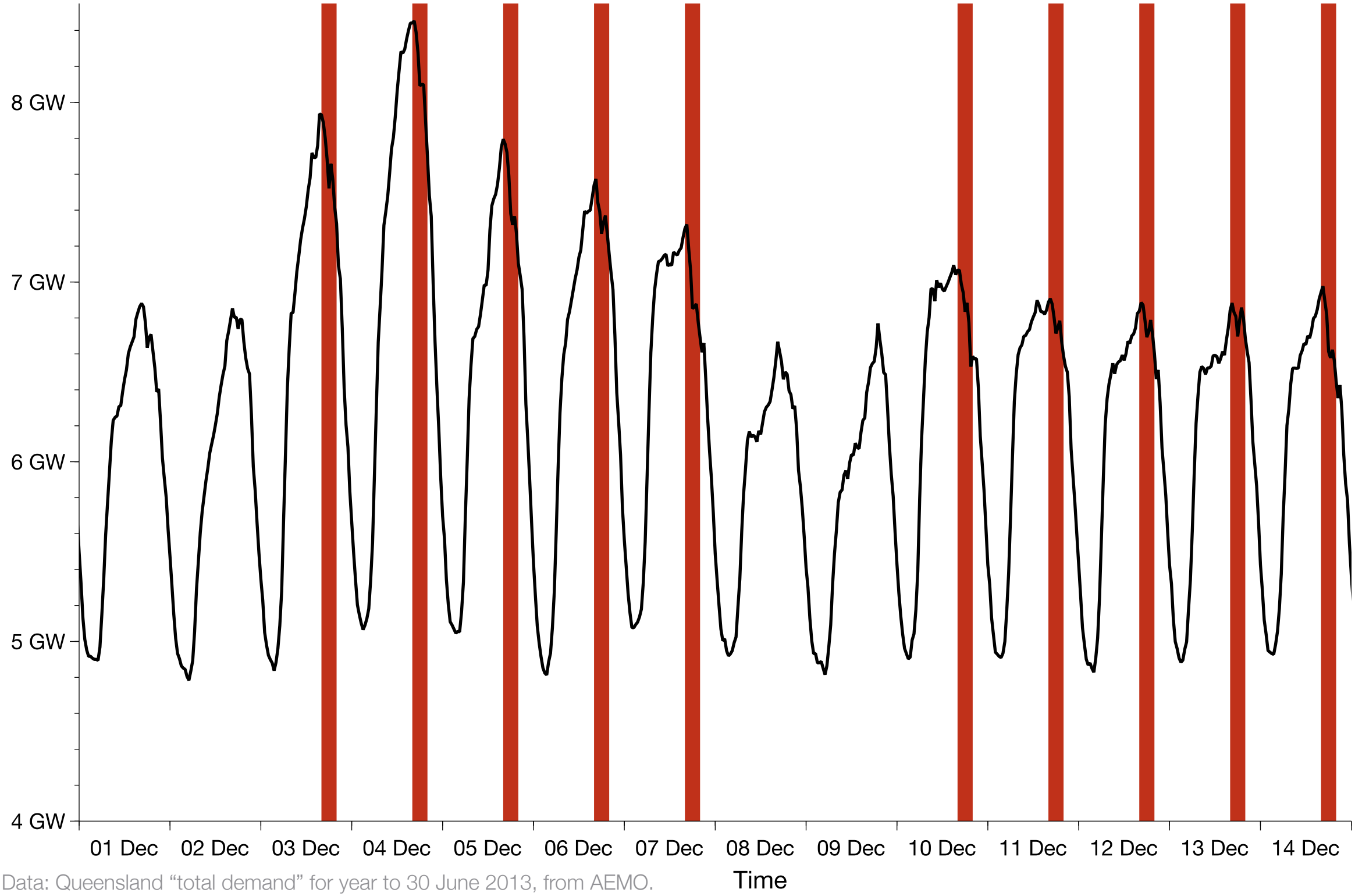
When do time-of-use tariffs apply?

Peak of a 3 part tariff

The shaded areas show the times that the peak component of a peak/shoulder/off-peak tariff applies in South East Queensland.



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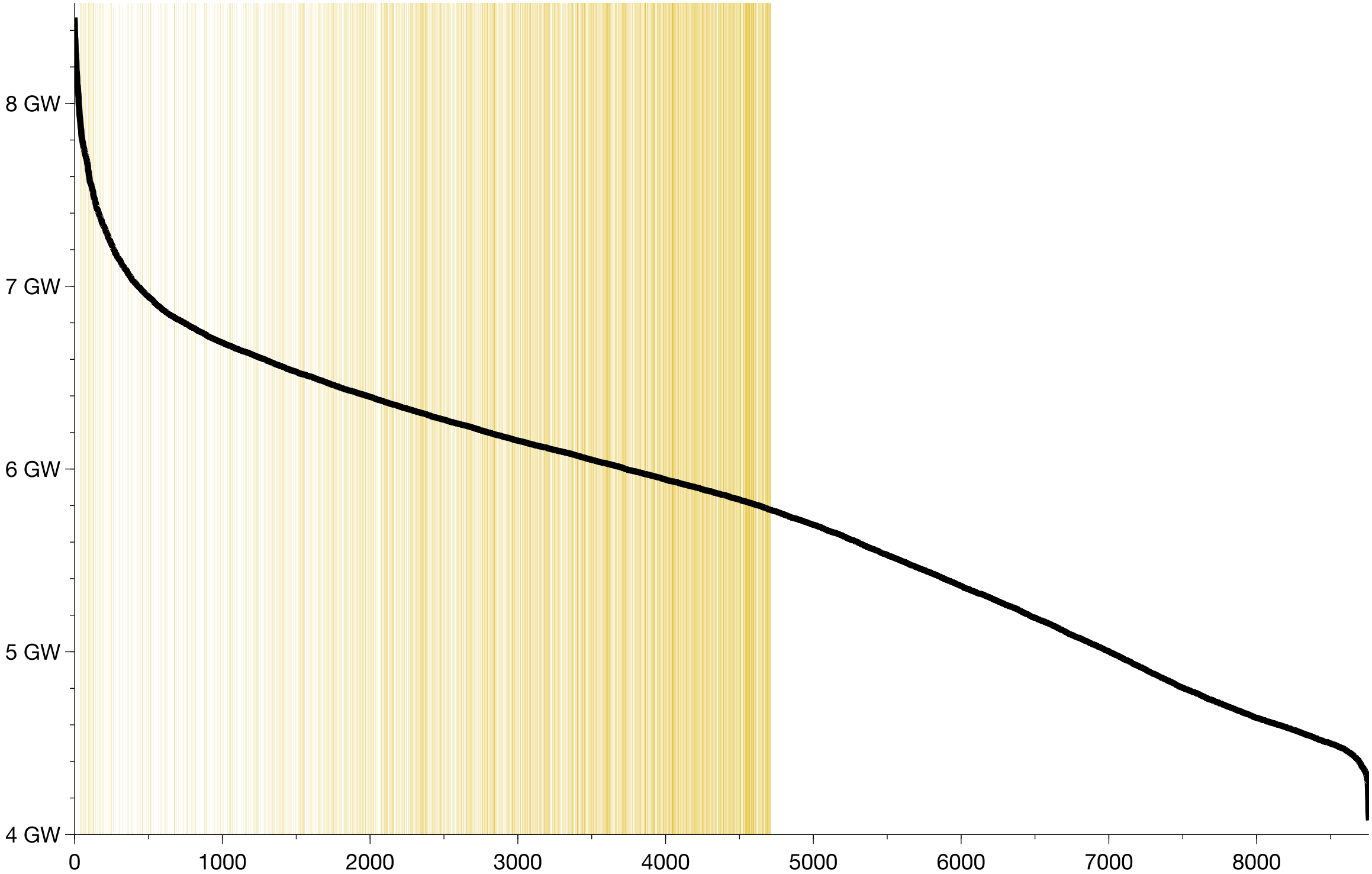
When do time-of-use tariffs apply?

Peak of a 2 part tariff

We have shaded the parts of the load-duration curve for which the peak charge applies. It does apply during the extreme peak periods that matter. But it also applies in the 5,000th-highest hour. It is not well targeted.



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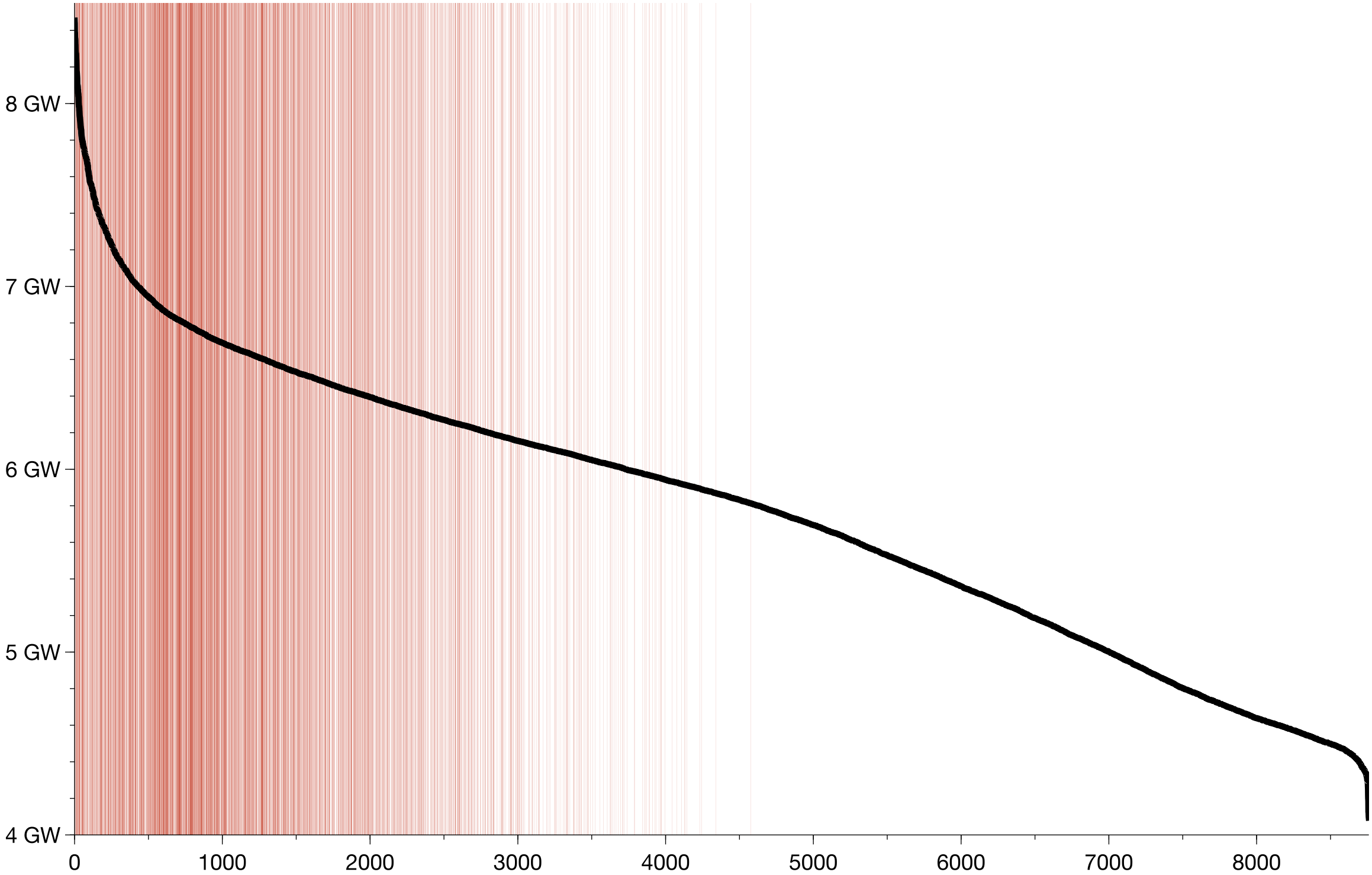
When do time-of-use tariffs apply?

Peak of a 3 part tariff

The 3-part tariff is better in that it doesn't apply so far down the curve. But it is still a bit of a blunt instrument.



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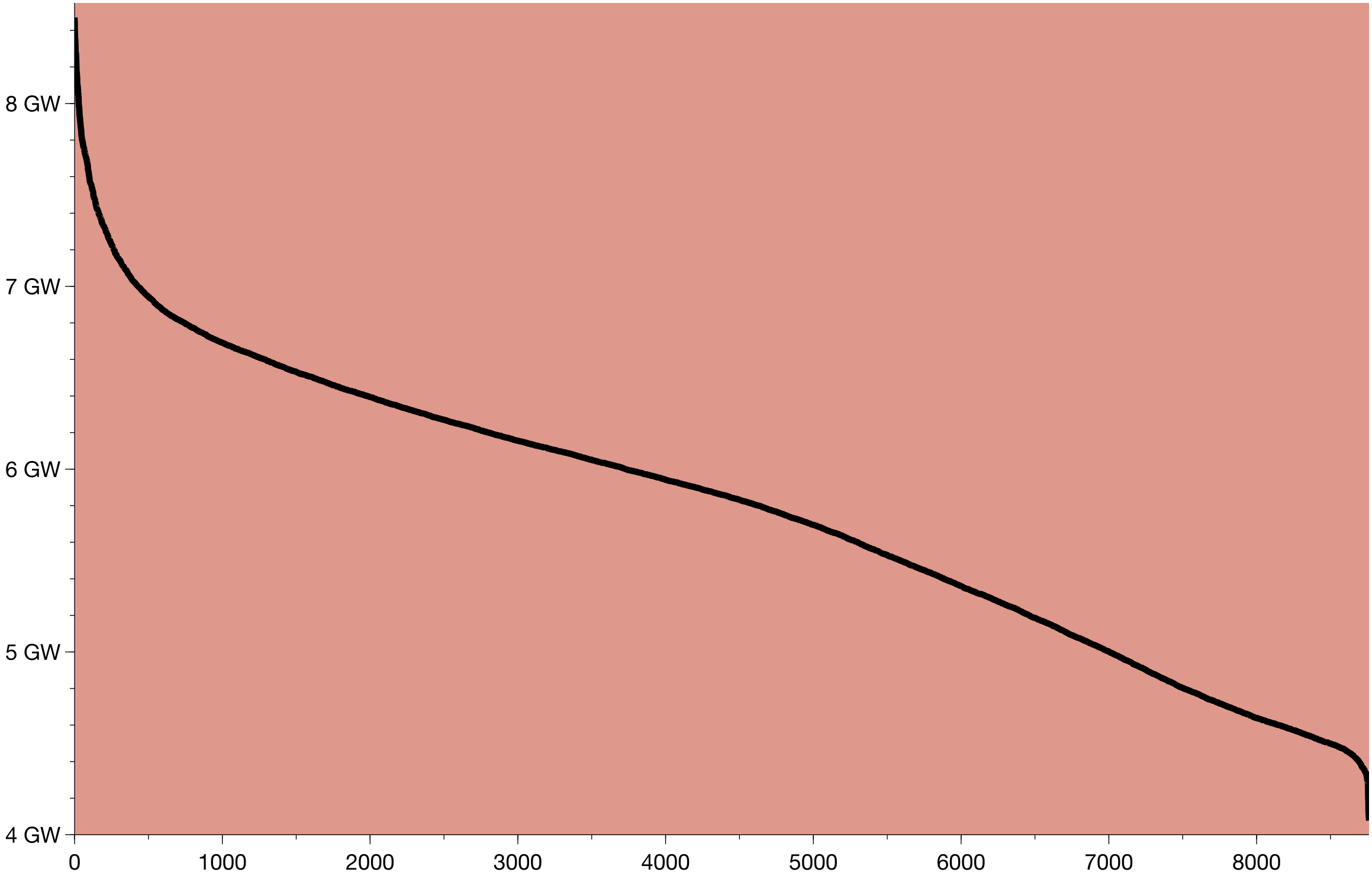
When do maximum demand charges apply?

Maximum demand charges are popular with DSOs. However, they're also not well targeted: they incentivise a customer to avoid exceeding their previous maximum demand, even at times when the network is under no stress at all.



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Comparison of peak demand management tools

Predictability in important: the DSO's planning people have to have enough confidence that the scheme will deliver the required number of MW when needed that they're willing to forgo building the upgrade, such that they'll be relying on response.

	Targeted?	Attractive to customers?	Provides predictable capacity?
Time-of-use	✗	✗	✗
Maximum demand	✗	✗	✗
Critical peak	✓	✗	✗
Peak-time rebate	✓	✓	✗
Explicit DR	✓	✓	✓

What's required for DSOs to do this?

- DSOs have to want to do it
- Customers have to want to do it

Why might a DSO not want to use this approach?

- If they have to comply with a deterministic planning standard
- If they are rewarded for the size of their asset base
- If they are heavily incentivised to minimise operating expenditure
- If they have a cultural bias towards building things

What will make customers want to take part?

- Money
- Realistic requirements
- Being able to combine with participation in other programmes
- Being approached by independent aggregators

Use of demand-side flexibility by DSOs

- Provides option value
- Reduces the risk of stranded assets
- Often saves money, even if the same assets end up being built
- May require removal of regulatory impediments

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