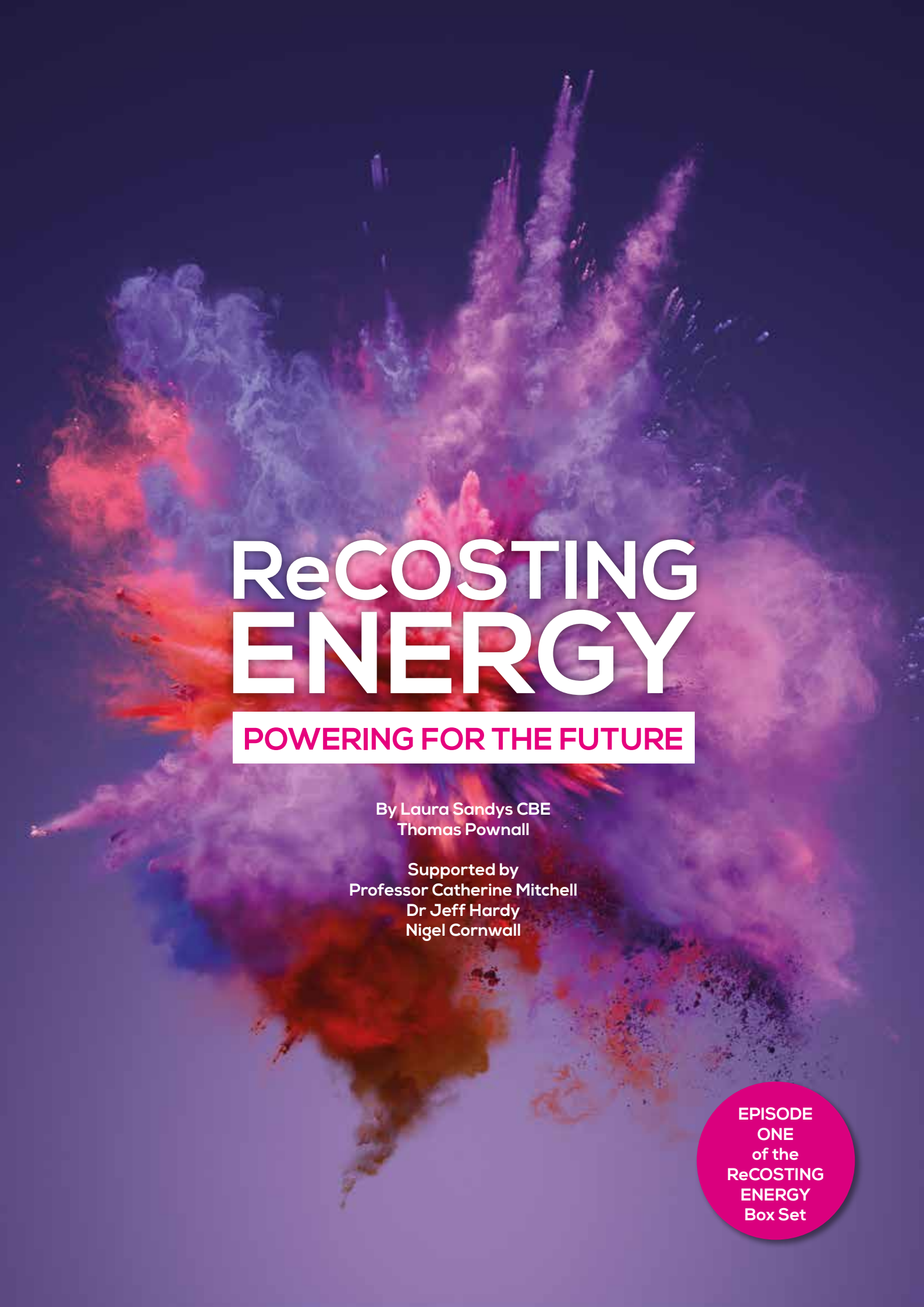

ReCOSTING ENERGY

POWERING FOR THE FUTURE

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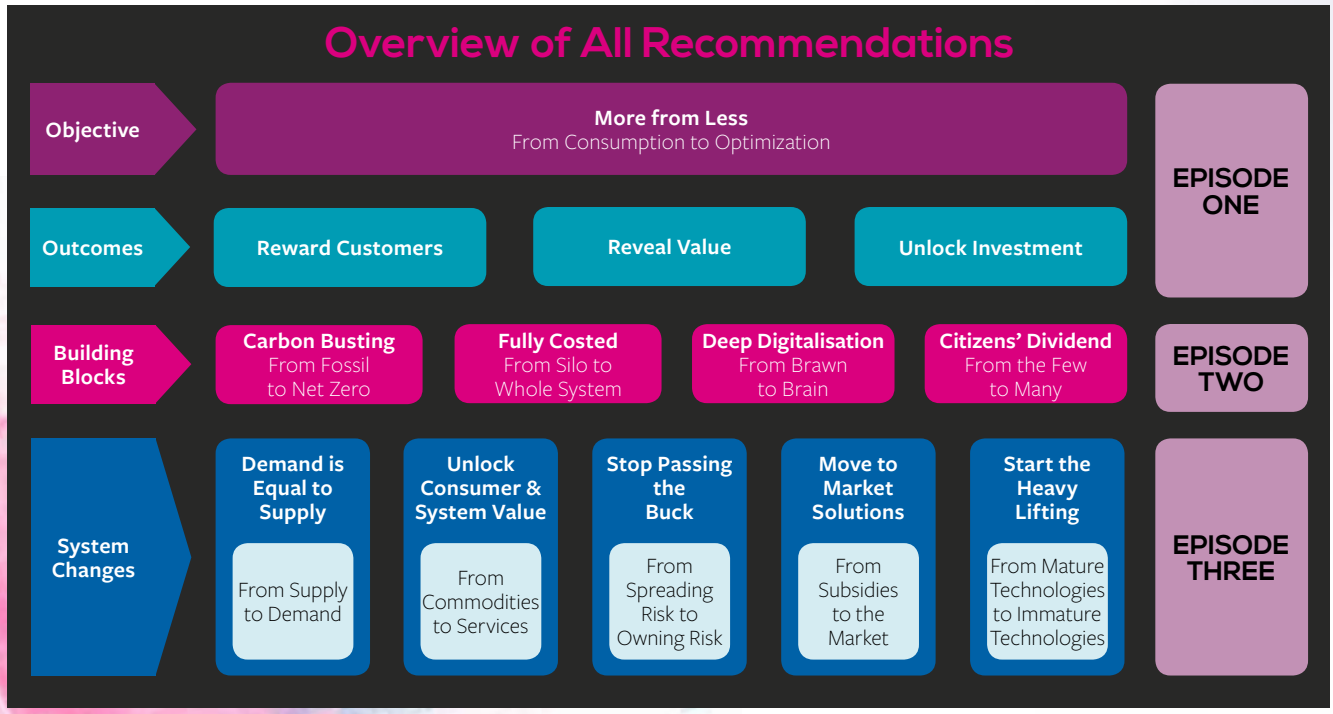
EPISODE ONE of the ReCOSTING ENERGY Box Set

EXECUTIVE SUMMARY

SHAPING A NEW FUTURE

The current energy market design, its funding mechanisms, what markets value, and the role of consumers were conceived in a fossil fuel, top down, pre-Net Zero world. We are moving from a system dominated by few more than 200 key players to a system with millions of assets and actions. This extraordinary challenge of moving from a linear system to a messy, diverse and different system requires fundamental changes to unlock the opportunities.

The current market design and governance regime is not wholly wrong, but there needs to be a new set of ambitions and an accelerated change in policy, regulation and market design before we embark on deeper decarbonisation of heat and transport.



The Decarbonisation Dividend

We should be able to decarbonise the whole energy system while ALSO

Delivering Customers Benefits

- **Cost Dividend:** Capturing the benefits of the marginal cost of the commodity
- **Reward Dividend:** Unlocking the value and rewards of customers' actions and assets
- **Equality Dividend:** Democratising access to decarbonisation assets eg: electric vehicles, energy efficiency and zero carbon heat solutions

Modernising the Sector

- **Economy Wide Dividend:** Delivering more with less
- **Innovation Dividend:** Unlocking the value in new technologies
- **Digitalisation Dividend:** Investing in the brain of the system as much as the brawn

Accelerating Decarbonisation Investment

- **Decarbonisation Dividend:** Setting targets and mandates to deliver decarbonisation
- **Investment Dividend:** Strengthening the Market
- **Speed Dividend:** Accelerating support to deploy newer decarbonisation assets

DOING MORE FROM LESS: FROM CONSUMPTION TO OPTIMISATION

To deliver Net Zero requires a philosophical change in how we look at the energy system from a consumption model to an optimisation model, driving value rather than commodity, fully utilising capital rather than wasting it and most importantly recognising, rewarding and incentivising consumer and demand side optimisation.

With the potential of millions of assets, generation, storing, hedging we need to unlock the value and potential of a much wider group of players – a consumption model will stand in its way.

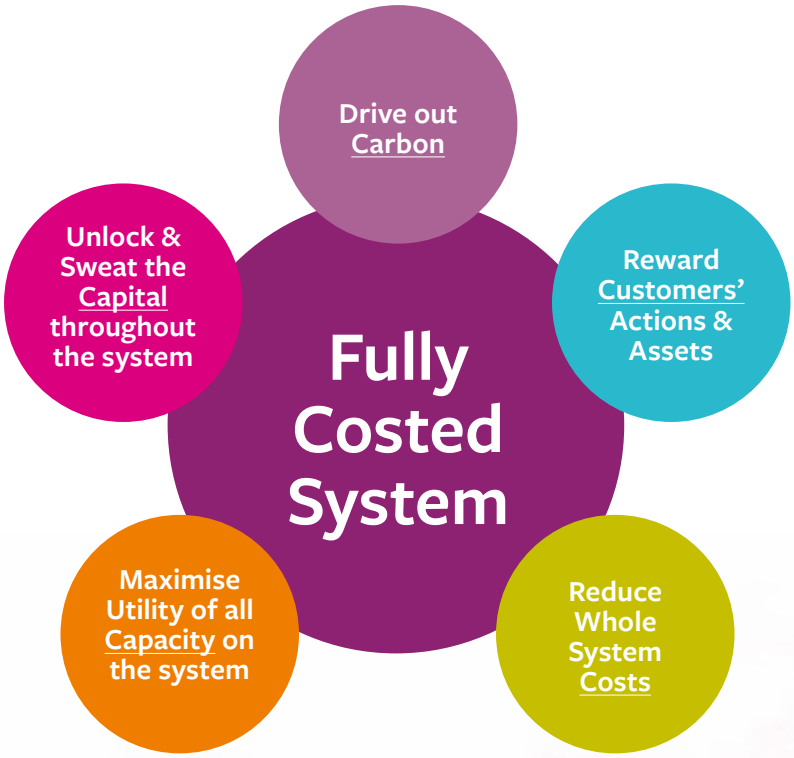
We are still designing our system around a few traditional energy players shaped around a vanilla top-down system with the customer at the end of the "plug".

Optimising the 5 Cs: Carbon, Customers, Costs, Capacity & Capital

To reach Net Zero we need to replace the trade-offs posed by the trilemma with a set of efficiency ambitions accelerating decarbonisation through optimisation. This requires a changed mind-set from how much can we produce, to how best can we use all the resources efficiently. At the heart of optimisation is a fully costed system that breaks down the current silos and throws a light on how carbon and costs are moved from one player to another with the customer and the planet picking up the pieces.

Fully costing the whole system will be particularly important when decarbonising heat.

Optimisation requires a new set of incentives, market pressures to unlock new assets and actions – delivering More from Less.



All regulatory and policy actions should be guided by optimising the 5 Cs, measured against the fully system costs

THE DECARBONISATION DIVIDEND

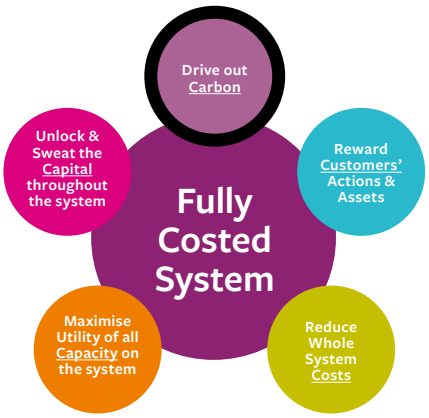
There is an exciting prize at the end of the journey to Net Zero – A Decarbonisation Dividend. These recommendations aim to deliver on some of those dividends driven by optimisation not consumption – and spreading the joy to citizens too.

Dividend	Barriers	Challenge	Recommendations
Drive out Carbon			
A Modern Climate Safe Energy System Low carbon solutions quickly squeezing out fossil fuels throughout the system	**Fossil Fuel Bias** There are still far too many cases of fossil fuels taking priority and discriminating against low carbon options	**Restack the Deck** What measures are needed to give priority to low carbon and drive out the inbuilt "bias" towards fossil fuels	**Carbon Busting** Clarity of Direction, changed incentives, and significantly increasing barriers to defaulting to fossil fuels
Reward Customers			
Crucial Value for Customers Customers and their actions will become a growingly and ultimately a critical part of the energy system with so much more value flowing in their direction	**Designed around Supply of energy not demand** The customer is still the victim and has limited access to the assets and actions that enable value to flow in their direction	**Access to Assets and New Services** How to release the capital all customers need to access and benefit from decarbonisation assets	**Demand is Equal to Supply** In a fully costed system customer demand is of equal value to supply and can be unlocked through new market design and new asset based services
Whole System Cost			
Reduce costs All actions and policies to account for and reduce whole system costs and allow for value to flow across the silos of today	**Silos capturing value** Policy and regulation consider and cost the system in silos and do not "trust" the power of demand actions	**Squeezing value from the system** Complexity of fully costing the system and assessing the impacts of one actor on another	**Accountable for Full System Costs** All policy, regulation and markets need to account for full system costs with a value to avoided costs to the system and consumer
Maximise Capacity			
Doing More With Less Optimise the capacity on the system increasing the productivity of assets and focus as much on the processing of energy as its production	**More is More & Siloed Actions** The system is designed around rewarding the quantity of a commodity not the value of services or functions provided	**Changing to More with Less** Moving from a consumption to an optimisation model reflecting the new assets and actions required to turn the commodity into a utility	**From Commodity to Service** Incentivising outcomes not inputs through valuing services not the commodities and driving risk into businesses not sitting with consumers
Unlock & Sweat Capital			
Accelerate investment & maximise its utility Efficiently use all assets on the system, unlocking significant investment and reducing waste	**Artificial Silos** Silos preclude revenue stacking, while rewarding wasted energy and not unlocking investment in serious system gaps	**Capital not Commodities** How to unlock capital in a most efficient manner delivering the appropriate assets designed around the system needs	**Deepen Support & Build the Market** Focus support on immature technologies while underpinning the open market

THE BUILDING BLOCKS

Without addressing the "plumbing" issues embedded in the system, investment will be slower, more expensive and more carbon intensive. Interim destinations and ambition are crucial, carbon preferencing must be stopped, and the system must be fully costed not in silos. It is also crucial that all measures and policies deliver a Citizens' Dividend that is tangible and visible to voters.

CARBON BUSTING:
From Fossil to Net Zero



AMBITION: Provide a clear timeframe for decarbonising energy and reform all perverse market design that prioritises fossil fuels

While the journey will be messy, the destination needs to be clear to unlock investment and accelerate action. A 2030 destination will reduce capital risk bringing down costs and provide greater urgency for regulation.

There are too many government and regulatory measures that allow for fossil fuel responses to be the default. An immediate restacking of the deck from fossil fuels to decarbonised energy sources would further unlock investment and pressure on the whole system to pivot away from fossil fuel solutions.

Policy Ambition and Clarity

- **Policy Mandates:** 80% mandate on suppliers to provide decarbonized electricity 2030, with a different but clear trajectory for heat and transport
- **Overall Cost Target:** Set a target cost for whole system decarbonisation by 2050. The Energy Transition Commission estimated that we should aim for $60MWh*

No tax or mandate should be imposed until consumers have easy and affordable alternatives. Government's task is to drive action to enable customers to have access to realistic choices

Restacking the Deck

- **Change the Merit Order:** Put demand first, and flexibility and low carbon second for all players throughout the system
- **Boring "Fossil" Bureaucracy:** Onerous reporting requirements for fossil fuel procurement applied to all actors and support mechanisms
- **Review Support Mechanisms, Markets and Regulations :** No Government or regulation should support mechanisms that favour fossil fuel
- **Tighten Up the Renewable Energy Guarantee of Origin Regime:** Reform of Regos – no more green washing

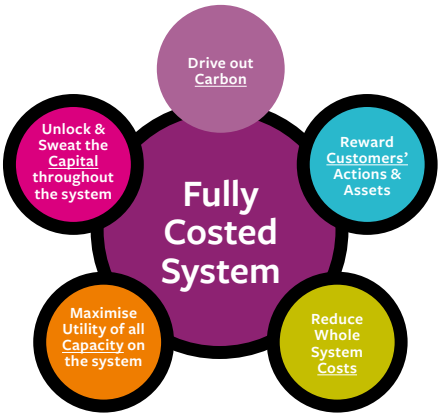
* www.energy-transitions.org/publications/making-mission-possible/

Shocking Record of the carbon intensity of regulated companies and some government support schemes

Market	Value (2019)	Size (2019)	Carbon intensity
Balancing mechanism	£590m	Abs: 20,000 GWh Net: 630 GWh	Fossil fuels >99% of turn up
Short term operating reserve (excl spin gen)	£50m	2000 GWh	>99% fossil fuel contracts
Fast reserve	£90m	220 GWh	85% fossil fuel contracts
Firm Frequency Response	£40m	3250 GWh	20% fossil fuel contracts
Mandatory Frequency Response	£30m	2500 GWh	Large units only. Will be primarily fossil fuel generation.
Capacity market (delivery 2021/22)	£500m	55 GW (de-rated)	70% fossil fuel contracts
DNO tenders	£1.5m	c. 850 MW (MWh unknown)	>80% fossil fuel contracts
Wholesale Market	£13,000m	219,000 GWh	~40% fossil fuel generation

Source: BEIS 'Carbon in Flexibility Markets' workshop, 14th October 2020, p. 10

FULLY COSTED SYSTEM:
From Silos to Whole System



AMBITION: Drive greater optimisation of the whole system considering full system costs and giving equal value to demand as to supply

Whole system costings and visibility of knock-on impacts will be crucial to unlocking the value.

- A Fully Costed System: A fully costed system methodology must be used by all regulated assets, regulation and policy to uncover the knock-on costs and reveal the value sitting between the current silos
- **New Metrics valuing demand side assets and actions:** Fully valuing all assets on the system providing a level playing field between demand and supply
- **NAO Audit:** NAO audit the full system costs of regulation and policy every five years, highlighting the missed money and costly "silos".

KEY FINDINGS FROM NEW METRICS

Comparing Whole System Value of Demand and Generation Assets

Value for Money: Demand-side measures can provide better value than generation technologies

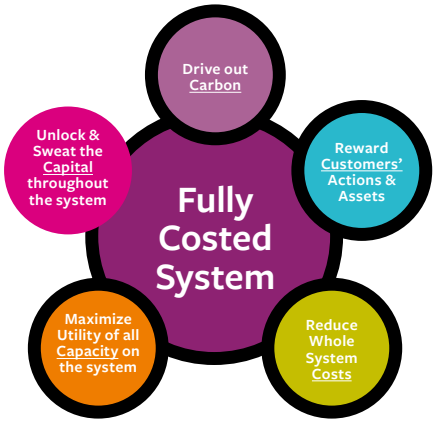
Whole System Benefit: More demand-side measures can reduce overall system costs

A Level Playing Field: Demand assets require equal access to all revenue opportunities as generating assets

Always a Player: Demand assets must always be considered as an equal option to that of generation

MORE IN EPISODE TWO

DEEP DIGITALISATION:
From Brawn to Brain



AMBITION: Develop a smart, responsive, network of energy and information to deliver a more productive, stable and optimised system releasing value across the varied, diverse actors, assets and actions

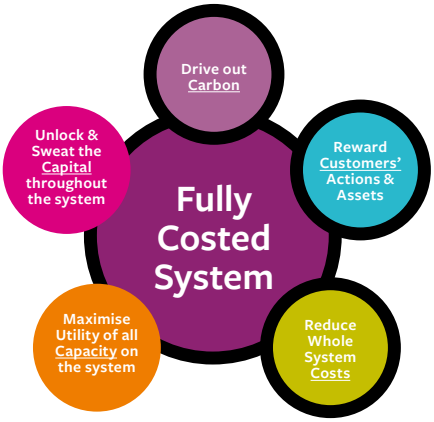
The system will be moving from 500 players to 50 million actions and assets so whole system digitalisation will be crucial – for the security and stability of the system as well as importantly unlocking value sitting in silos and captured by analogue business models. Data is the feedstock, digitalisation is the prize and the Energy Internet is the ultimate destination.

TVs were internet enabled before there was universal uptake of streaming services but provided optionality to consumers

- **Key Digital Tools:** There are key digital tools required to establish the foundations that can enable the new system to operate and for value to flow.
- **Energy Enabled Products:** While consumers might not want to be managing the energy system their products should be mandated to be "energy enabled" allowing for connectivity, optimisation and cost reductions to
be captured.
- **Turbo-charge Interoperability:** There needs to be an urgent move to develop interoperability tools throughout the system driven by open APIs and open data protocols.
- **Support Schemes:** Many investments made by Government and regulation are still focused on "generation" and more needs to be directed to digital system design, efficiency tools and the digital architecture.
- **New Focus on Skills and Capabilities:** The sector and its regulation is still too focused on "the big stuff" rather than skills and softer tools required to deliver an efficient system.

Digitalisation is crucial to unlock the potential of millions of actions and assets, delivering value and ensuring stability

THE CITIZENS' DIVIDEND:
From the Few to the Many



AMBITION: Design the system for citizens, offering opportunity and rewards, as equal actors in building a decarbonised system

The Citizens' Dividend could be seen by many as a "nice to have", however this is a crucial component of the new system to ensure that through the decarbonisation journey Citizens share the value, experience rewards and enhanced services.

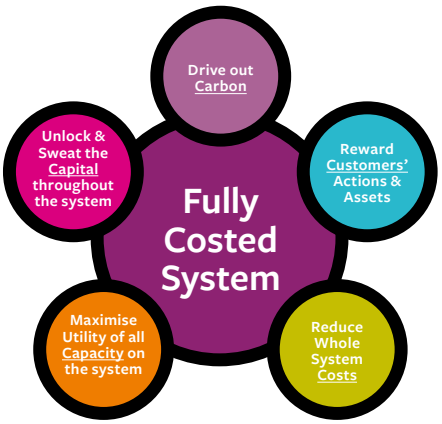
We now have an opportunity to reshape the system to deliver what would have been seen as impossible in the past.

- **Focus on Demand as much as Supply:** A system designed around Customers' real needs, wants and choices.
- **Everyone is a Player:** Fanciful a few years ago, today our ambition must be that every home and business can play a valuable role, not sitting at the side lines.
- **Rewarding Customers equally:** Incentives and access to support, markets and opportunities must be equally available to customers' assets to share in the rewards.
- **Payback for Support:** There needs be an explicit Citizens' Dividend sharing in the rewards from those who benefit from Government support.

Consider that every household could become part of the energy system delivering value and system actions - and rewarded for this!

SYSTEM CHANGES:

DEMAND AND SUPPLY ARE EQUAL



AMBITION: A system designed around customers' needs, giving them equal access to support funds, markets and investment recognising their equal value to the whole system

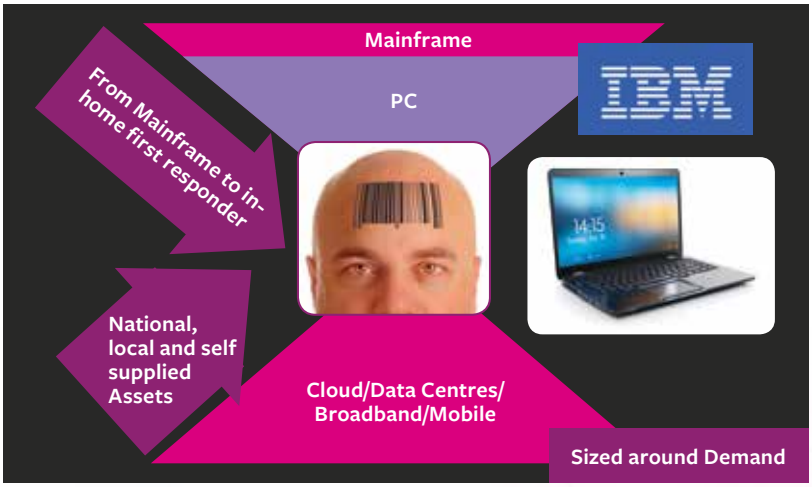
Unlock the Rewards for Customers, open up access to the assets required for Net Zero and deliver an excellent service and experience, by designing the system around demand not supply.

While energy has come a long way, the system is still primarily shaped around "What can you do for us?" rather than "What do you need from us?".

Designed for Customers

Design the whole system from the customers' needs, recognising that the system is there to serve customers. Consumers must be offered choice, differentiation and tailoring, reversing the current top down design. Customers' role in the decarbonisation of heat will be particularly important and optimising their needs must be in place.

As with data the consumer has limited interest in being active but new services should be developed, shaped to automate and optimise their needs



The world of data moved from being designed around mainframes to be shaped by consumers' personal computers served by local, national and in home capacity with optimisation automated by the system not the consumer

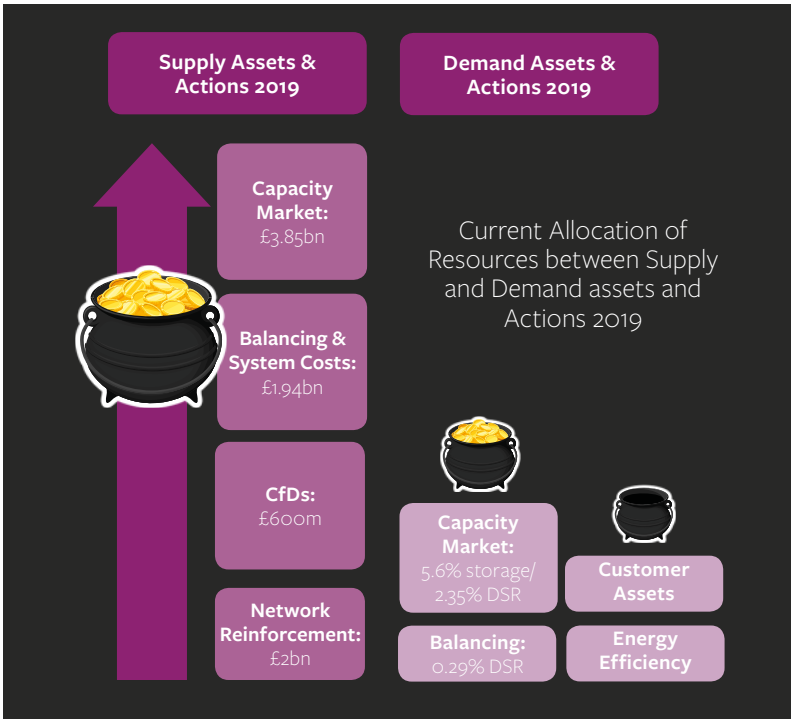
Powering Up Customers

The role and value of customers is still marginalised with flexibility, demand actions and most importantly energy efficiency sitting on the side-lines and not considered central to cost reductions, stability and security of the system.

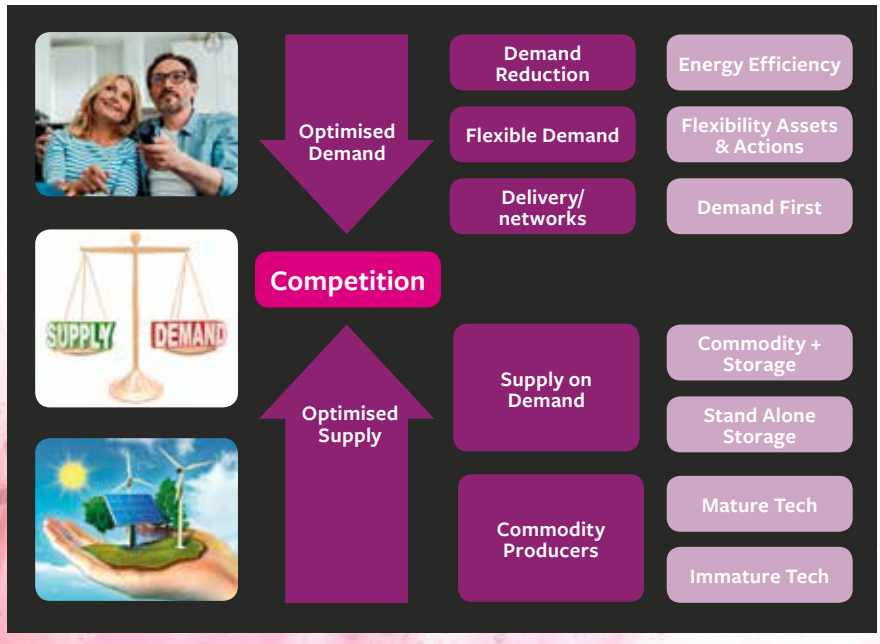
As the capital costs of truly participating and gaining value from the system is a big ask for most customers, it is important that customers are also considered equal when it comes to government support schemes and market mechanisms, consummate to their contribution to the whole system costs.

Demand and supply might not be equal in scale but in value, and that crucial value needs to be unlocked and promoted.

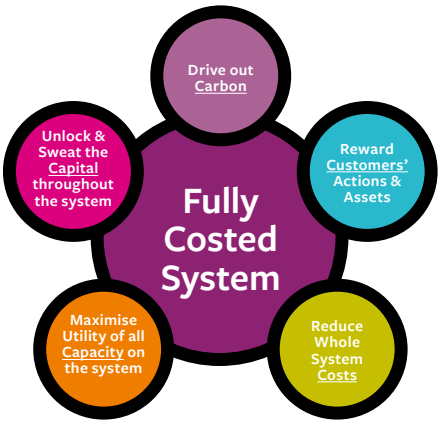
- **Fully Value Demand:** Full Value needs to be attributed to demand actions and assets using the new metrics
- **Equal Access to all support mechanisms:** Miniaturised CfDs, and the Capacity Market must be available to reduce the cost of demand assets and energy efficiency at all scales. These will no doubt be accessed by retailers of these assets not the consumer.
- **Equal Access to all markets:** All energy markets need to be accessible to demand actions, inclusive by design with open data standards and automatable
- **Promote a Flexibility Purchase Agreement:** Introduce similar market options for the sellers and buyers of demand services to those of supply.
- **Energy Efficiency – the turbo charged value:** Move energy efficiency from just a social need to playing an integral role in the energy system delivering full system value through permanent demand reduction. The new metrics reveal the significant value for energy efficiency.
- **Energy Enabled Products:** Mandated product standards from fridges to air conditioners to be energy enabled allowing for customers to automate how they optimise their energy utilisation.



Below: New Competition between Demand and Supply: this will start a new competitive tension between demand assets and actions and supply options ensuring we "size" our system around optimising demand first



UNLOCK CONSUMER & SYSTEM VALUE:
From Commodities to Services



AMBITION: Combine services and markets, unlocking the many capital assets needed in all parts of the system

Value is created by utilising assets to their capacity, by rewarding those that add value and through internalising risk that is more efficiently managed by businesses than by consumers.

Service models focus on outcomes driving efficiencies, innovative propositions designed to add value at least cost – and least energy consumed. Services drives risk to be internalised, delivers a reduction in consumption and provides certainty of cost and service. It also allows for more added value to be provided through greater tailoring to customer needs.

On the generation side we need to promote the storage and "processing" services so badly needed and not unlocked through the current commodity markets.

The Mobile Phone market moved from commodities to products and service contracts, unlocking exciting products while also reducing consumption of the data and telephony "commodity"

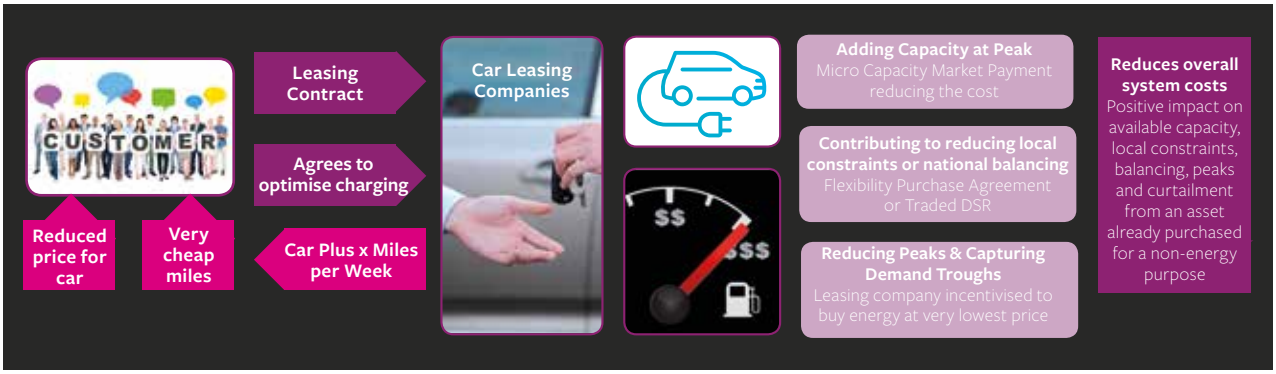
Customer Services

We can provide real choices to consumers tailored around their new and changing needs and contributions. This is not to restrict consumers from buying commodities but offering them diverse choices on how and what they decide to pay for. In addition service contracts by their nature aim to deliver more with less as they internalise the cost of the energy and are driven to manage the costs more efficiently than just passing them onto consumers.

- **Unlock Capital Investment:** For customers service contracts are more effective than commodity models that have limited ability to unlock capital investments like electric vehicles or solar panels needed by consumers to decarbonise
- **Services Take Risk away from Consumers:** Service contracts can reduce volatility and complexity for consumers, ensuring that risk sits with businesses who are better able to manage risk than consumers
- **Opens up the Market to energy embedded in products:** Energy delivered through product and service led business models such as miles embedded in a car leasing arrangement, are more easily enabled by service based propositions

Consumer protection is a significant issue for service and long term contracts and so enhanced consumer protection will be required to deal with financial services, contractual redress and misuse of data, however consumers are accustomed to service agreements

An EV Service Agreement – A Model based on Mobile Phones



- Customers offered a leasing arrangement for a car with a service agreement including x miles per week similar to a mobile phone contract.
- The leasing company optimises the charging of the car through automated services reducing the cost of the energy.
- The leasing company is able to reduce the capital costs through accessing the Capacity Market.
- The leasing company is also able to sell a flexibility purchase agreement to key players, providing greater certainty to those exposed to imbalance risks.
- Delivering the customer a cheaper cost for the asset, lower running costs and reduced volatility. The system benefits from the increased capacity and flexibility resources that assist all within the system to reduce costs.

Supply Services

There needs to be a distinction between a raw commodity and the utility value of an energy service. This creates a differential value and business model between energy as generated and energy shaped around demand. This distinction offers those who can "add value" with access to demand and flexibility assets to get a lower price for the commodity, while less sophisticated energy "retailers" can buy the fully balanced product.

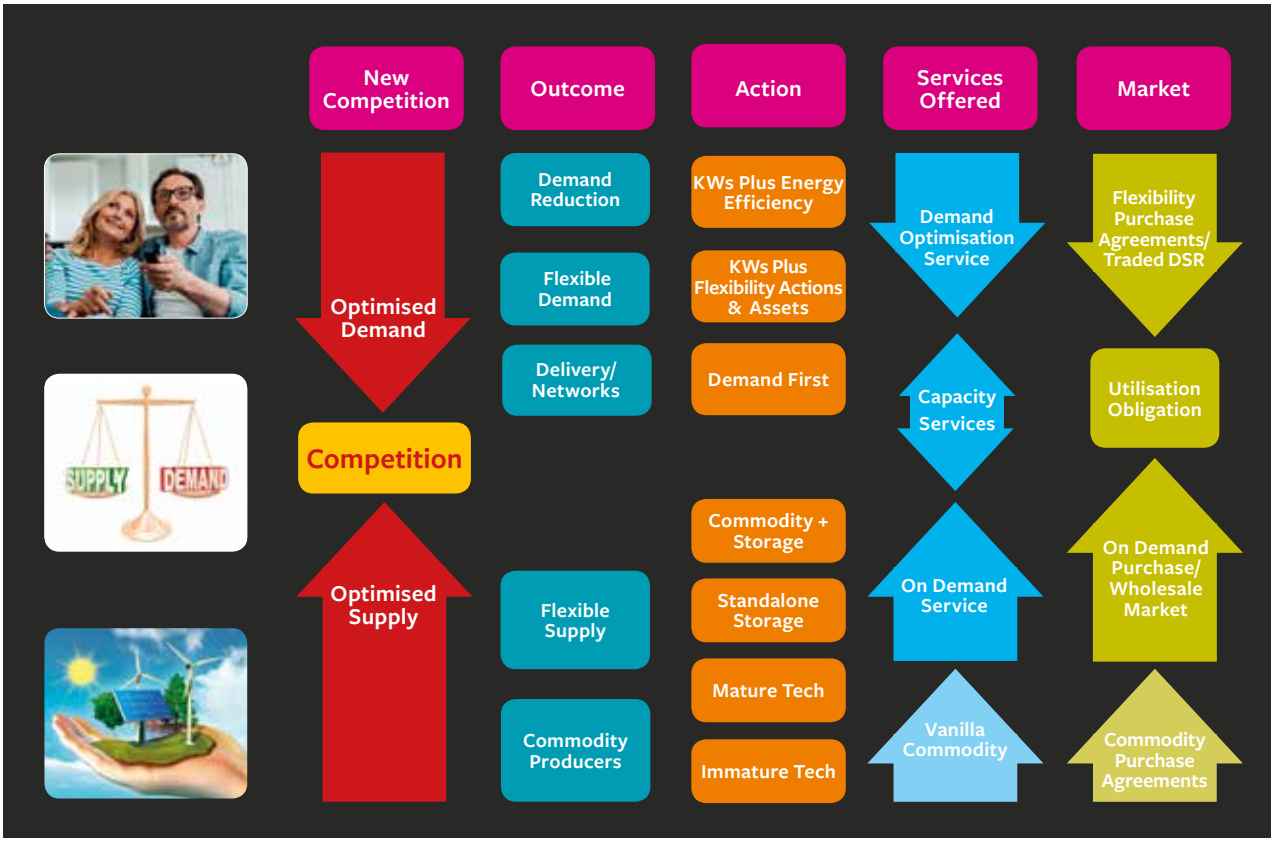
- **Split the value between the Commodity As Generated and an On Demand Service:** Moving from costing the commodity to valuing its outcomes unlocks investment in better "processing" and "managing" of the commodity driving generators to add value
- **A Commodity "purchase":** Purchased as generated – appealing to those with demand and flexibility capabilities
- **On Demand "service":** Appealing to those who want a fully managed service, opening up the market to many non-energy companies with generators / developers managing risk
- **Complementing the Flexibility Purchase Agreement:** Through the Flexibility Purchase Agreement all players within the sector can benefit from being able to balance and manage the fluctuations between demand and supply

Without distinguishing between as generated and "processed" energy we will end up with Butter Mountains and Milk Lakes.

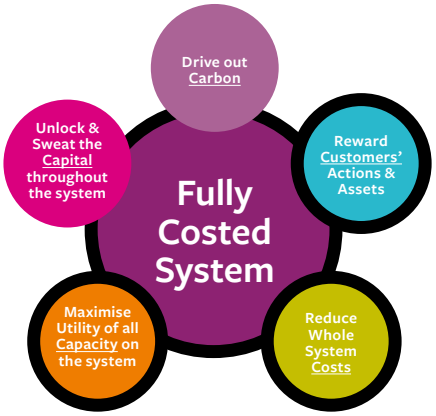
The Three New Service Agreements

Mechanism	Description	Whole System Benefits
Flexibility Purchase Agreements	Retailers, DNOs, ESO and generators buying and selling demand as they do supply	Unlocking demand assets, optimising the overall system costs and rewarding customers for their actions and assets
On Demand Purchase Agreements	Generators, storage operators and aggregators able to increase value through 'self-managing' imbalance and designing services that meet demand	Reducing imbalance costs, internalising risk and building stronger business models while enabling retailers to devolve imbalance risk
Commodity Purchase Agreements	Retailers with access to demand side actions and assets can access the commodity more cheaply, enabling greater value to flow to the management of demand and supply	Offering a very low price to those with more sophisticated business models who have greater understanding and ability to manage demand

From Commodities to Services



STOP PASSING THE BUCK:
From Spreading Risk to Owning Risk



AMBITION: Risk needs to be owned and will be better managed by risk creators with the least cost of risk passed onto customers

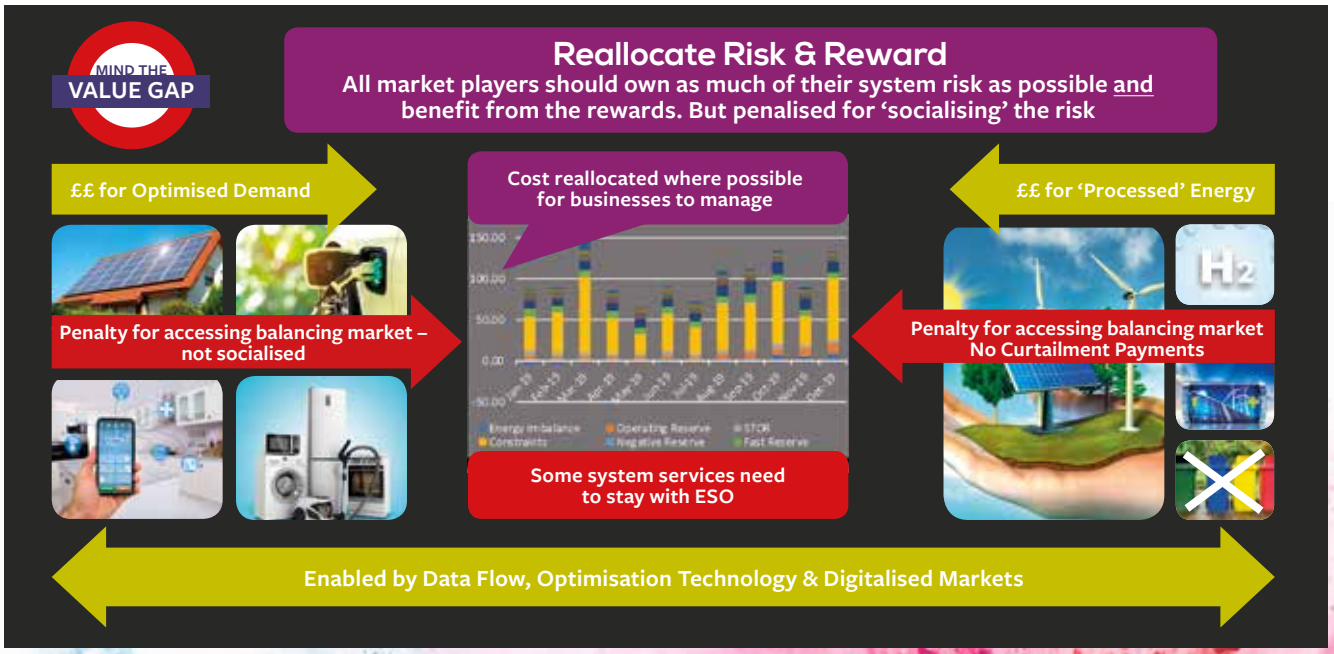
Far too many risks are passed on and smeared across all customers when risk should sit with businesses that create them and are best placed to manage and be rewarded for risk. Owning risk will assist building stronger business models that blend responses and assets.

Smearing and socialising risk with costs passed onto the consumer must be resisted as much as possible, particularly as they have no agency to mitigate that risk.

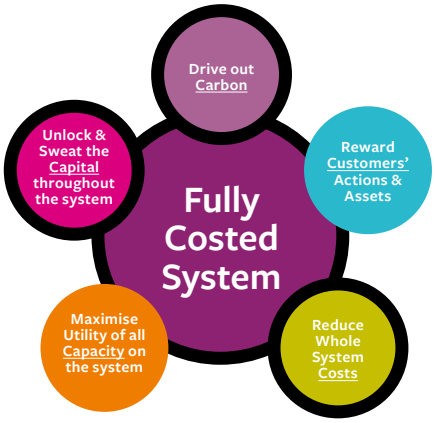
- **Increase Suppliers "Information Imbalance Charge"**
  Currently this is set at zero but should be increased to incentivise better demand / supply management, more optimisation and unlock value in demand, storage, system management and smarter generation
- **The Risk Of Supplier Failure Reviewed**
  Costs should be allocated to those that create them not consumers
- **Resist Capping Price Signals**
  While seen as pro-consumer, capping system charges and distorting real price signals will in the medium term reduce value in demand actions and assets and not provide customers with the ability to help shape the system to their longer term cost and service advantage.

Insurance - the Missing Partner

- Insurance is a very powerful tool to assess, manage and mitigate for risk distancing the costs from the consumers, driving continual improvement and more efficient at assessing and predicting risk than the current regulatory capabilities.
- Insurance should become a much more mainstream player in managing energy risk



MOVE TO MARKET SOLUTIONS:
From Subsidies to the Market



AMBITION: Boost investment in unsubsidised decarbonisation for mature technologies normalising the market and reducing the current subsidy distortions

Increase investment quickly into both mature and immature technologies, focusing on derisking the capital not the commodity. Moving the mature technologies towards market solutions while pivoting support measures to immature technologies, demand and consumer assets.

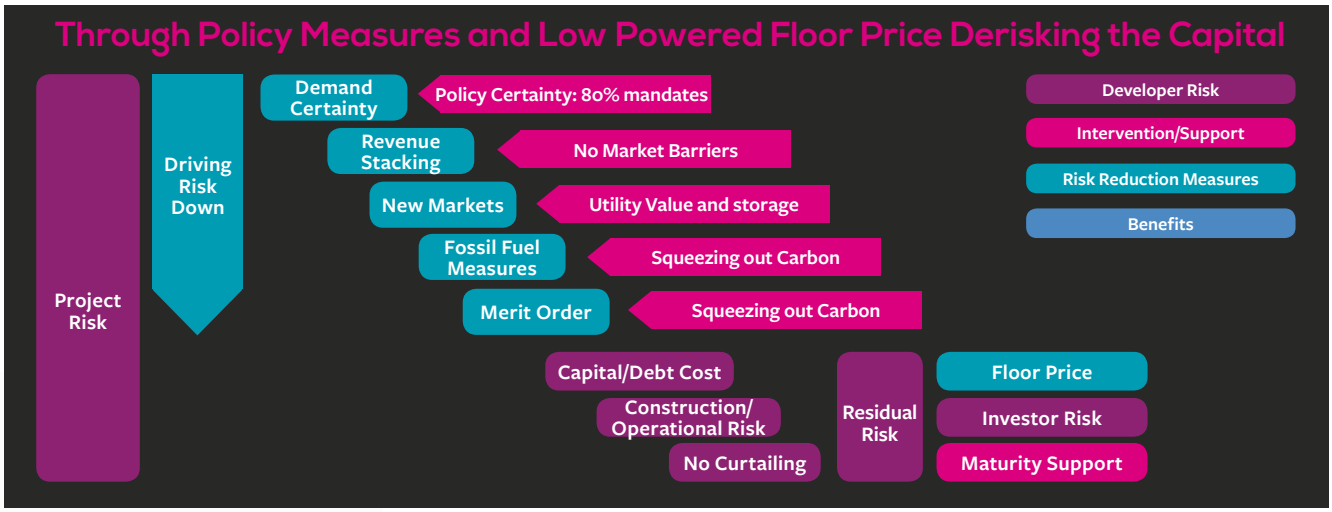
Equal policy and regulatory time and effort should be spent focusing on designing and supporting the unsubsidised market as it is on the subsidy mechanisms. Moving as many developers of mature renewables away from Contracts for Difference (CfD) will allow Government support to invest in immature technologies and demand side assets.

This requires focus on some significant risks in the merchant and PPA market, not least credit worthiness of the counterparties that could only be managed through much higher cost of capital impacting the overall costs of the system.

- **Reducing Risk through Policy and Mandates:** This report's proposals on significantly reducing fossil fuel competition, new low carbon obligations for all markets, regulatory assets and support mechanisms, and with greater policy certainty goes quite a way to help derisk the capital mature renewables.

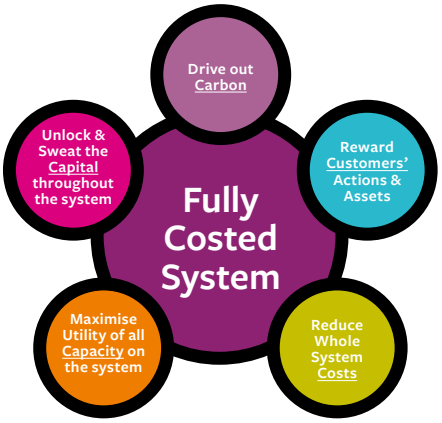
Public Goods In Food

Even in a competitive sector like food there is a derisking component sitting with the farmer rewarding Public Goods. This support does not reward "revenues" but does derisk embedded "capital" that delivers societal benefits



- **Low Powered Floor Price:** Due to weak counterparties further impacted by COVID and to aim to capture the lowest cost of capital, there does need to be a decarbonisation "public good" to derisk the capital but not designed to guarantee or underpin rewards. Ofgem's off-taker of last resort, currently only accessible to those with CfDs, should be equally available to those without CfDs.
- **Commodity Purchase Agreements and On Demand Purchase Agreements:** Reflecting the new values between the commodity and the on demand service Government should promote the emergence of these differential contractual relationships.

START THE HEAVY LIFTING:
From Mature to Immature Technologies



AMBITION: Focus Government support on immature technologies and customer assets to accelerate decarbonisation

Contracts for Difference have experienced significant mission creep, now becoming the default support for technologies that are mature and have reached parity with fossil fuels. In the medium term it needs to pivot back to its original design and do some very heavy lifting with technologies at the beginning of their cost parity journey from hydrogen, CCUS, interseasonal storage and demand side assets.

However there are some measures that should be taken immediately to reform current Contracts for Difference.

SHORT TERM REFORMS: DELIVERING MORE FROM LESS

- **Sweat the Capital already invested:** Enable revenues to be stacked not least by enabling the Capacity Market to be accessed by assets receiving CfDs.
- **Mandate Storage:** Mandate procured or co-located storage capacity for generation over 500 MW to reduce wasted energy.
- **No more Waste:** Progressively reduce access to curtailment payments with none being paid beyond 2030.
- **Extending the life of Assets:** Obligation for on-going production post CfD term reverting to the market and being able to access the market floor price as above.

MEDIUM TERM: BITE THE BULLET AND SPREAD THE JOY

- **Increase the Pot significantly:** Government support is needed to go faster and further into support for the immature technologies crucial to decarbonisation.
- **Pivot to immature technologies and non-generating assets:** There needs to be a stronger focus on the immature technologies and "processing" assets not least long term storage that are not unlocked through current markets.
- **Spread the Joy:** Delivering customers with the similar access to support mechanisms commensurate with their value to the system by Miniaturising Contracts for Difference and the Capacity Market.
- **Citizens' Dividend:** As government increases its support across the decarbonsiation landscape, citizens should explicitly benefit from upsides through a profit share from those assets that they have derisked creating a Citizen Transition Fund.

Attract New Investors

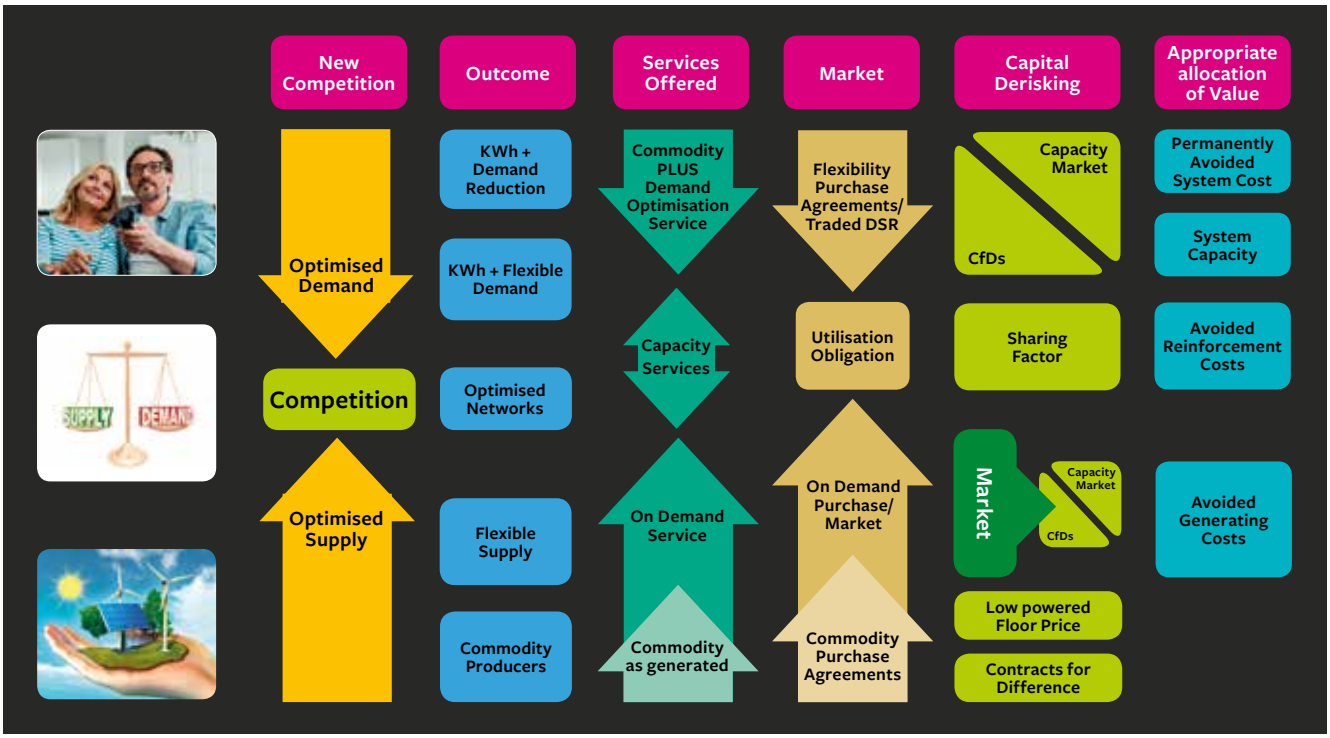
There is a growing interest from new investors who have a different appetite for risk and reward. While the "big stuff" might predominantly attract infrastructure investors, with growing confidence in how the market operates, mechanisms and new routes to investment must be investigated that are attractive to different types of investors.

- **Move the Mindset:** BEIS should establish a Financial Sandbox, allowing for diverse investors to examine and shape new routes to market and investment drawing in new expertise and new ideas.

CONCLUSION

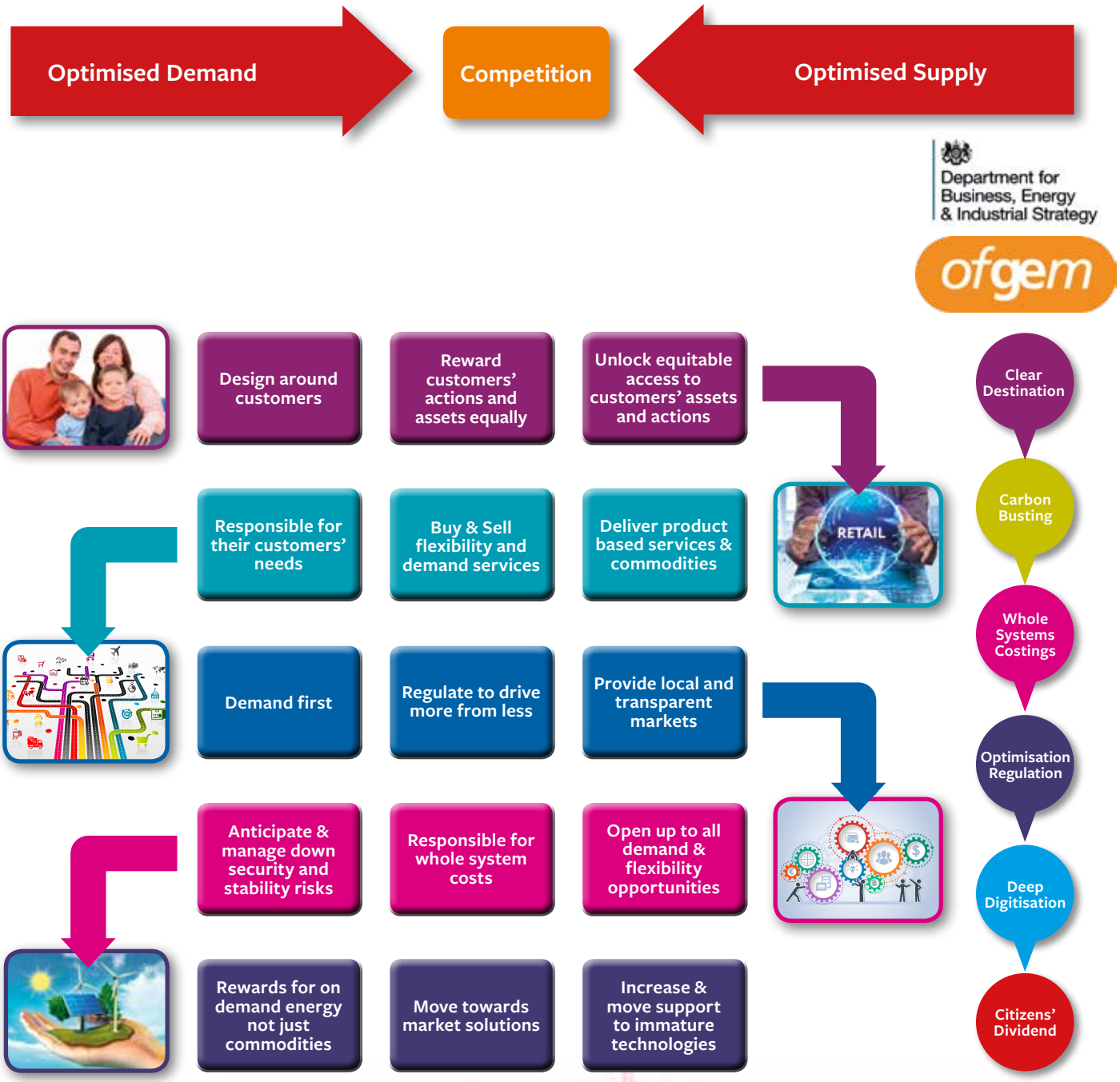
The key components of our recommendations require changes to the sector's mindset as much as large regulatory or policy changes.

- **New Focus on Carbon:** No longer tolerant of fossil fuel bias
- **New Allocation of Value:** Whole system costs and values need to be at the heart of the transformation
- **New Important Actor:** Demand actions and assets as important as generation
- **New Competitive Pressures:** Competitive tension between optimised demand and optimised supply
- **New Route to Market:** Services being prevalent unlocking the new "value" in the system
- **New Beneficiaries of Support:** Customers able to access markets, and support schemes commensurate to their value to the system
- **New Service Agreements:** Opening up new value and competition between the raw commodity, energy on demand and flexibility



Shaping a market that competes Optimised Demand with Optimised Supply showing the new service arrangements and the support mechanisms. Importantly highlighting the avoided costs of key choices.

Optimising the System



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