ofgem
Promoting choice and value for all gas and electricity customers

CAE/IEE Christchurch, NZ

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Security of Supply
A view from the UK

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Security of Supply
A view from the UK

- **Setting the scene**
- **Themes:**
  - **The Elements for Security**
  - **Some of the Must Do's**
  - **The role of Distribution**
  - **Challenges of renewables**
  - **Innovation for networks**
- **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

9, Millbank, London SW1

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

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

Market Mechanisms
Regulation
Government Policy
"Permission to Operate" factors

Two Approaches to Investment

- Central planning:
  - Forecast where the market is going
  - Build according to forecast – customers bear the risk
- Market-based:
  - Encourage entrepreneurial investment (more nimble, better incentives) - investors bear market risk
  - For natural monopolies, design incentives to build in response to demand; measure and reward company outputs

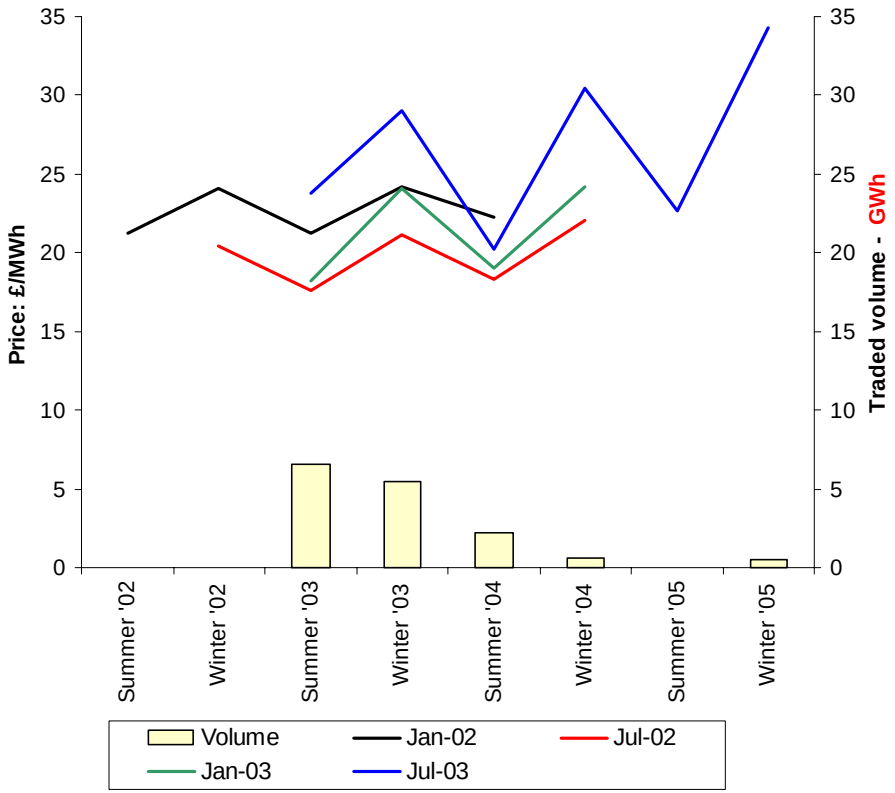
GB New Electricity Trading Arrangements (NETA)

Effective markets foster security by:

- Providing transparent and timely price information
- Market participants responding to spot and forward prices
  - New investment and retirement decisions
  - Mothballing and de-mothballing decisions
- Putting incentives on all participants to manage their risks
- Facilitating contracting ahead

JESS Joint* Energy Supply Security Working Group

Ofgem+Government: 6-monthly reporting of electricity and gas indicators

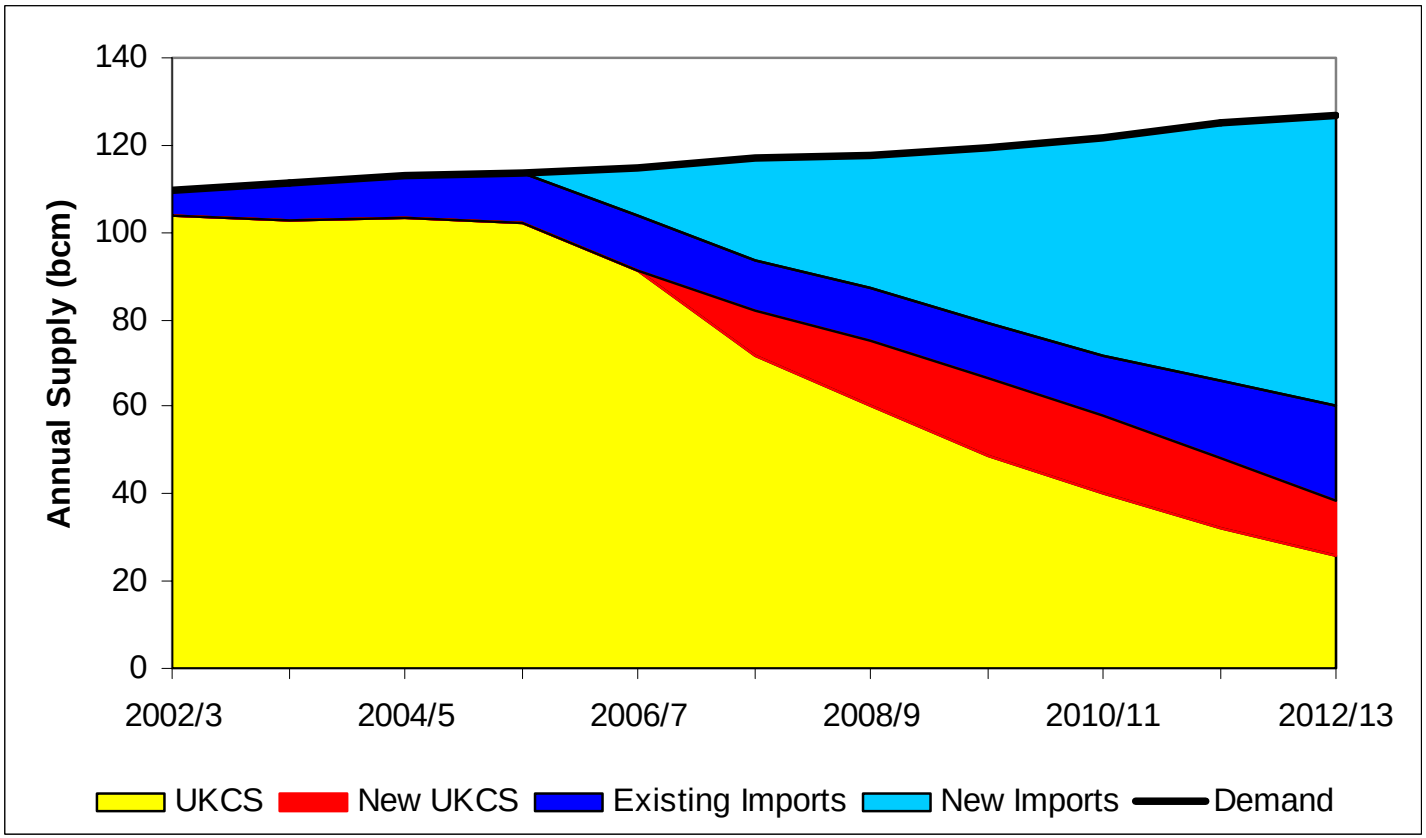


Third report – Examples 1

Electricity Forward prices for 'peak load'

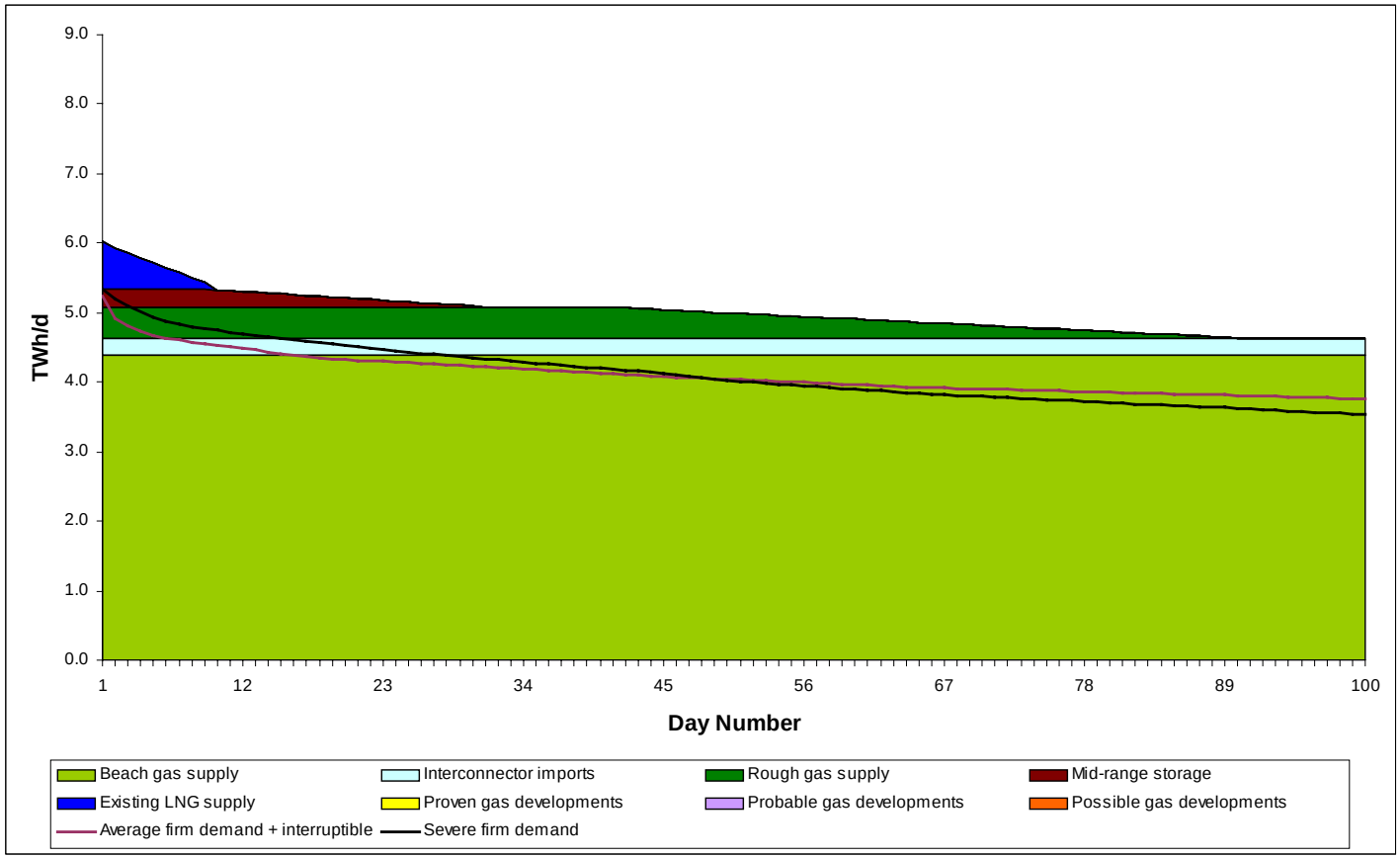
- eg blue line shows July 03 prices for years to winter 05
- Note these are contract prices, not forecasts

JESS Example 2: Projected UK gas imports (Source NGT)



UKCS= UK continental shelf

JESS Example 3: Demand duration curves (gas)



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**.

Security of Supply: some questions

- ***What confidence can project developers have that government and regulator will not intervene ?***
- ***Does the market reveal the necessary price signals ?***
- ***Have all the risks/uncertainties in the supply chain been assessed and addressed – the bankers will find them, but they won't act to resolve them!***
- ***How effective are contingency arrangements, demand side and generation side? Are they documented and exercised ? Is company failure addressed ?***
- ***Black Start is exceptionally demanding: do you have standards for restoration time and for prioritisation ?***

The Elements of Supply Security

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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

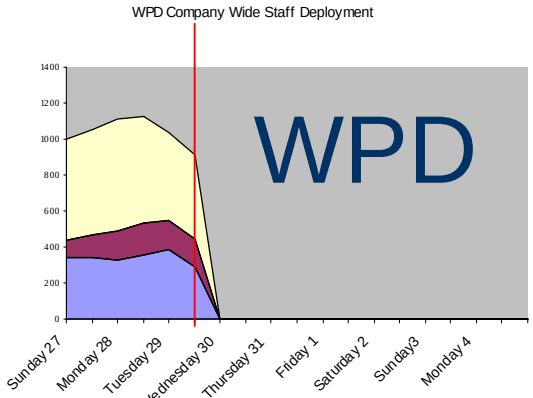
- Demand side management; eg voltage reduction
- Black Start contribution: correct load blocks, interface and co-ordination with generators
- Exercises
- Black Start Policy: prioritisation of demand ? target timing ?

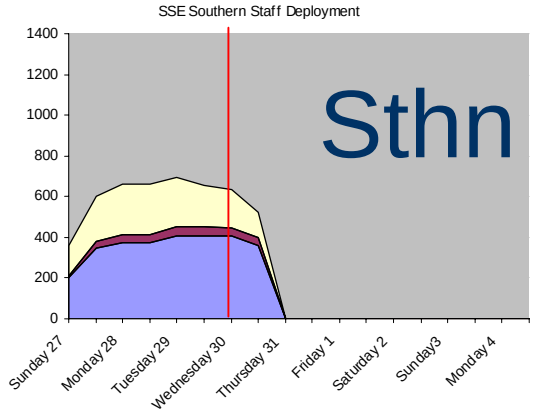
RESILIENCE

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

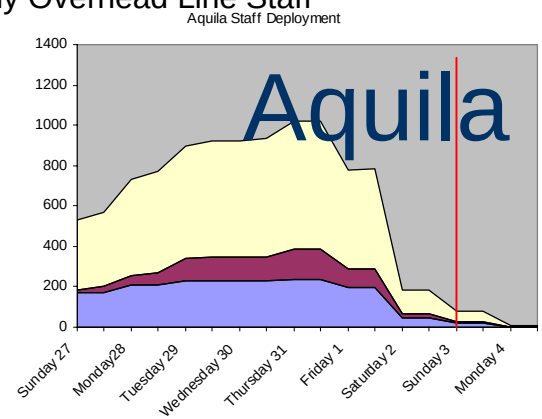
October 02 Storm - Staff mobilisation by Co.

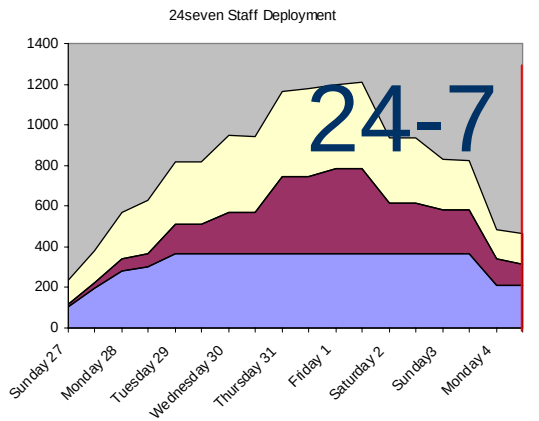
The vertical line on each indicates the day during which the last customer was restored





Total
Imported Overhead Line Staff
Company Overhead Line Staff





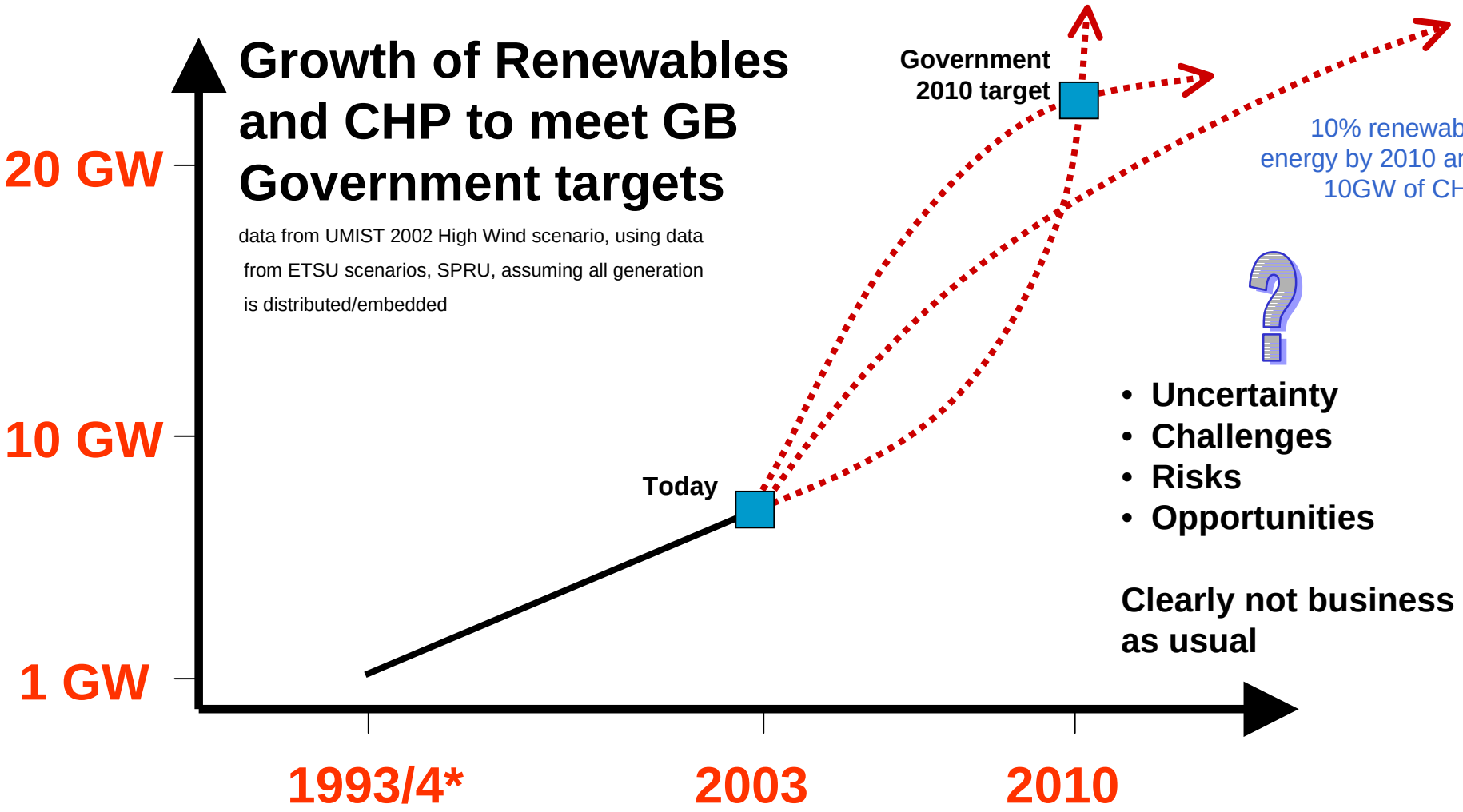
Distribution: Strategy & Direction ?

- 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

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

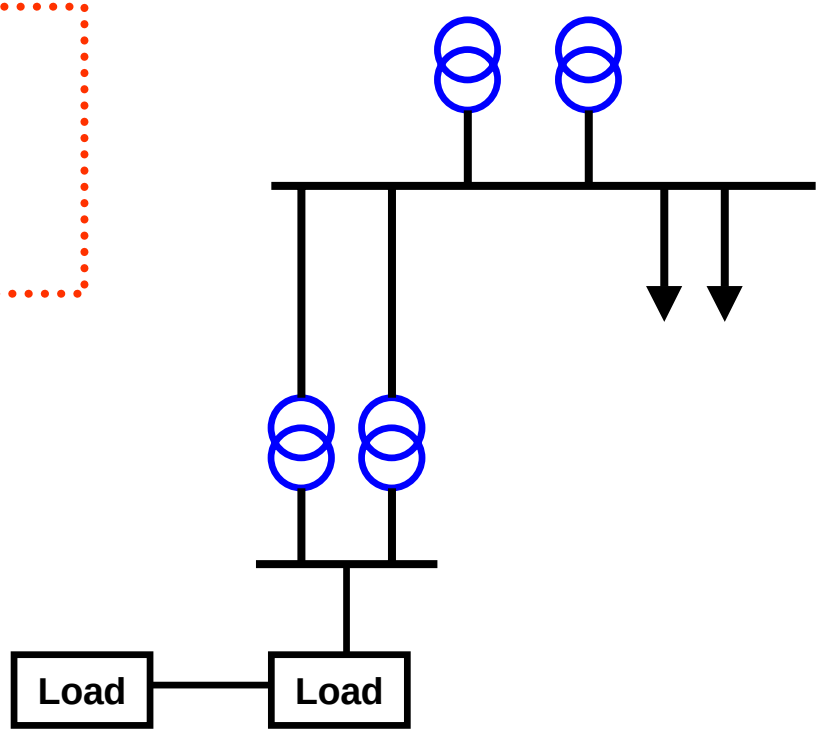


* 1.2 GW embedded independent generation – NGC SYS, March 1994

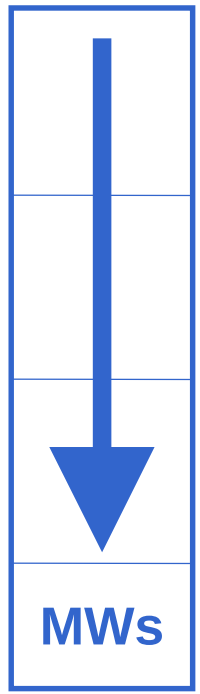
A view of tomorrow

Today's networks

Unidirectional power flows

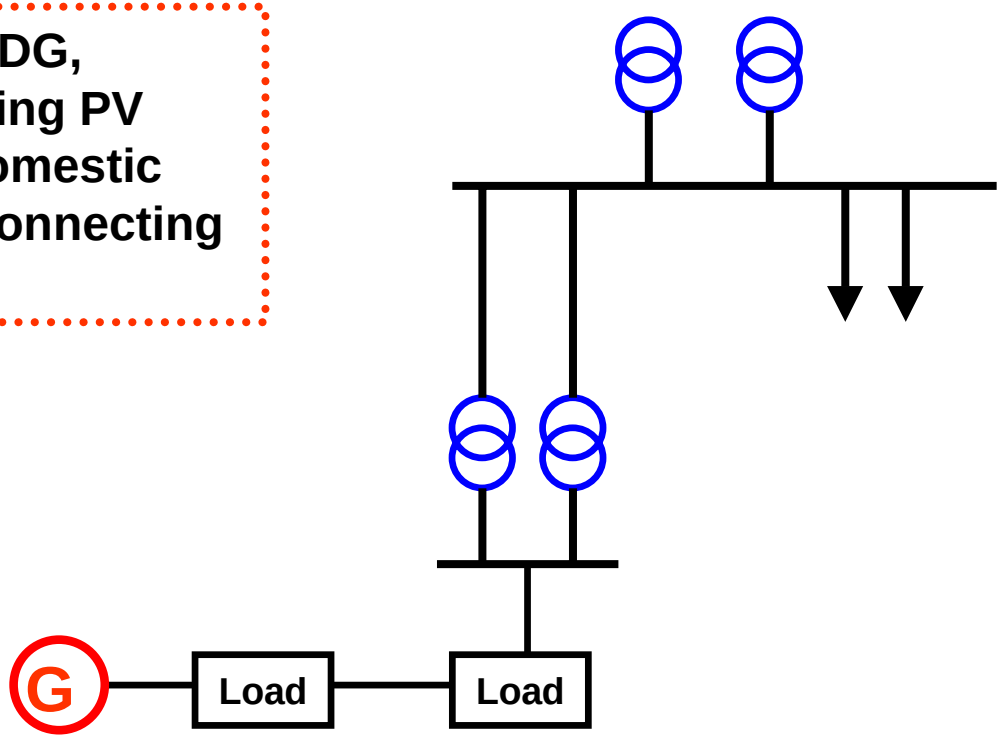


Boundary flow

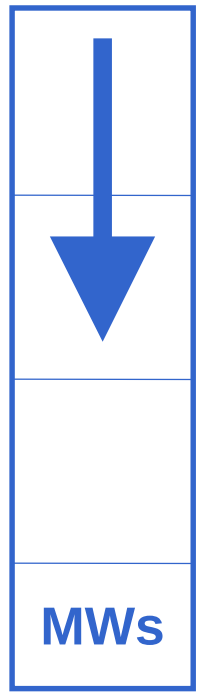


A view of tomorrow

Some DG, including PV and domestic CHP connecting at LV

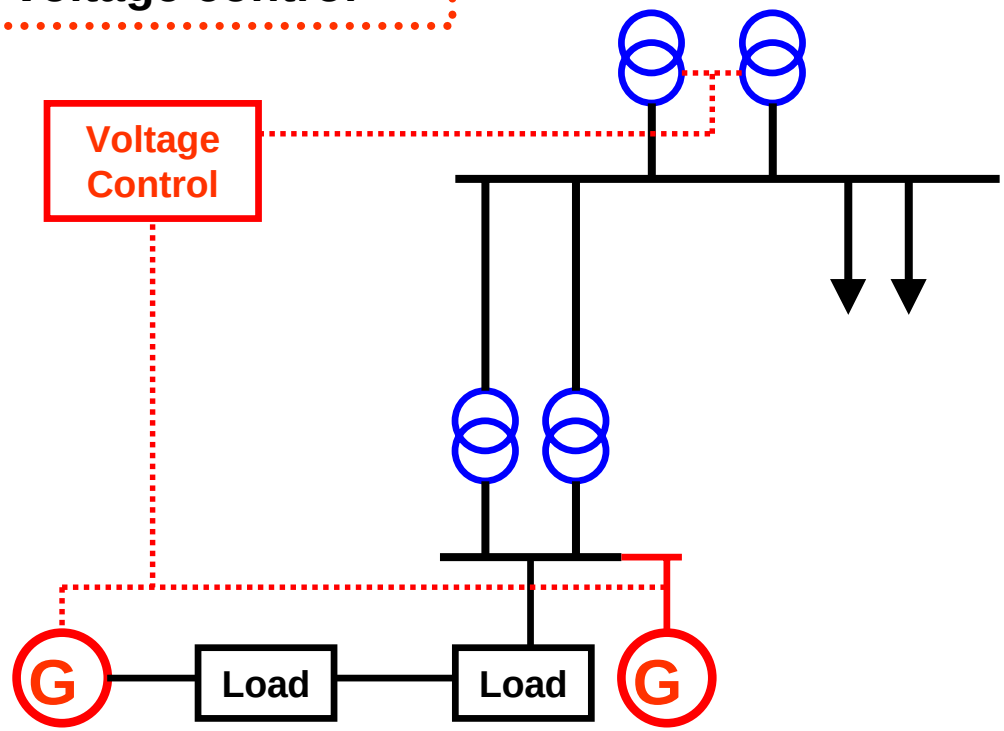


Boundary flow reduced

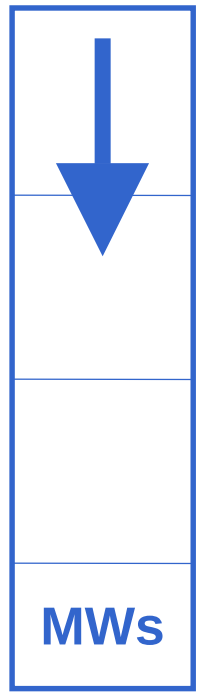


A view of tomorrow

Active voltage control

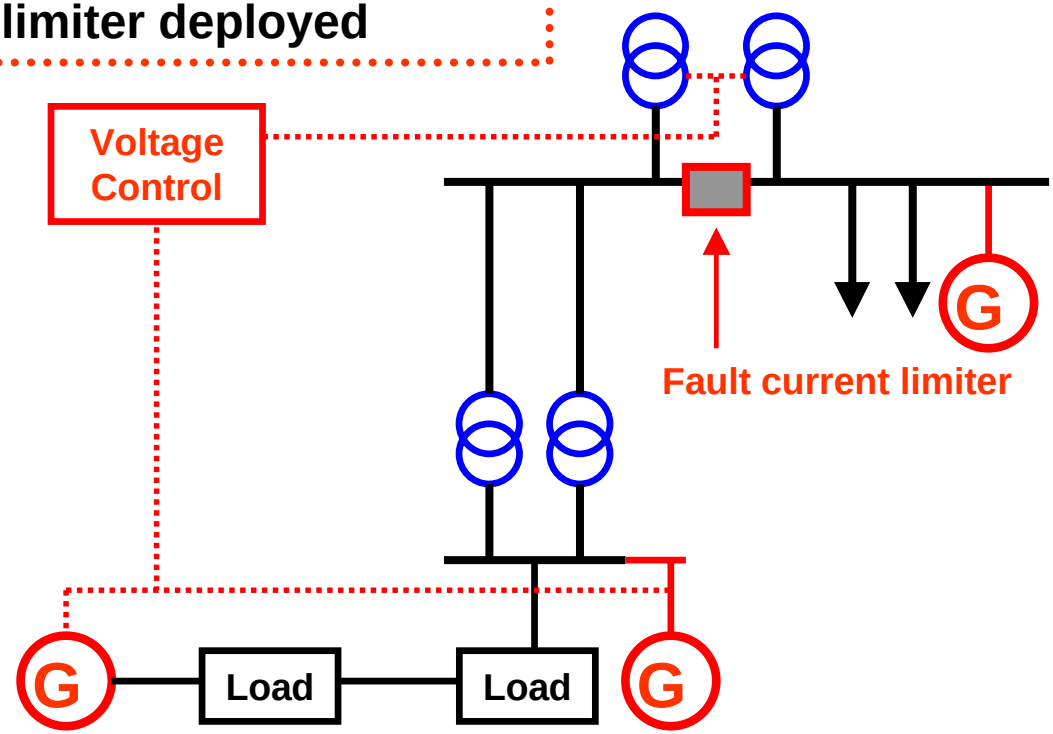


Further reduced boundary flow

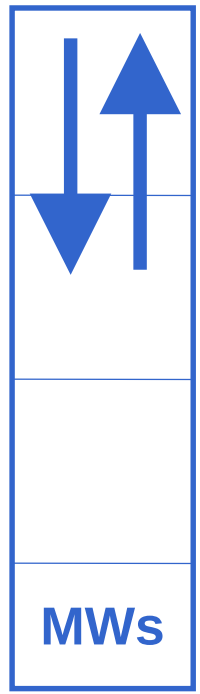


A view of tomorrow

Network may now export, fault current limiter deployed

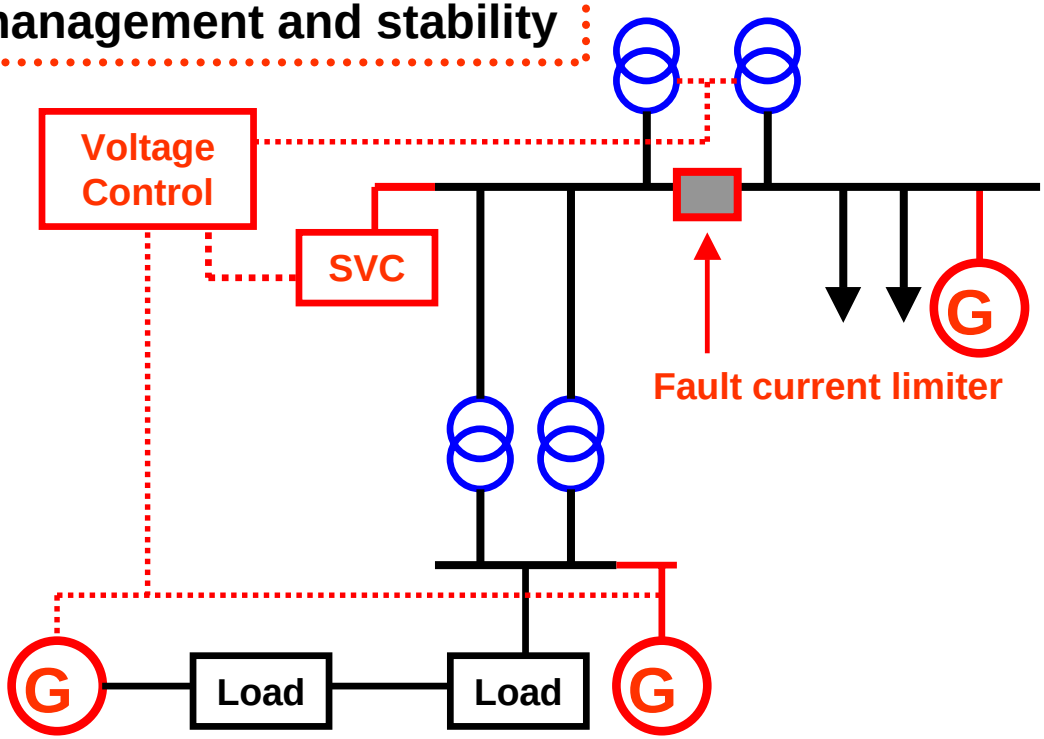


Potentially, two-way boundary flows



A view of tomorrow

SVC deployed for reactive power management and stability



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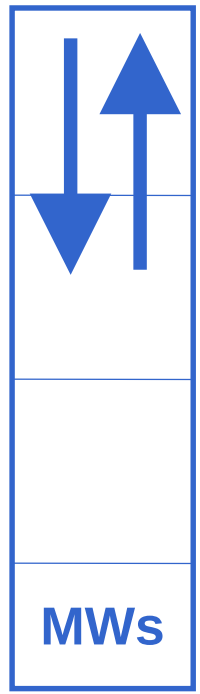
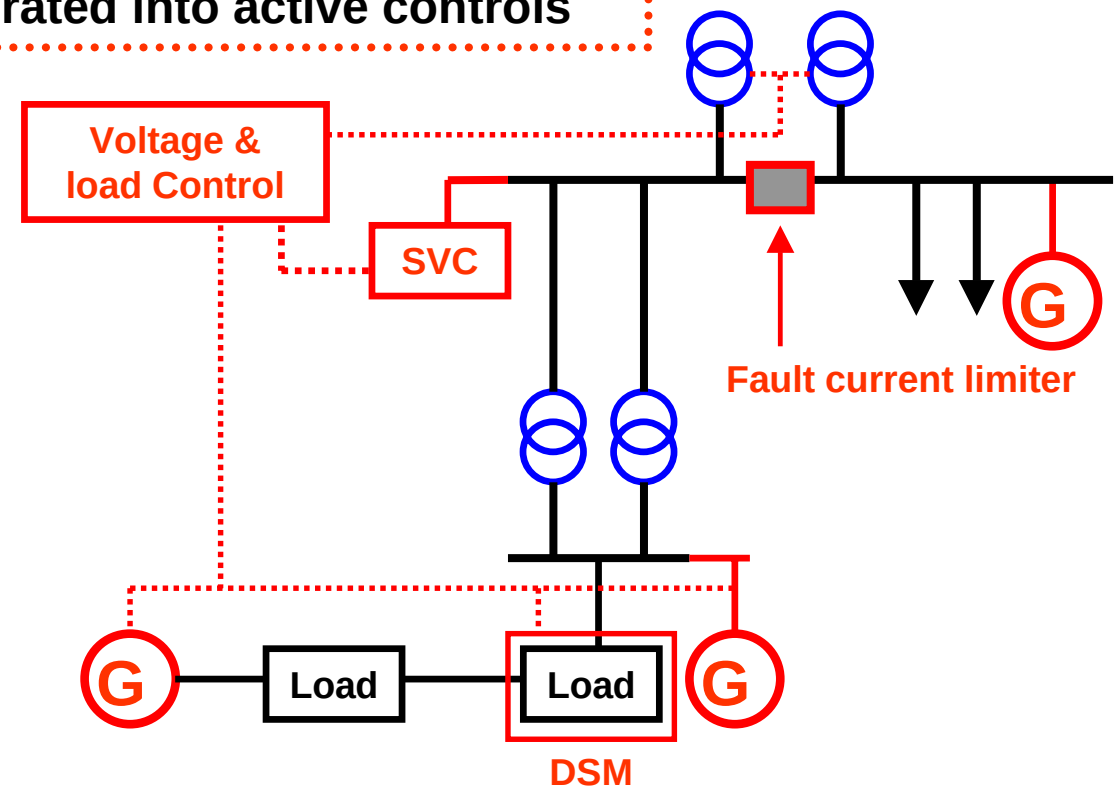
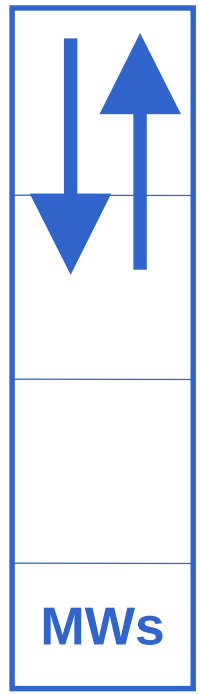


A view of tomorrow

Demand management integrated into active controls

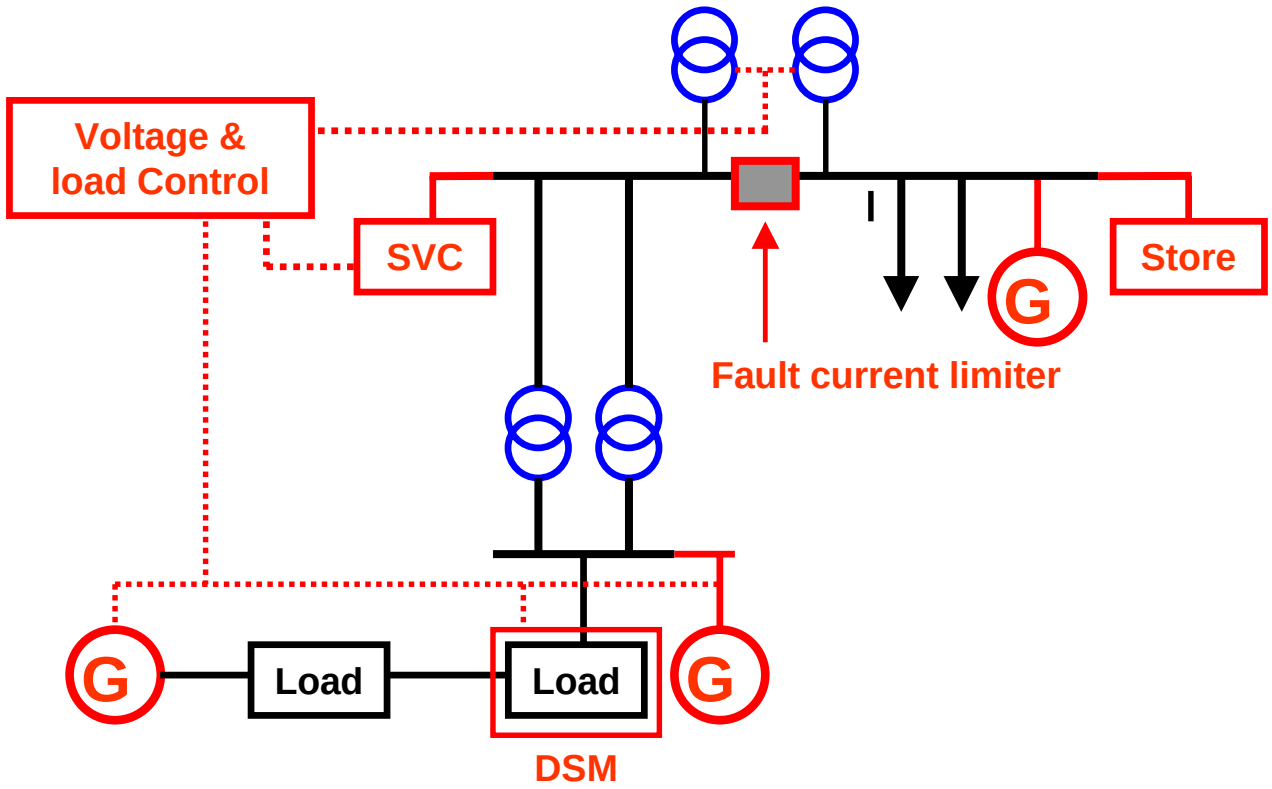


Potentially, two-way boundary flows

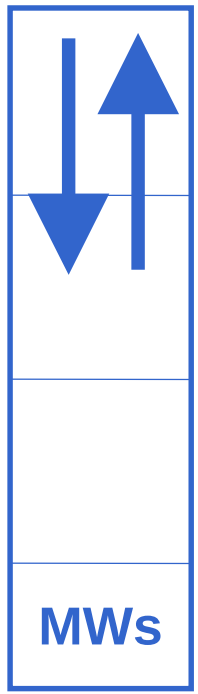


A view of tomorrow

Bulk energy storage deployed

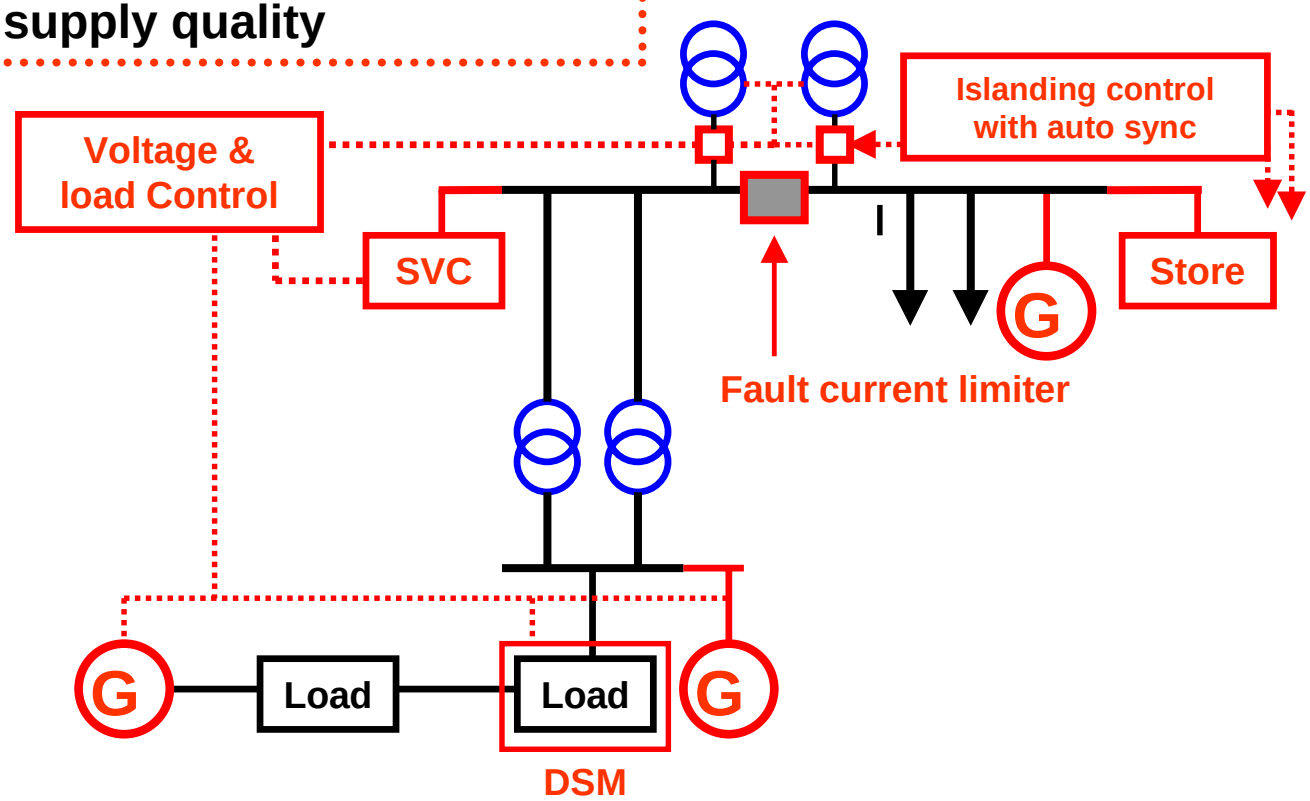


Potentially, two-way boundary flows

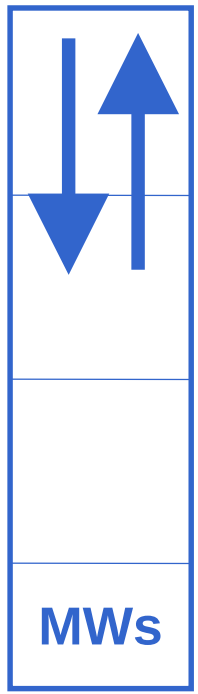


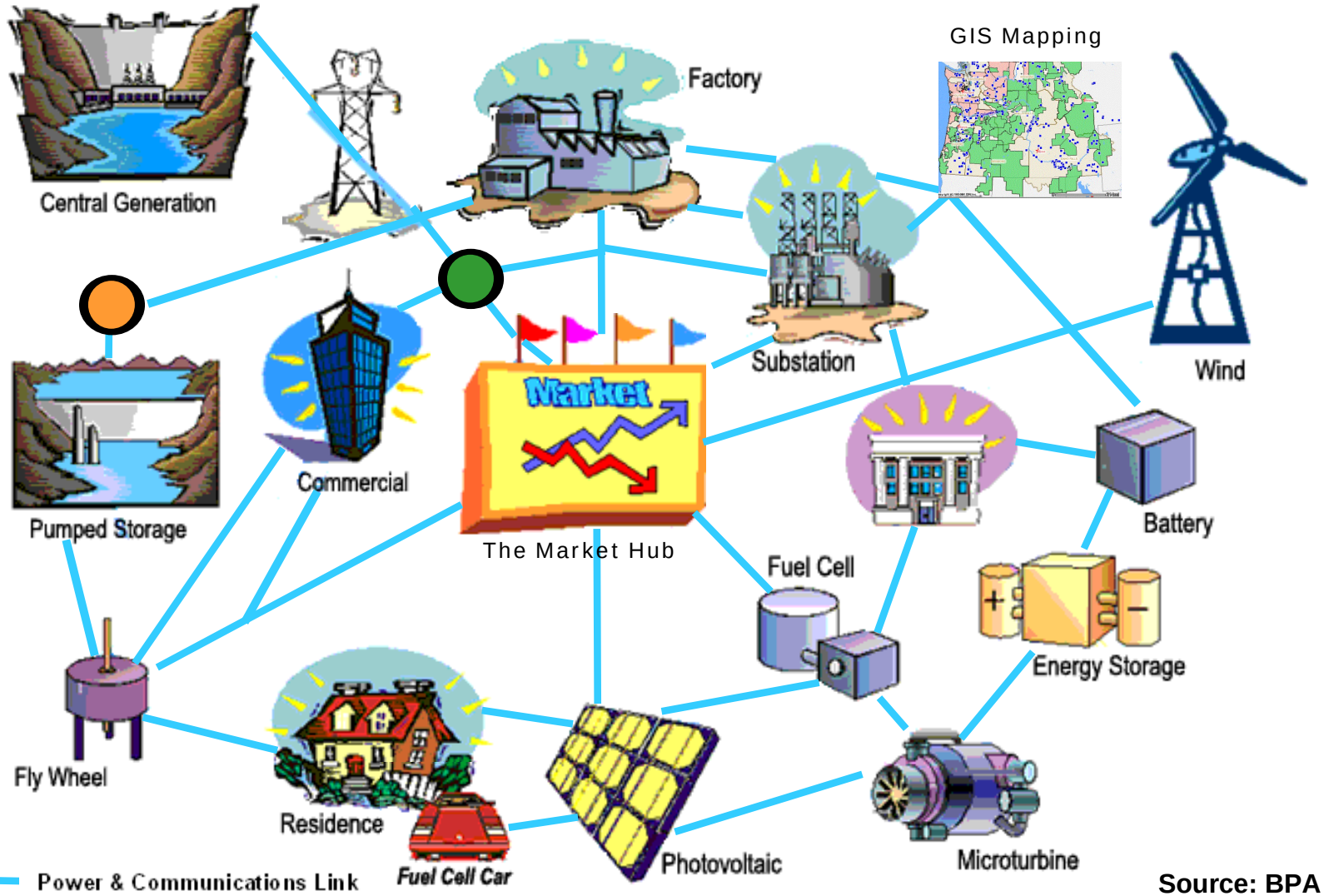
A view of tomorrow

Islanding capability enhances local supply quality



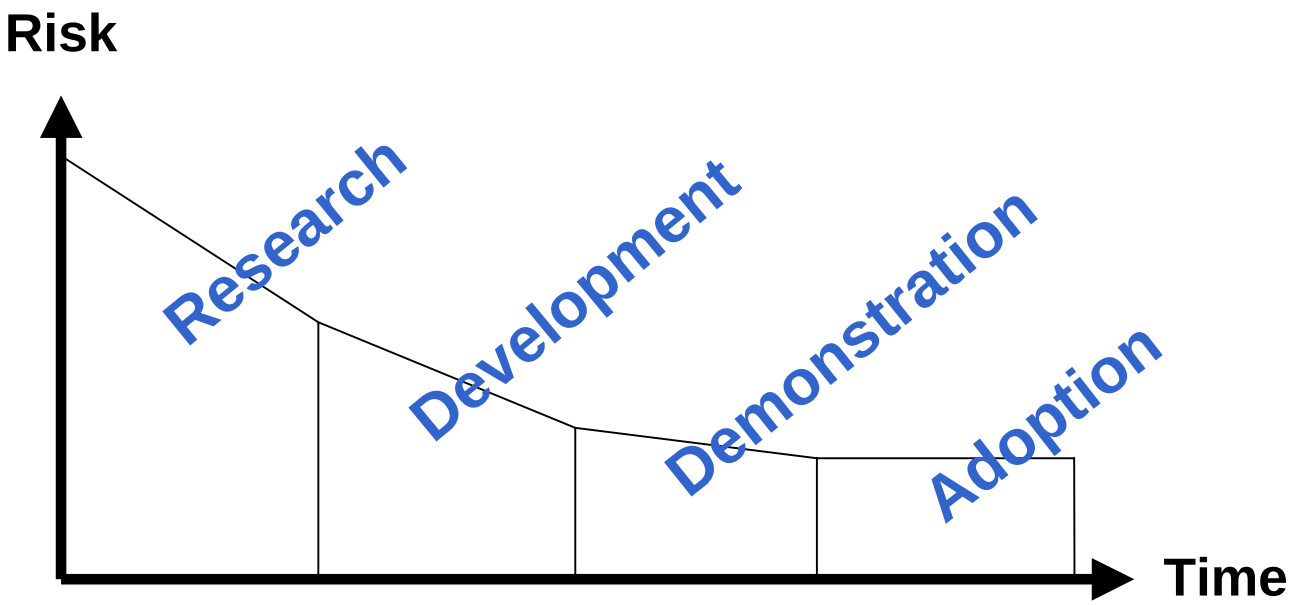
Potentially, two-way boundary flows




Central Generation
Factory
GIS Mapping
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

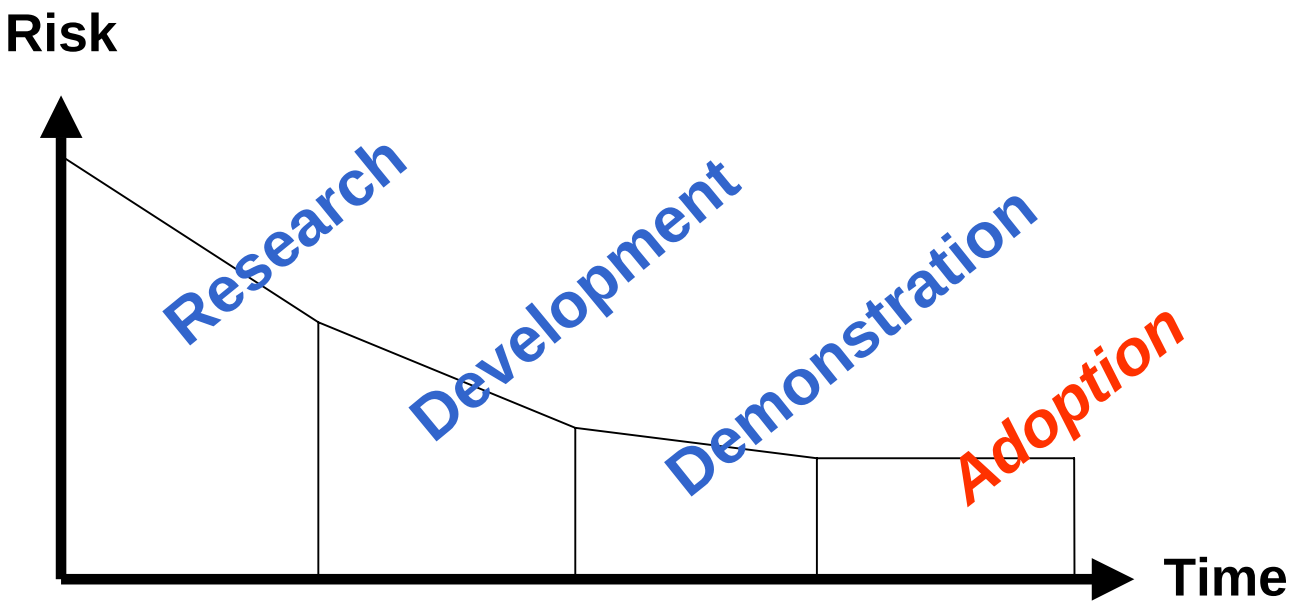
Source: BPA

The innovation process



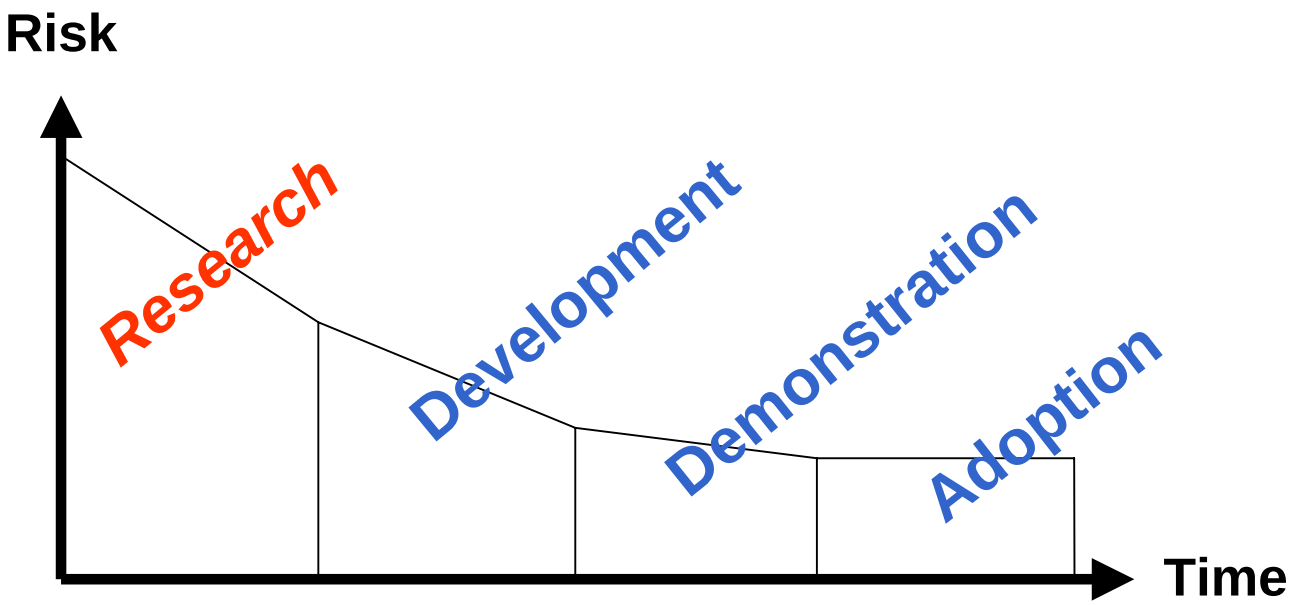
Multi-stage process to convert ideas to products/solutions

The innovation process



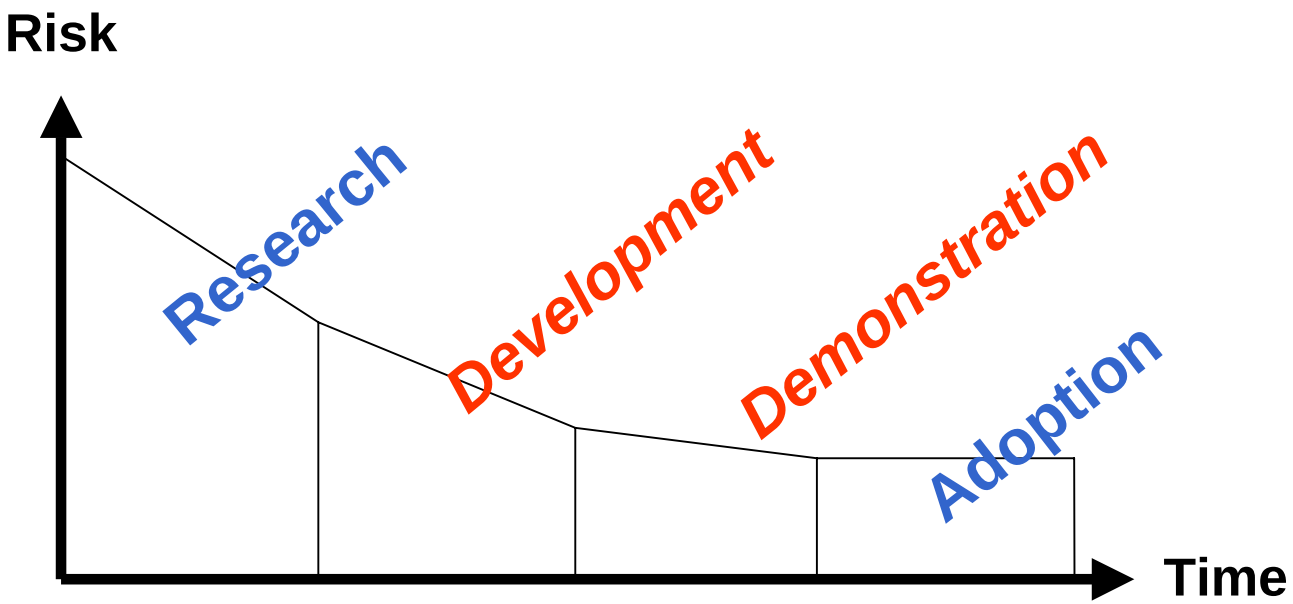
RPI – X & Capex
Treatment effective

The innovation process



Manufacturers and research community lead

The innovation process



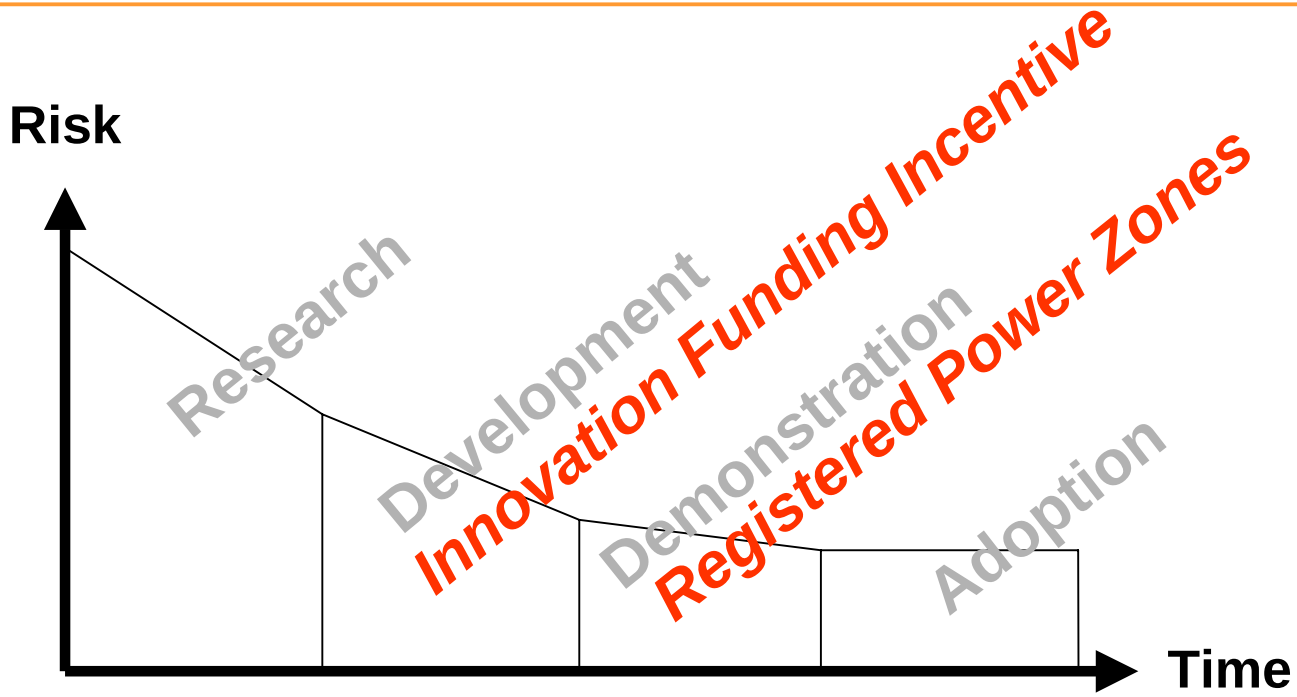
DNO involvement necessary here:

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

The innovation process

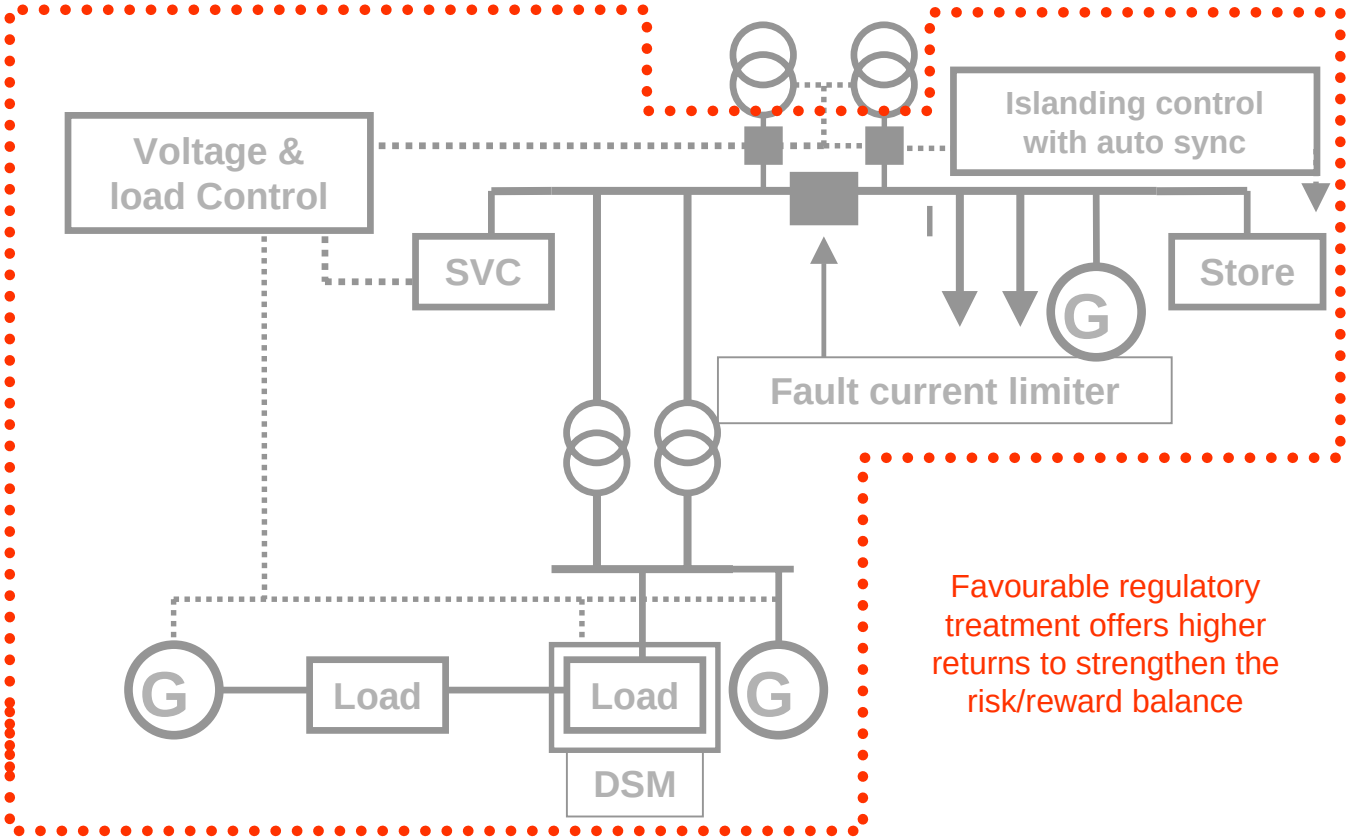
IFI

- **Perhaps 0.5% of turnover p.a**
- **Use it or lose it basis**



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

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**

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 & management** skills in the companies ?
- a more complex, risk-managing, environment will need **new competences**

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

…. and returning to Supply Security

- Technical, Commercial, & Regulatory solutions must be integrated
- The successful strategies will include the demand side, not generation alone
- Permission-to-Operate needs to be addressed actively; hearts and minds…
- Government or Regulatory intervention brings considerable risks
- But, Government and Regulatory involvement is essential to achieve change
- The market participants & asset owners are best placed for a strategic view

Incentivise them to find the solutions; don't leave it to the bureaucrats

In Conclusion

- Accountability essential for every link in the supply chain
- Effective incentives change behaviours
- Don't forget the intangibles
- Distribution – new opportunities ahead
- Change succeeds through well laid plans

The sector shares the obligation for Security of Supply:

No winners if the lights go out

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