ofgem

Promoting choice and value for all gas and electricity customers

Christchurch, NZ

November 2003

Electricity Distribution

Back at the Front?

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Electricity Distribution
Back at the Front?

- **Setting the scene**
- **Themes – in brief:**
  - **Asset Risk Management**
  - **Distributed Generation**
  - **Innovation**
  - **Transmission**
  - **Security of Supply**
- **Conclusions**

The UK in outline

Technical:

Electricity peak demand ~ 60GW (in winter)
Annual energy consumption ~ 300TWh
Maximum Transmission Voltage 400kV
DC Interconnection to France 2000MW

Markets:

- GB has replaced Pool with New Electricity Trading Arrangements (NETA)
- NETA is a commodity type market
- GB now has full competition, with choice for all gas and electricity customers

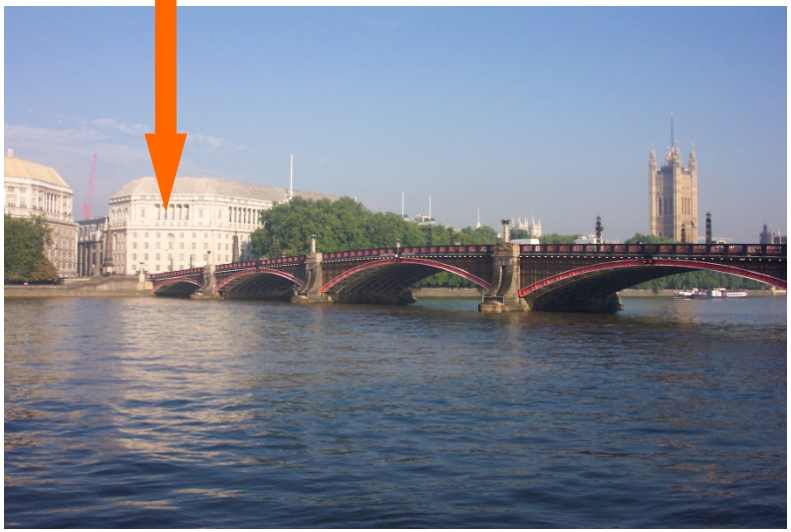
Regulation:

- Single gas and electricity regulatory body
- 'De-personalised' regulation

about ofgem

- Total staff currently 290
- Principal disciplines:
  - Economists 50%
  - Finance/Admin 15%
  - Legal 5%
  - Social/Environmental 5%
  - Technical 4%
- Overall Budget £30m

A postcard from Ofgem's office near UK Parliament



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Asset Risk Management - GB

- **Background:**
  - Energy networks are key to security of supplies
  - Increasing public expectations, but ageing networks
  - Even well run companies cannot eliminate all risks
  - Asset Risk Management is therefore a key function

- **Action taken:**
  - Survey of UK electricity & gas network companies
  - High level approach (Regulator is not the asset manager)
  - Results published January 2003

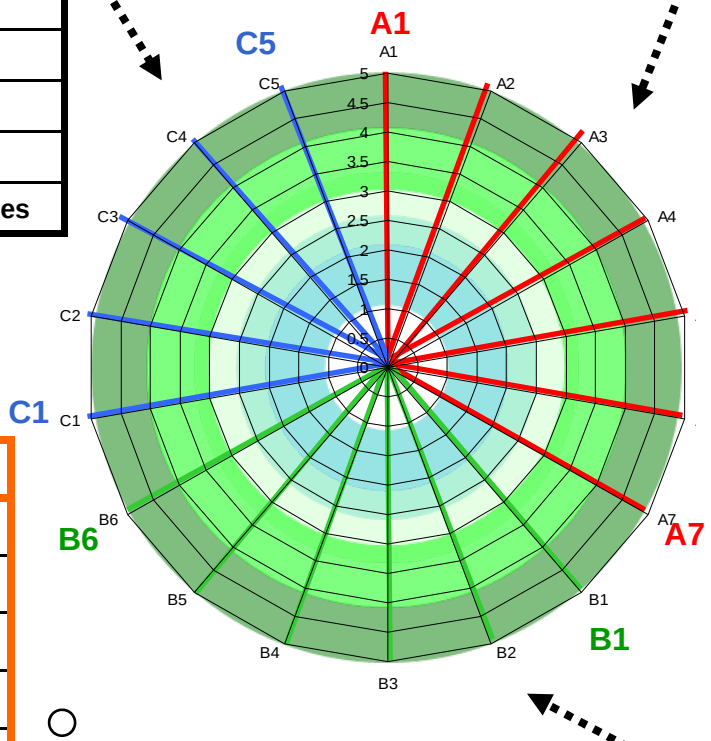
(http://www.ofgem.gov.uk/docs2003/01armsurvey.pdf)

Ofgem ARM Survey

- **Key Principles**
  - The asset owners should know best, not the Regulator
  - Regulator wants assurance – but should not prescribe how it should be done
  - ie the WHAT, not the HOW
  - Encourage good practices (see weblink below)
- **Approach**
  - ARM processes are ‘embedded’ in companies
  - There will therefore be evidence to be seen and assessed
  - This is hard to ‘window dress’ for a visiting auditor!

Results Format: key to Radar Plots

C	Asset Life Cycle Management
1	From Procedure to Delivery
2	Asset Register Contents
3	Utilisation
4	Use of Contractors/Suppliers
5	Inspection & maintenance regimes



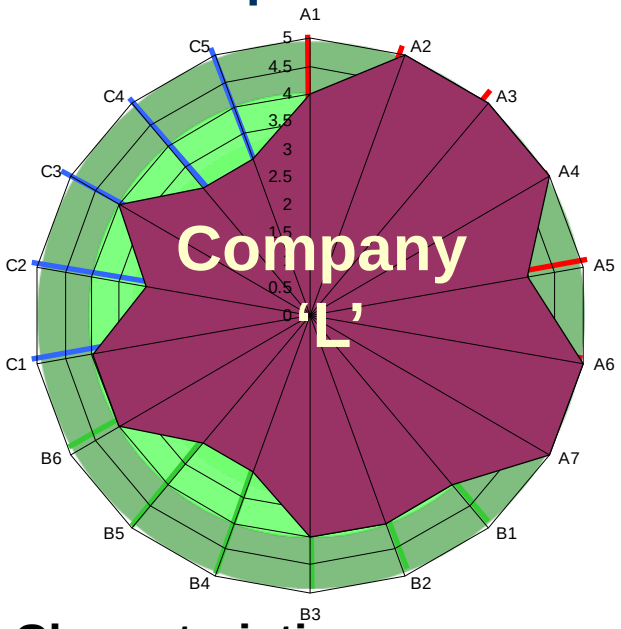
A	Business Strategy & Direction
1	Aims and Objectives
2	Identifying Key Issues for Asset Risk Management
3	Assigning Accountabilities
4	Structures and Contracts
5	Operating, Integrating and Interpreting
6	Risk Assessment and Decision-Making
7	Review Process

Score	Classification
5	Leading
4	Above Intermediate
3	Intermediate
2	Below Intermediate
1	Trailing

B	Asset & Network Strategy
1	From Policy to Procedure
2	Defining Asset Life and Serviceability
3	Recording Asset Information
4	Innovation and New Technology
5	Security of Supply and Asset Utilisation
6	Compliance with Legislation

Results: Examples of 2 real companies

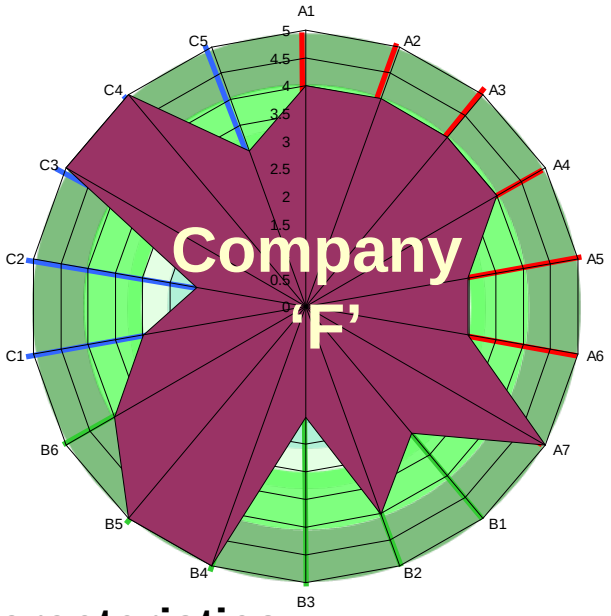
Well Developed "All Rounder"



Characteristics:

- Plan longer term (>5yr)
- Comprehensive risk management
- Well developed Asset register/IT

Patchy development only



Characteristics:

- Less longer term planning (>5yr)
- Patchy development, may reflect improvements in progress

ARM Results: Themes and Trends

- Differences – but **no urgent causes for concern** identified.
- Some companies adopting **longer time horizons** (>10 years)
  - However, general concern that risks associated with future people/equipment resources not addressed to same degree.
- Significant variation between companies in the effectiveness of **asset data** capture and management.
  - Varying quality of linkages between risk studies, inspection policies, asset register contents and the use made of asset information.

Asset Management: some questions

- ***Are you managing your asset risks ?***
  If so, have you evidence for that conclusion ?

- ***Do you know your asset strengths and weaknesses ?***
  Does your business plan reflect this ?

- ***Have you got access to the asset skills you need;***
  …will you have them tomorrow ?

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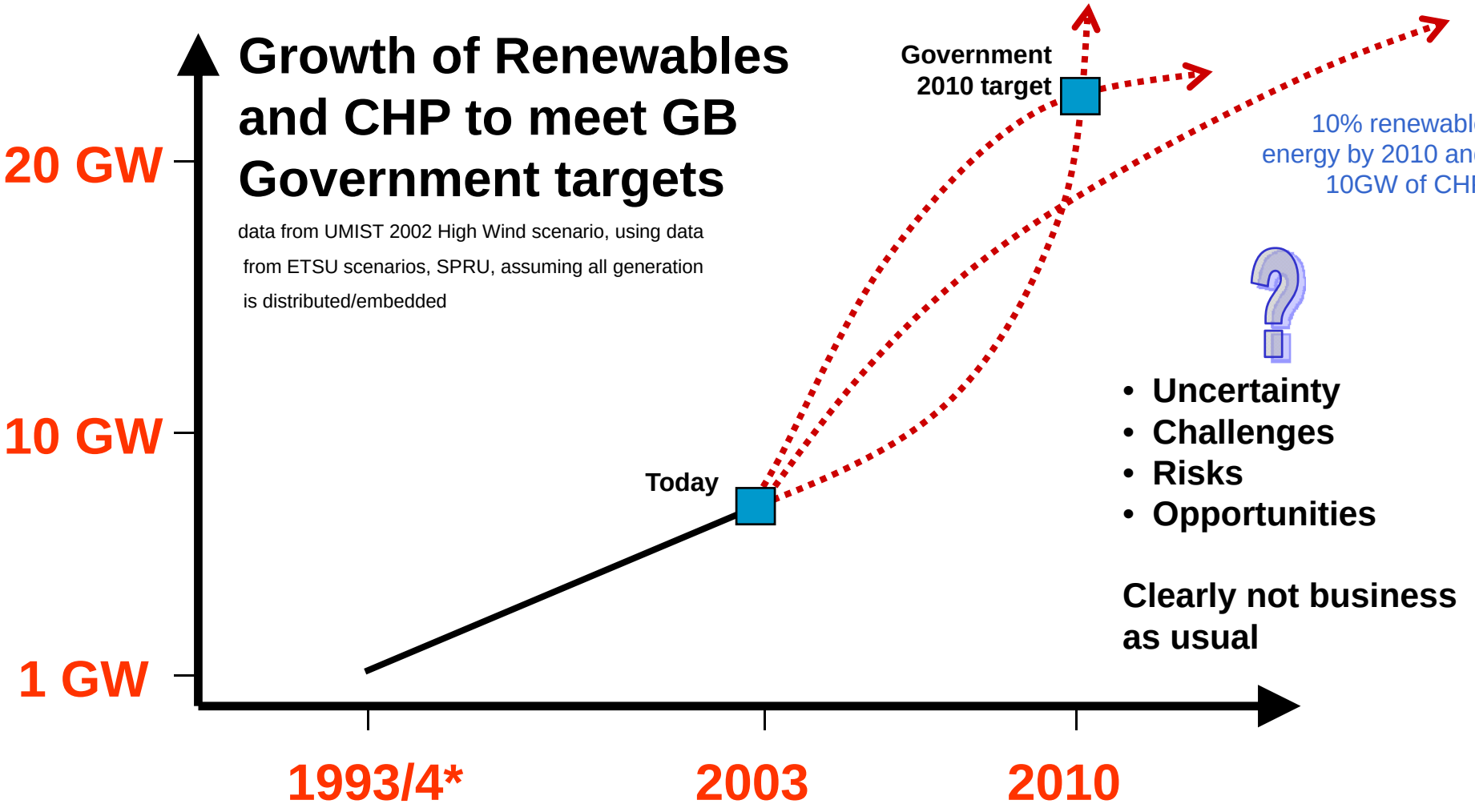
Growth of Renewables and CHP to meet GB Government targets

data from UMIST 2002 High Wind scenario, using data from ETSU scenarios, SPRU, assuming all generation is distributed/embedded



* 1.2 GW embedded independent generation – NGC SYS, March 1994

Distribution: Strategy & Direction ?

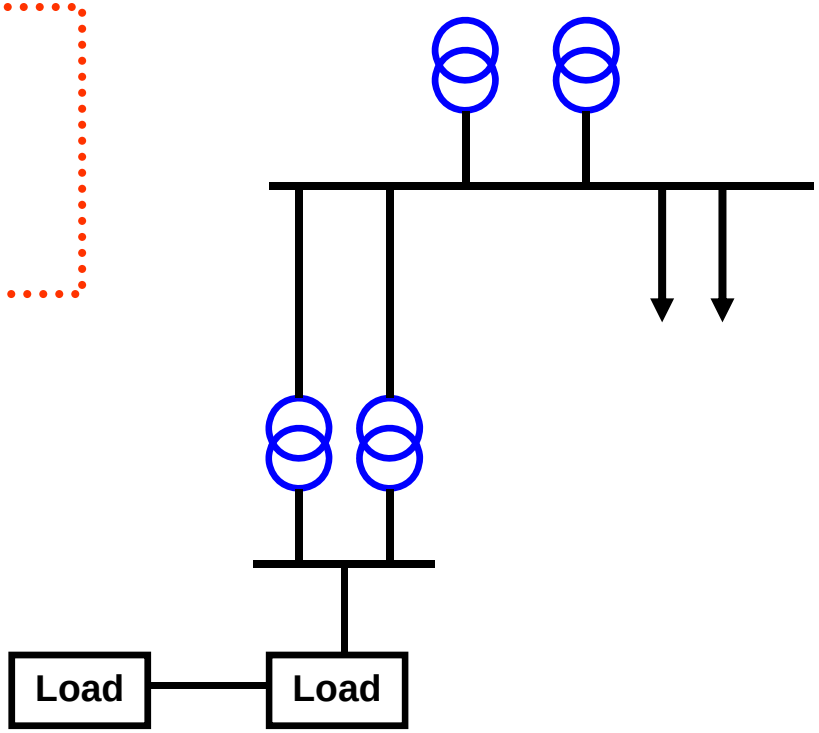
- Distribution networks are ageing AND their role is set to change
- Greener generation will need to connect at all voltage levels, including domestic (230v)
- Major investment ahead: perhaps £1bn by 2010 in UK
- Today's solutions won't solve tomorrow's problems

The successful companies will be those that best manage innovation

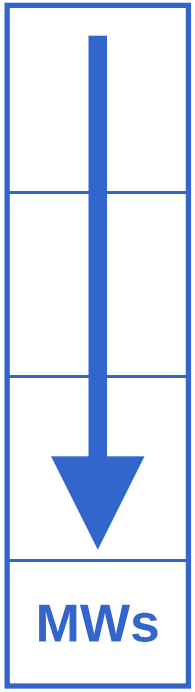
A view of tomorrow

Today's networks

Unidirectional power flows

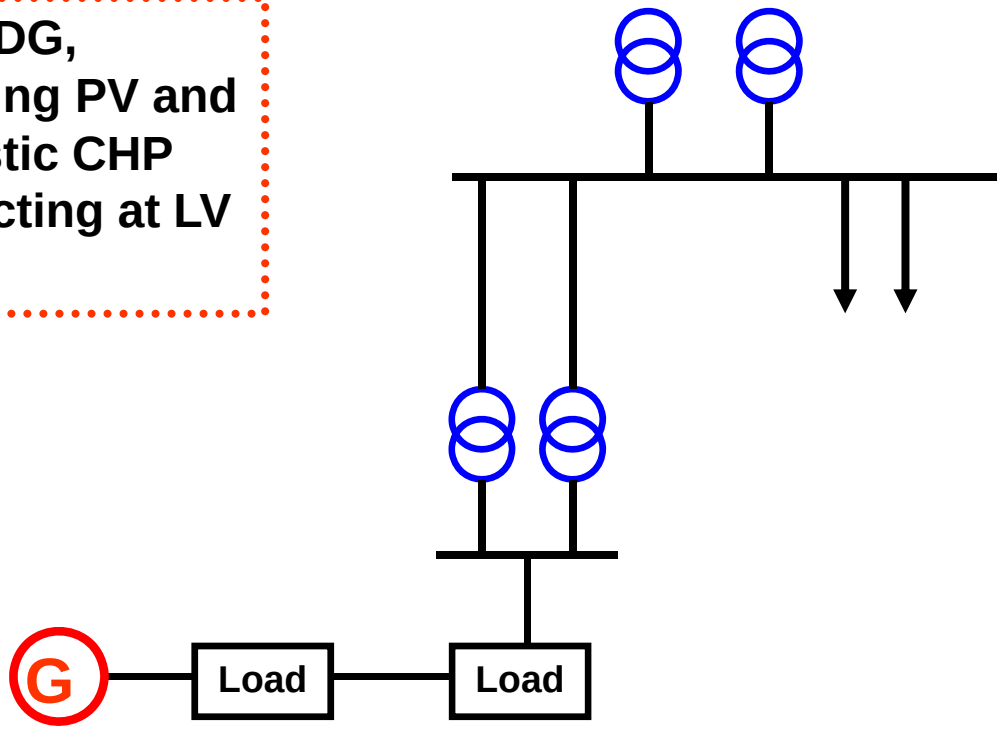


Boundary flow

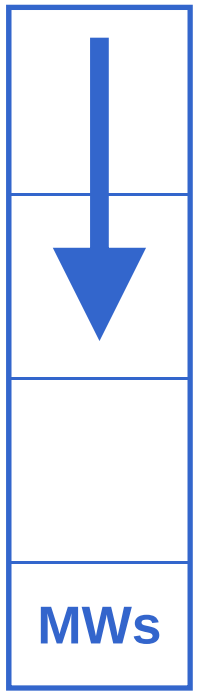


A view of tomorrow

Some DG, including PV and domestic CHP connecting at LV

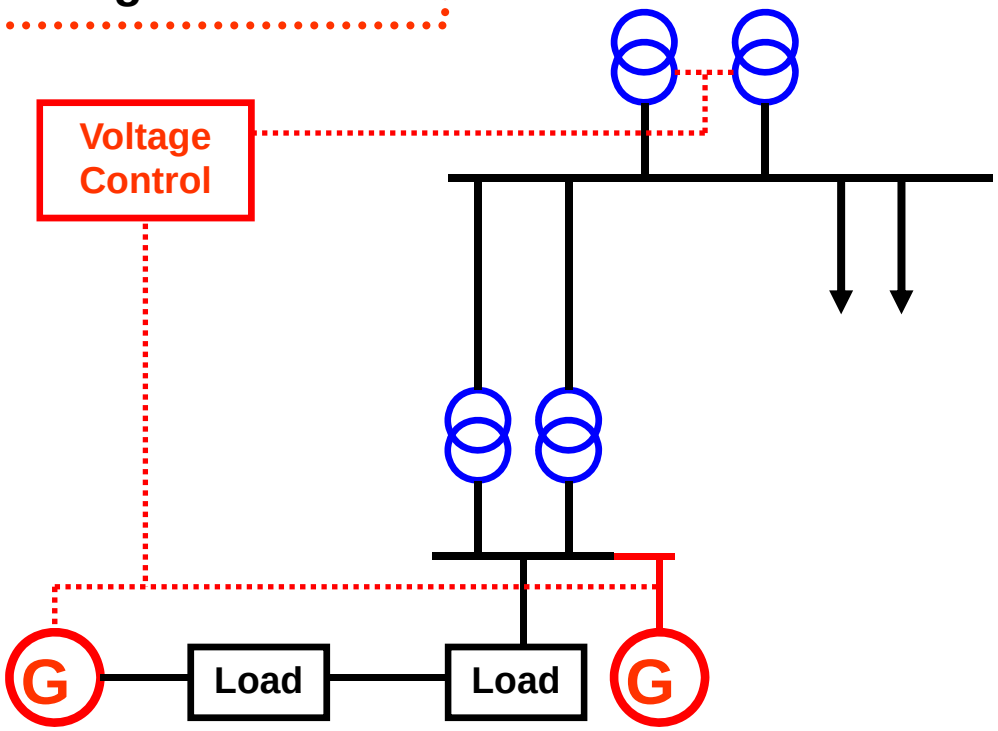


Boundary flow reduced

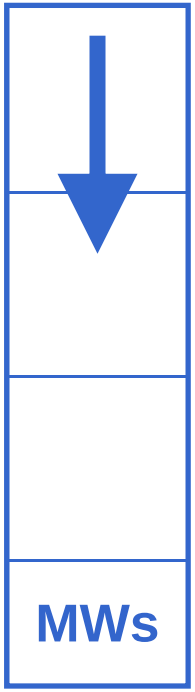


A view of tomorrow

Active voltage control

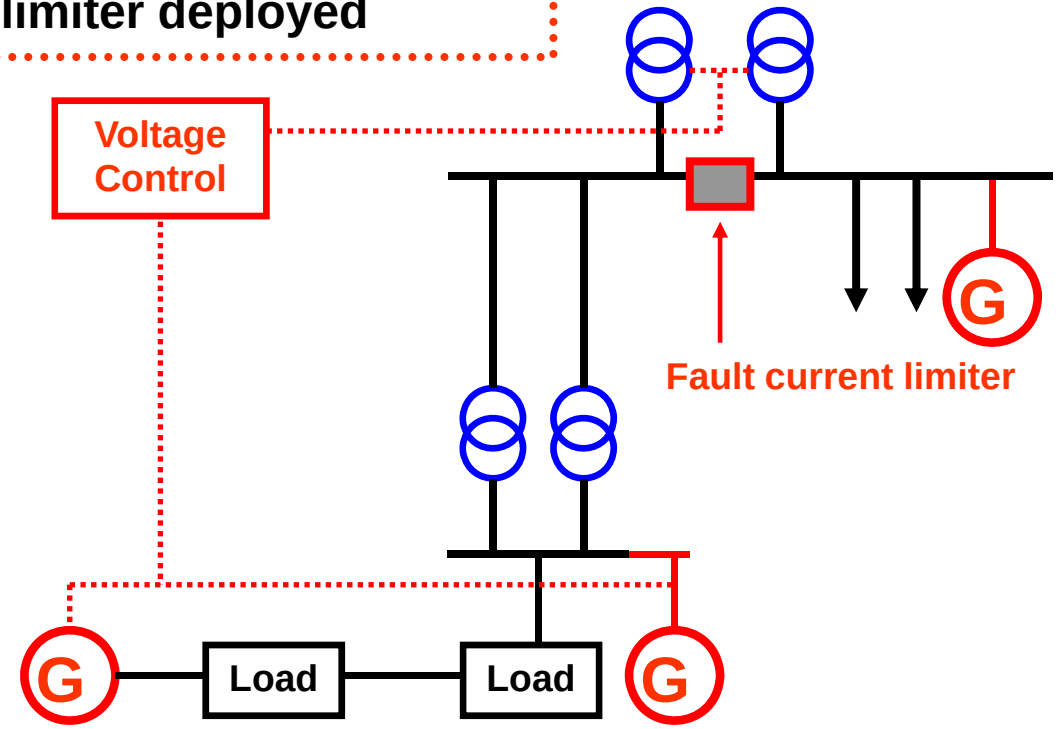


Further reduced boundary flow

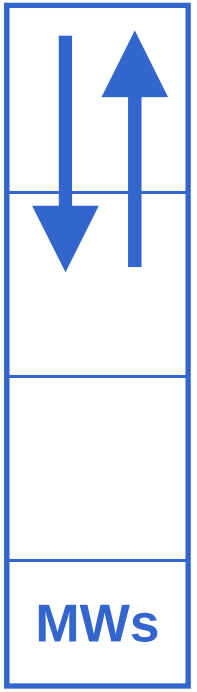


A view of tomorrow

Network may now export, fault current limiter deployed

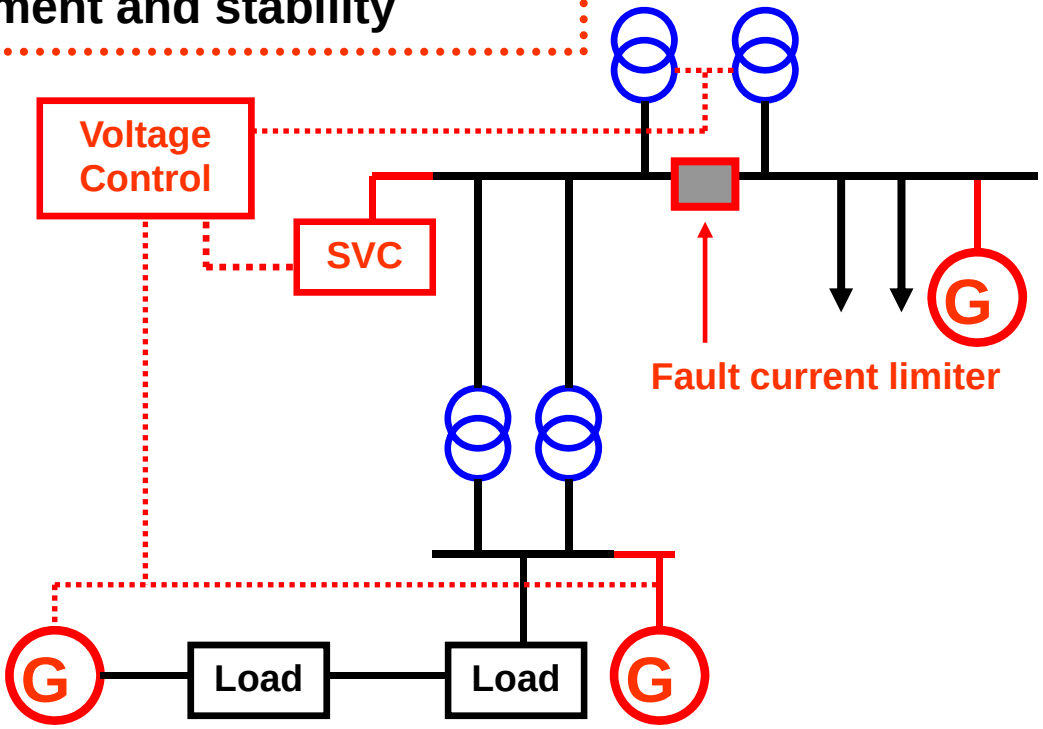


Potentially, two-way boundary flows



A view of tomorrow

SVC deployed for reactive power management and stability



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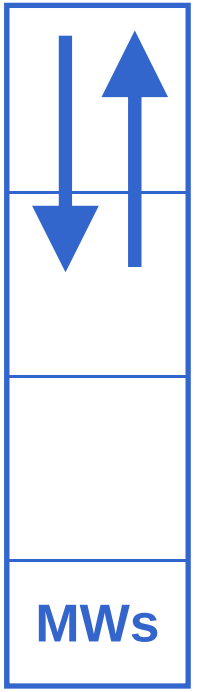
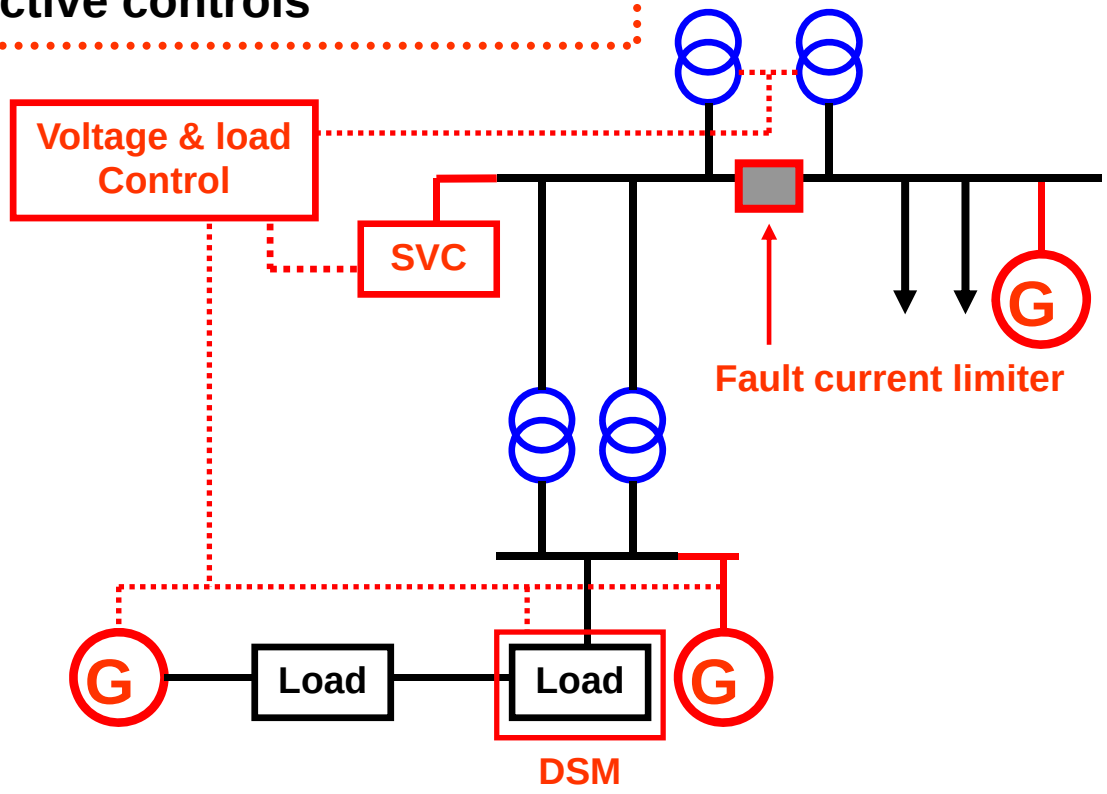
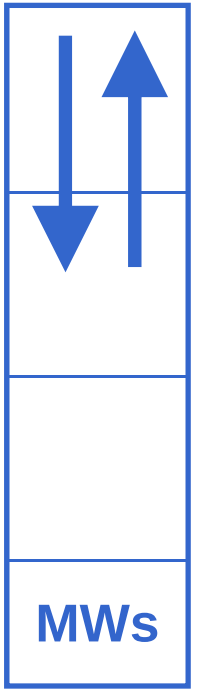


A view of tomorrow

Demand management integrated into active controls

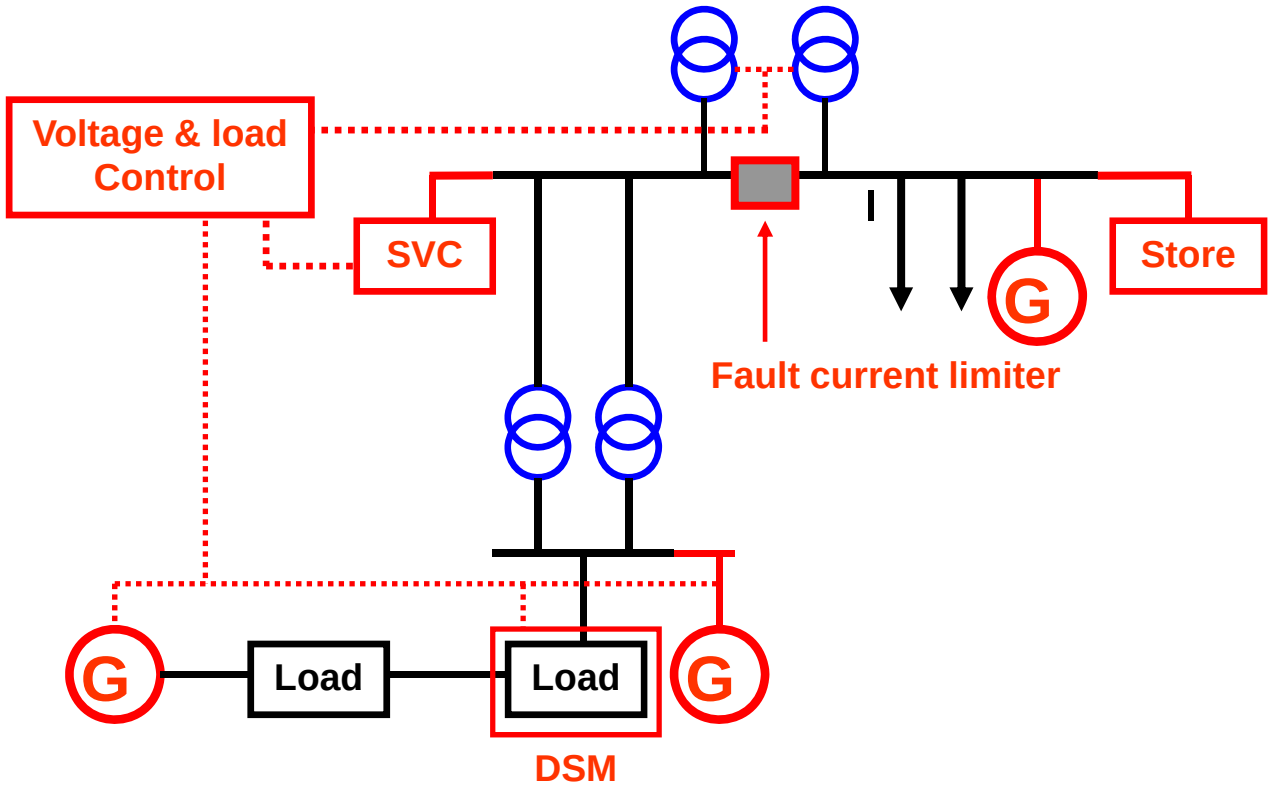


Potentially, two-way boundary flows

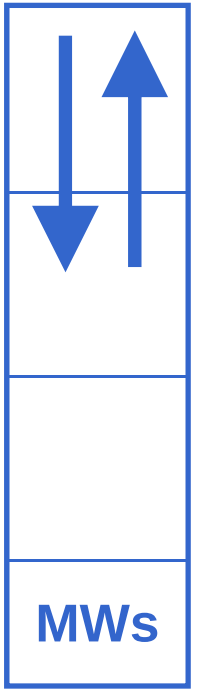


A view of tomorrow

Bulk energy storage deployed

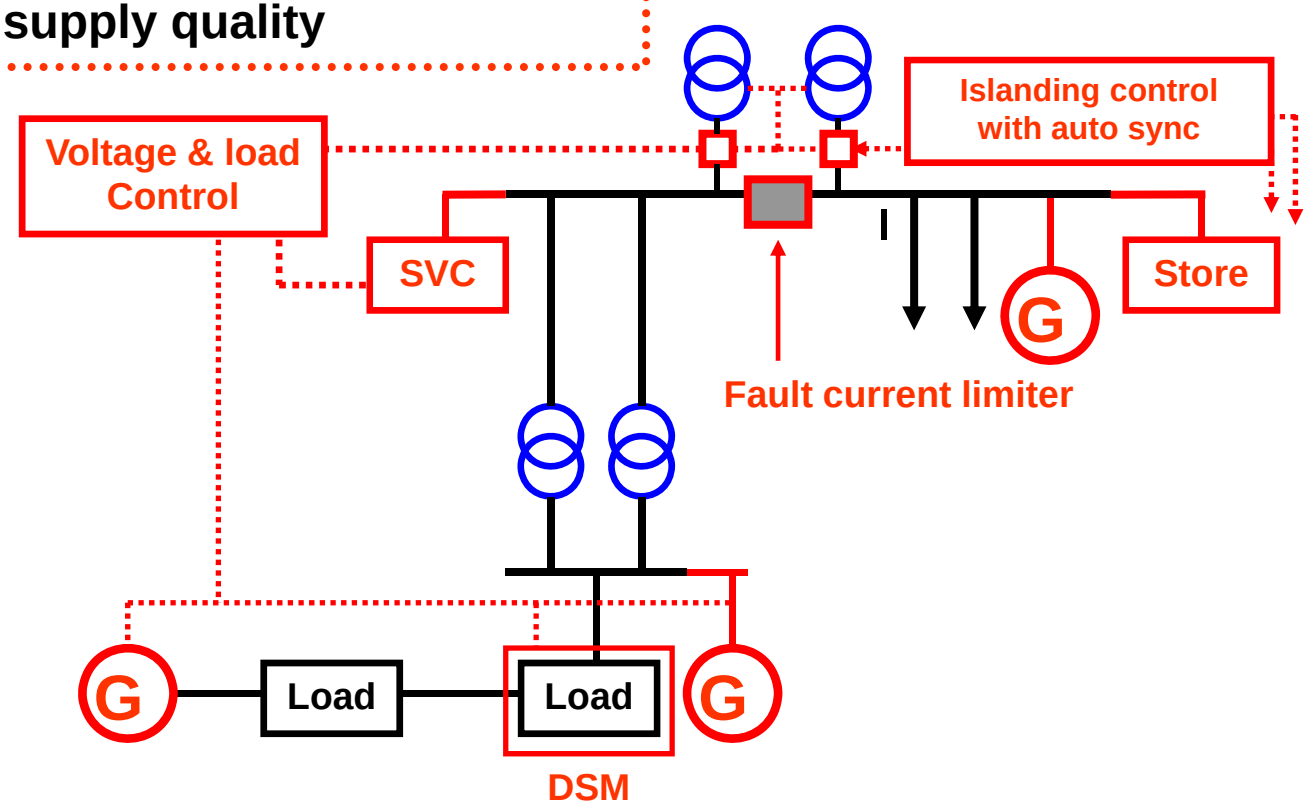


Potentially, two-way boundary flows



A view of tomorrow

Islanding capability enhances local supply quality



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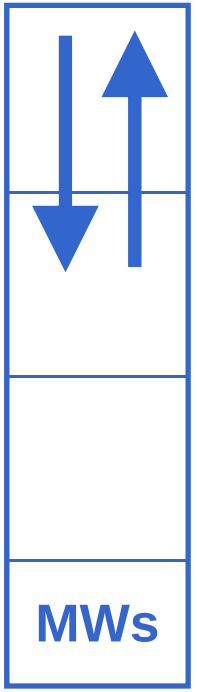
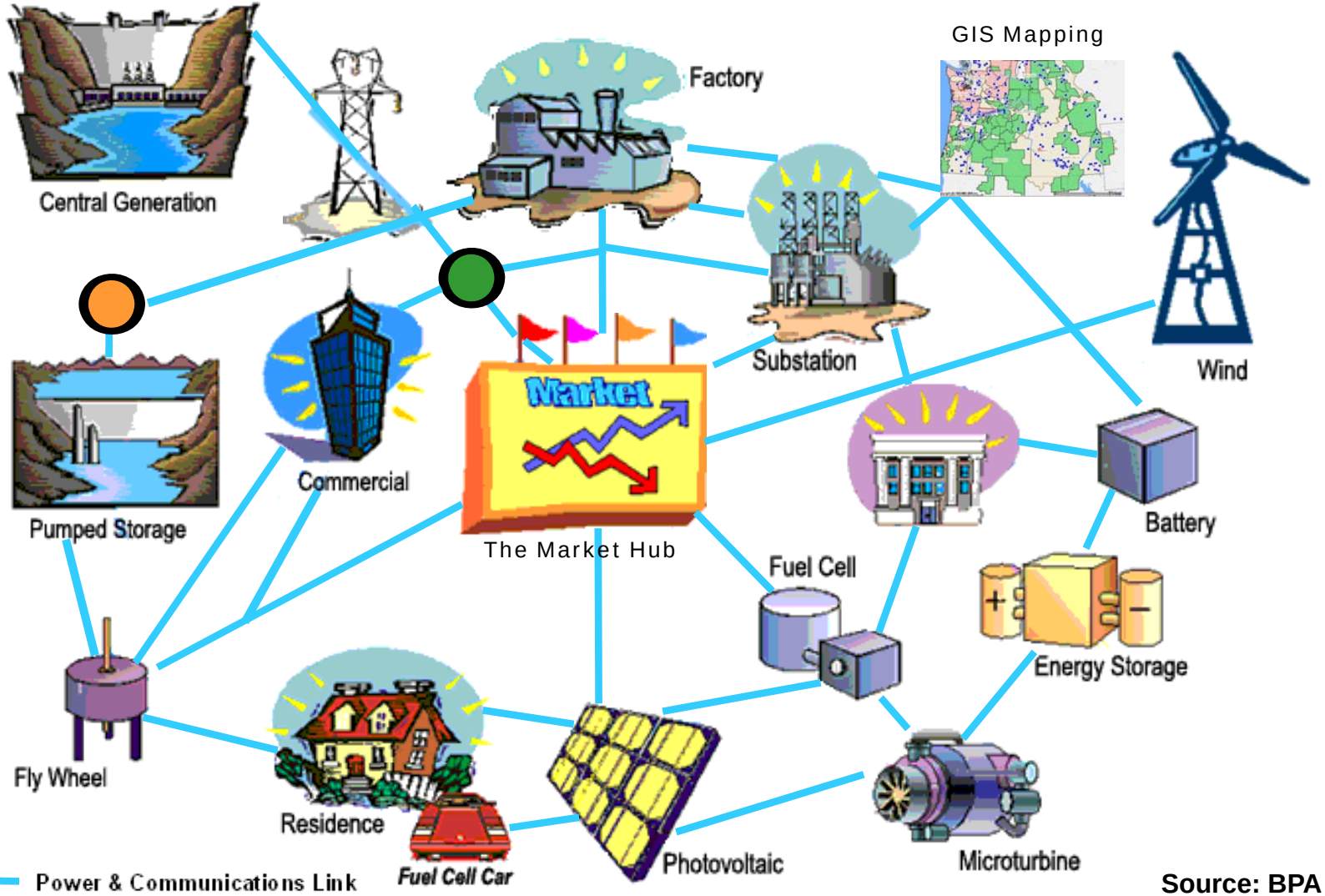
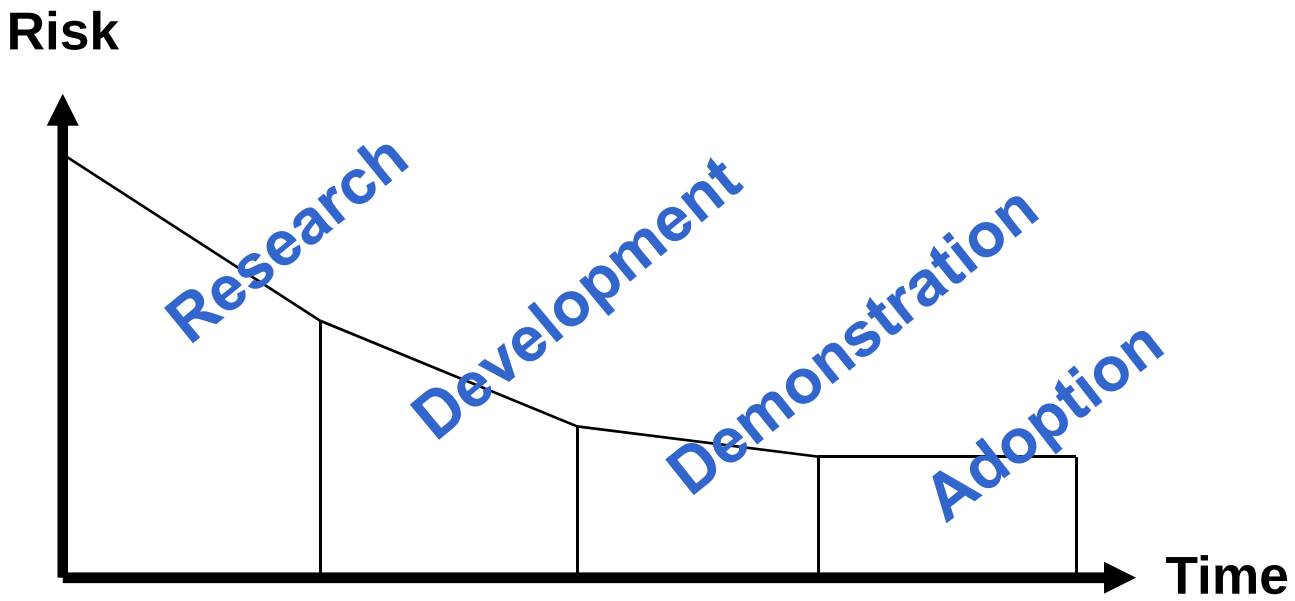



GIS Mapping
Central Generation
Factory
Substation
Wind
Pumped Storage
Commercial
Market
The Market Hub
Battery
Fuel Cell
Energy Storage
Fly Wheel
Residence
Fuel Cell Car
Photovoltaic
Microturbine
Power & Communications Link

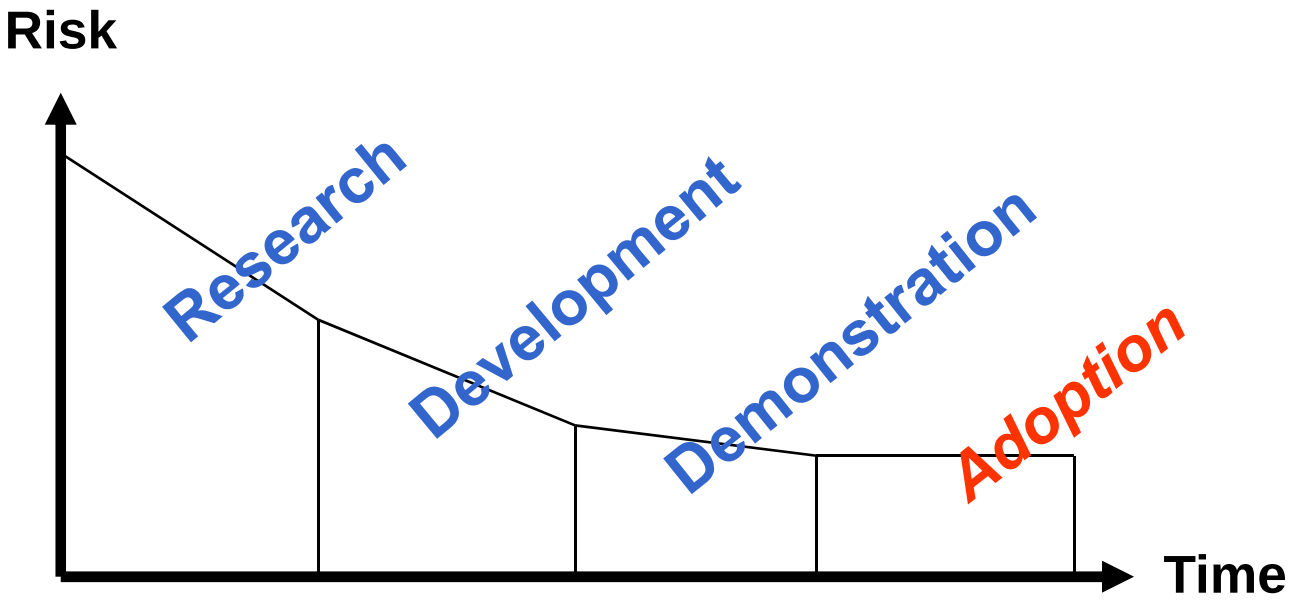
Source: BPA

The innovation process



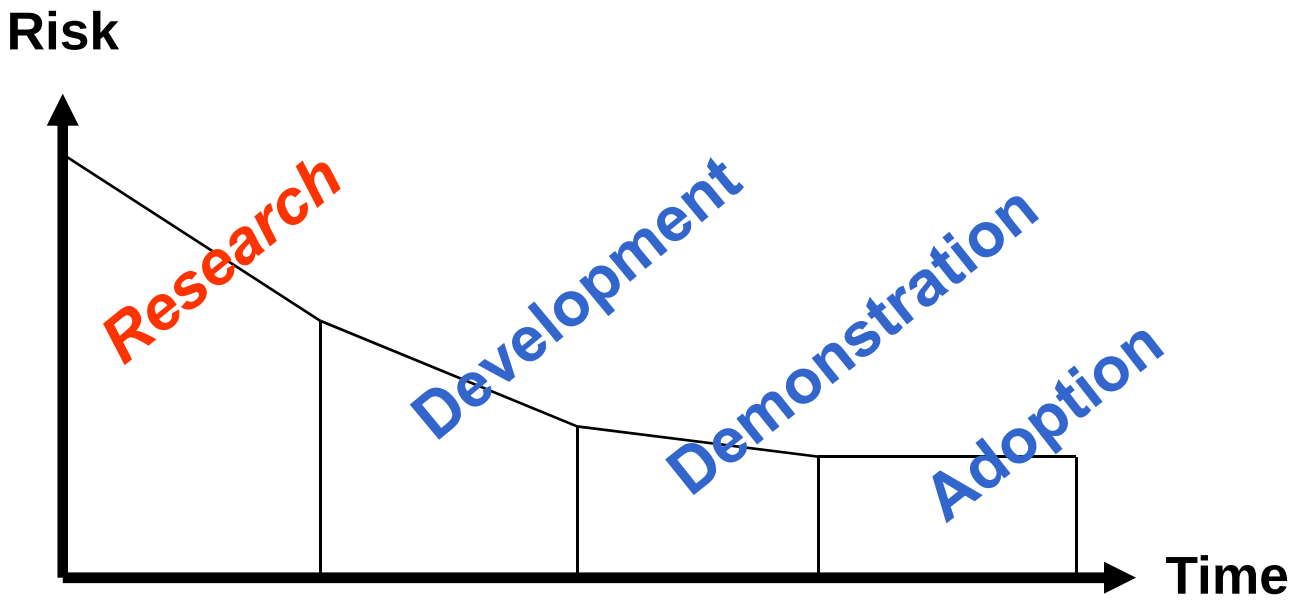
Multi-stage process to convert ideas to products/solutions

The innovation process



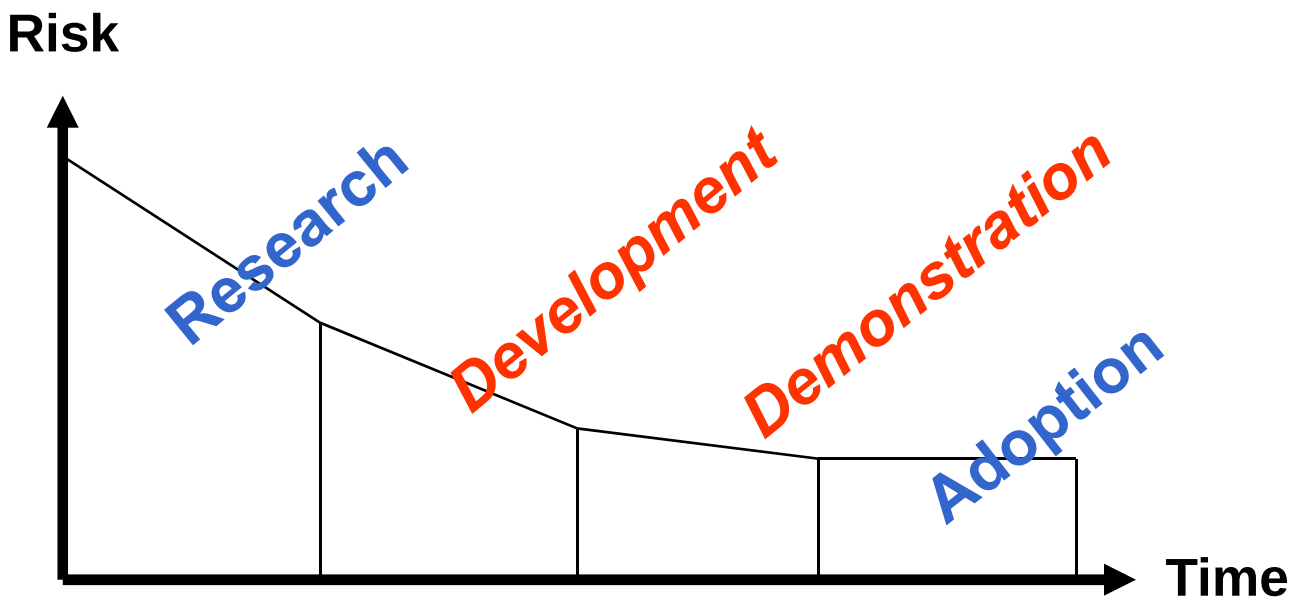
RPI – X & Capex
Treatment effective

The innovation process



Manufacturers and research community lead

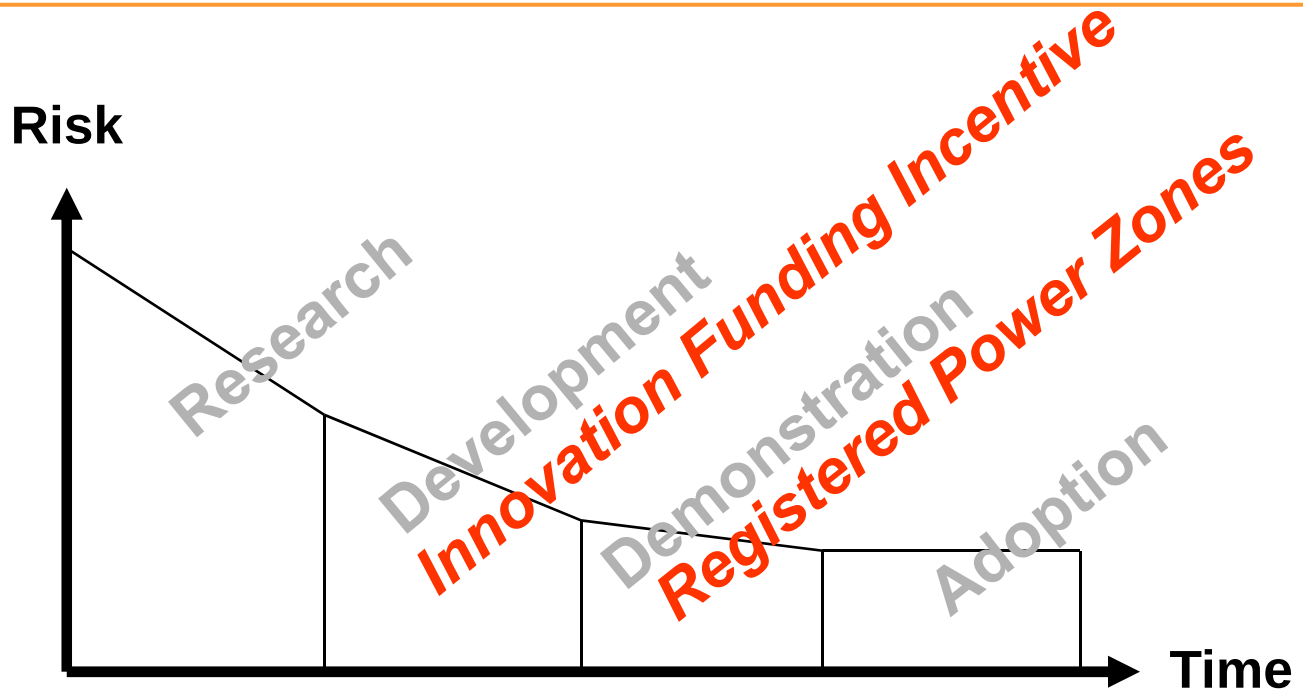
The innovation process



DNO involvement necessary here:

a distinguishing feature is the requirement for field testing and the inadequacy of laboratory simulations alone

The innovation process



IFI & RPZ – Ofgem's proposed incentives for GB distribution companies to operate higher on the curve

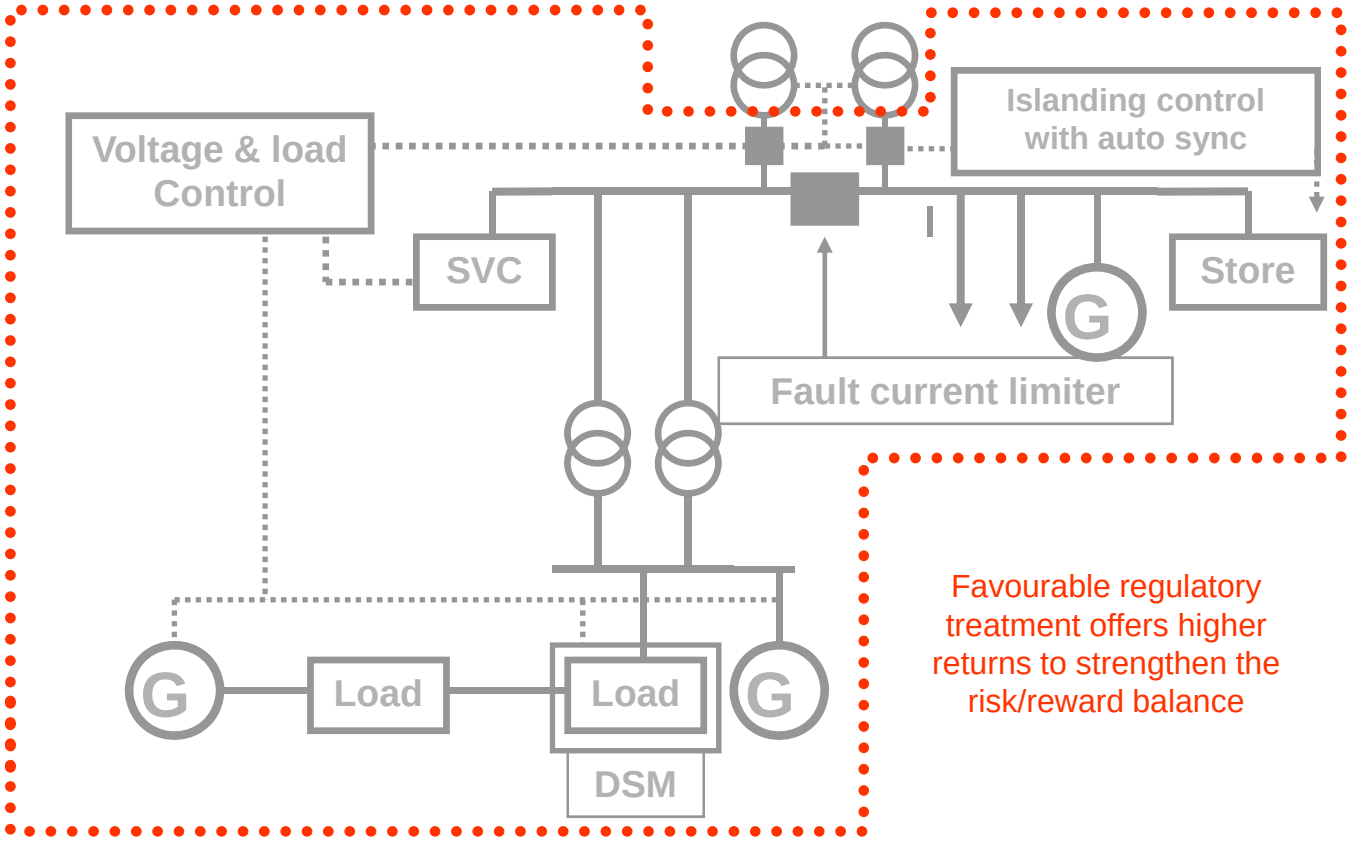
IFI headlines – current thoughts

- A '% of turnover' allowance for innovation (perhaps 0.5%)
- Expenditure allowed on a 'use it or lose it' basis
- Annual, open, reporting of activities to promote best practices

RPZ headlines – current thoughts

- Ofgem registers, but does not approve projects
- Enhanced financial incentives (a multiple of the price control DG incentive), that reflect the degree of innovation
- Open reporting of RPZ projects to promote best practices

Advantages of a 'Power Zone' ?



Favourable regulatory treatment offers higher returns to strengthen the risk/reward balance

- ✓ **Special regulatory treatment**
- ✓ **Nursery for innovation, suited to demonstrator projects**
- ✓ **Enhanced Quality of Supply**
- ✓ **Benefits of "badging" as a form of endorsement**
- ✓ **May attract external grant funding**
- ✓ **May foster Regional Development joint projects**
- ✓ **Signals a generation-friendly network to developers**
- ✓ **'Club Rules' protect customers and ensure information sharing**

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  - Distributed Generation
  - Innovation
  - **Transmission**
  - **Security of Supply**
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GB Transmission: live issues

- Security of Supply; London & Birmingham recent failures; call for Transmission 'output measures' ?
- Extending NETA wholesale market to Scotland; National Grid Company have bid to be 'GB System Operator'
- Ofgem consulting on investment signals for Transmission owners; major reinforcements likely for renewables
- Peak demand generation margins; low wholesale prices; gas/electricity interactions

Focus in UK: Energy White Paper

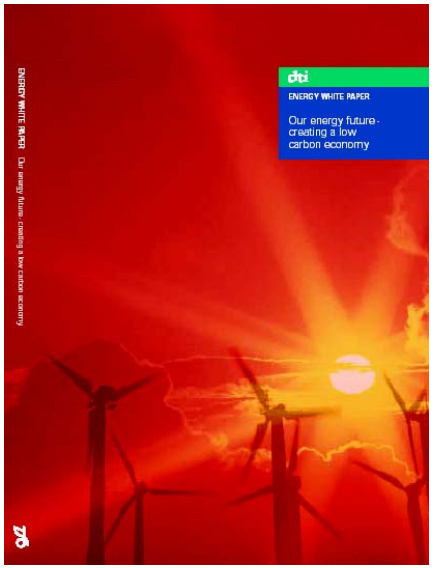
"Our energy future – creating a low carbon economy"

Now:

- UK currently self-sufficient in energy
- liberalised market has delivered low prices
- progress to date on greenhouse gas cuts

Medium term:

- increasing import dependency for gas
- challenging reduction targets for 2010/20
- ensure that liberalised markets respond and maintain supply security



Published 2003.

Weblink shown below.

Energy Bill now in progress.

The Elements of Supply Security

PRIMARY ENERGY SOURCE	ENERGY CONVERSION	ENERGY TRANSPORT	COORDINATION & CONTROL
Coal, gas, renewable etc	"generation"	"transmission" "distribution"	Generation balancing, and stability
Capacity ? Diversity ? Import dependence ? Interruption risk ?	Dependability ? Construction lead times ? Investment signals ? Funding ?	Asset management ? Renewal ? New capacity ? Resilience to extremes ?	Efficiency and incentives ? Accountability ? Facilities ? Competence for rare events ?

The Role of Distribution in Supply Security

SUPPLY CHAIN

- Effective asset risk management
- Events worldwide have raised concerns for network integrity
- RESILIENCE required to cope with exceptional events

ENERGY TRANSPORT

"transmission"
"distribution"

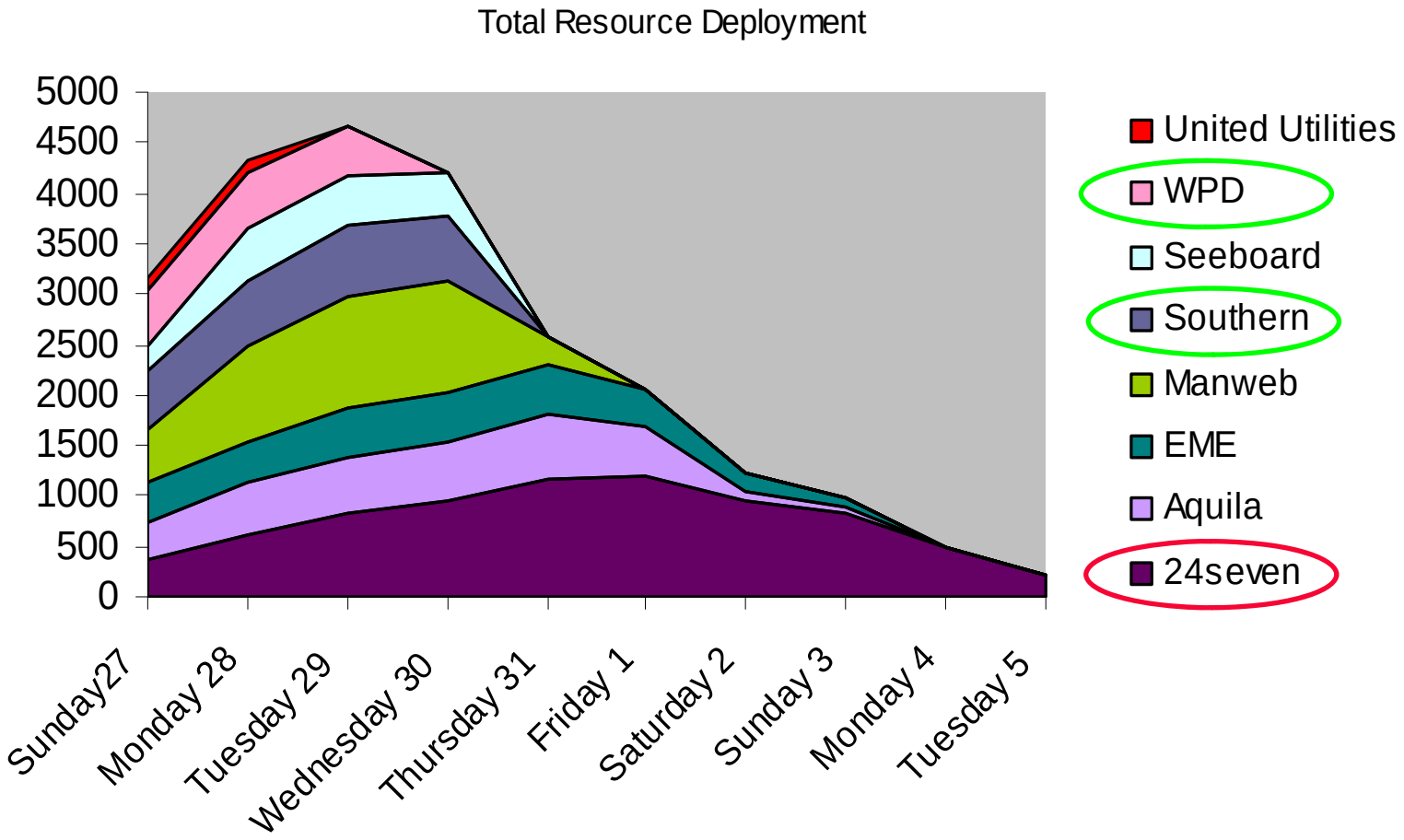
CONTINGENCIES

- Demand side management; eg voltage reduction
- Black Start contribution; correct load blocks, interface and co-ordination with generators
- Exercises
- Black Start – prioritisation of demand ? target timing ?

RESILIENCE

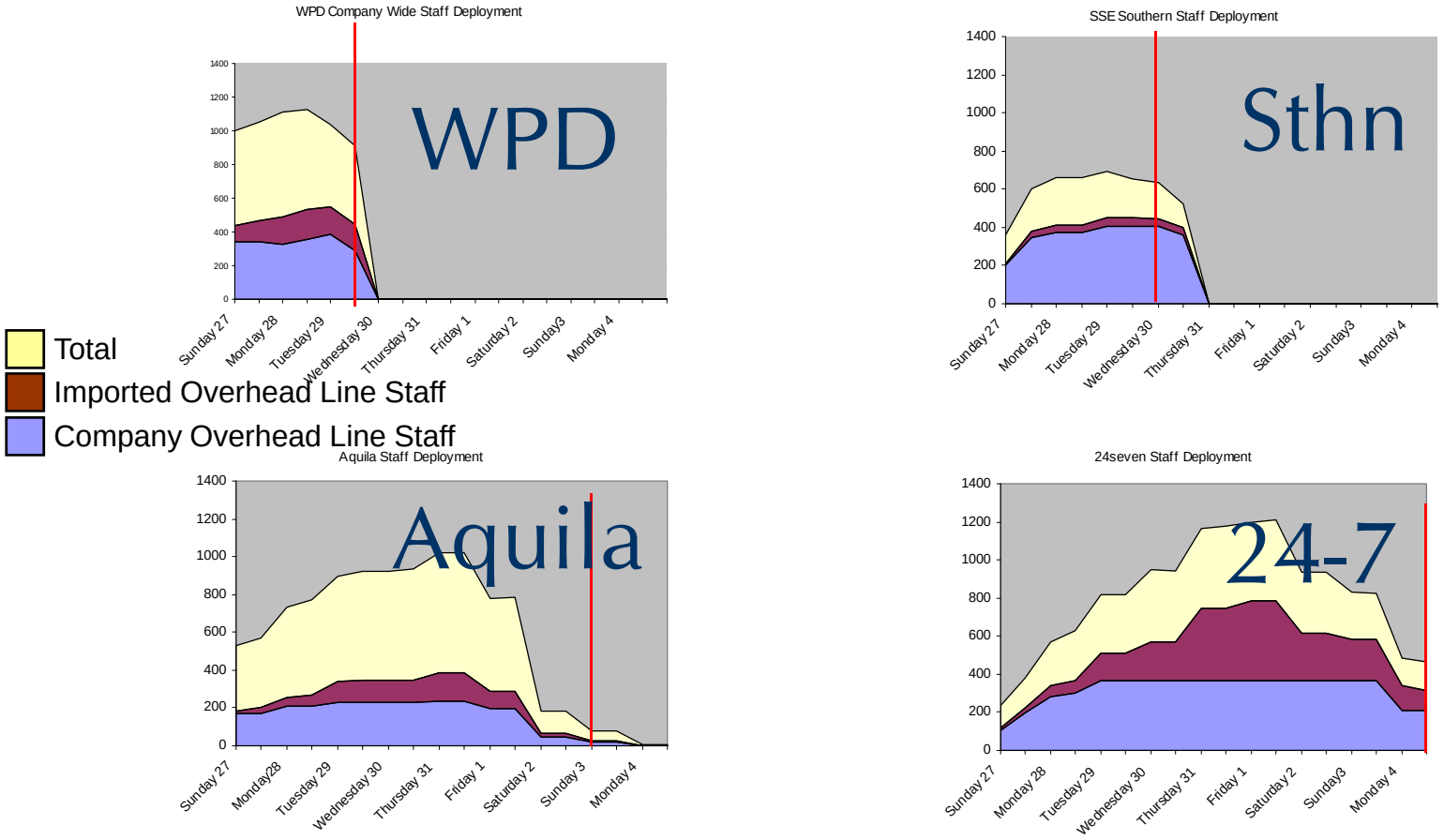
- UK Government investigated October02 storm disruptions
- Consumer willingness to pay for greater security ?
- Tree clearance increasingly a landowner sensitivity
- Early management response shown to be critical
- Risk of IT systems failing under operational duress

October 02 Storm : Deployment of Resources



October 02 Storm - Staff mobilisation by Co.

The vertical line on each indicates the day during which the last customer was restored



Some questions for Supply Security

PRIMARY ENERGY SOURCE	ENERGY CONVERSION	ENERGY TRANSPORT	CO-ORDINATION & CONTROL
Coal, gas, renewable etc	"generation"	"transmission" "distribution"	Generation balancing, and stability

Are all parties aligned to same ends ? Do penalties fall where due ?

Are the market signals for investment sufficient and timely ?

Is political or regulatory intervention a duty, or a hazard ?

Can any deficiencies in market rules be rectified promptly ?

Market externalities eg environmental obligations, planning consents ?

Exposure to terrorism, industrial action, climate change, storms ?

The "must do's" of Supply Security

- ✓CLEAR ACCOUNTABILITIES – all parties, Gov't Reg'r & Markets
- ✓INCENTIVES & PENALTIES on critical behaviours
- ✓ADEQUATE INFORMATION for market participant decisions
- ✓MONITORING of market signals and participant behaviours
- ✓CONTINGENCY PLANS for the unexpected, inc. company failure

… and don't overlook the intangibles:

Complex markets require well-informed parties, and effective relationships.

Good, professional, relationships cannot be instructed.

Relationships are harder to maintain when people regularly change roles.

Gov't/reg decisions do not need to be liked, but they must be understood.

….. these things can be enabled and facilitated

Current status of these in Britain

95% of energy is traded bilaterally, only 5% through balancing mechanism

Failure to honour contracted energy trade, exposes parties financially

Market includes forward prices in electricity and gas (an investment signal)

Ofgem has an active ‘market surveillance’ team and powers to intervene

Market has new governance arrangements that enable rapid rule changes

Steadily widening range of published information (including JESS reports)

and on the intangibles…

Industry forums are very valuable for understanding past events, for explaining new developments, and strengthening professional networks.

Regulator strives for **competence & focus** in market and technical issues.

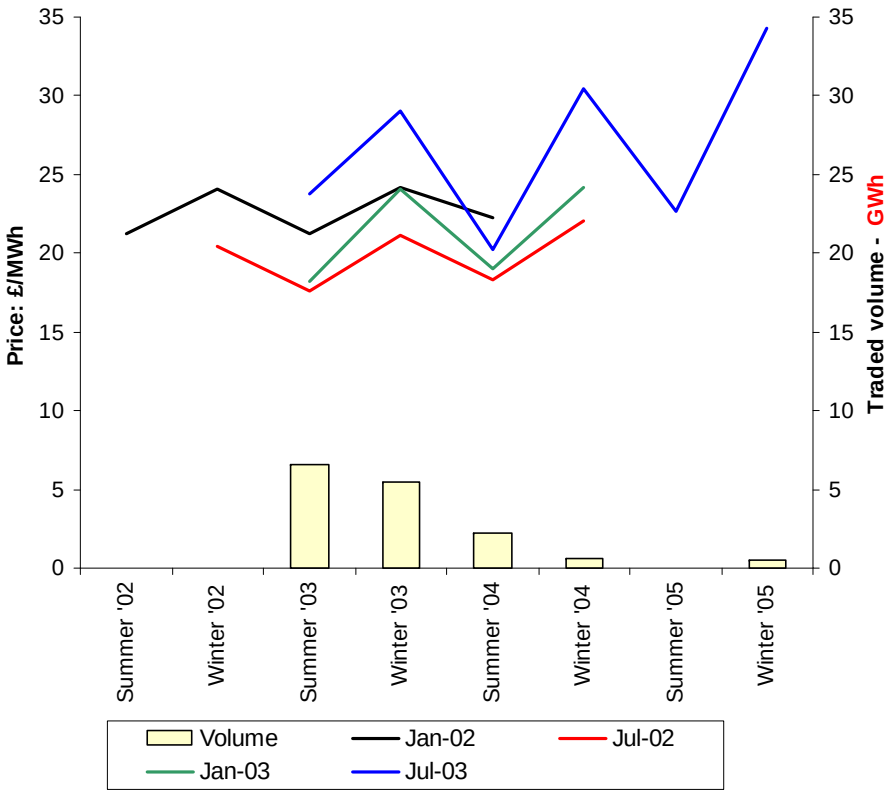
Regulator remote from political pressures and **advocates non-intervention**.

JESS = Joint* Energy Security of Supply Working Group

*Ofgem/Government

- Publishes indicators every six months, forward looking
  - Availability of gas (from now to at least 7 years ahead)
  - Availability of electricity supplies/generation and associated fuels
  - Adequacy of generating capacity and gas/electric infrastructure
  - Are markets delivering appropriate investment signals
  - Identify weaknesses / barriers that might prevent above

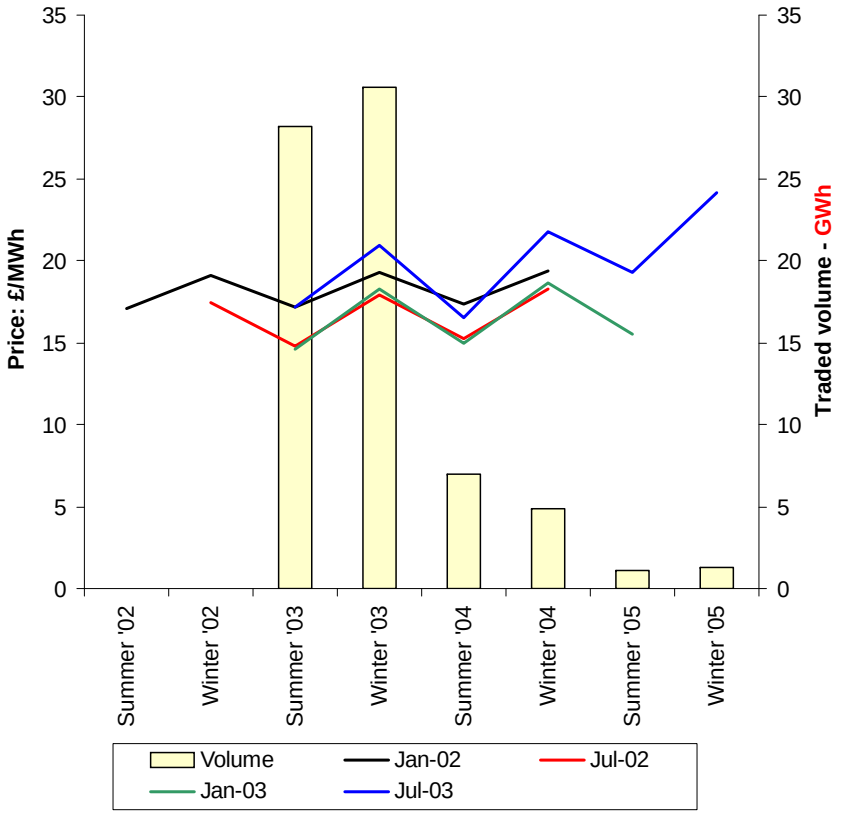
JESS report – Example 1



Electricity Forward prices for 'peak load'

- eg blue line shows July 03 prices for years to winter 05
- note these are contract prices, not forecasts

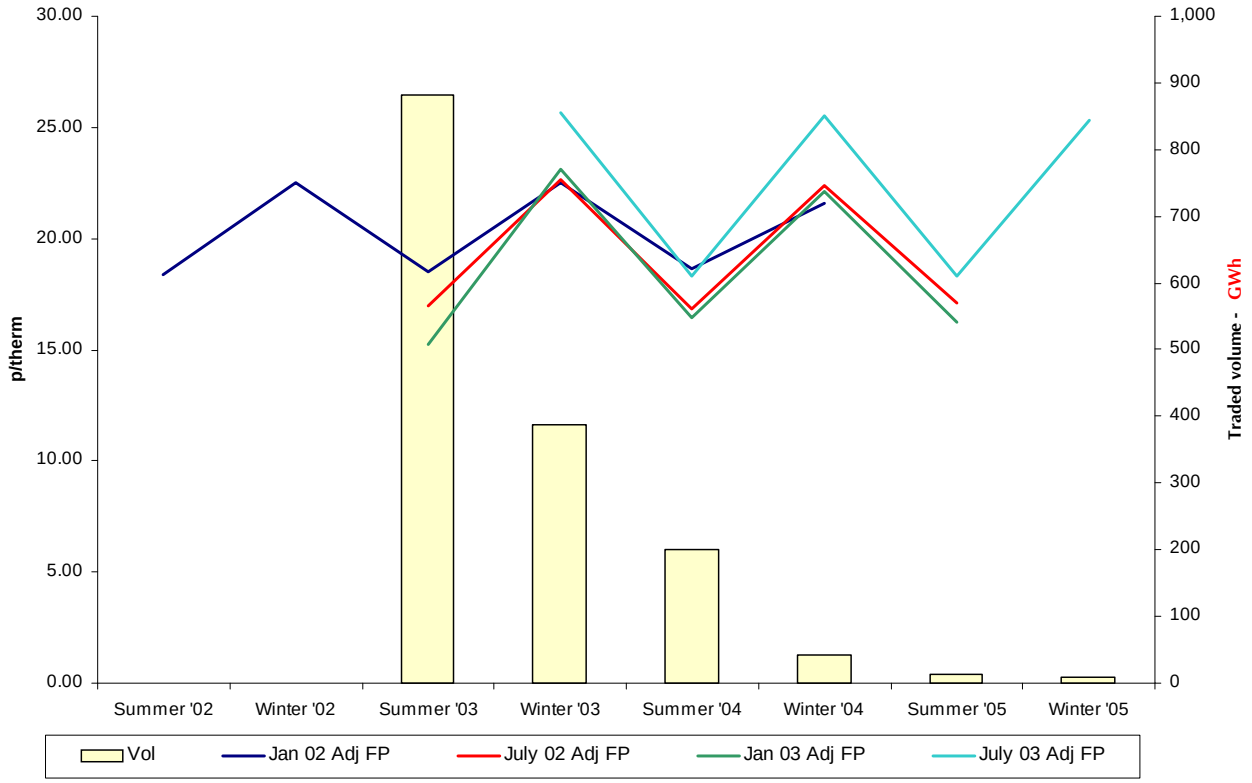
JESS - Examples 2



Electricity Forward prices for 'base load'

- eg blue line shows July 03 prices for years to winter 05
- note these are contract prices, not forecasts

JESS Example 3: Forward gas prices



Security of Supply: some questions

- ***What confidence can project developers have that government and regulator will not intervene ?***
- ***Does the market 'dampen' important price signals ?***
- ***Have all the risks/uncertainties in the chain been assessed and addressed – the bankers will find them, but it's unlikely to be their job to address them!***
- ***How effective are contingency arrangements, demand side and generation side? Are they documented and exercised, .. by all the parties ? Are company failures covered ?***
- ***Black Start is exceptionally demanding: do you have standards for restoration time and for prioritisation ?***

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  - Innovation
  - Security of Supply
- **In Conclusion**

what we haven't had time for…..

If Distribution networks become active, rather than passive systems:

- they start to resemble **mini-transmission systems**
- could Distribution companies be more than asset owners/operators ?
- might companies operate, and be rewarded, as **'energy transporters'** ?
- but what about the **engineering skills** needed in the companies ?
- and the **management capabilities** and company mindsets ?
- a more complex, risk-managing, environment will need **new competences**

Does the sector have the vision to create a new business framework ?

Finally

- ✓ Distribution challenges are substantial and security critical
- ✓ TECHNICAL + COMMERCIAL + REGULATORY solutions will have to be integrated for success
- ✓ New business opportunities and new career opportunities !

Electricity Distribution

is indeed going to be

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