Replacing the Pool in the UK: Justification for and Effects of the New Electricity Trading Arrangements

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Agenda

The Birth, Logic and Life of the UK Pool

The New Electricity Trading Arrangements

NETA: Effects, Status and Current Views

Implications of NETA for Colombia
The Birth, Logic and Life of the UK Pool
The 1980s: Electricity Reform in the UK

In the mid-1980s, Margaret Thatcher decided that:

- The State should get out of the economy
- The broad public should become share-owning capitalists
- The power of the coal miners’ union (strikes had crippled the nation in the mid-1980s) should be reduced

Problems with the electricity monopolies were minor, e.g.:

- The Central Electricity Generating Board (CEGB) planned a massive building program of questionable value
- The Area Boards (ABs) were bureaucratic, overstaffed, etc.
- But prices, efficiency and debts were reasonable

*Reform was driven by politics, even ideology, not by pressing problems or the commercial interests of prospective market players*
The Objectives and Process

The initial objective was privatization, not competition

- But the privatized gas and telecoms monopolies were behaving badly, so competition was promised in electricity
- Initially, only large consumers were to be competitive, but small consumers were added later for political reasons

The Government put the Energy Minister in charge

- He hired independent (but not very expert) consultants to manage the process through a committee structure
- The CEGB, ABs, large consumers, etc., hired their own “experts”
- Working groups met to define contracts, regulation, etc.

Even the “experts” did not know how or if a competitive electricity industry was possible
The Initial Industry Structure

The CEGB was restructured into companies that would be privatized through share sales

- Initially, generating assets were split between only two GenCos, so that one would be large enough to carry the nuclear plants
- When bankers decided the nukes could not be sold, a separate, State-owned nuclear GenCo was created to be sold later
- A TransCo was created to own the grid and manage operations

The twelve ABs were restructured into twelve Regional Electricity Companies (RECs)

- The number of RECs was debated, with no clear conclusion
- For simplicity, each AB became a single REC

*There was too little competition in generation, but otherwise this structure was sensible*
The Proposed Contract Arrangements

The initial plan was to sell CEGB assets for prices high enough to cover the £20 billion in CEGB debt

- The RECs would contract to buy GenCo output for high prices
- RECs would recover their high costs from captive consumers
- This strategy became untenable when it was decided that small consumers could switch suppliers

To avoid the risk of bankrupting the ABs and/or CEGB:

- The Government wrote off much of the “stranded” CEGB debt so that prices in the GenCo/AB contracts could be lower
- Competition for small consumers was delayed for some years to give time to recover the residual stranded costs (coal contracts)

*A little analysis allowed the UK to foresee/avoid the problems that destroyed California 10 years later*
The Proposed Operating Arrangements

It was initially assumed that each REC would call “its” contracted plants to meet its own load

- But a REC’s contract rights would often not match its load and a GenCo’s called output would often not match its plant
- So both RECs and GenCos proposed to pool their resources

RECs would pool their contracts in a “D-Pool” and

- Dispatch D-Pool contracts to meet total REC load at least cost
- Somehow “share the savings” from pooling

GenCos would pool their plants in a “G-Pool” and

- Dispatch total plant to meet total REC contracts at least cost
- Somehow “share the savings” from pooling

Thus, the first attempt at a “bilateral” market was quickly forced by reality into a (two!) pool system
The Two-Pool System in Theory

In principle – i.e., ignoring the complexities of reality – the two-pool system was not illogical

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**Diagram:**

- **Forward Contracting**
  - Contract Data
  - D-Pool
  - GenCo Data
- **D-Pool**
  - REC $Q_{actuals}$
  - Contract Data
  - $Q_{cont}$
  - $Q_{actuals} - Q_{cont}$
  - D-Pool Payments
  - Among RECs
  - ?Split Savings?
- **Contract Settlements**
  - Contract Payments
  - REC to GenCos
  - $Q_{cont} \times P_{cont}$
  - G-Pool Payments
  - Among GenCos
  - ?Split Savings?
- **G-Pool**
  - GenCo $Q_{actuals}$
  - Physical Ops
The Two-Pool System in Reality

In reality, a two-pool system was a technical nightmare

- Standard contracts would have to specify many technical characteristics of generators, creating inflexibility and risks
- Load forecast errors, transmission constraints, and more would require multiple iterations between the G-Pool and D-Pool
- The split-savings calculations would not be based on market prices and hence would be arbitrary and contentious

The technical problems were compounded by others

- Arbitrage between the Pools created commercial risks
- The Pools were nominally “private” but could not be exclusive

*Months and over £10 million were wasted, and the Energy Minister lost his job, before the two-pool system was abandoned*
The “Unified Pool” Solution

Eventually, a simpler, single-pool system was adopted

\[ \text{Net Net Payments} \]
\[ \text{RECs to GenCos} \]
\[ Q_{\text{cont}} \times P_{\text{cont}} + P_{\text{pool}} \times (Q_{\text{actuals}} - Q_{\text{cont}}) \]

The UK’s NETA
November 29, 2001
Features of the (Unified) UK Pool

The Pool was not a substitute for contracts, but:

- A way to make contracts simpler, more flexible and more consistent with efficient system operations
- An easy, cheap and efficient alternative to a lot of short-term contract trading as a way to reconcile contracts with reality
- Allowed/expected/caused most energy to trade under contracts

The Pool allowed anybody to operate as they pleased

- Generators could (and did) “bid zero” to assure that they ran
- Contracts for differences (CfDs) could (and did) make the Pool price apply only to uncontracted Qs or “contract imbalances”

*If bidding zero and CfDs were unacceptable, some words and settlement mechanics could have been changed to create a “net-settlement” Pool*
“Bidding” vs. “Scheduling”

QM and PM are the same whether Q₀ is bid into the Pool at zero or is “scheduled” to run at any Pool price >0.

“Scheduling” Qₛ and offering to sell Q₁ in the BM if P < P₁ and to buy Q₂ if P > P₂ is just a hard way to define a supply curve.

Criticisms of the Pool were/are often based on meaningless distinctions between words and forms.
A “Net-Settlement” Version of the Pool

Contract Qs could easily have been “scheduled with” the Pool and netted out of Pool settlements

\[ \text{Net Net Payments to GenCos} = Q_{\text{cont}} \times P_{\text{cont}} + P_{\text{pool}} \times (Q_{\text{actuals}} - Q_{\text{cont}}) \]
More Features of the UK Pool

The Pool was no more “compulsory” than any workable system must be, given that any generator must:

• Abide by technical and information rules that apply to all
• Tell the system operator what it plans to do, whether or not it will voluntarily change those plans, and if so at what prices
• Pay (or be paid) prices reflecting the costs (or benefits) its operations create for the system and its other users

The Pool bidding/dispatch/pricing process was just a market-oriented way to accomplish all of this

*The Pool had some obvious, fixable problems; but its basic concepts were sound, worked well in practice, and have been used (in improved form) in every successful electricity market since*
Successes of the UK Pool

The Pool worked remarkably well, given its novelty

- There were never any reliability problems or significant inefficiencies in system operations
- Wholesale prices were stable and “reasonable,” despite – or perhaps because of -- the GenCo oligopoly
- GenCo “gaming” of the rules was transparent and quickly addressed more-or-less successfully
- There was plenty of investment in new generation right from the start, most of it by new, non-portfolio generators
- Most energy was traded under contract (CfDs), with the Pool used mostly for flexibility and imbalances

The few problems the Pool did have were relatively minor compared to problems encountered in other, later electricity markets elsewhere
Problems for the UK Pool

There were some real technical problems with the Pool, but these were largely ignored

- Day-ahead pricing with no real-time market
- Little demand response (a universal and difficult problem)
- Crude market-clearing/pricing/dispatch process
- No congestion pricing (not a big problem in the UK)

The politically important criticisms of the Pool were very different, and had four principal motivations

1. GenCos’ market power and resulting “too high” prices
2. Economic and political self-interest
3. Free-market theory and/or philosophy
4. Alleged technical flaws that supported the other criticisms
1. GenCos’ Market Power & High Prices

With only 3 GenCos (one with > 50%), market power was inevitable and surely increased prices

- But this had little/nothing to do with the Pool itself
- The Pool made entry easy, so the oligopoly eroded fast
- Pool prices fell as more competitors emerged

Critics said that the Pool increased market power

- The “compulsory” Pool prevented more competitive methods of trading
- The single-price Pool auction made it easier for GenCos to exercise market power
2. Economic and Political Self-Interest

Large consumers wanted the Pool to

- Restore the subsidized CEGB “interruptible” contracts
- Make (too) high payments for demand-side responses
- Allow “trading outside the Pool” (to shift system costs to others)

Marketers/arbitrageurs (e.g., Enron) wanted to:

- Eliminate the Pool’s automatic imbalance pricing/trading, to
- Force market participants to do more short-term trading

The Labour Party had political reasons to trash the Pool

- It was Margaret Thatcher’s idea and was widely seen as a success
- Alleged “flaws” in the Pool that favored gas over coal plants could be used to justify limits on new gas plants that saved miners’ jobs

Big consumers, market-makers and coal miners were a strong influence on the Labour Government
3. Free-Market Theory/Philosophy

Free-market economists in high places said:

- Electricity is not (much) more complex than other commodities
- Decentralized markets should and can make (almost) all operating decisions as well as investment decisions
- Electricity monopolies and the Pool existed only because of an engineering, central-planning mindset that was now obsolete

In this view, the Pool was not a real market; instead, it:

- Was “compulsory”, “centralized dispatch” that “dictated the terms on which the bulk of electricity output is traded” [SCL*]
- Competed unfairly with short-term, decentralized trading

* Quotes from Stephen Littlechild’s “Beesley Lecture,” 12 November 2001
4. Alleged Technical Flaws in the Pool

“Bidding zero” to self-dispatch was (allegedly) ineffective

• “Not everyone could do this” and it was not consistent with the “ideal of the Pool” or “normal competitive markets” [SCL]
• Contracts for differences (CfDs) were not good substitutes for “physical” contracts

The Pool (allegedly) favored gas plants over coal plants

• Gas plants could bid zero to assure that they ran
• Coal plants were not paid enough for their “greater flexibility”

The Pool’s uniform-price auction (allegedly)

• Made GenCo market power worse
• Should be replaced with “pay-as-bid” pricing

There was never much/any basis for such assertions, but they supported other positions
The New Electricity Trading Arrangements (NETA)
New Electricity Trading Arrangements

The Objective: Force forward contracts to match physical operations so that:

- Prices would be determined in decentralized (presumably pay-as-bid) markets rather in the centralized (single-price) Pool
- Gencos could/must self-dispatch specific plants to match specific contracted loads

The Method: Require market participants to:

- Report contract Qs to NGC 3-4 hours before operations
- Severally penalize any real-time deviations from contract Qs

The Problem: Contract Qs cannot accurately reflect

- Changes in conditions, which can be very large over 3-4 hours
- System complexities such as transmission constraints
NETA’s Balancing Mechanism (BM)

Because contracts cannot reflect system complexities or real-time effects, the System Controller (NGC) must:

- Modify physical operations from those implied by contract Qs
- Pay those who incur costs to help balance the system
- Recover balancing costs, ideally from those who cause them

An open, efficient spot market does this well, but:

- Gives market participants an easy, cheap way to buy and sell contract imbalances without a lot of short-term trading
- Was therefore unacceptable given NETA’s philosophy

So the NETA balancing mechanism deliberately:

- Is NOT an open, efficient market useful for commercial trading
- Penalizes real-time imbalances to force short-term trading
The Mechanics of NETA’s BM

The BM has the form of a market operated by NGC

- GenCos submit schedules and then may submit bids to produce more or less at various prices – i.e., they submit supply curves
- NGC accepts bids, *pays each bidder its bid price*, and allocates the resulting costs to those with imbalances

Each BM bidder must guess the market-clearing price

- Bid prices will not reflect costs, so dispatch will be inefficient
- Average prices may not be lower than a market-clearing price

The allocation of imbalance costs is designed to:

- Pay little/zero (or less) for energy provided to the system
- Charge high, punitive prices for energy taken from the system

*This is a real-time market, but a grossly inefficient one designed to force a lot of short-term trading*
The NETA/BM Process

NETA is just a net pool with inefficient real-time operations and grossly inefficient pricing

The UK’s NETA
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NETA and California

NETA is an even less efficient version of the inefficient ISO wholesale market that failed in California

CalISO’s real-time market was artificially constrained and deliberately inefficient, but not as badly as NETA’s
The Real Issue: Real-Time Ops/Pricing

All these systems are basically the same; one critical issue determines how and how well they work:

Does the RTM manage real-time operations and determine settlement prices efficiently, or is it deliberately inefficient to force short-term trading?

*The defining characteristic of NETA is its non-market BM and its high imbalance prices/penalties*
NETA: Effects, Status and Current Views
Effects of the BM’s Imbalance Penalties

Different BM buy/sell prices or imbalance penalties:

• Force a lot of costly, otherwise-unnecessary short-term trading
• Force specific units to run when it would be cheaper to shut down (e.g., a boiler tube breaks) and buy in the market
• Force specific loads to take more or less than they “need” in real time (e.g., because the weather changes) just to stay in balance
• Create strong incentives to integrate both horizontally and vertically to gain portfolio benefits
• Discriminate (for no good reason) against single-unit and unpredictable generators, i.e., cogenerators, wind farms, etc.
• Penalize (non-BM) loads and generators for managing loads and generation to help balance the system

*These problems were predictable, were predicted and are already apparent under NETA*
Current Status of NETA – 1

Prices have been falling for several years

- More structural competition among GenCos was reducing prices before NETA began operating and continues to do so
- NETA advocates say this proves NETA works to reduce prices

BM prices were initially volatile with wide spreads

- Low volume of BM bids and *ad hoc*, non-market BM pricing made BM prices more volatile than Pool prices ever were
- The spread between the BM buy and sell prices was large, with the buy price sometimes negative

BM pricing has “improved” and BM costs have fallen as:

- *Ad hoc* BM pricing rules have been changed (in *ad hoc* manner)
- Market participants have stayed more in balance, i.e., have incurred more balancing costs themselves in sub-optimal pools
Large consumers say (MEUC to OFGEM, July 3, 2001):

• “OFGEM … does not need reminding that one of the main corner stones of NETA was to encourage demand side participation. This has not occurred and is unlikely to, as matters stand at this time.”

• “Furthermore, the much-heralded changes to the electricity trading arrangements have not yet demonstrated any material benefits for consumers …”

Small generators say they cannot compete

• Small portfolio and uncontrollable output result in large BM penalties and make it hard/impossible to compete

• OFGEM responded to Gov’t enquiry by conceding the problem, but saying (in effect) “wait and see”
Current Status of NETA – 3

Congestion pricing is an unsolved (if not large) problem

- OFGEM is considering illogical/unworkable interzonal “physical” transmission rights in order to maintain NETA’s decentralized trading philosophy
- The only logical and workable/working solution is an integrated energy/transmission market operated by NGC, which is inconsistent with NETA’s basic philosophy
- Luckily for NETA, congestion is not a major problem in the UK

NGC’s role in the market is increasing all the time

- With no real-time market to manage physical operations, NGC must take many contracting and other actions outside the market
- Unless/Until NETA’s philosophy changes, NGC’s monopoly role and influence will continue to grow
Stephen Littlechild on NETA

The leading Pool critic and NETA advocate now says:

• “A reduction in the spread of cash-out prices should be welcomed, together with … a single cash-out price” under some conditions.

• Such changes “should justifiably relieve the situation of generators in general, and of renewable generators in particular”

• “Greater use of the balancing mechanism … is not undesirable given that the market seems now to have changed irrevocably …and will enable an increasingly efficient allocation of trades as between the bilateral markets and forwards exchanges on the one hand and the balancing mechanism on the other.”

• Pool-based markets worldwide (including the UK Pool “to a significant extent”) have high levels of bilateral contracting

If NETA’s imbalance penalties are causing problems, were not needed to get bilateral contracting and should now be reduced, what has NETA achieved?
Implications of NETA for Colombia
Colombia’s Electricity Market

Colombia’s market is modeled closely on the UK Pool

- The basic concept of a central pool and spot market is valid now just as it was when the market was designed/implemented
- But the UK Pool was the first such market and was crude compared to later markets, e.g., in congestion pricing
- In addition, conditions are much different in Colombia than they are in the UK, particularly the nature of the transmission grid

Details of Colombia’s pool-based market should be reexamined and perhaps changed

- Advances in market design theory and information technology should be considered and probably incorporated
- Most importantly, the system-wide “unconstrained” Pool prices that “work” in the UK should almost surely be replaced with locational pricing in Colombia
But If the UK Scrapped Their Pool .?..?

The UK’s replacement of the Pool with NETA

• Was an unnecessary, costly, ideologically-driven action that has done nothing worthwhile even in the UK that could not and should not have been done in other, less costly ways

• Is likely to be effectively reversed by reductions/elimination of the imbalance penalties that are NETA’s defining characteristic

Colombia has no reason to consider anything like NETA

• Pool-based markets are working well worldwide

• Even NETA is a form of pool, just an inefficient one

• Any problems in the Colombian market can be fixed within the context of a pool-based market

**NETA is irrelevant for Colombia (or anywhere else) except as a nuisance that must be addressed**