

# Mechanisms to encourage innovation in the UK grid

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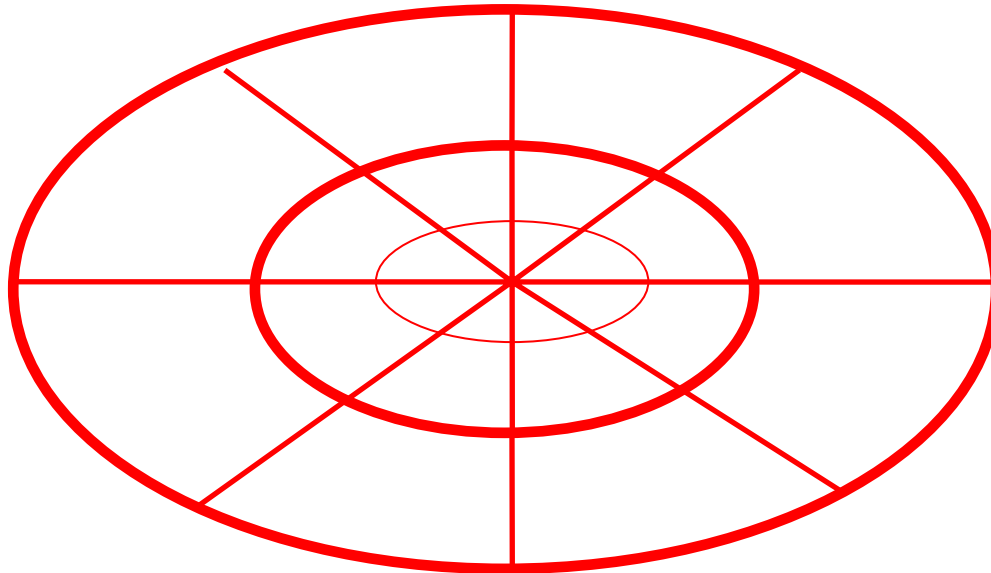
# Presentation Structure

- Introduction
- Work in progress
- Network innovations
- Incentivisation for DNOs
- Concluding remarks



# Introduction

# Networks

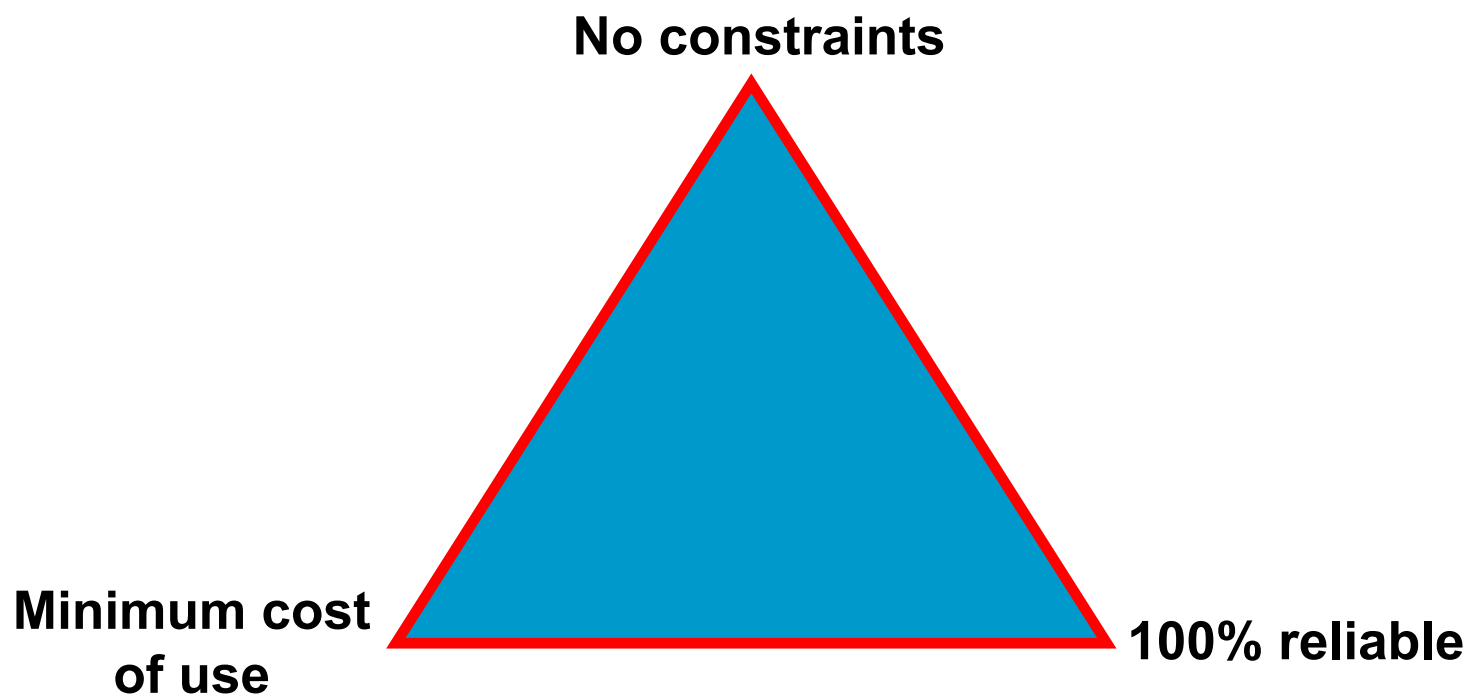


The unsung heroes...

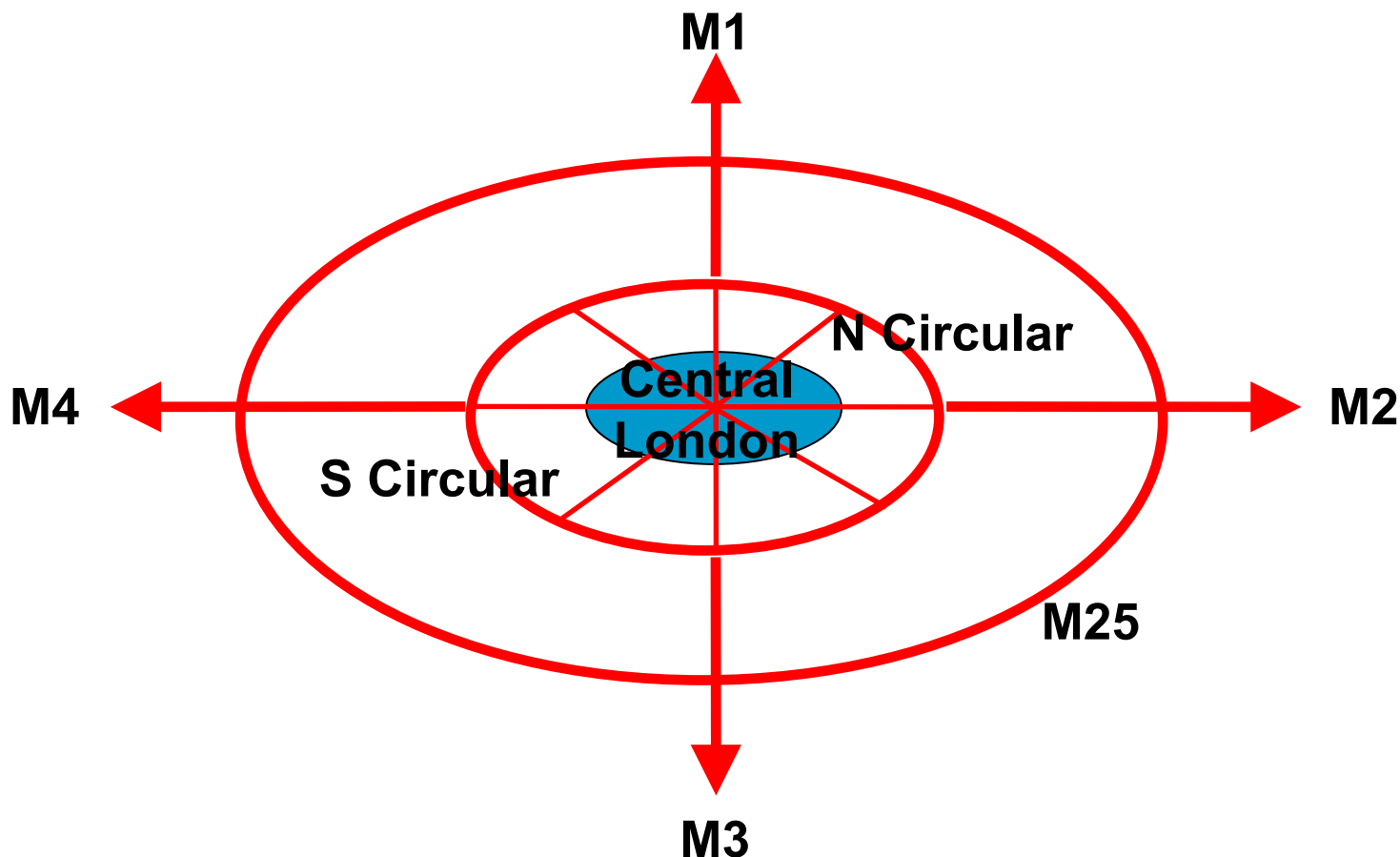
...ignored until they constrain

...or cost too much

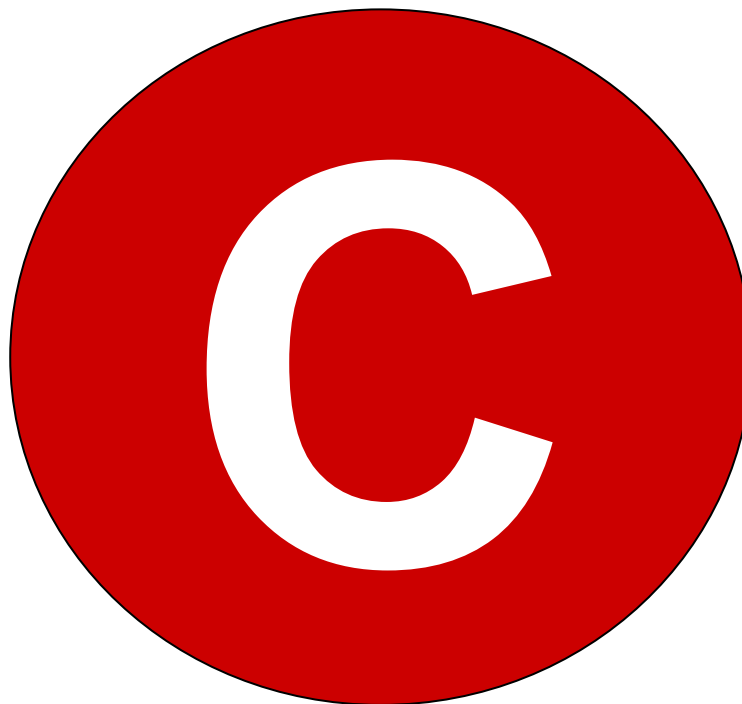
# The Perfect Network?



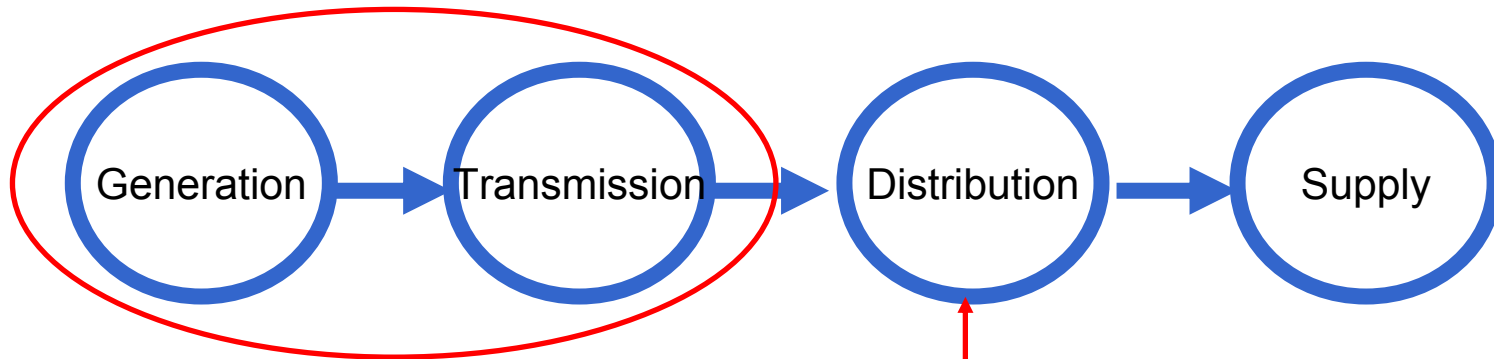
# The Imperfect Network!



# Active Management?



# The Electricity Supply Network



Meshed, active network

Tapered, passive network

# The Challenge

- To develop distribution networks that:
  - Continue to reliably supply demand customers and facilitate DSM
  - Allow the connection of generation at all voltage levels
  - Become more controllable and 'intelligent'
  - Improve or tailor quality of supply
  - Achieve the optimum utilisation of assets and the minimum usage charges

# Work In Progress

Distributed Generation Coordinating Group



# DGCG's Mission Statement

“...to facilitate the achievement of the Government's targets for renewable generation and CHP...

...identify and consider any network issues that are constraining the further development of distributed generation.

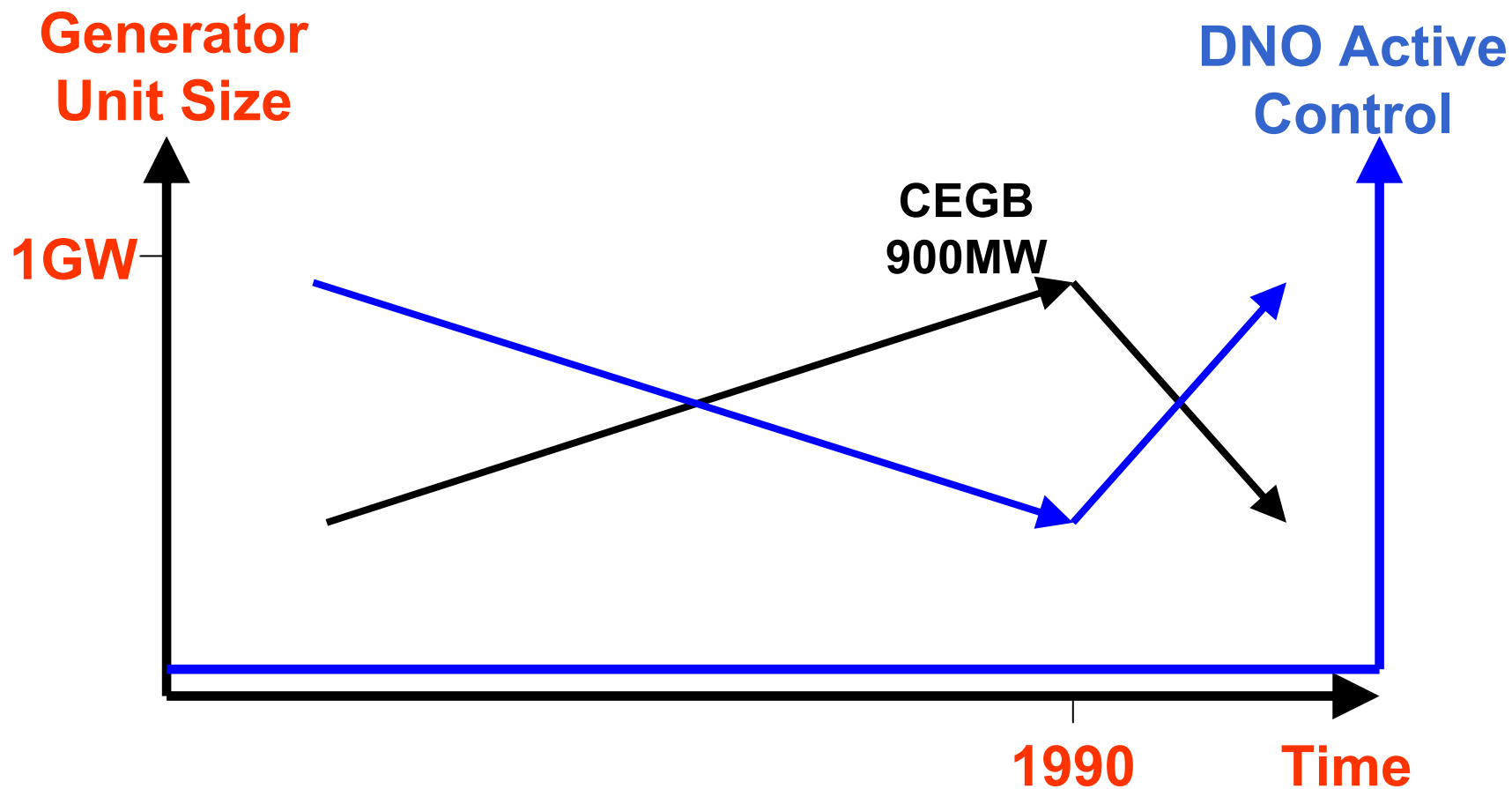
...recommend to the DTI/Ofgem the actions necessary to remove these constraints and if appropriate advise on priorities and incentives.”

# Read All About It!

[www.distributed-generation.org.uk](http://www.distributed-generation.org.uk)

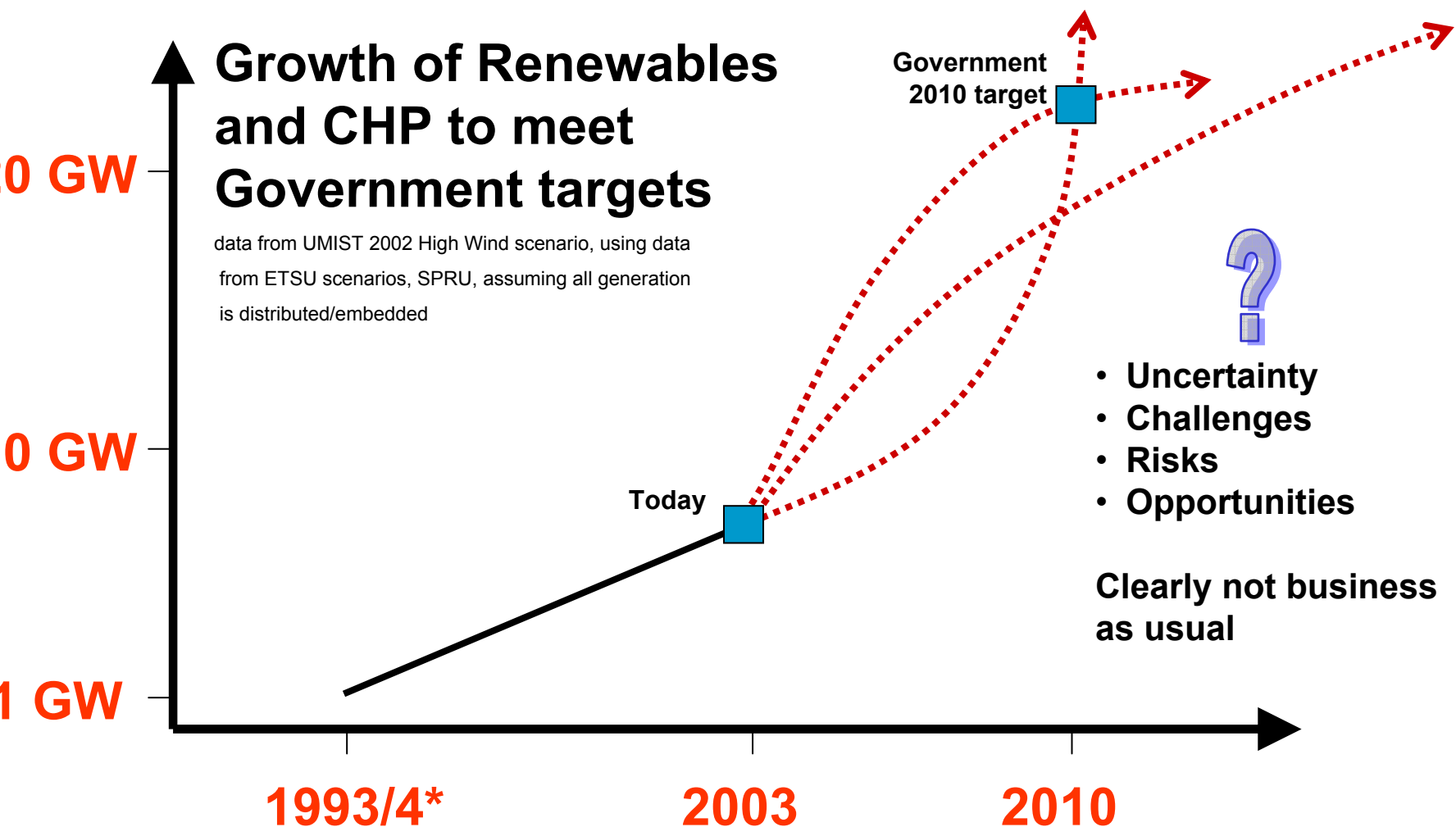


# Networks Innovations



# The drivers for innovation

- In the immediate future, the growth of DG is likely to be the key driver for innovation in DNO networks
- Generation potentially at all voltage levels, including LV
- Many of these networks are approaching 40+ yrs service
- Substantial investment likely to be ahead for both reasons
- The regulator will seek efficient use of customers' money

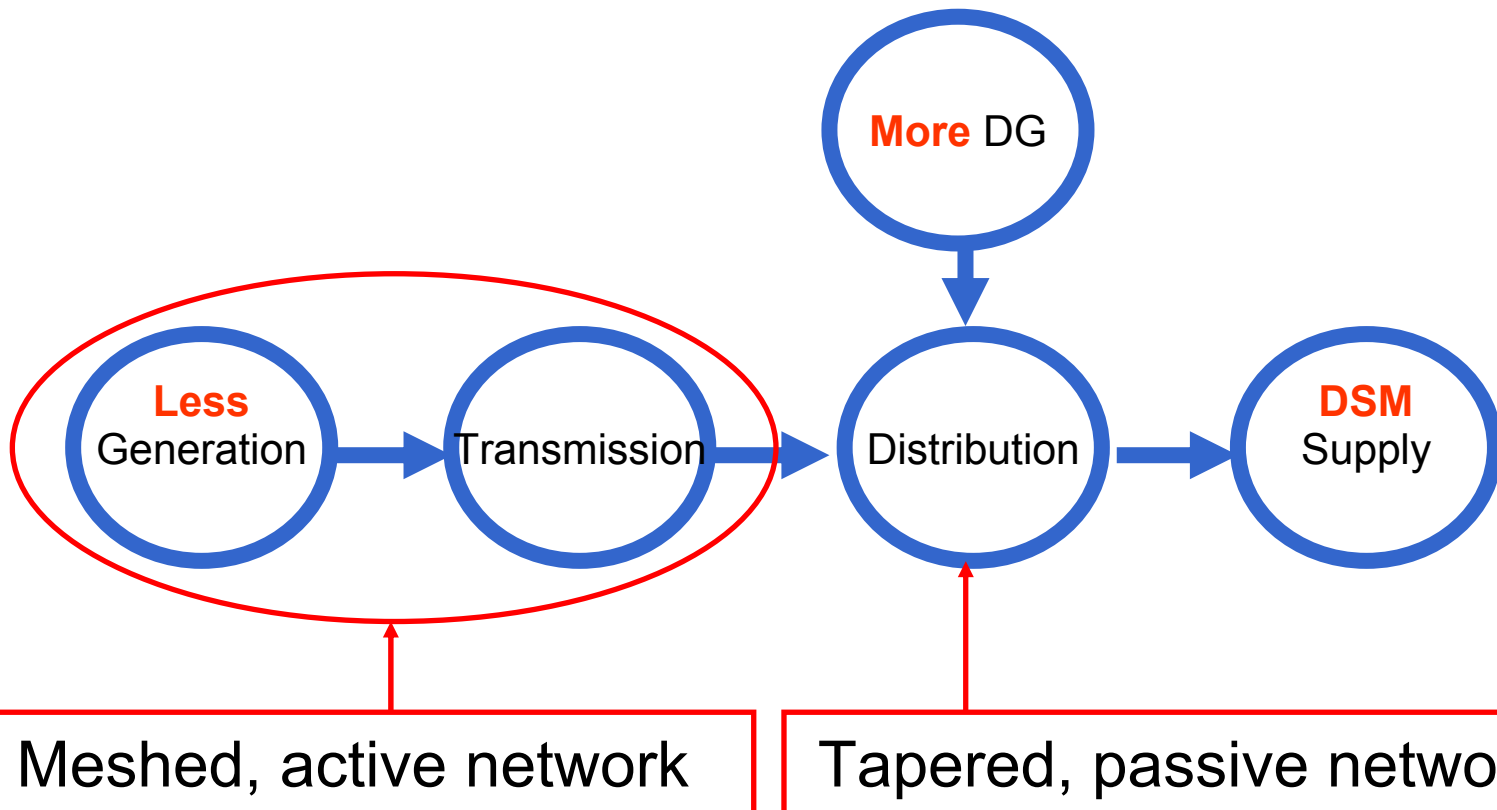


\* 1.2 GW embedded independent generation – NGC SYS, March 1994

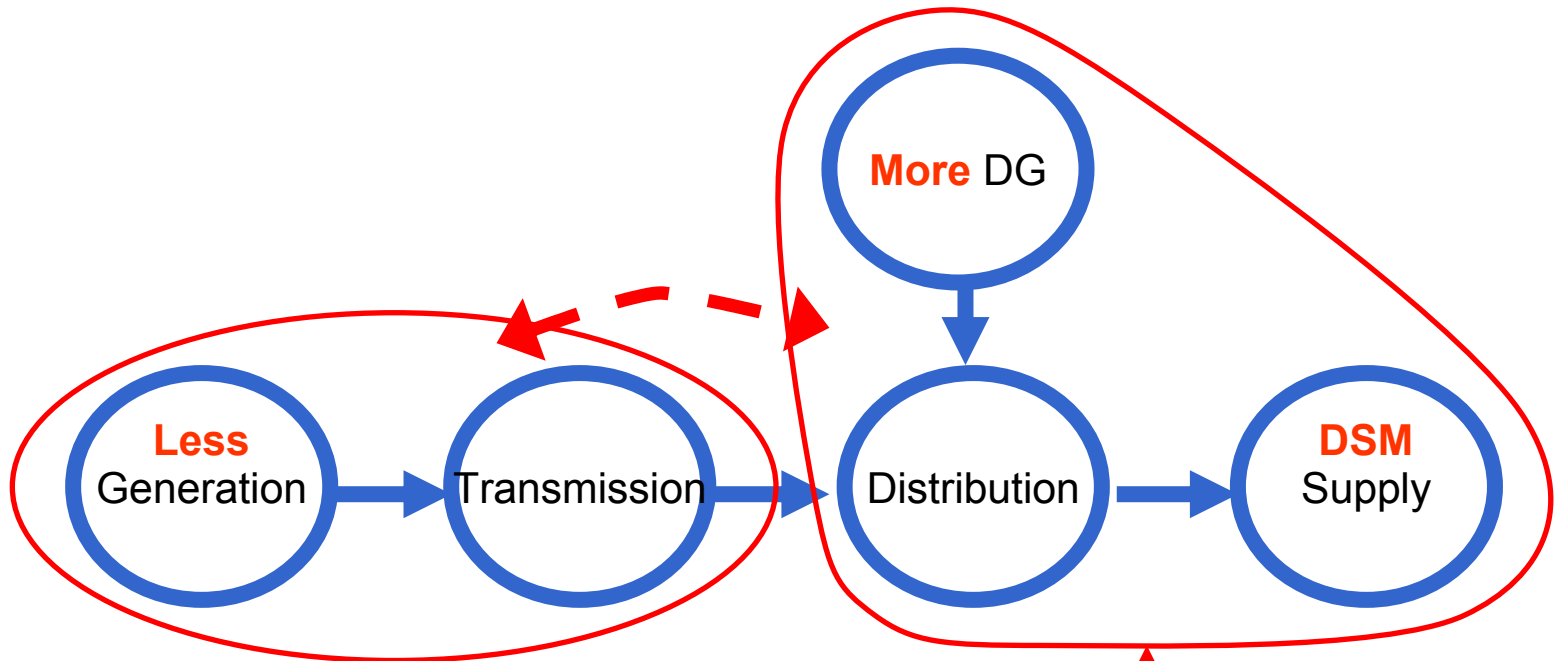
# Drivers for change - DG

- 'Fit & Forget' DG connection will soon become impractical and a very inefficient use of investment
- Continuing a 'passive' system control philosophy will constrain generation connection
- Need for networks to become progressively more 'active' and 'intelligent'
- UMIST study confirms that 3x more generation can be connected to a given network if it is converted to 'active' operation
- More efficient use of networks will result in better value for money, reduced need for new lines and new substations, and quicker connections

# The Electricity Supply Network



# The Electricity Supply Network



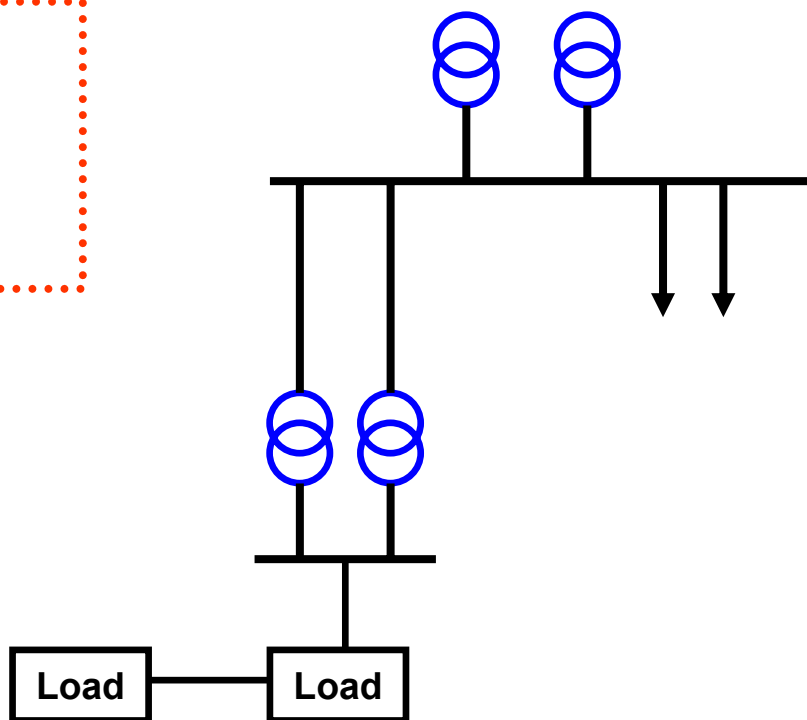
Meshed, active network

Increasingly active network

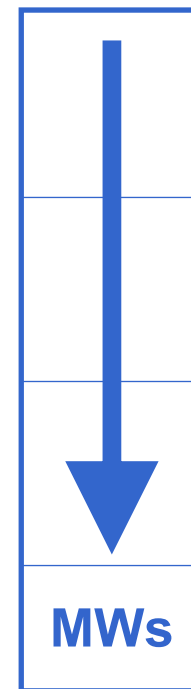
# A view of tomorrow

Today's networks

Unidirectional power flows

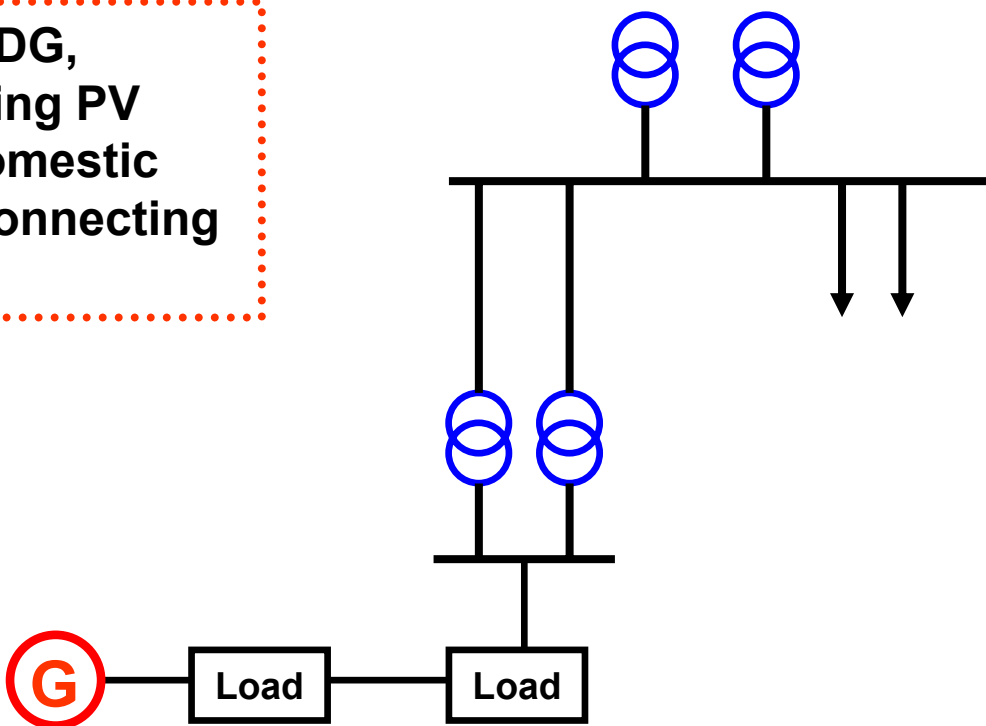


Boundary flow

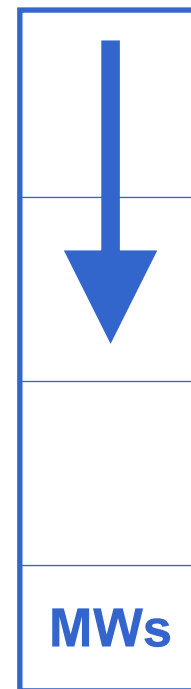


# A view of tomorrow

Some DG, including PV and domestic CHP connecting at LV

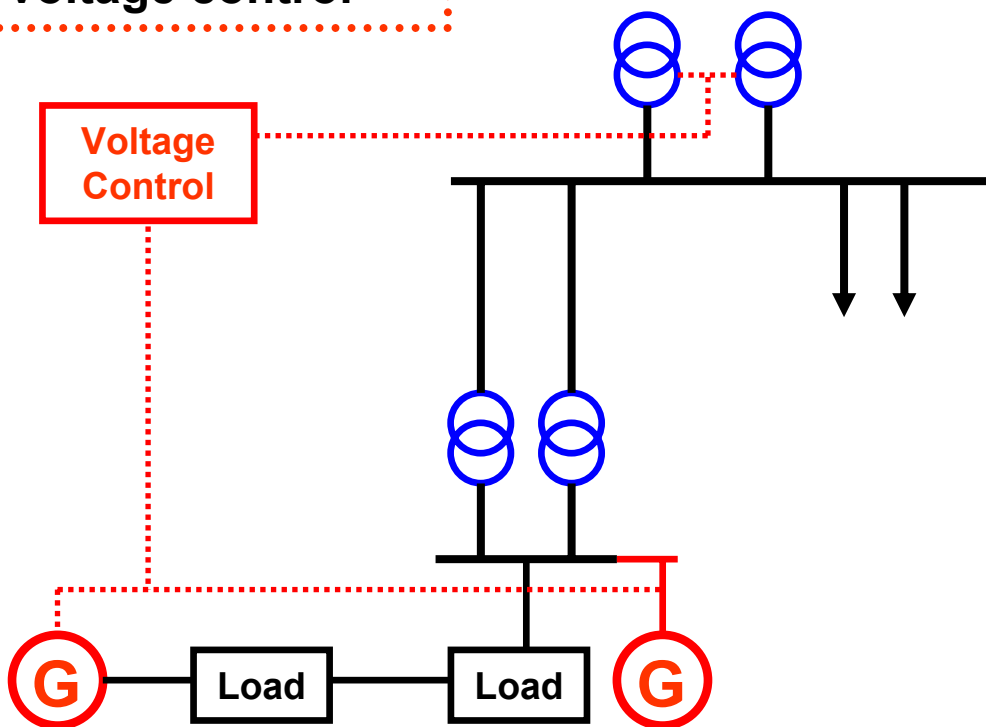


Boundary flow reduced

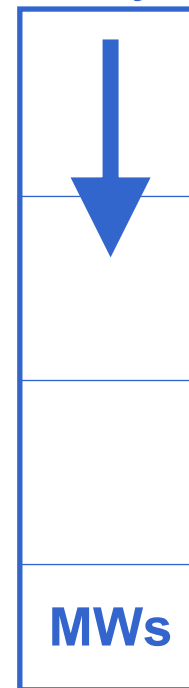


# A view of tomorrow

## Active voltage control

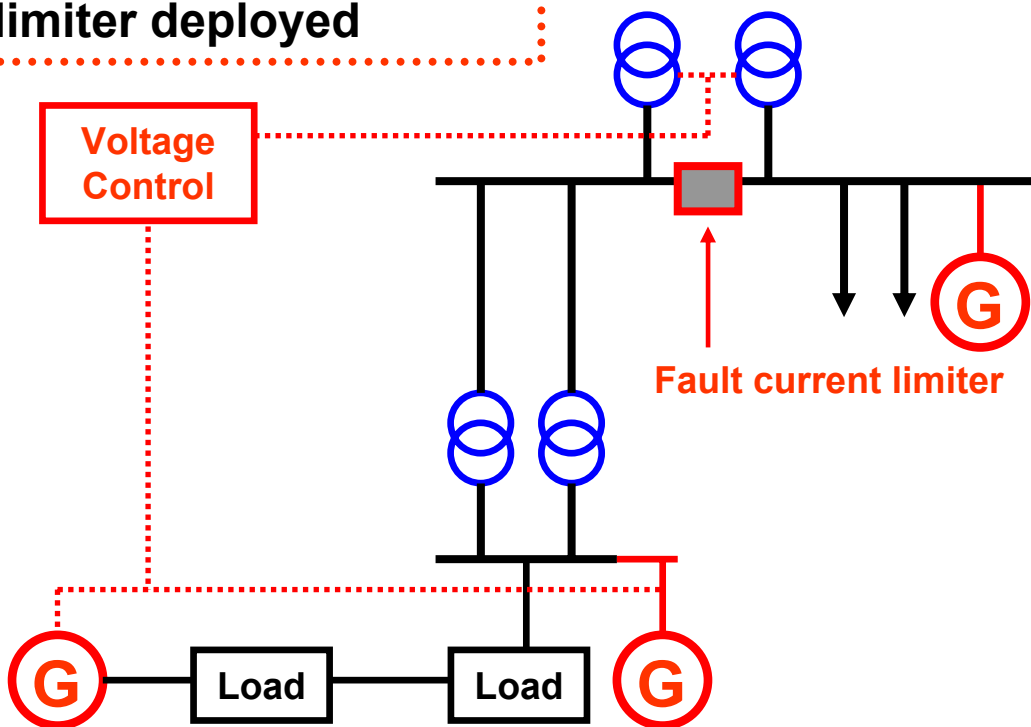


Further reduced boundary flow



# A view of tomorrow

Network may now export, fault current limiter deployed

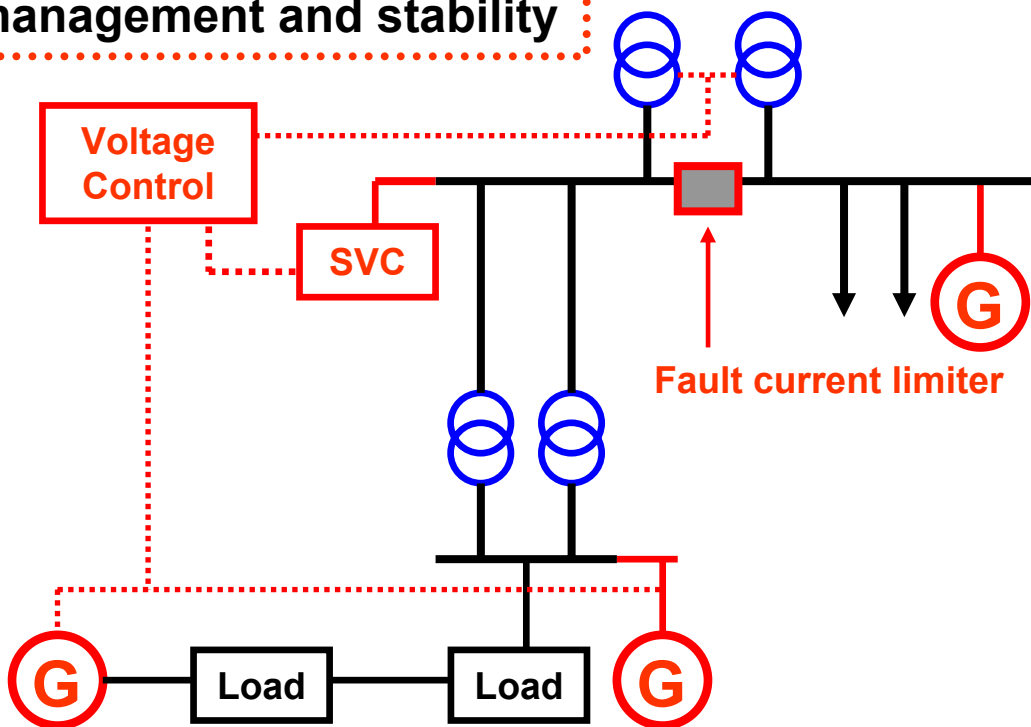


Potentially, two-way boundary flows



# A view of tomorrow

SVC deployed for reactive power management and stability

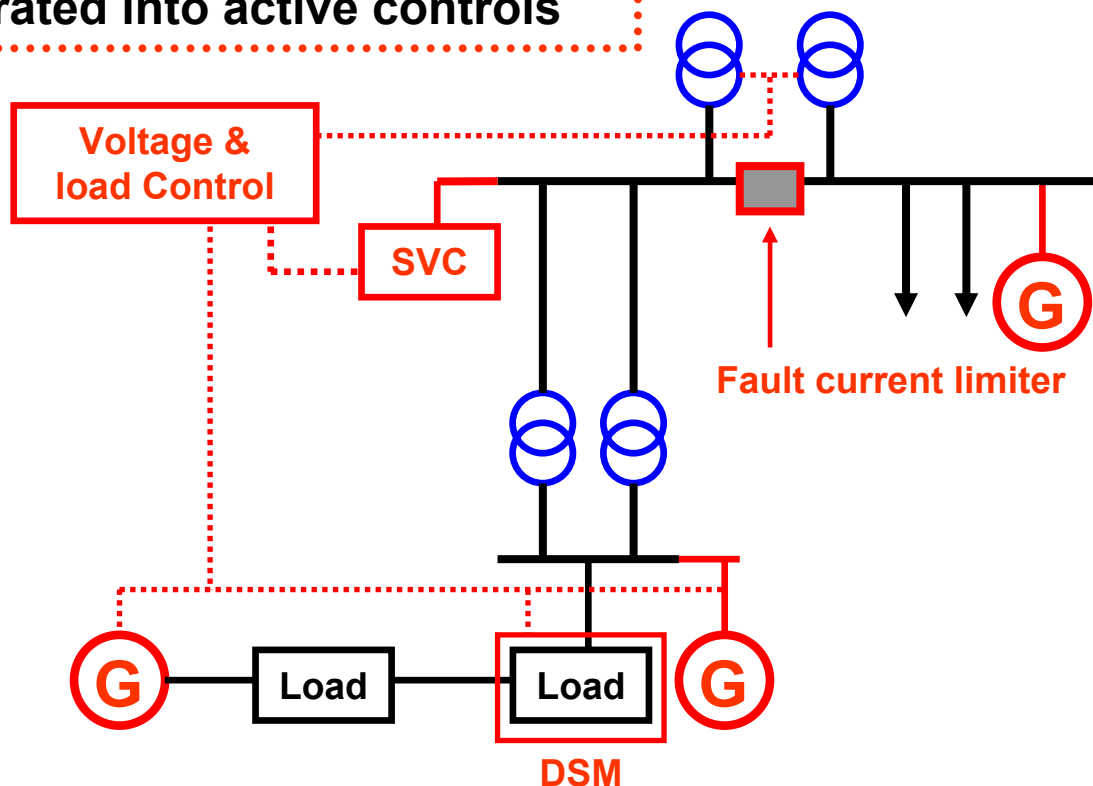


Potentially, two-way boundary flows



# A view of tomorrow

Demand management  
integrated into active controls

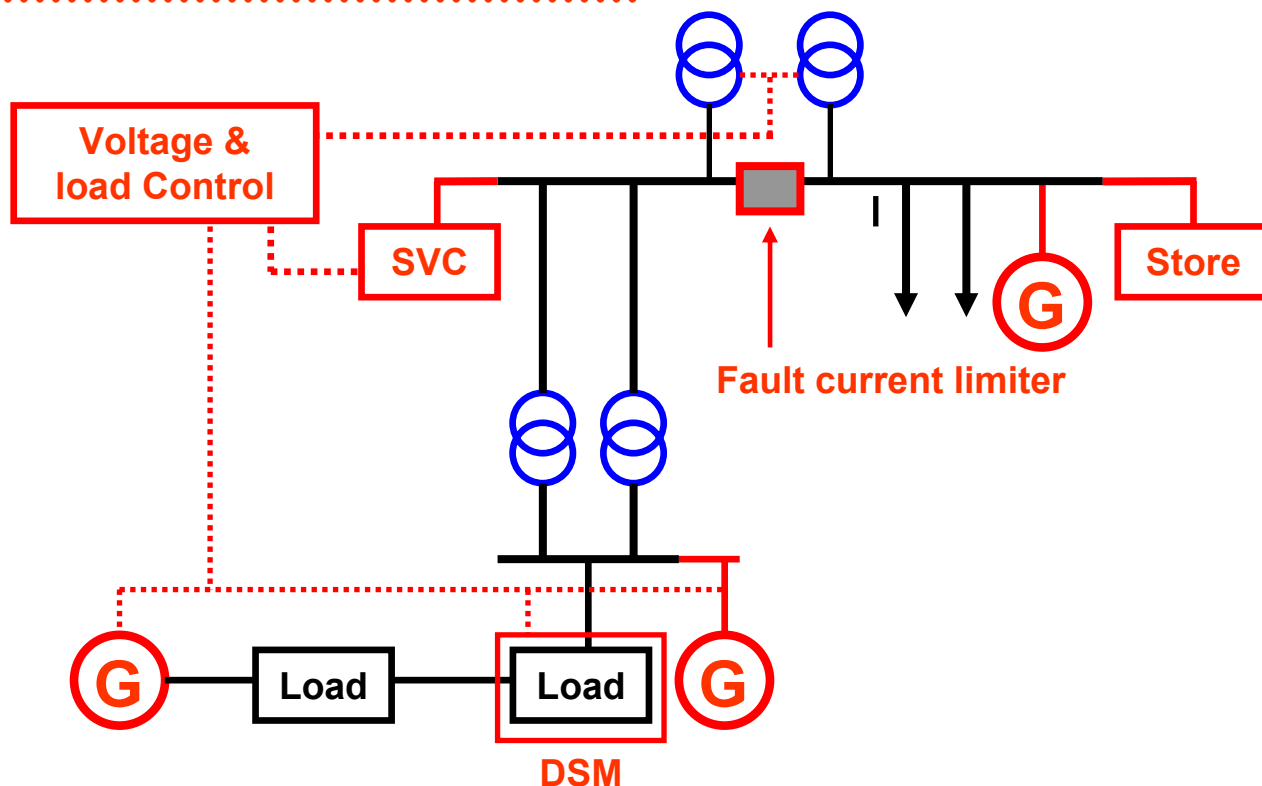


Potentially, two-way  
boundary flows



# A view of tomorrow

**Bulk energy storage deployed**

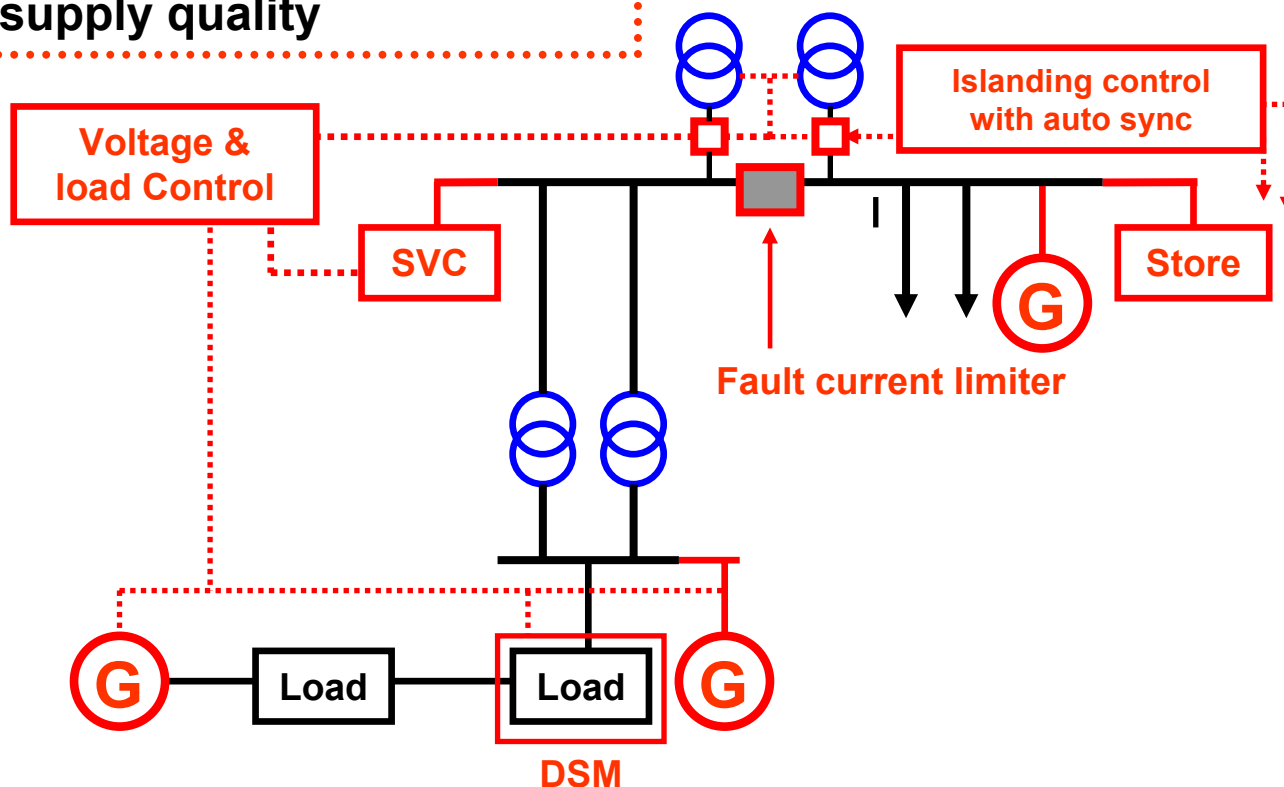


Potentially, two-way boundary flows



# A view of tomorrow

Islanding capability enhances local supply quality

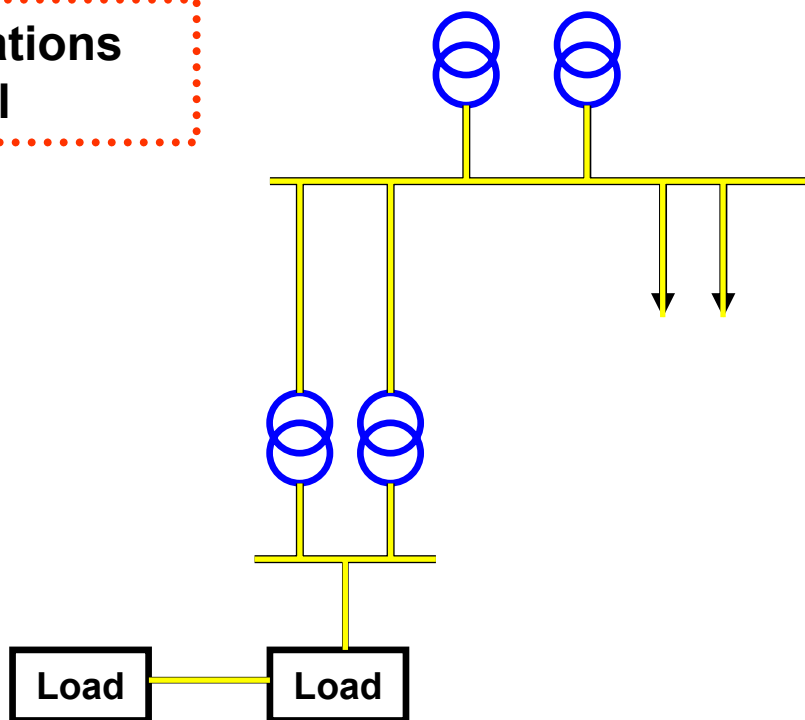


Potentially, two-way boundary flows

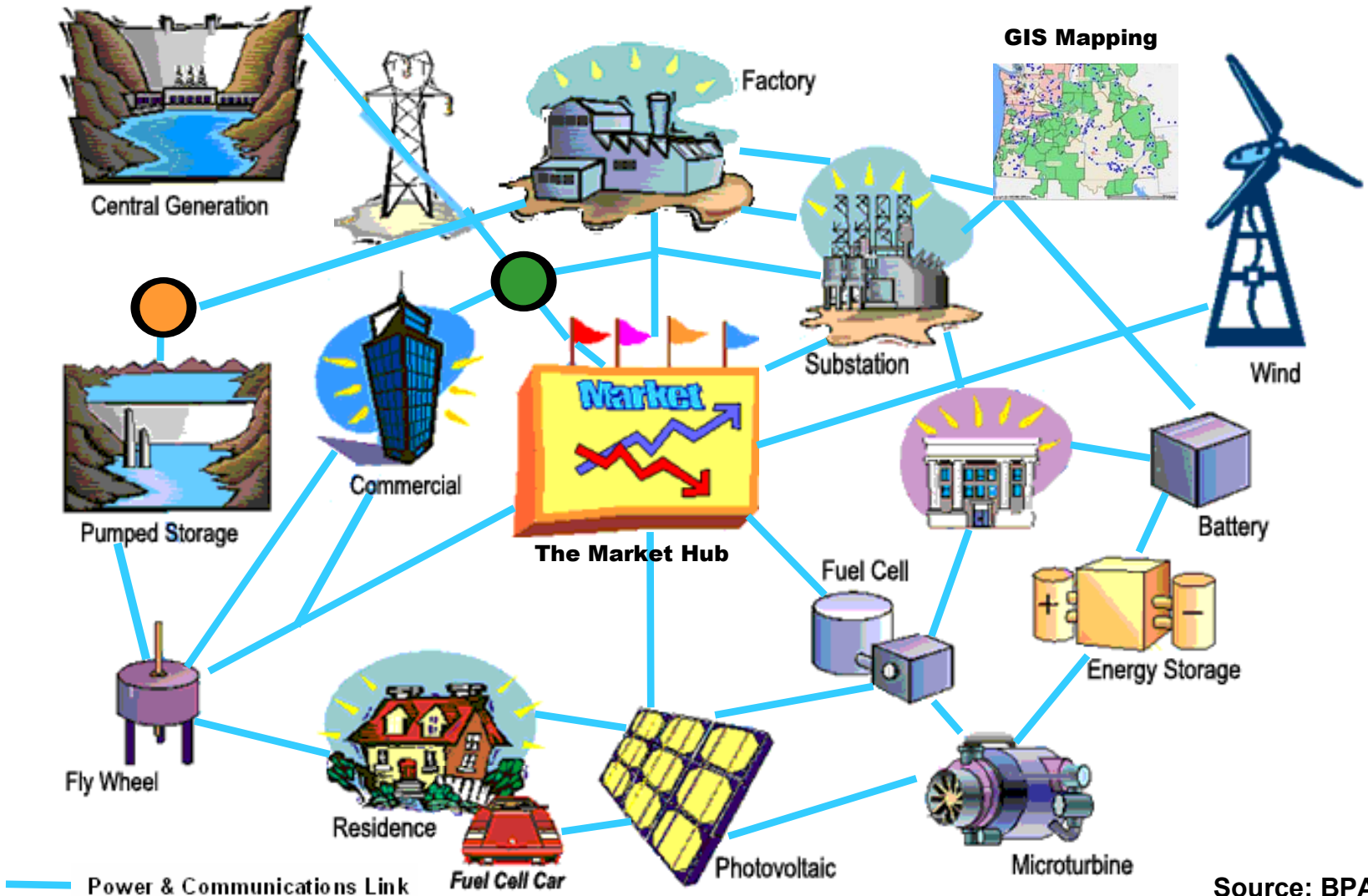


# A view of tomorrow

Communications  
overlay vital



# EnergyWeb



Source: BPA



# Incentivisation for DNOs

# Innovation and regulation

- DNO regulation is focussed on a core low risk business
- “RPI-X” has worked well to regulate this core business
  - but has not provided incentives to innovate
- Innovation is acknowledged to carry a different risk profile: the regulatory framework should adapt to recognise this

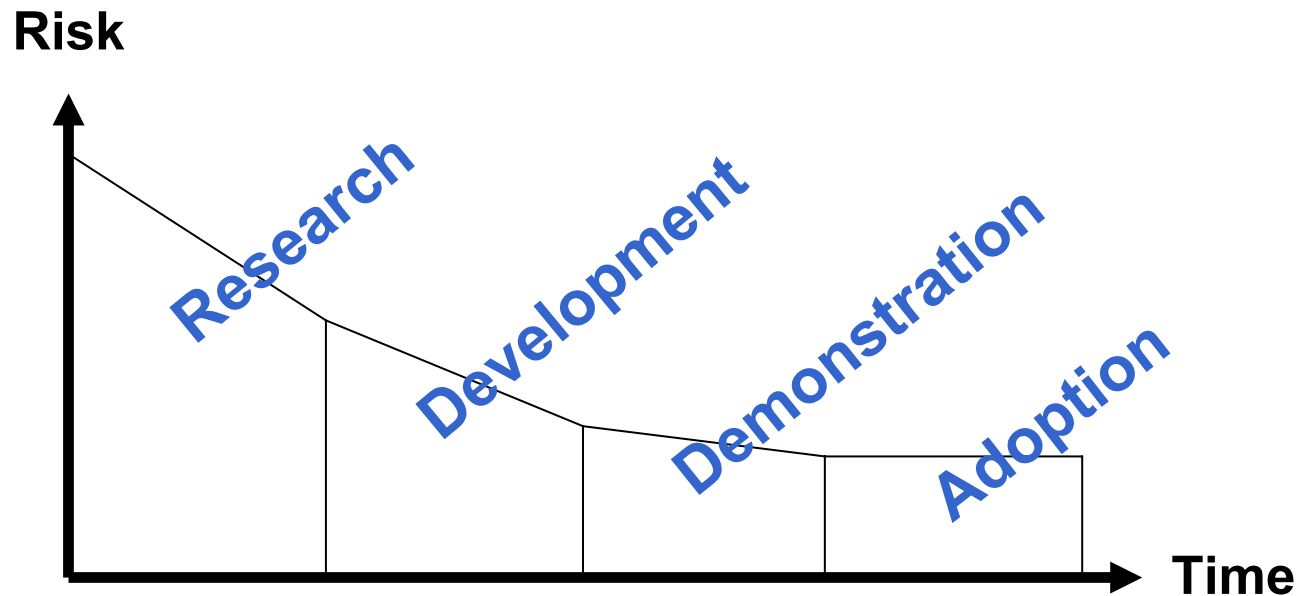
***Need now to develop the regulatory framework to allow DNOs to operate in different risk/reward business environments***

# IFI & RPZ

- Recent Ofgem discussion paper (16 July 2003)
- This paper considers the introduction of:
  - **an Innovation Funding Incentive (IFI)**
- And develops further the concept of:
  - **Registered Power Zones (RPZ)**

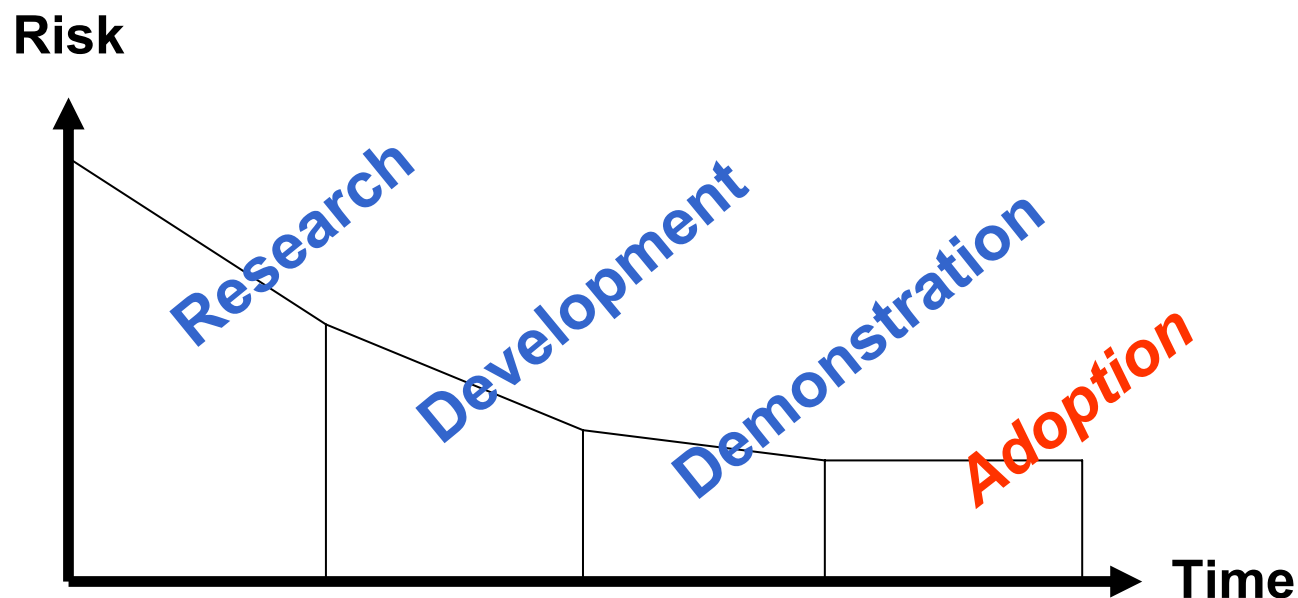
***Proposals are not finalised, but here is the thinking behind the paper...***

# The innovation process



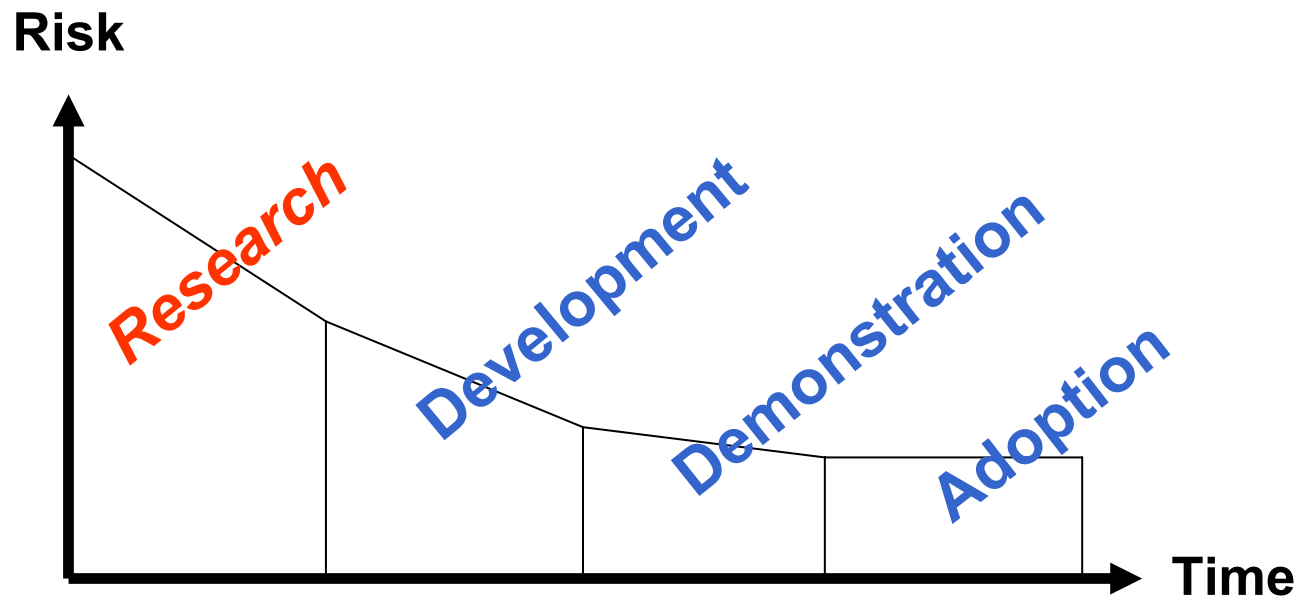
***Multi-stage process to convert ideas to products/solutions***

# The innovation process



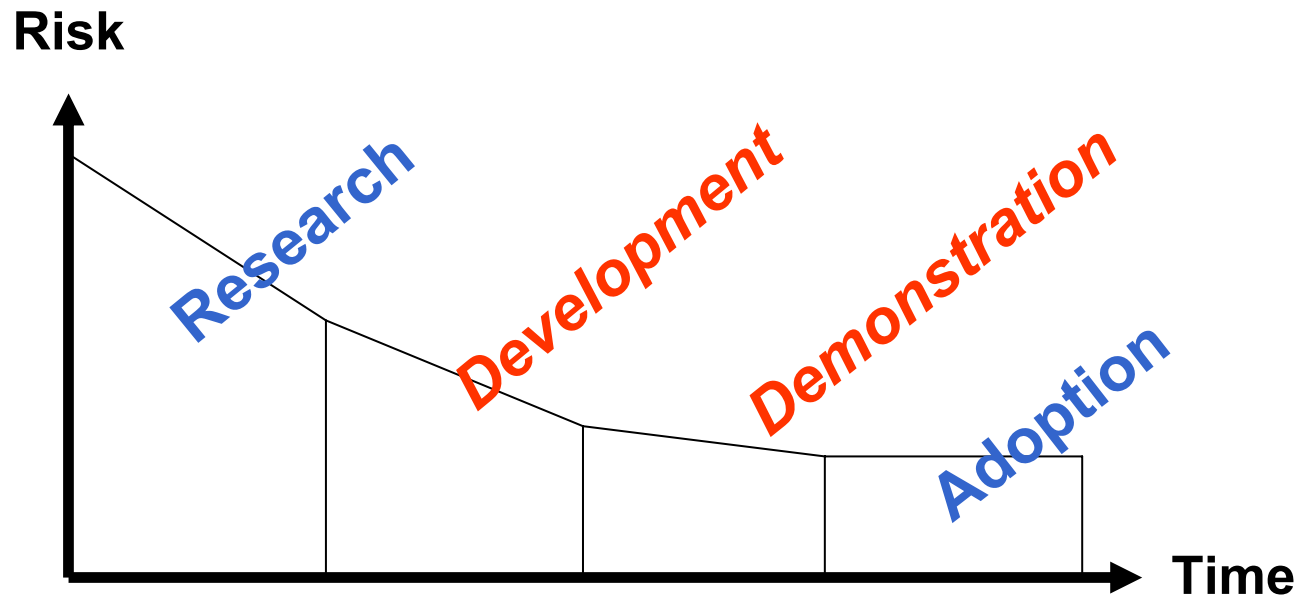
***RPI – X & Capex  
Treatment effective***

# The innovation process



***Manufacturers and  
research community lead***

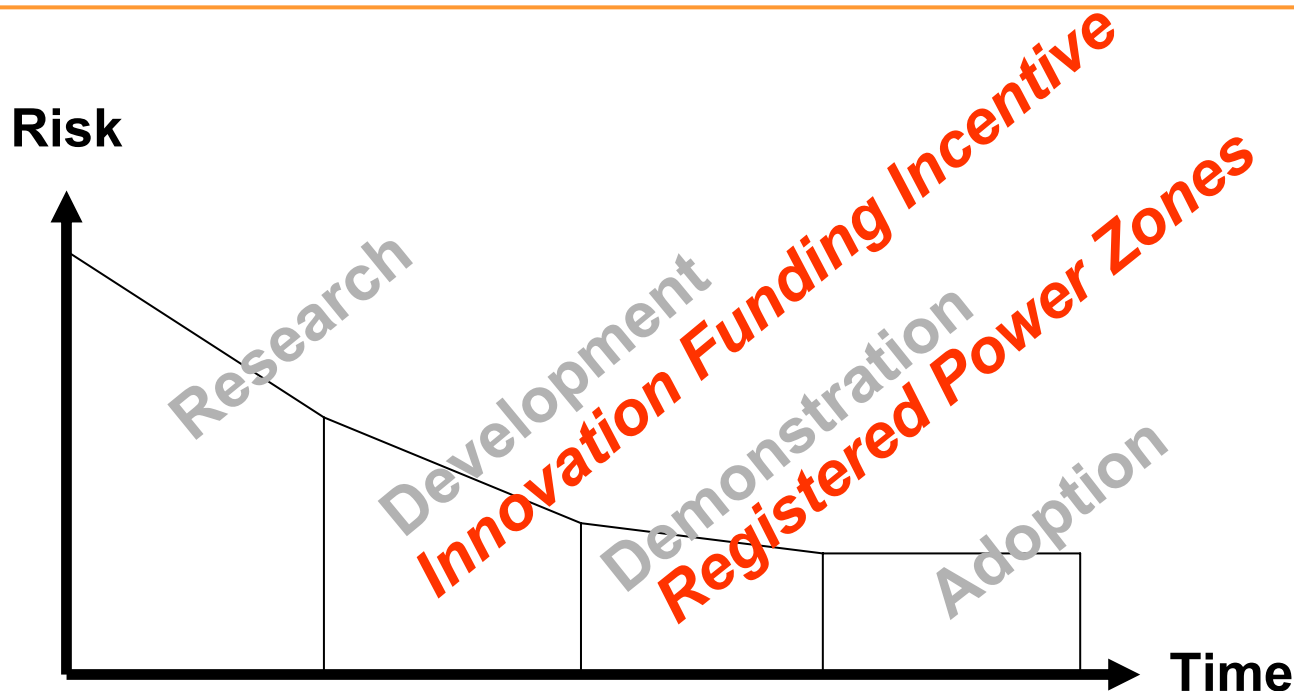
# The innovation process



***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 – Targeted incentives for DNOs***

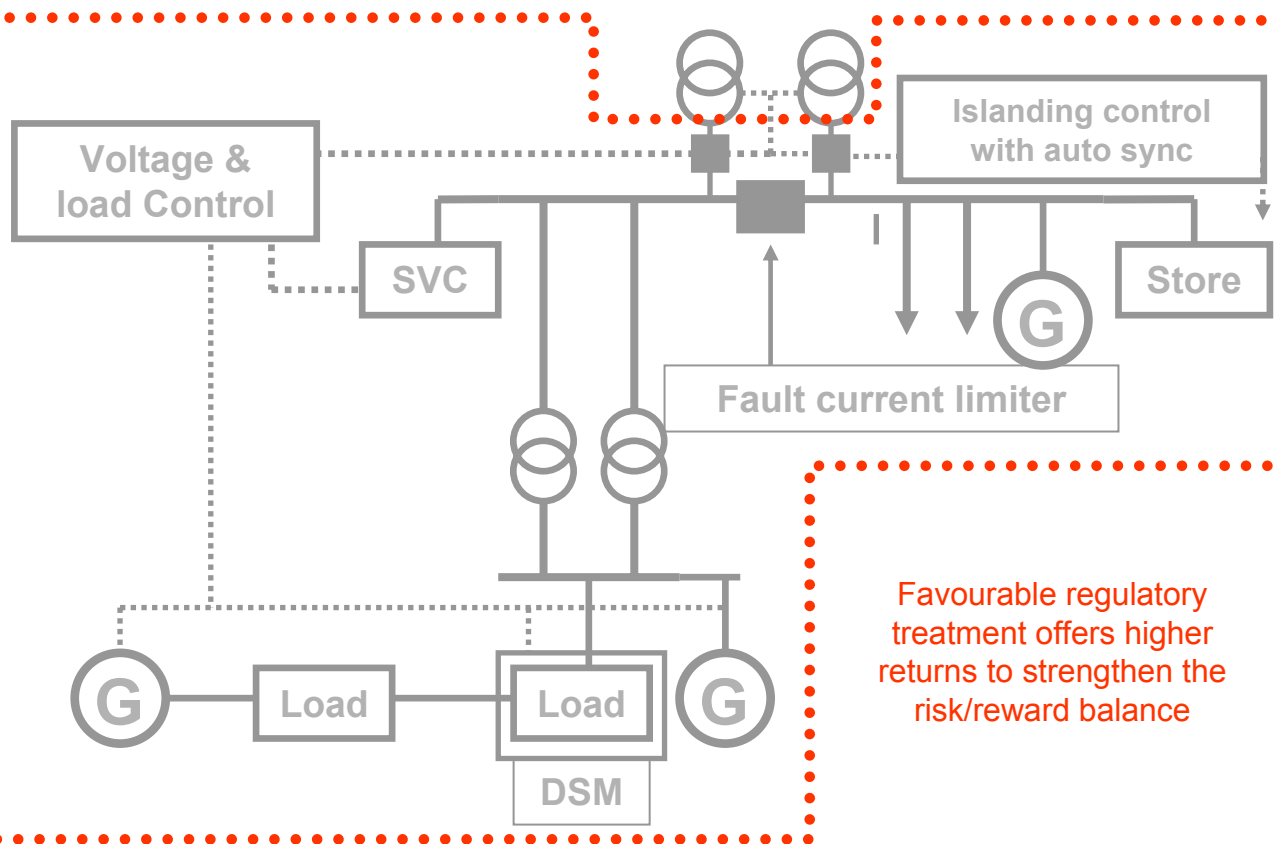
## IFI headlines – current thoughts

- DNOs would be given an opex allowance for innovation
- Capped at ‘best practice’ level – ref DTI’s R&D scoreboard
- A proportion of each project would be funded by the DNO
- Companies must demonstrate efficient expenditure control
- Expenditure allowed on a ‘use it or lose it’ basis
- Annual, open, reporting of activities to share best practices

## RPZ headlines – current thoughts

- Companies propose projects that Ofgem registers (but not approves). Regulator not best-placed to pick R&D winners.
- Enhanced financial incentives (a multiple of the price control DG incentive), that reflect the degree of innovation.
- Companies manage and are responsible for all project risks.
- Open reporting of RPZ projects to share good practices.
- Any additional grant funding obtained by DNO would not be recovered by Ofgem.

# Advantages of a 'Power Zone' ?



- ✓ 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

# Concluding remarks

- We are not technology constrained
- We are constrained by the inertia in the asset base
- Revolution is not really an option

***The challenge is to achieve timely evolution of distribution systems so that they provide customers with the services they need efficiently and economically***



*ofgem*

Promoting choice and value for all  
gas and electricity customers