

Data Centre Supply Chain Orchestration

Key Performance Indicators

—6 weeks

average energisation slip per site against the plan

+14%

megawatts energised on the planned date across the programme

0

sites released to energise before their power chain is complete

—3 months

equipment waiting in storage before installation

4 weeks

earlier warning of a supplier slip than the delivery notice



12 sites

in the modelled programme, each with its own power chain, grid date, order book and storage, solved as one allocation



100+

lead time and readiness scenarios behind every allocation, so each energisation date carries a measured spread



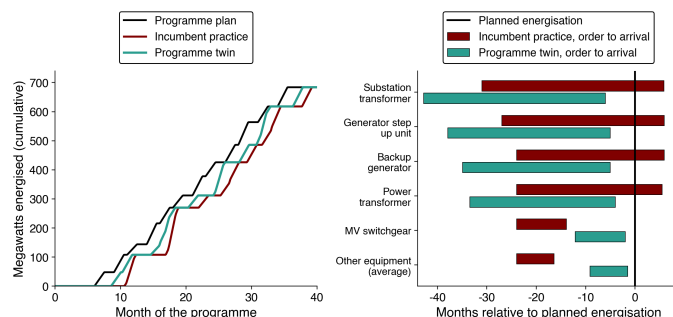
Offline

retrospective and offline, run beside a copy of the programme records with no live connection to planning or site systems

A data centre programme is a race between equipment lead times and revenue that only starts at energisation. The long lead items in the power chain, the transformers, switchgear, generators and their step up units, now take longer to arrive than the site takes to build. Developers respond by ordering years ahead and holding equipment in storage, and still miss energisation dates, because a slip at one factory reaches several sites at once and no site can energise until every element of its power chain is on site and commissioned. The order book, not the construction plan, sets the date.

EntroMetrix builds a programme twin of the equipment supply chain. Every site's power and cooling chain is a set of dependent deliveries, each with a lead time distribution learned from the programme's own order history and supplier notices, and an energisation date is feasible only when every element of the chain has arrived and been commissioned, a completeness rule enforced by construction. Above the twin a scenario based optimiser allocates scarce order slots, storage and crews across the portfolio to put the most megawatts on plan for the least early holding, re solved monthly as notices arrive. A risk layer scores every open order's chance of slipping, weeks before the supplier says so, from that supplier's own delivery record.

The programme and the order book



On the left, cumulative megawatts energised across a twelve site programme over three years: the plan, the incumbent lookahead practice, and the twin's allocation, which lands closer to plan by moving slots and stock as slips appear. On the right, one site's order book: under the incumbent practice every item is ordered about two years ahead, so the transformers and generators arrive after the planned date while the switchgear waits over a year in storage; the twin orders each item against its learned lead time and a risk buffer, so everything arrives shortly before it is needed.

What the Model Does

- **Programme twin:** every site's transformers, switchgear, generators, UPS and cooling as dependent deliveries with learned lead time distributions.
- **Completeness by construction:** no site is released to energise before every element of its power chain is on site and commissioned.
- **Slot allocation:** scarce order slots, storage and crews are assigned across sites to maximise megawatts energised on plan.
- **Early holding cost:** months of equipment in storage is a cost in the objective, not a free hedge.
- **Rolling replan:** the allocation is re solved monthly as supplier notices, grid dates and site readiness change.
- **Honest benchmark:** scored against the incumbent lookahead practice and a perfect information bound over at least a hundred lead time scenarios.

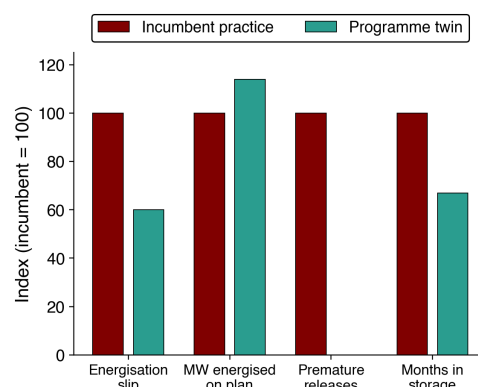


Figure 1. Four of the five levers indexed against the incumbent practice at 100: average energisation slip, megawatts energised on the planned date, sites released before their power chain is complete, and months of equipment in storage. Premature releases fall to zero because the twin enforces completeness; the four week earlier warning of a supplier slip is a time and is stated in the strip above.

The twin is built from records the programme already holds. Purchase orders, acknowledgements, supplier delivery notices and goods receipts for every long lead item, the storage log, site readiness and grid energisation dates, and the commissioning record of each hall are enough to learn each supplier's lead time behaviour and to reproduce how every site's energisation date moved under the plans actually run. Two years of history covers a full ordering cycle for the longest lead items; framework agreements, storage capacity and crew limits are set with the procurement and construction teams before any allocation is proposed.

Ordering earlier and storing centrally is already worth months on a programme, and developers do both. What practice cannot do is decide which site should take the next slot when a factory slips, because that answer depends on every other site's grid date, readiness, stock and crews at the same time, and it changes every month. That is the decision the twin makes, and it is where the gains here come from. A month lost at the end of a programme is a month of revenue lost on plant that is already built and paid for, which is why the objective prices a late megawatt against early holding rather than treating storage as a free hedge.

The KPIs here are modelled and deliberately conservative: about six weeks less average energisation slip per site, 14 percent more megawatts energised on the planned date, no site released before its power chain is complete, about three months less equipment waiting in storage, and a supplier slip flagged about four weeks before the delivery notice arrives. They sit inside what better ordering and storage practice is already worth on a programme of this size, and they address the equipment half of the problem; where grid power availability sets the date, the twin schedules to the grid date rather than claiming it back. The study is retrospective and offline, replayed against the programme's own two years of orders, deliveries and energisation dates before any allocation reaches a desk.

What the Model Does (cont.)

- **Lead time learning:** each supplier's delivery record gives a distribution, not a promise, and it updates with every notice.
- **Supplier slip warning:** the probability of a slip is scored weekly for every open order from the supplier's own record.
- **Perfect information bound:** an oracle that knows every lead time in advance sets the ceiling on megawatts on plan.
- **Scenario scoring:** every allocation is scored across at least a hundred lead time and readiness paths, not one.
- **Grid dates as inputs:** utility energisation dates are hard inputs the allocation works around, never assumed away.
- **Data need:** two years of orders, notices, receipts and commissioning dates for the long lead items.

What the Model Is Designed to Deliver

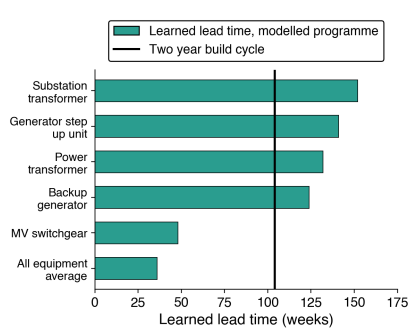


Figure 2. Lead times the twin learns for each long lead item in the modelled programme, against a two year build cycle. Transformers and generators arrive later than the site is built, so the twin orders them against their learned lead time and a risk buffer.

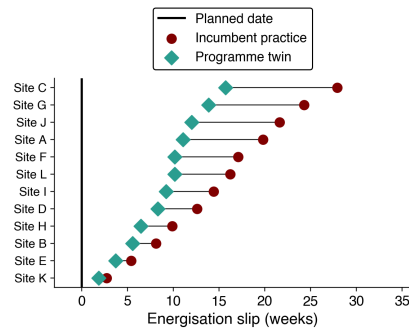


Figure 3. Energisation slip against the planned date for twelve sites in a modelled programme. Under the incumbent practice sites slip by about fifteen weeks on average; under the twin's allocation by about nine, six weeks less, with the largest slips cut most.

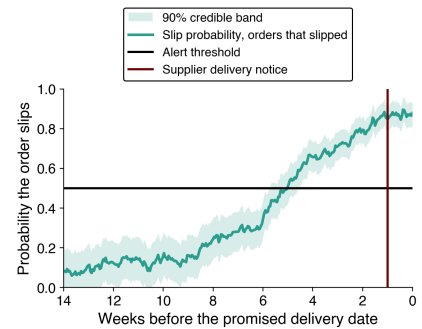


Figure 4. Probability that an open order will slip, scored from the supplier's own delivery record against weeks before the promised date. The score crosses the alert threshold about five weeks before delivery, four weeks before the supplier's own notice typically arrives.

Megawatts on Time, Capital Not Idle

Designed for data centre developers, operators and their contractors

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