Low Carbon Network Fund Review and Synthesis

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Overview

- Background
  - LCNF context
  - Motivation
- Methodology
  - Categorising projects
  - Identifying learning themes
- Initial Findings & Implications
  - DSM/DSR
- Future Work

DNO Innovation Context

- RPI-X
  - 1990 to 2015
  - 5 year cycle
  - Focus on cost efficiency

The risk averse nature of most monopoly networks and the static focus of the regulatory framework resulted in low rates of innovation and companies that are not seen to be open to new ideas.

The Low Carbon Network Fund

- £500m allowance DPCR5 period (1 April 2010 to 31 March 2015)

- Aimed to replicate the incentives on unregulated companies to innovate

- Objective: help DNOs understand how they provide security of supply at value for money and facilitate transition to the low carbon economy

LCNF Tier 2

- £320m over 5 years – max £64m per year
- Small number of flagship projects
- Competitive process
- Compulsory DNO contribution (~10%)
- Successful Delivery Incentive (£100m)
- Cost recovery set out in annual LCNF funding direction

LCNF Tier 1

- Small scale projects
- Non competitive
- 'Use it or lose it' allowance
- £80m allocation of LCNF total

LCNF Take Up

- 41 Tier 1 Projects
  - £29.49m
  - 27 Close Down reports issued
- 23 Tier 2 Projects
  - £221m
  - 7 Close Down reports issued

LCNF Take Up

DNO	Projects	Funding Awarded £m
Tier 2		
ENWL	4	29.14
NPG	1	31
SPEN	2	11.02
SSEPD	4	37.94
UKPN	6	61
WPD	6	50.2
		220.3
Tier 1		
ENWL	8	9.2
NPG	1	2.88
SPEN	6	2.3
SSEPD	9	5
UKPN	4	4.46
WPD	13	5.65
		29.49

Money left on the table?

Motivation for Review

- A key feature of the LCN Fund is the requirement that learning gained from projects can be disseminated

- Has this been achieved?
    - Yes, but…

Motivation for Review

- Availability and format of information varies significantly

- Large projects – huge online libraries, progress reports, academic papers, white papers, close down reports, themed summary reports…

- Smaller projects – close down reports

- No specific facility to provide an overview or summary of the learning achieved by the fund as a whole

Methodology

- Systematic approach
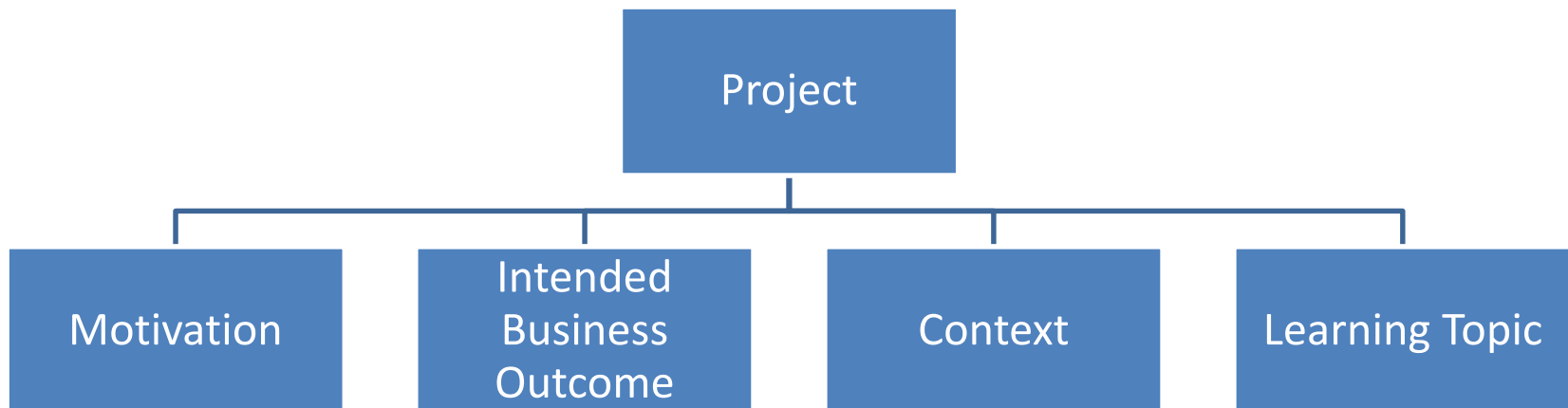- Framework for categorising projects
- Identifying learning themes
- Synthesis of learning by theme
- Assessing progress towards Business As Usual

Research Questions

- What are the main themes of learning that have emerged from LCNF activities?

- What is the accumulated learning for specific solutions/technology from these themes?

- Which solutions are closest to Business As Usual?

Categorising Projects

- Based on review of close down reports and project registration documents - observed themes and key words
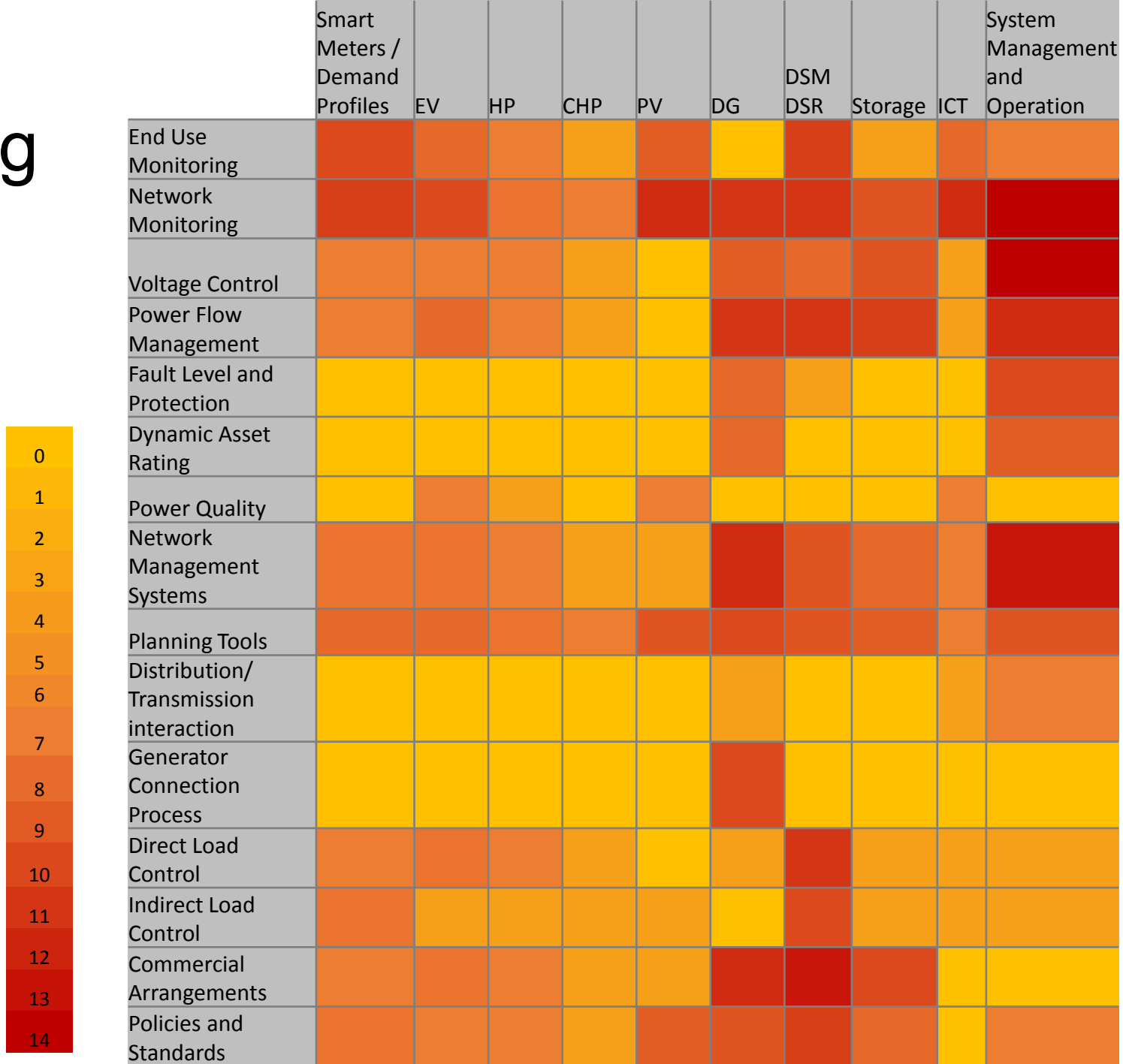
Categorising Projects

Motivation		
Facilitate Meeting of New Low Carbon Demand	Facilitate Connection of New Embedded Generation	Management of Assets

Intended Business Outcome		
Improved Network Visibility	Improved Network Operation	Improved Policy/Process

Categorising Projects

Context (what)									
Smart Meters / Demand Profiles	EV	HP	CHP	PV	DG	DSM / DSR	Storage	ICT	System Operation

Learning Topic (how)						
End Use Monitoring	Network Monitoring	Voltage Control	Power Flow Management	Fault Level and Protection	Dynamic Asset Rating	Power Quality

Learning Topic (how)							
Network Management Systems	Planning Tools	Distribution/ Transmission interaction	Generator Connection Process	Direct Load Control	Indirect Load Control	Commercial Arrangements	Policies and Standards

Project Register

				Learning Topic				
			Context					
		Objective						
	Motivation							
Title	DNO	Budget (£m)	Tier	Start Date	End Date	Progress	Close Down Report Issued	Voltage Level
Trial Evaluation of Domestic Demand Management Solutions (DDMS)	SSEPD	0.28	Tier1	Sep 10	Aug 12	100%	Yes	LV
Distribution Network Visibility	UKPN	0.25	Tier1	Sep 10	Nov 13	100%	Yes	HV/LV
Interconnection of WPD and NGC SCADA systems	WPD	0.078	Tier1	Nov 10	Dec 12	100%	Yes	EHV/HV/LV
The 'Bidoyng' Smart Fuse	ENWL	0.44	Tier1	Dec 10	Dec 14	100%	Yes	LV
Customer Led Network Revolution	NPG	31	Tier2	Dec 10	Dec 14	100%	yes	HV/LV
Low Carbon London	UKPN	28	Tier2	Dec 10	Dec 14	100%	yes	HV/LV
LV Network Templates	WPD	7.8	Tier2	Dec 10	Jul 14	100%	yes	LV

Mapping Project Activity

	Smart Meters / Demand Profiles	EV	HP	CHP	PV	DG	DSM DSR	Storage	ICT	System Management and Operation
End Use Monitoring										
Network Monitoring										
Voltage Control										
Power Flow Management										
Fault Level and Protection										
Dynamic Asset Rating										
Power Quality										
Network Management Systems										
Planning Tools										
Distribution/ Transmission interaction										
Generator Connection Process										
Direct Load Control										
Indirect Load Control										
Commercial Arrangements										
Policies and Standards										

Legend: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14

Identifying Themes for Synthesis

- Visibility
- LCT Impact
- DG
- DSM/DSR
- Storage
- System Management and Operation

Synthesis Theme - DSR

- 4 projects addressing on-demand I&C DSR
- 1 project addressing 'non-firm' managed connections
- 3 projects addressing residential ToU tariffs
- 3 projects addressing direct control of residential appliances
- 3 projects addressing direct control of new LCT

Synthesis Theme - DSR

- I&C managed connection demonstrated successfully
- I&C on-demand DSR solution demonstrated successfully
  - Variation in methods and results

Use-case	Trial Scope	Dispatch Method	Response Time	Response Duration	Technical Reliability	Contractual Arrangements
• Substation upgrade deferral • Constraint management • Pre-Fault • Post-Fault • Outage management	10's of events to 100's of events	• Phone Call • SMS •Automated	30 mins max	30 mins - 4 hours	66% - 83%	• Availability £10 - £50/MWh • Utilisation £200 - £600/MWh

Synthesis Theme - DSR

- I&C managed connection DSR is ready for BAU
  - C2C manged connection method is available to all DNOs - estimated that C2C could currently release 3.1GW of existing capacity on the HV networks

- I&C on-demand DSR is close to BAU
  - Uncertainty on CBA for pre-fault DSR
  - Growing evidence on reliability
  - Growing understanding of how to incorporate DSR within existing security of supply planning

- Challenges for I&C on-demand DSR remain
  - Geographical nature of DSR requirement
  - Best method of contracting DSR (shared access)
  - Better understanding of reliability and planning methods

Synthesis Theme - DSR

- Residential ToU DSR has shown limited potential
  - Static and Dynamic tariffs tested
  - Average peak reduction ranging from 4%-8% but wide variation in response levels – critical system peaks no affected
  - Geographical requirement is a challenge
  - CBA analysis based on trials is negative
  - Expected to be supplier led if suitable incentives transpire

Synthesis Theme - DSR

- Residential direct demand control has also shown limited current value to DNOs
  - Technologies proven but CBA analysis limited
  - Smart Appliances and Heat Pump control has shown up to 10% peak shaving potential, however trial numbers are small, cold-load pick up issues were observed and anticipated costs are significant
  - EV control has shown most potential, particularly as a contracted service – however CBA still uncertain

Assessing Business As Usual

Strong Evidence Against	-4	Results are strongly conclusive that no significant benefit/value has been shown. The DNO specifically states no intention to revisit this technology/solution
	-3	Results demonstrate very minor benefit/value. Major developments in the technology, cost or other circumstances are required. There is no indication from DNO of future work/interest.
Indications Against	-2	Results indicate very limited benefit/value, however the scope or method of the trial/research has not shown this conclusively. The theoretical potential of the solution remains attractive and the DNO does not rule out future investigation .
	-1	Results indicate some potential benefit/value, however the scope or method of the trial/research has not shown this conclusively. A CBA justifying deployment has not been possible (either through lack of sufficient evidence to conduct CBA or because potential benefit is estimated to be insufficient). Further innovation trials are highlighted by the DNO as of possible interest with a view to ED2.
Inconclusive	0	Results are mixed/unclear and do not provide evidence for or against BAU adoption. Lessons can be drawn on further trial/research requirements to provide suitable evidence. Further innovation trials/research are necessary.
Indications For	1	Results indicate a reasonable level of benefit/value and learning has been generally encouraging, however major uncertainty or barriers still exist. The CBA may not currently justify deployment but factors such as Option Value, Flexibility and potetial for technology improvement maintain the DNO activity and interest as an option into ED2.
	2	Results indicate a good level of benefit/value and high-level CBA is positive, however some barriers still exist and/or it is expected the solution will not be required until ED2 - (e.g. solution to very high national levels of EV penetration). Some further innovation work is intended through ED1 with a view to ED2.
Strong Evidence For	3	Solution is technically and commercially ready for deployment, CBA is positive, however challenges around developing deployment capability and integrating into existing systems/process is required - DNO indicates some deployment/adoption towards end of ED1.
	4	Solution is technically and commercially ready for deployment, CBA is positive, few barriers are noted and DNO has committed to significant deployment/adoption in RIIO-ED1 business plan.

Synthesis Theme - DSR

I&C non-firm	C2C											■
I&C on-demand	LCL										■	
	FALCON							■				
	NTVV				■							
	CLNR										■	
Residential ToU	CLNR				■							
	LCL				■							
	BRISTOL		■									
Residential Appliance Control	CLNR			■								
	LCL		■									
	ECHO		■									
Residential LCT Control	CLNR			■								
	LCL			■								
	I2							■				

BAU Score

-4	-3	-2	-1	0	1	2	3	4

Implications - DSR

- I&C DSR should progress to BAU
- DNO interaction with residential consumer demand resource is unlikely to progress without further research and innovation
    - Greater, more-reliable, geographic-specific response needs to be enabled as a market offering
- DNO procurement of managed EV charging service has been demonstrated
    - Such services for new LCT are not expected to be required in the current pricing control period
    - Further work required on technical and commercial understanding of such solutions and the development of appropriate planning tools

Next Steps

- Peer review (DNO input)
- Complete synthesis themes
- Final report Jan 16

Questions?