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Flexible Networks: Storage & DSR

Wednesday 1 November 2017

CLASS

Customer Load Active System Services

Increasing capacity while maintaining service

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Engineering & Technical Director

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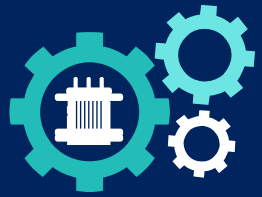
Agenda

CLASS
Customer Load Active System Services



Background	BAU – developing the business case	BAU design
Procurement	Securing the benefits	Progress and next steps

Our smart grid development

Leading work on developing smart solutions

Deliver value from existing assets

Customer choice

LCN Fund Low Carbon Networks

Five flagship products (second tier/NIC) £42 million

C2C

SMART STREET

Celsius

CLASS

RESPOND

Background

> *Sought to demonstrate that electricity demand can be managed by controlling voltage…*
>
> …without any discernible impacts on customers

CLASS
Customer Load Active System Services

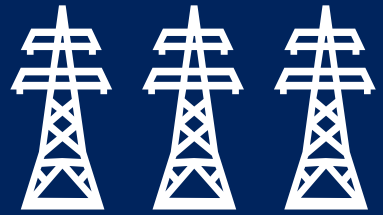
Customer Load Active Systems Services

CLASS project overview

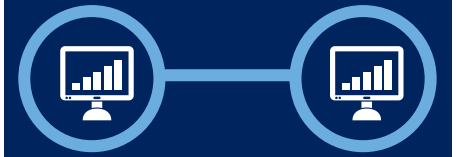
Objectives	Reduction of peak demand	Frequency response and voltage support	Voltage and demand relationship	No effect on customers
What?	Baseline measure: Spring 2014 Monitoring waves: Summer 2014 to Spring 2015 All **485 000** customers in test area received letter **696** customers recruited at **baseline** **1,357 monitoring** interviews			
Customer hypothesis	**“CLASS will be indiscernible to customers”** Customers will not see / observe / notice an impact on their supply quality when these innovative techniques are applied			

Results summary

Statistical findings are that domestic customers did not notice the CLASS functions



Lessons have been learned during the installation phase, that can be integrated into any future ‘rollout’



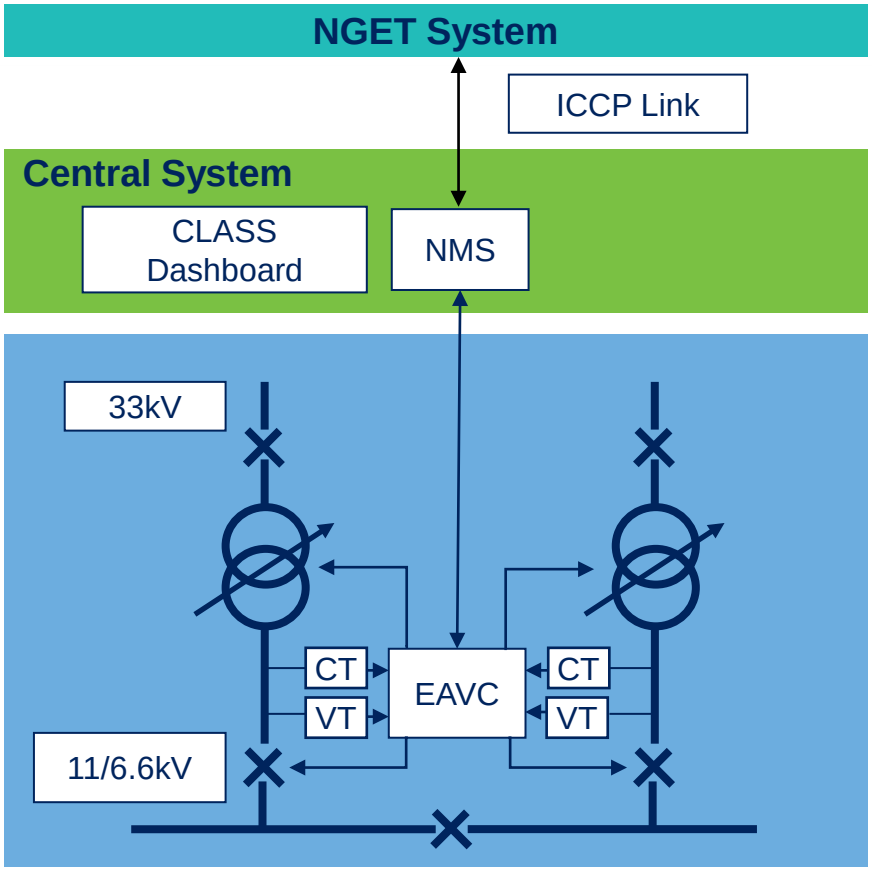
CLASS has provided National Grid with the ability to use an ICCP link which provides them with a demand response during a system frequency event

CLASS has shown an approximately linear relationship between voltage and demand

High level benefits

- Low cost high speed frequency support
- 3GW demand reduction or boost
- 2GVAr National Grid voltage control
- Reinforcement deferral
- 24/7 voltage/demand relationship matrix

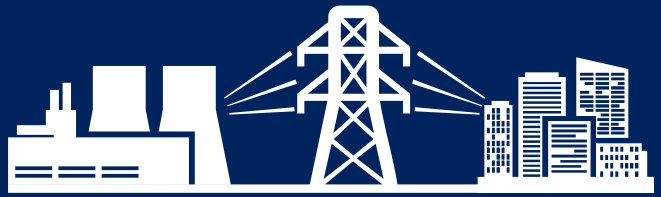
CLASS system overview



NGET System	ICCP link will provide future capability for National Grid to access the CLASS functionality directly for flexible whole system response
Central System (Dashboard)	Facility to specify service requirements Monitors the status of each CLASS substation and which should be armed or disarmed Monitor performance
Enhanced Automatic Voltage Controller	Measure performance. voltage, current, power, frequency etc Hold arm/ disarm flags for each of the CLASS services Trip or close circuit breakers or operate tap changers to implement CLASS services

Potential markets identified

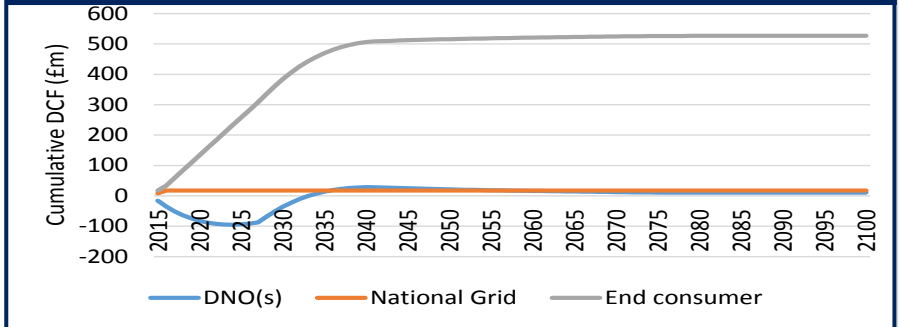
What are balancing services?	Who provides balancing services?



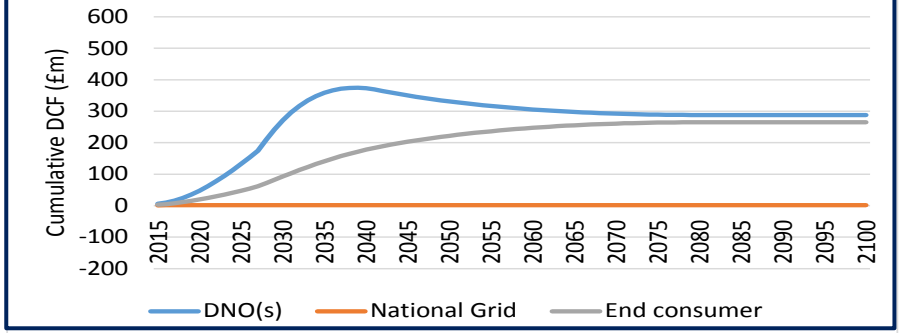
Range of energy and capacity products designed by National Grid – the system operator Used to maintain the balance of supply and demand after gate closure, to maintain stability, and ultimately ensure security of supply	Balancing mechanism (BM) providers – large, often transmission-connected generators Non-BM (distributed resources) Demand side response Other TSOs (via interconnectors)

Potential benefits

Cumulative discounted cash flow by stakeholder (LRMC pricing)



Cumulative discounted cash flow by stakeholder (Shadow marginal pricing)



CLASS deployment
354 substations (180MW) 2014-15
5,900 substations (3GW) 2027
Linear growth between

DNOs incurring capex until 2027

Totex capitalisation means net revenues are shared over 45 years

DNOs under LRMC break even in long run but not until 2035

Stakeholder	LRMC NPV	Marginal NPV
DNO(s)	£10.3m	£287.8m
National Grid	£17.2m	£1.3m
Consumers	£526.8m	£265.2m
Total	**£554.3m**	**£554.3m**

Conclusions of project extension

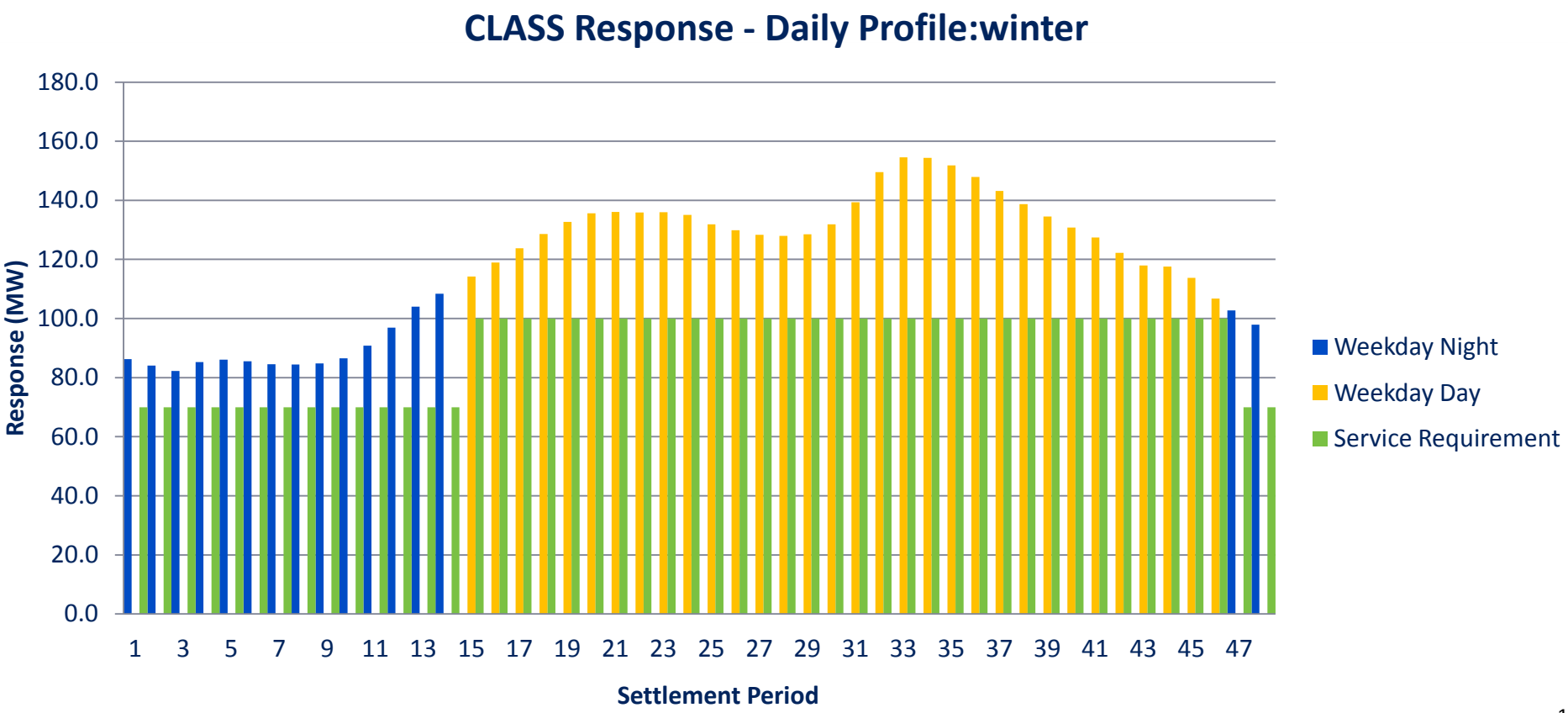
There is significant scope for CLASS to reduce consumer costs	The DUoS sharing factor allows consumers to benefit under a range of pricing strategies	Future benefits and revenues from CLASS less certain
Most valuable if CLASS treated as capable of providing dynamic and high response If not, deployment of CLASS will be constrained by 2027, reducing its potential to benefit consumers	More consumer benefit if CLASS is priced at cost, manifesting as reduced BSUoS Under shadow marginal price, all revenues, costs and risks shared between DNO and consumers Note that CLASS deployment levels could vary as a function of pricing rules	NPV horizon does not necessarily reflect DNO business decision-making Competitive technologies expected to drive prices down Growth in market requirement not enough to offset this

What services do we plan to provide to National Grid?

Product	Notes
Primary Frequency Response	• Activates automatically when frequency drops below a set level • Delivered through switching out a single transformer • **Must respond in within 10s and maintain service for 30s** • **Minimum requirement currently 1MW**
Secondary Frequency Response	• Activates automatically when frequency drops below a set level • Delivered through tap changes • **Must respond in 30s and maintain service for 30m** • **Minimum requirement currently 1MW**
Fast Reserve	• Activates by an instruction from National Grid • Delivered through tap changes • **Must respond in 2m and maintain service for 15m** • **Minimum requirement currently 50MW**

First CLASS Installation

CLASS response – daily profile: winter



Progress & next steps

Investment decision	Procurement	Implement	Commercial terms	Optimise
Business case updated: CLASS will be rolled out in up to 260 primary substations	Procurement process concluded with the appointment of Schneider Electric in February 2017	Installation complete at three sites Control system changes due at end of 2017 Rollout to majority of sites 2017-2019	Conclude framework agreements with National Grid for balancing services in 2018	Identify the best way to utilise CLASS characteristics for future services

For more information

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