From operating energy networks to managing energy systems: How electricity distribution firms are paving the way for new and innovative business models in energy distribution

A focus on the case of France

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AGENDA

1. OVERVIEW / PAPER OBJECTIVES
2. METHODOLOGY
3. MODELLING RESULTS
4. CONCLUSION

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POWER UTILITY FIRMS ARE DOOMED!

"In 20 years, I would say there will not be more than three of the incumbent power utility firms: the ones who look after the two real parameters of the market: clients and services"

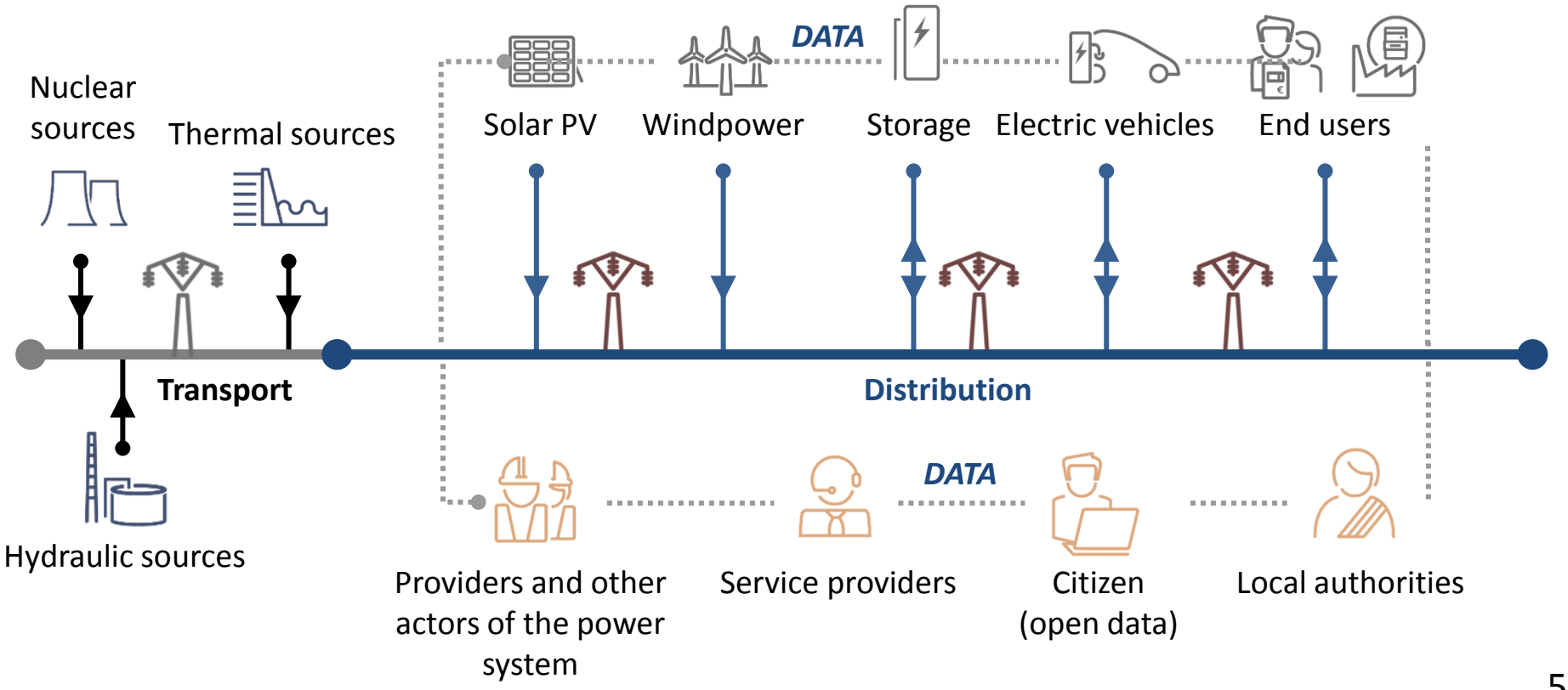
***Philip Lowe**, Ex-Managing Director the Energy division at the European Commission*

THE DSO OF THE FUTURE AS A GENERATOR OF UTILITY FOR THE ENTIRE ENERGY SYSTEM

INTREGRATE NEW USES FOR ELECTRICITY

OPERATE THE DISTRIBUTION NETWORK IN A MORE EFFECTIVE WAY

PROCESS, PROTECT AND SHARE DATA WITH ALL STAKEHOLDERS OF THE ENERGY TRANSITION



CREATE ECONOMIC UTILITY BY DIVERSIFYING INTO NEW ENERGY SERVICES

Assessing the price elasticity of power demand for 3 new services deployed by the French DSO

Smart metering with IHD

Individual data platforms

Electric mobility studies

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DATA COLLECTION ON RESIDENTIAL CUSTOMERS

1,592 French households surveyed (July-December 2016)

GROUP A (H=656)	GROUP B (H=320)	GROUP C (H=320)	GROUP D (H=296)
Smart meter with IHD	Smart meter with IHD	Exploratory studies for integration of EV's	CONTROL GROUP ("pure" power distribution service only)
	Individual data platform service	Price signal 60 min. before capacity surge	
	Price signal 60 min. before capacity surge		

• **Primary data:** Power consumption collected at a 30-minute time interval;

• **Secondary data**: home size ; number of residents per house ; state of property ; age of house ; average household income ; average income spent on mobility expenses ; number of vehicles per household ; average amount of time spent per day on the Internet.

APPRAISING THE PRICE ELASTICITY OF POWER DEMAND

Price elasticity of power demand

$$e = \frac{\delta \ln c}{\delta \ln p}$$

c = power consumption in kWh
P = price of power
δ = log differential operator

Double-difference model to assess price elasticity of power

$$\ln(c_{it}) = \sum_{g \in \{A;B;C\}} \beta_g D_{ht}^{g} + \gamma_g + \delta_e + \varepsilon_{ht}$$

C_{it} *Power consumption of household i during time interval t (30 minutes)*
D^g_{ht} *Binary variable {0;1} equal to 1 when h belongs to D and if there is price increase at time t*
γ_g *Binary variable {0;1} indicating belonging to group {A;B;C}*
δ_e *Binary variable {0;1} equal to 1 when price is increased due to a network constraint*
ε_{ht} *Idiosyncratic error term*
β_g *Percentage variation in consumption among households in any of the groups {A;B;C}*

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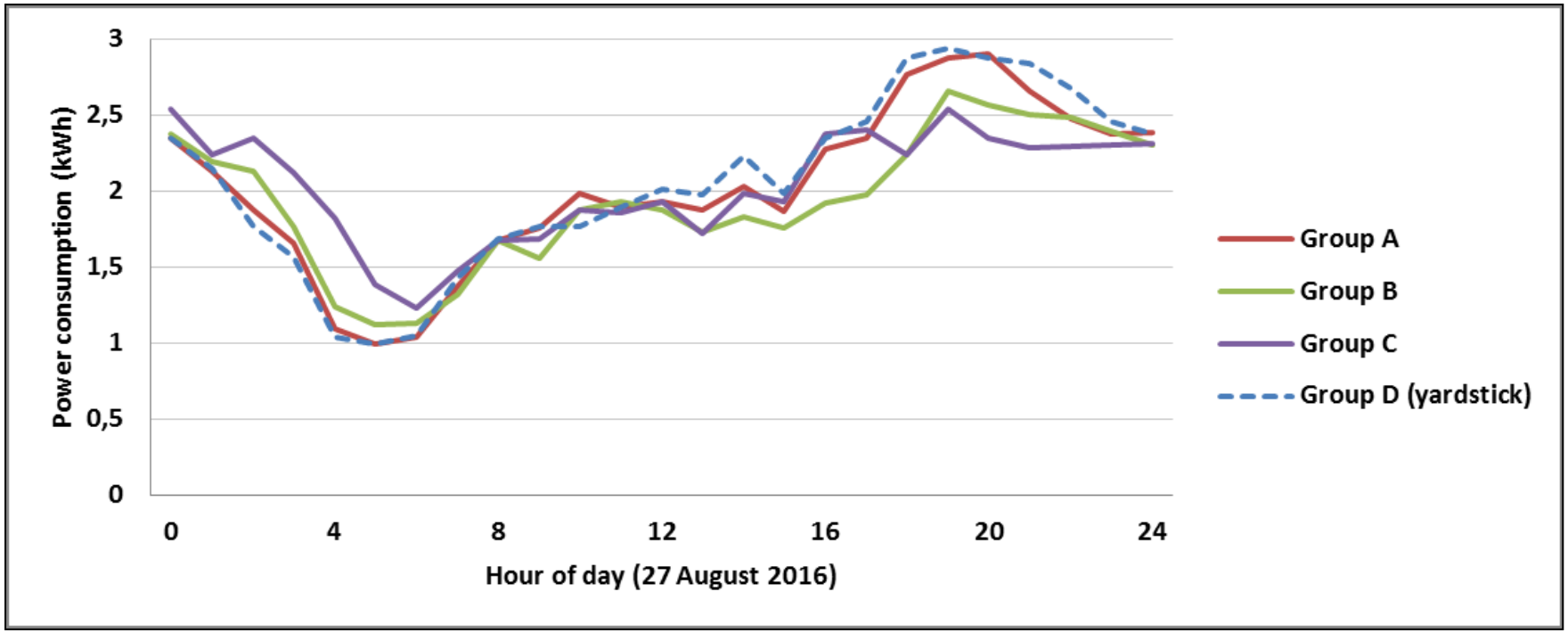
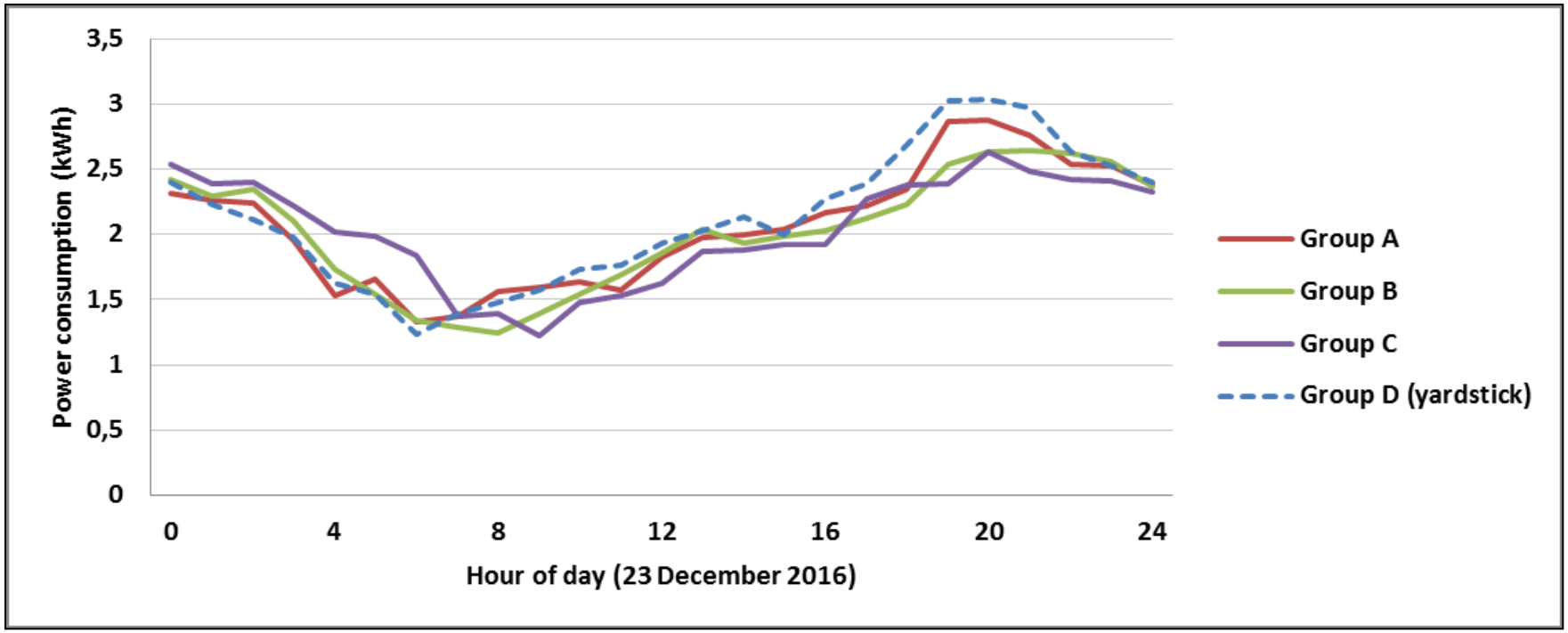
PRICE SIGNALS HAVE A BIGGER IMPACT THAN SMART METERING SERVICES ALONE ON POWER CONSUMPTION

Summer consumption



IN WINTER TOO!

Winter consumption



MORE DSO SERVICES EQUALS LESS CONSUMPTION

$$\ln(c_{it}) = \sum_{g \in \{A;B;C\}} \beta_g D_{ht}^{g} + \gamma_g + \delta_e + \varepsilon_{ht}$$

Value of BETA (consumption variation between each group and control group)

	NO FIXED EFFECTS	HOUSEHOLD EFFECTS FIXED	TIME EFFECTS FIXED	HOUSEHOLD + TIME EFFECTS FIXED
Group A	**-0.011**	-0.019	-0.013	-0.012*
Group B	**-0.018****	-0.057**	-0.038**	-0.049*
Group C	**-0.147****	-0.112**	-0.169**	-0.151**
Household effects fixed	NO	YES	NO	YES
Time effects fixed	NO	NO	YES	YES
Total obs.	1,592	1,592	1,592	1,592

, **, * indicate significance at 0.10 ; 0.05; and 0.01 respectively*

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THE DSO OF THE FUTURE ACTING AS A MARKET AND VALUE CREATION ENABLER

TRENDS	EMERGING ROLES FOR THE DSO
New services thanks to big data	Provide data to the market to enable new businesses and new services for *prosumers*
Demand & production response	Buy flexibilities to reallocate investments or cut off operational costs Certify demand response as a neutral stakeholder In some cases, assess technical feasibility of demand response on distribution asset
New ways of consumption within communities	Provide data and infrastructures to share local production within community/exchange energy at distribution level

MAIN CHALLENGE: OVERCOME REGULATION TO TRANSFORM EXPERIMENTATION INTO STANDARD SERVICES

THANK YOU

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