

Gas Markets Reform: A Global Perspective

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My Focus and Approach Today

- Gas markets** are our focus today, but it is useful to consider gas as a ‘network commodity’ like electricity
- The differences are historical/operational, not fundamental
 - Lessons from one can be useful for the other

The **long run** is our ultimate concern, but the problem of managing and pricing **short run** network operations:

- Has been/is the biggest obstacle to efficient competition
- Must be solved to assure rational capacity expansion

Thus, I will discuss today the history and logic of short-run operations in both gas and electricity markets, and some implications for “Optimising the Contribution of Gas to New Zealand”

Competitive Gas Markets and Contract Carriage

Competitive Electricity Markets and Network Markets

Applying Network Market Concepts to Gas

Some Implications for New Zealand

The Evolution of Gas Markets

The modern gas industry began in the US, with:

- Long pipelines financed with long-term gas sales contracts
- Some competition **among** , but not **on**, pipelines

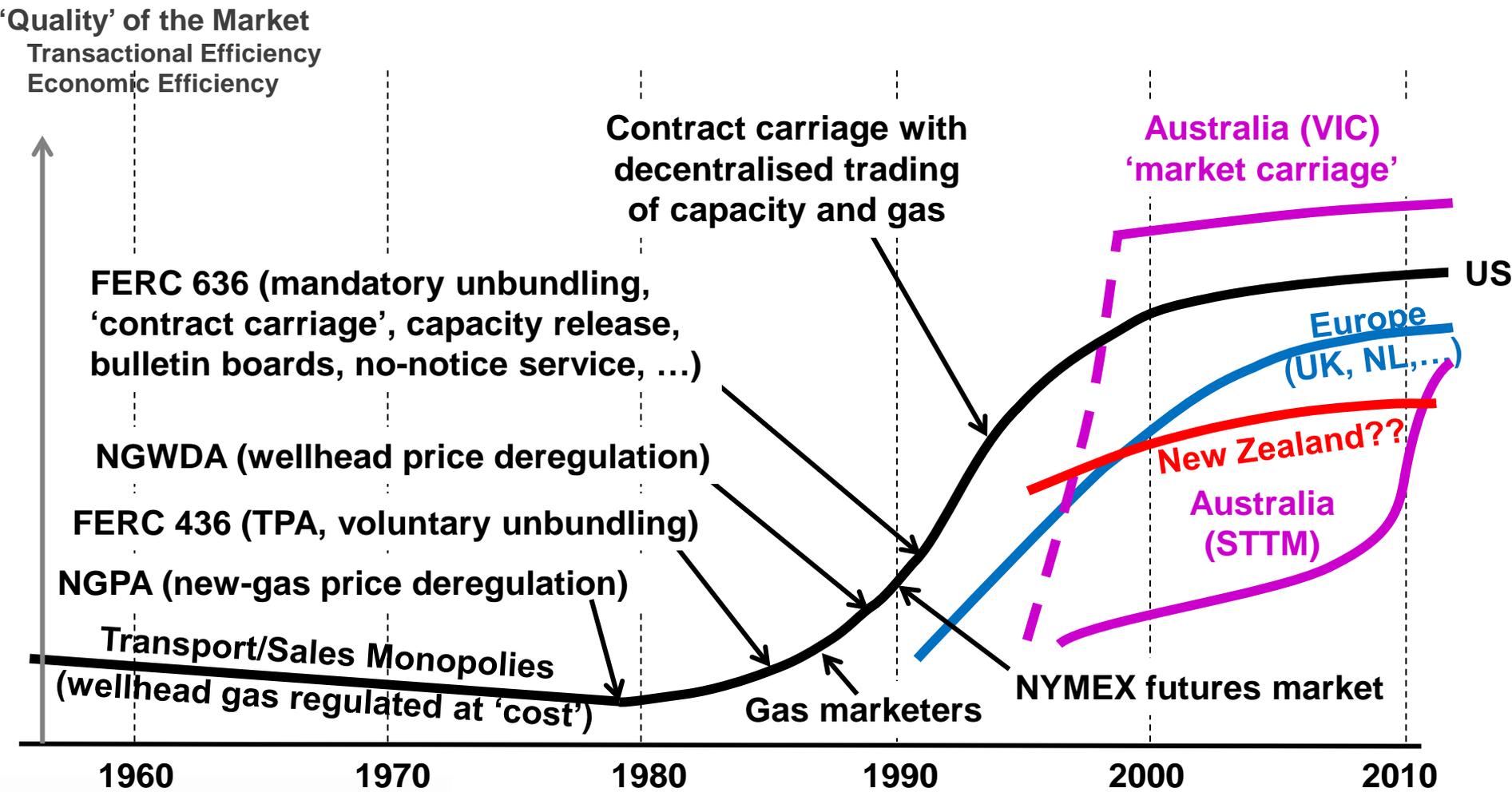
In stages beginning ~ 1980, pipelines were required to:

- Stop selling gas and become gas transporters
- Convert their gas sales contracts to capacity contracts
- Make capacity tradeable and offer 'contract carriage'

Contract carriage requires a complex, decentralised system for trading of capacity (and gas), which:

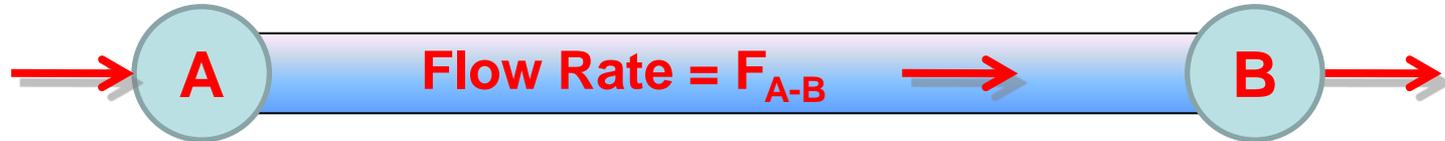
- Evolved organically in the US over the 1980s/90s
- Was copied in Europe and elsewhere

Contract Carriage Evolved Organically – Until ...



What Is Contract Carriage? The Problem

The Simplest Network



The Operational Problem: Security

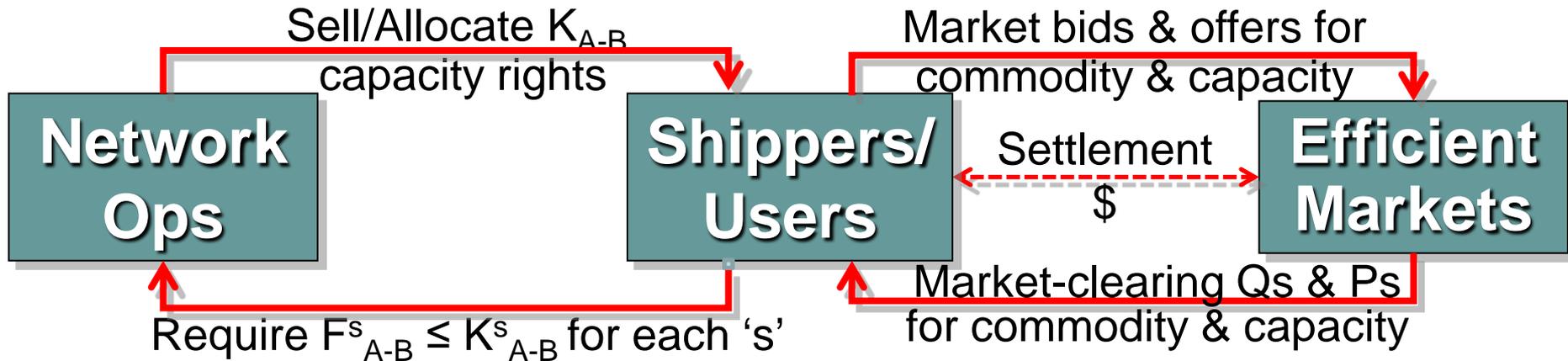
Keep $F_{A-B} \leq K_{A-B}$ = maximum 'safe' flow rate (in, e.g., TJ/day)

The Economic/Commercial Problem: Efficiency

Assure that the limited capacity is used each 'day' by those with the most valuable uses for it that 'day', when:

- Market conditions can change from 'day' to 'day'
- The value of capacity depends on the value of the commodity at A and at B

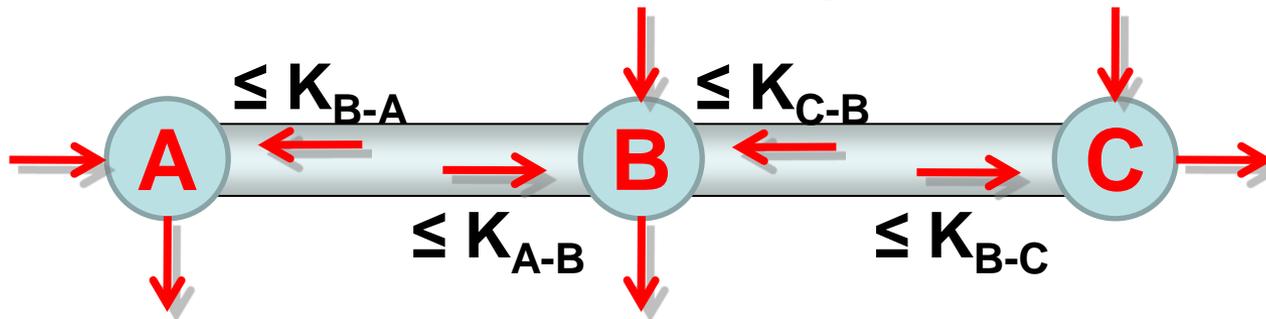
The Contract Carriage Solution – in Concept



*The concept is neat and logical;
the reality can be (much) less so*

Contract Carriage in Practice

Simultaneous clearing of commodity and capacity in decentralised markets is complex/inefficient
... and more so as network complexity increases

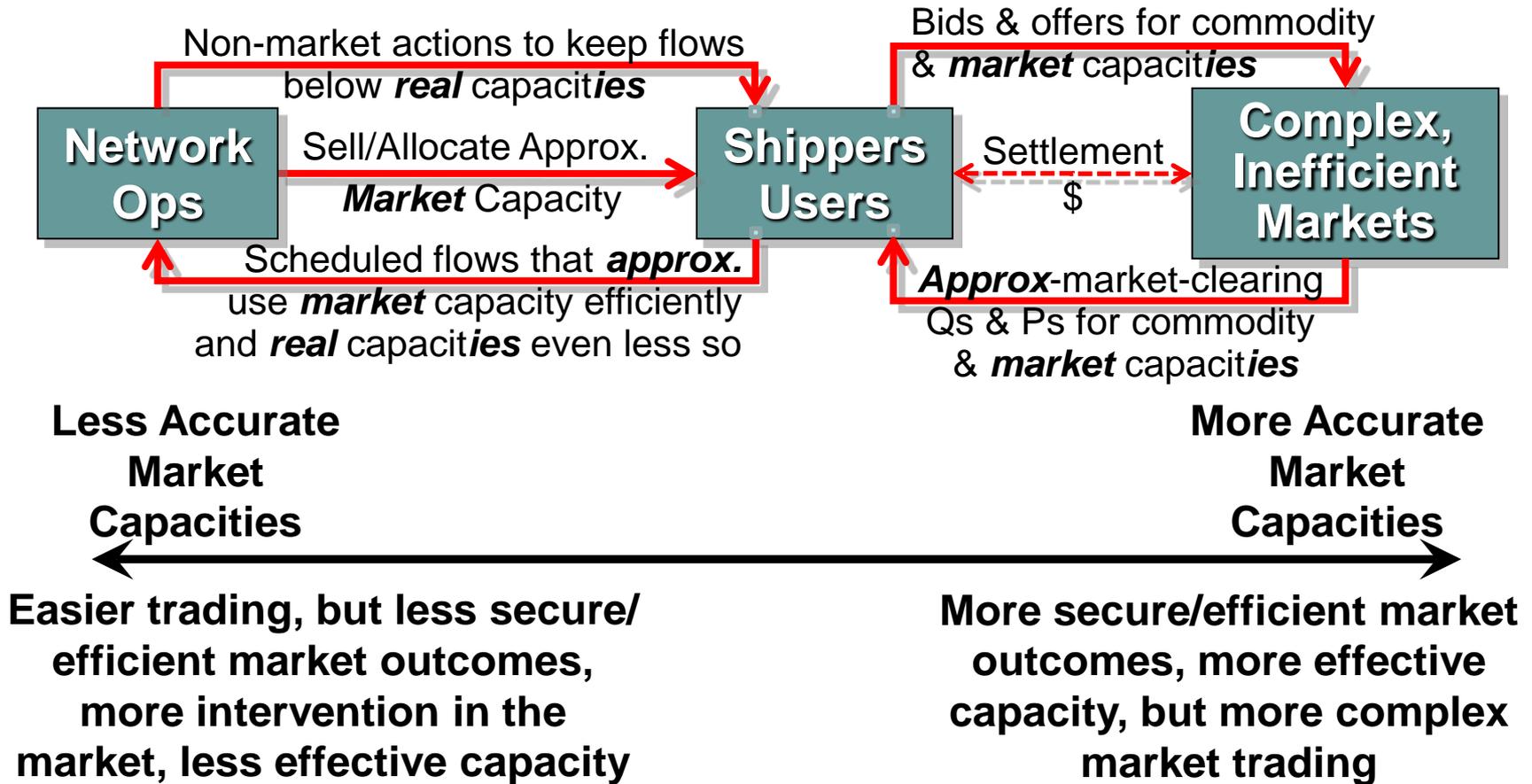


A real network has no single 'capacity', but dozens/hundreds (thousands?) of '**capacities**'

Decentralised markets can handle (inefficiently) only a few, approximate **market capacities**

For security, market capacities should (and typically do) understate real capacities

A More Realistic Picture of Contract Carriage



The high costs and inefficiencies may be acceptable on a large system ... but for (e.g.) New Zealand??

Why Not Just Add More Capacity?

Network capacity could ‘simply’ be expanded until Users can ignore the network in commercial trading, because:

- Congestion almost never arises; and
- When it does, it can be managed easily in non-market ways, e.g., with proportional curtailments

This is essentially **common carriage** – which:

- Can ‘work’ where capacity is cheap and operational management is difficult (e.g., on a distribution system); but
- Will be inefficient/risky where capacity is costly and future demand for it is uncertain

The Logical Solution: Manage congestion efficiently, and then add capacity only when/if it is expected to reduce congestion costs enough to pay for itself

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The Evolution of Electricity Markets

Regional power grids developed in the US:

- Not for long-distance transport, but to 'pool' generation
- With great success; prices fell steadily from 1890 to 1970

In the 1980s, pressure for competition grew, but:

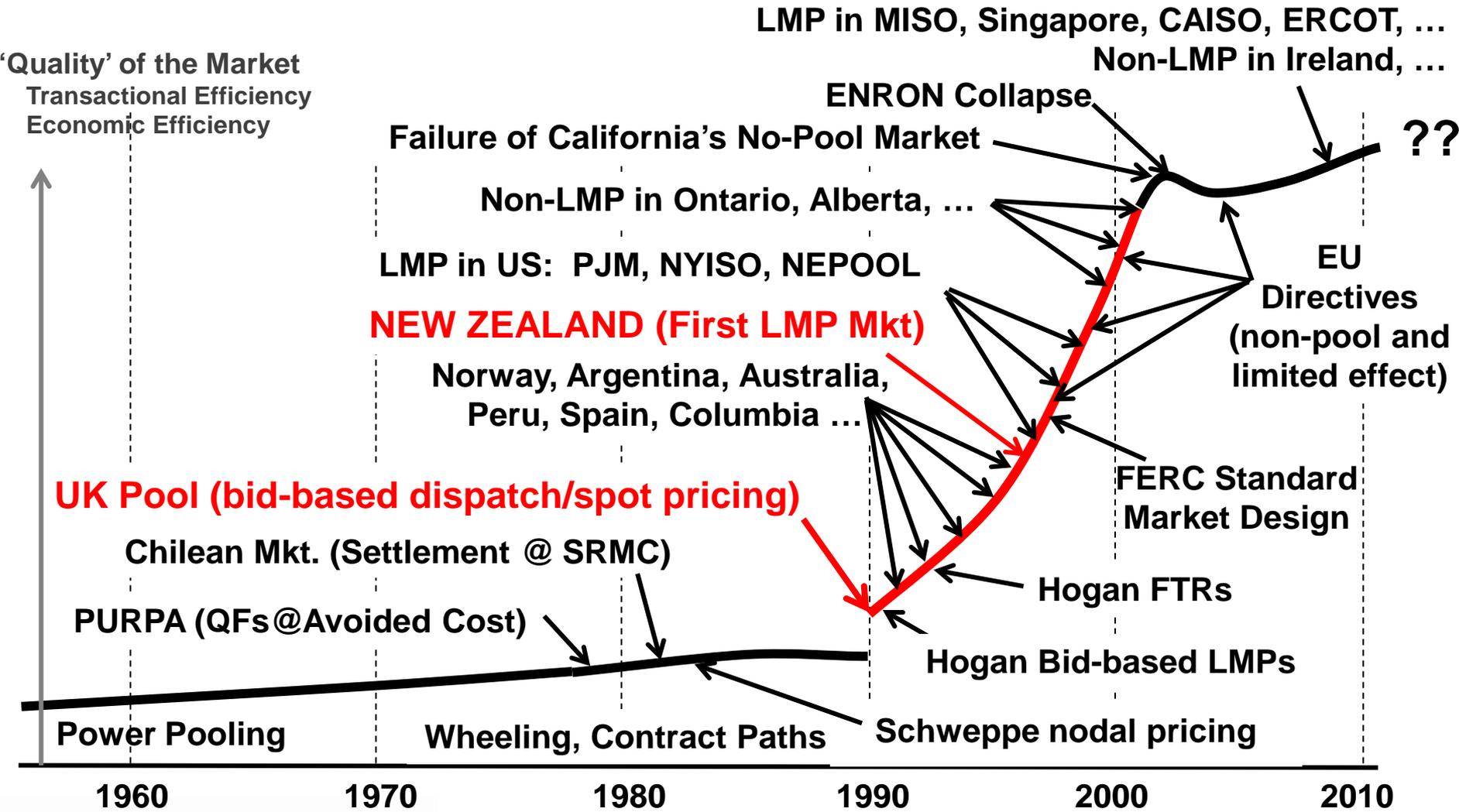
- Operations are more complex/critical for power than for gas
- A 'contract path' model was tried but did/does not work well

When Margaret Thatcher set out to privatise the UK power sector, she did not know it was impossible, so:

- She insisted on a competitive industry based on commercial contracts
- Nobody knew how to do it, but at the last minute ...

The UK Pool set the stage for a 'Cambrian-Explosion' in the number and diversity of markets (species)

The 'Cambrian Explosion' in Electricity



The Breakthrough 'Network Market' Concept

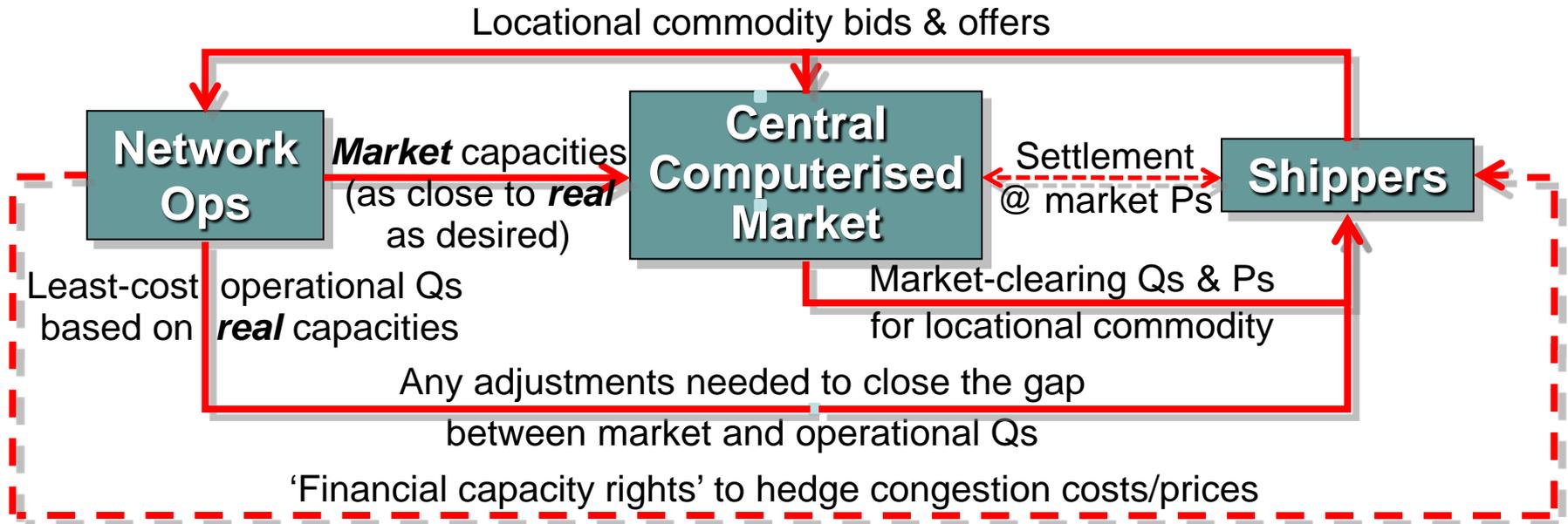
The fundamental conflict in a network market is that:

- Users' need ***decentralised commercial freedom***
- Operators' need ***centralised technical control***

The logical resolution of this conflict is a centralised, computerised ***spot market integrated with Ops***

- Users freely bid/offer to advance commercial objectives
- The spot market includes network realities as accurately as desired and still clears quickly (in minutes) and cheaply
- Ops uses the spot market bids/offers and systems to find, implement and compensate any 'out of market' adjustments needed for security or efficiency
- Capacity rights become financial 'congestion hedges' that have no direct effect on operations or pricing

A Sophisticated Network Market Process



Even simple versions of these concepts and processes can be useful in gas – particularly on a small system

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What Is Best for a Small Gas System – e.g., NZ?

Neither contract carriage nor common carriage – or some hybrid – is likely to be cost-effective; but:

- As the Bard said: “There are more things in heaven and earth ... than are dreamt of in your [contract /common carriage] philosophy”
- Network market principles can be used to purpose-build a market-based solution for the specific situation

Australia has shown how, inventing two, very different solutions for two, very different situations

- The ‘market carriage’ system in Victoria; and
- The Short-Term Trading Market (STTM) elsewhere Victoria

The details may not be applicable to New Zealand, but the general principles and the process are

Example 1: 'Market Carriage' in Victoria

In 1997-99, Victoria had to create a market from scratch

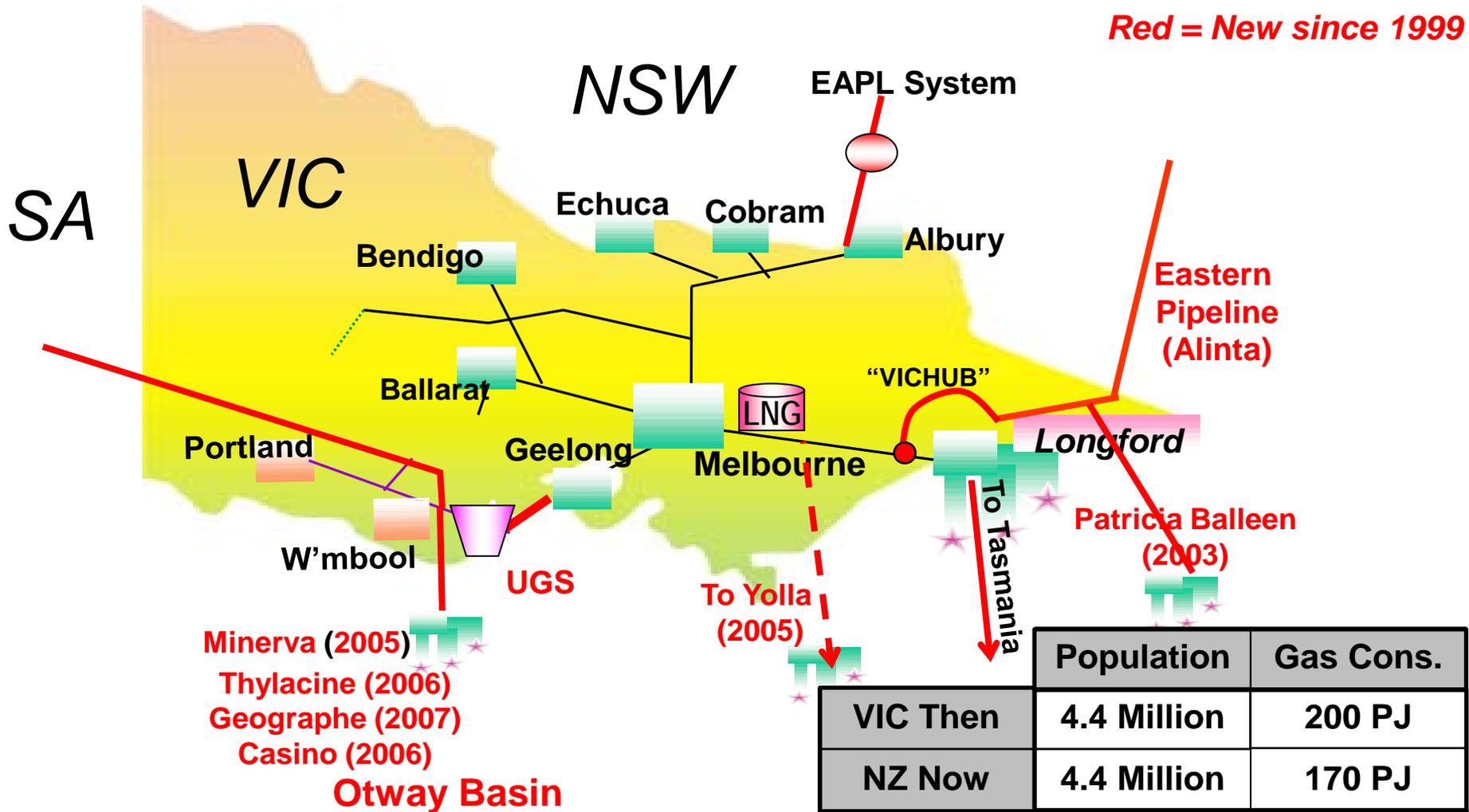
- Neither contract nor common carriage were suitable
- So network market concepts were adapted to gas

In the unique Victorian 'market carriage' gas system:

- Market bids/offers are used in a central optimisation/
market clearing process to find for each day
 - A daily Market Schedule and gas price that ignore the network
 - An Operational Schedule that reflects the real network
 - When these differ, the least-cost way to close the gap
- Capacity rights (Max. Daily Quantities) are purely financial

***The VIC market has worked well, and has evolved to handle
(stimulate?) new supplies, storages and pipelines***

Victoria: Comparison & Growth



Example 2: The Australian STTM

In 2008-10, in Australia outside Victoria:

- Gas/capacity trading on the contract carriage pipelines to metropolitan areas was limited/inefficient
- Pipelines would not change contracts or procedures, so integrating spot trading with Ops was not possible

In the Short-Term Trading Market (STTM):

- Each pipeline states its TJ/day 'capacity' to its hub
- A daily spot market allocates/prices this capacity and gas
- Shippers/pipelines operate under their contracts as before, with STTM incentives to deliver STTM quantities
- The STTM capacity price is paid by shippers who use capacity to shippers who have pipeline capacity contracts

The STTM is working well and is being extended

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What Does New Zealand Have Now?

Vector uses a simple form of ***contract carriage***

- A shipper cannot ship more gas than the (market) capacity it holds, and Vector limits the (market) capacity it sells
- But Vector's market capacity is a poor approximation of real capacity that (probably) significantly understates real capacity and cannot be freely traded

In practice, this is more like ***common carriage***, which:

- Only 'works' as long as there is excess capacity
- Creates calls for new capacity at the first sign of congestion

This is not a criticism of Vector; they are doing the best they can with the operational system they have

What Should New Zealand Do Now?

To increase the efficiency and effectiveness of gas competition, New Zealand has four basic options:

- ***Muddle Through:*** Try *ad hoc* solutions such as letting ‘capacity’ follow the customer and hope for the best
- ***Build Uneconomic Capacity:*** (Try to) guarantee full cost recovery and hope more gas is discovered
- ***Create a Real Contract Carriage System:*** Develop a more complex system of capacities and hope for efficient markets
- ***Create a Network Market:*** Use the above concepts to purpose-build a network market for New Zealand

I do not now know the best solution for New Zealand; but 25 years of thinking about/working on network markets give me a pretty good idea where New Zealand should start looking

And What Might New Zealand Find?

If New Zealand were to develop a more efficient network market, it would probably find that:

- Smarter operational management can increase **effective** capacity; congestion might become/remain a non-issue
- Such a system is less difficult and costly than expected/feared – and certainly cheaper than adding capacity
- Even a simple network market could improve trading efficiency and costs enough to stimulate more competition, and perhaps even more investment, in the gas sector

Creating a real network market is certainly worth serious consideration, and may well be the best approach, for “optimising the contribution of gas to New Zealand”