

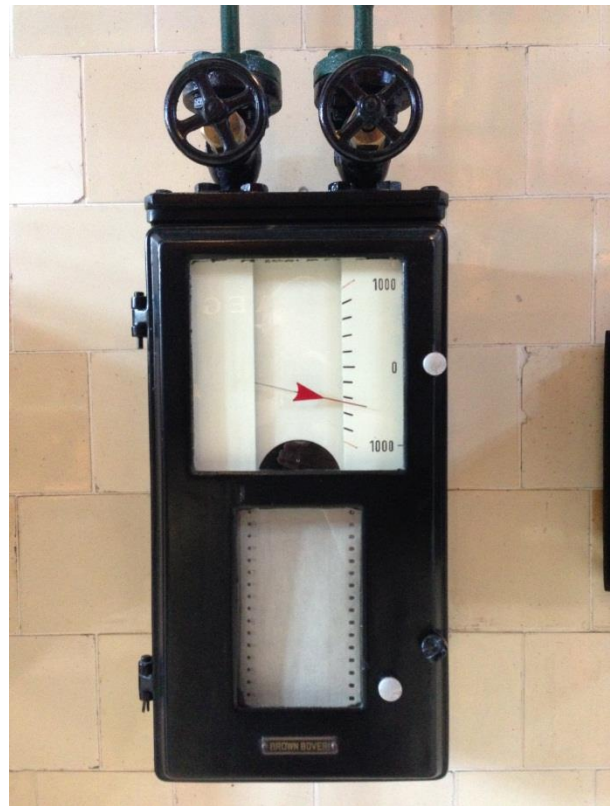
# Dynamics of Energy Demand Change

**Movement**

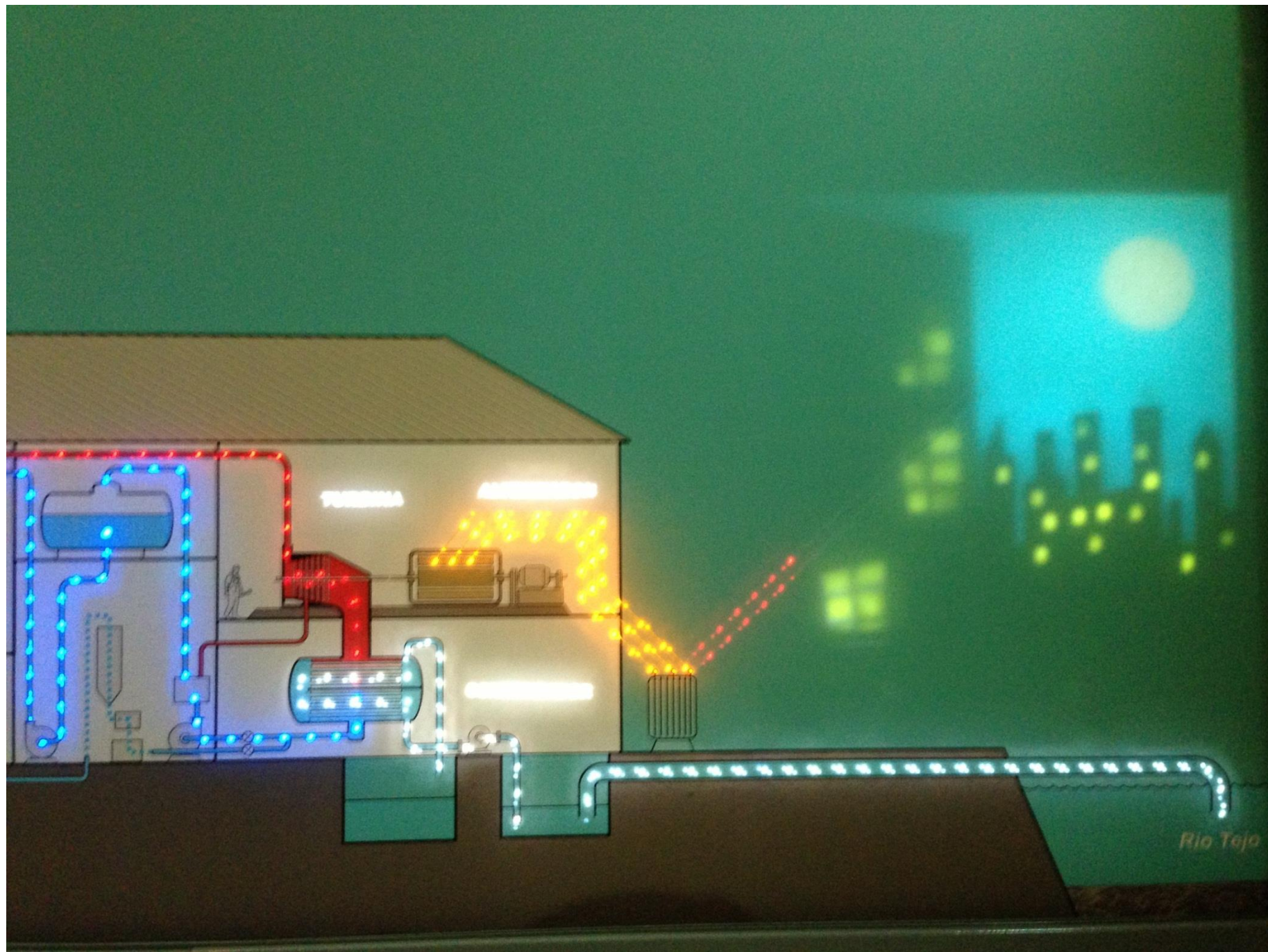
**Rhythm**

**Synchronicity**










# DeMAND

DYNAMICS OF ENERGY, MOBILITY AND DEMAND



[www.demand.ac.uk](http://www.demand.ac.uk)







Energy itself is not demanded. The demand is for the **services** that using energy can provide – heat, light, mobility, communication



Those services are demanded by **social practices** (driving demands power for movement; washing demands heated water). Energy is therefore used in the course of the accomplishment of social practices.



Energy demand it follows depends on the entire range or constellation of interwoven practices that are enacted in any one society.



Technologies are intrinsic to the provision of energy services. Energy flows through the **material arrangements within which practices transpire** (the supply infrastructures, through to end use devices and technologies; pipes and wires, boilers and toasters). Supply and demand are interrelated through these arrangements.



These systems reproduce interpretations of **need and of normal and acceptable ways of life.**

Shove and Walker (in press) 'What is energy for?: social practice and energy demand', *Theory, Culture and Society*



Energy is used not for its own sake, but in the course of accomplishing social practices (what people do).

What people do obviously matters for energy demand

Technologies and infrastructures obviously matter for energy demand, and for what people do

If we are interested in

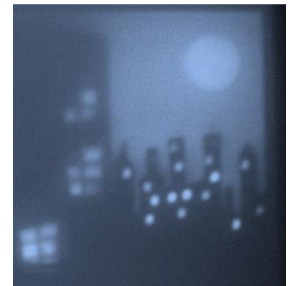
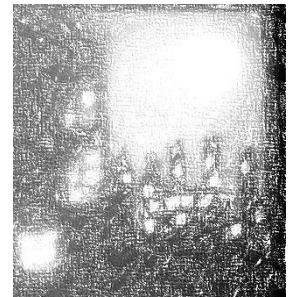
**Demand**

we need to focus on

how technologies, infrastructures and practices interact. And on the **dynamics** of these interactions

# Dynamics, Time and Temporalities

- time is multifaceted, has multiple expressions
- range of scaled temporalities - minutes, diurnal, weekly, seasonal, annual, decadal, epochal ..
- dynamics of different forms



## Change

## Rhythm

## Synchronicity

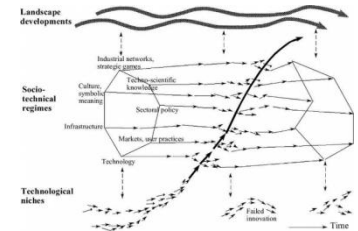
## Movement

# Change

annual, decadal, epochal

Most familiar, most examined:

- energy-society relations; energy and civilization e.g. *“culture develops when the amount of energy harnessed by man per capita per year is increased”* (White 1943: 338). Energy as driving force of change
- change/transition in energy using technologies, their form, efficiency, sustainability; systemic interrelations (social, political, economic), socio-technical co-evolution e.g. Verbong and Geels (2010), Elzen and Geels (2004)



For us .... **understanding trends and changes in energy demand is a matter of understanding the dynamics of social practices**; how practices develop, change and evolve.

- Interweaving of material arrangements, skills and knowledge, norms and conventions
- patterns of recruitment, patterning of repetition, frequency



## The rise of air conditioning (in the UK)

... there is no one explanation for how and why air-conditioning is being installed in the UK. In each of the settings we studied (office, hospital, hotels) the relation between technology and practice - that is, between air conditioning and what people do - was different.

Air conditioning is not simply a matter of personal preference or human comfort, nor is it simply about cooling as if that was a practice in its own right. The dynamics of air conditioning are embedded in the dynamics of multiple social practices...

[www.sprg.ac.uk](http://www.sprg.ac.uk)



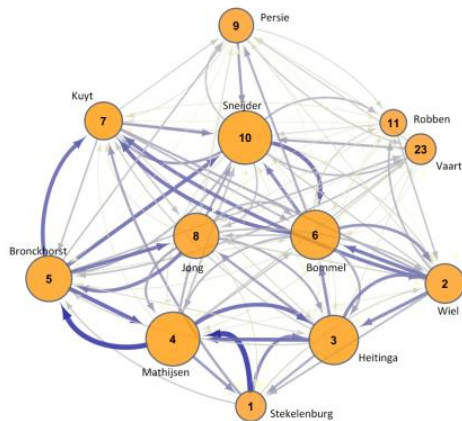
Shove E, Walker G. & Brown S., '**Transnational transitions: the diffusion and integration of mechanical cooling**' *Urban Studies*, online Aug 2013.



# How 'energy using' practices change

For example: **elderly, well being and mobility**

**understanding more holidaying abroad**



<http://blog.go-walkabout.co.uk/2012/05/boom-in-over-50s-looking-for-cheap-backpacking-insurance/>

For example: **business travelling**



**face to face** but when, how often, as part of what practices? selling; negotiating – how this varies and changes across professions and occupations. How technologies of various forms are involved in shifting travel patterns.

# Rhythm

diurnal, weekly, seasonal, duree  
pulse, beat, repetition

‘Everywhere where there is interaction between a place, a time and an expenditure of **energy** there is rhythm’ (Lefebvre 2004)

Social order is made of rhythmic conventions; ‘**rhythms emerge from human practices**’ (Edensor 2010)

... sleeping, waking, eating, going to school, working, bathing, washing, visiting ...

‘The week imposes a rhythmic beat on a vast array of major activities’ (Zeruvabel 1985; 2)

... shopping, worshipping, working, socialising ...

**Rhythms of practice create peaks, troughs and cycles of energy demand** – over daily cycles, weekly cycles; over time (and over space)

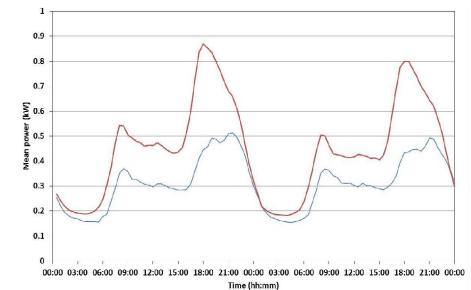
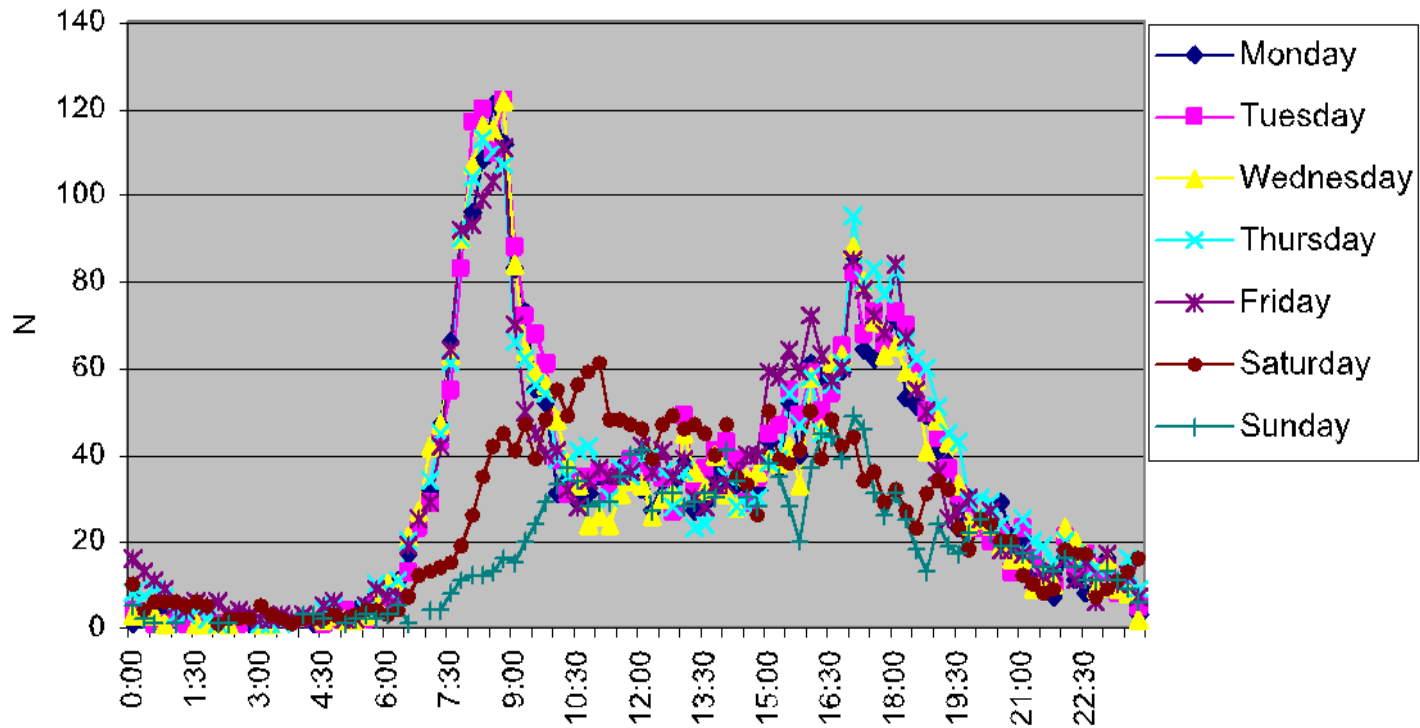


Figure 5: Test cell 1a mean half-hourly demand for two days in September 2012 and January 2013



## Time Use Data



'Home and OnLine '2000 Time Use Survey Data (UK) N of persons reporting (sample n = 1093)

Rhythms of practice create peaks and troughs in household/business energy demand – over daily cycles, weekly cycles

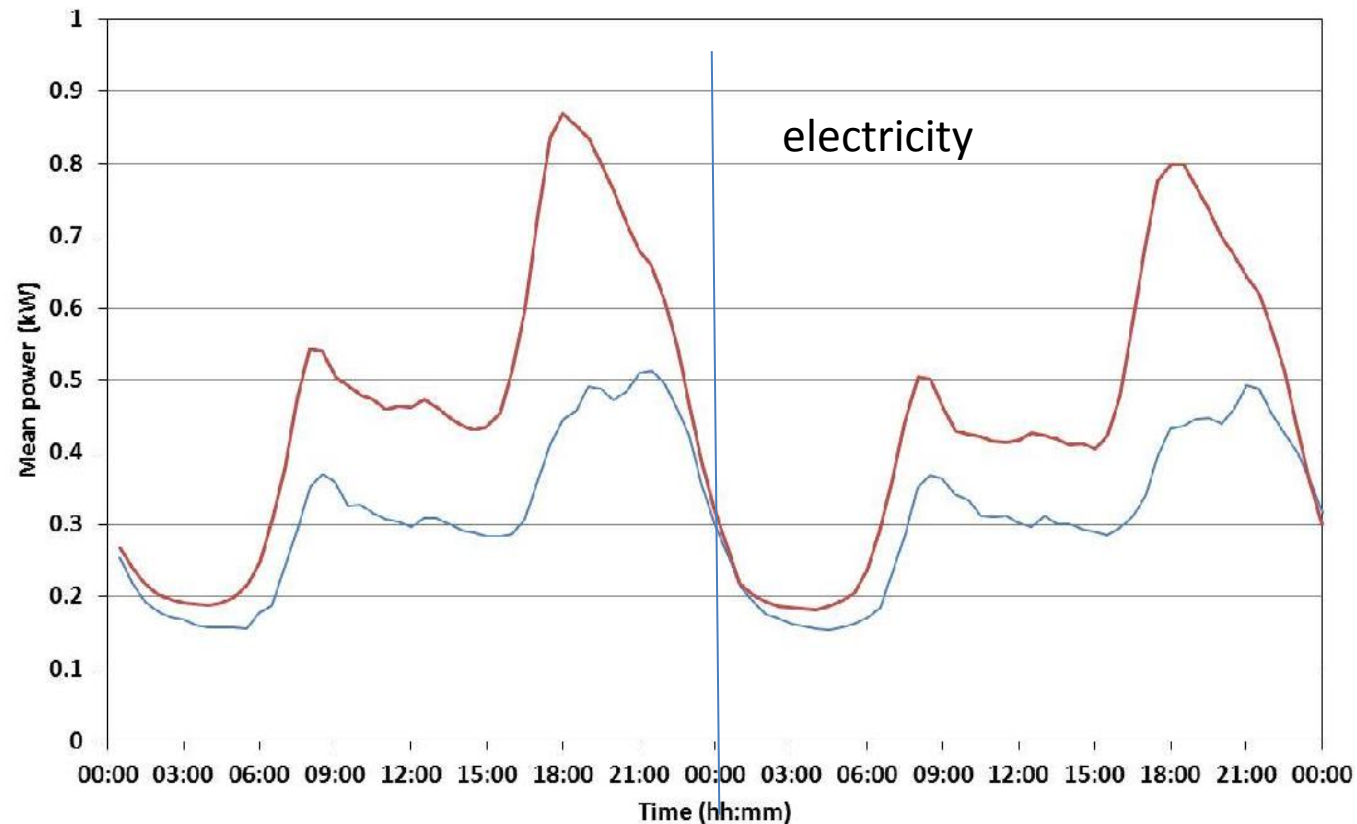
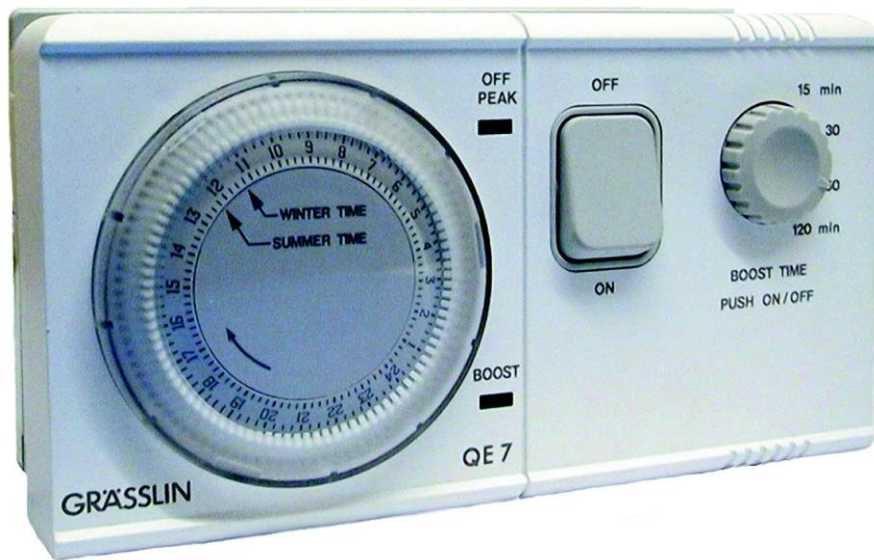


Figure 5: Test cell 1a mean half-hourly demand for two days in September 2012 and January 2013

**Technologies that urge or demand 'rhythmic consistency'; delegating rhythm to nonhuman actors (Schwanen 2007)**



**Matching (to some degree) the rhythm of energy services with the rhythm of social practices – following or forming rhythm?**





# Technologies that temporally detach or decouple energy 'consumption' from end use practice – **charging as rhythm shifting**

Charging rhythms, energy service rhythms

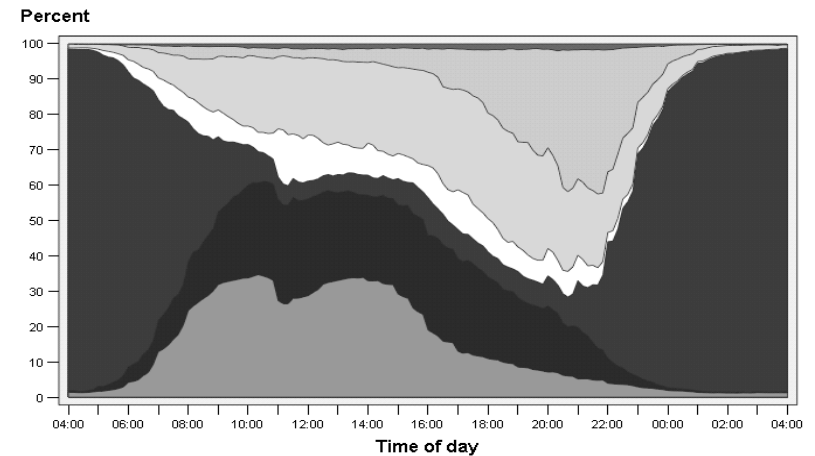


# Synchronicity

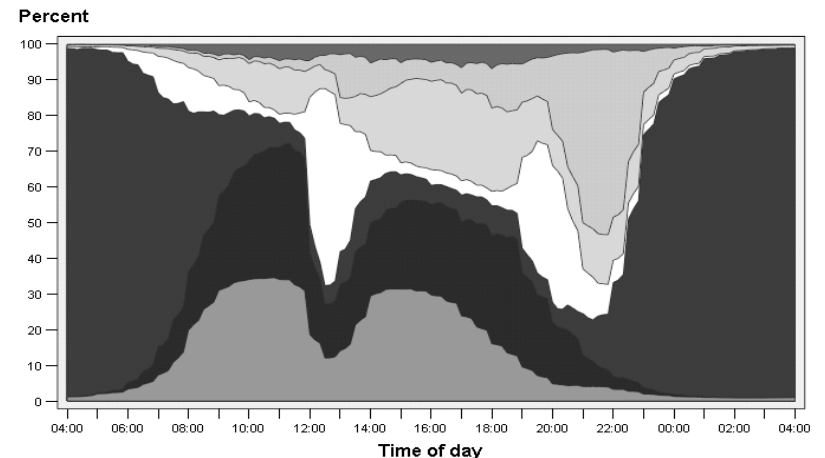
*“The rhythmic structure of the day is not merely individual but collective and relies upon the **synchronisation of practices** that become part of how ‘we’ get things done” (Edensory 2010: 8)*

*“All social life is timed. It has a time-based order. Synchronisation and ‘time structuring’ are fundamental to any collective order” (Adams 1990; 108)*

Patterns and trends in ‘societal synchronisation’



Finland



France

## **THEME 1: Trends and patterns in energy demand**

*Develops new ways of analysing the relation between the dynamics of end use practices and dynamics of energy demand, moving beyond reliance on aggregate patterns and averages.*

**1.1** *The structure and social distribution of end use practices*

**1.2** *Timing and peak demand*

**1.3** *Trends over time*

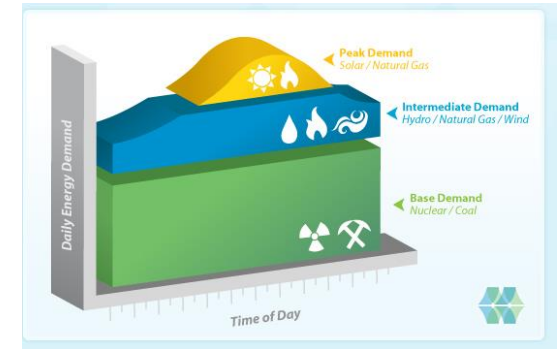




# Energy demand and synchronization 1

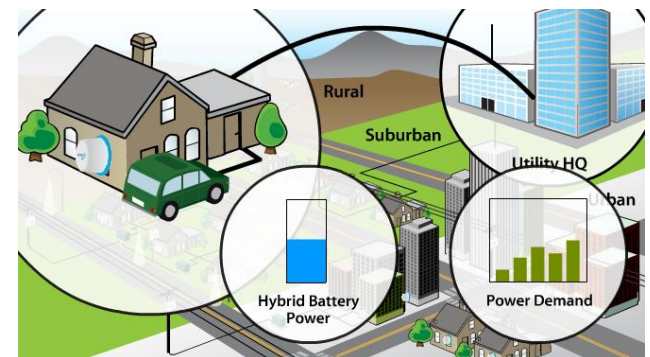
## Peak load

Aggregated energy demand - or the load on the system/infrastructure/grid (within given spatial/network boundaries) - is generated from the **synchronization of social practices**



The 'peak load problem' is produced by (i) multiple patterns of social synchronization – doing together in time and space – and (ii) an infrastructure that simultaneously services those multiple doings

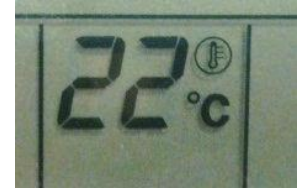
How do peaks and their make-up shift with changes in social practice, infrastructure, technology?



# Energy demand and synchronization 2

## Natural - social

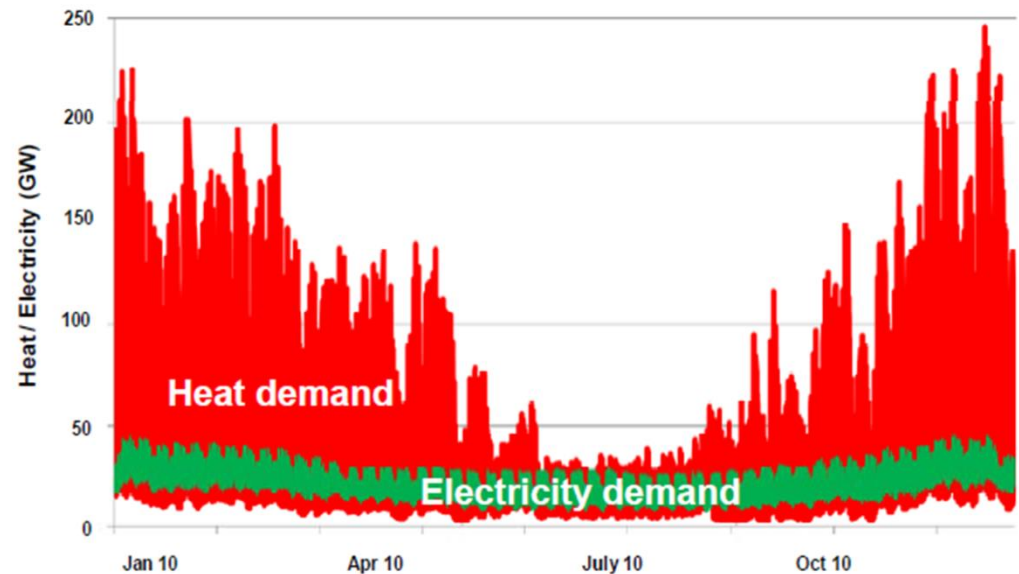
Synchronization between **natural** and **social** rhythms - matters in two ways:



at different times of year some social practices are more or less energy intensive in their reproduction (heat, light) – do practices and their use of energy follow natural rhythms or ignore/resist them?

Acute seasonal disparities in energy use

Daily figures from 2010



Source: Energy Technologies Institute

# Energy demand and synchronization 2

Natural - social



As energy supply becomes more dependent on natural fluxes and rhythms (wind, sun, tidal) **synchronization between supply and demand matters** - can demand be 'made' to match with supply?



At different **scales** – household and business to system level





# ***Movement***

The 'smart world' ..... can demand be purposefully moved?  
Can the time patterning of practices that generate demand be shifted?

-  **to shave the peaks; save on investment in infrastructural capacity; reduce carbon emissions**
-  **to match temporalities of demand with temporalities of supply e.g. where intermittency of renewables is an issue**

Demand shifting taking different technological & institutional forms – price incentives, technology controlled etc ...



**British Gas in the UK to trial giving customers free electricity on Saturdays**

How **green** is California's **electricity**? 8.8% clean.

**WattTime creates tools that empower you to lower your carbon footprint by shifting when you use energy to times when the grid is green.**



Email Address

State

California



Submit



Clean energy  
solutions for all

**SHIFT →**

Will your energy be cleaner later? Use WattTime Shift to forecast the best time today to use electricity. Sometimes it's better to procrastinate!

**ALERTS →**

Don't miss a chance to make an impact with your energy choices! Sign up for WattTime Alerts to get personalized notifications of particularly dirty or clean times delivered right to your phone or inbox.

**EXPLORER →**

Now you can monitor the grid in your town and across the country—check out WattTime Explorer to see where your power is coming from and discover the clean energy trends that affect you.



## Fixity?

*'Rhythm disappears into the mist-enveloped realm of fixed things'* (Mels 2004; 23)

Social practices are interwoven, sequenced, locked into temporal patterns of the familiar/normal/necessary; therefore hard to disentangle



## Pliability?

*"there is no identical absolute repetition indefinitely ... there is always something new and unforeseen that introduces itself into the repetitive"* (Lefebvre 2004: 6)

The social ordering of time is full of regulation and governance – setting both the possible and the 'right' time of things (Adams 1990)

... **starts/beginnings and ends/stops; opening times, working days; timetables ...**

And plenty of examples of energy demand shifting for **non- energy** reasons

## Movement as a question of power and governance?

Where (if anywhere) is the power to retime the temporal ordering of practices located? Who has it, how can it be exercised, under what conditions, for what practices, to what degree, to what ends? Where do resistances lie?

- Employers can and already do shift their **working hours** to fit with commercial objectives (including energy related ones)
- The UK is planning to deregulate the timing of **school holidays**, and the school day – an act of significant societal de-synchronisation

What wider consequences and inequalities lie within time-related demand management?



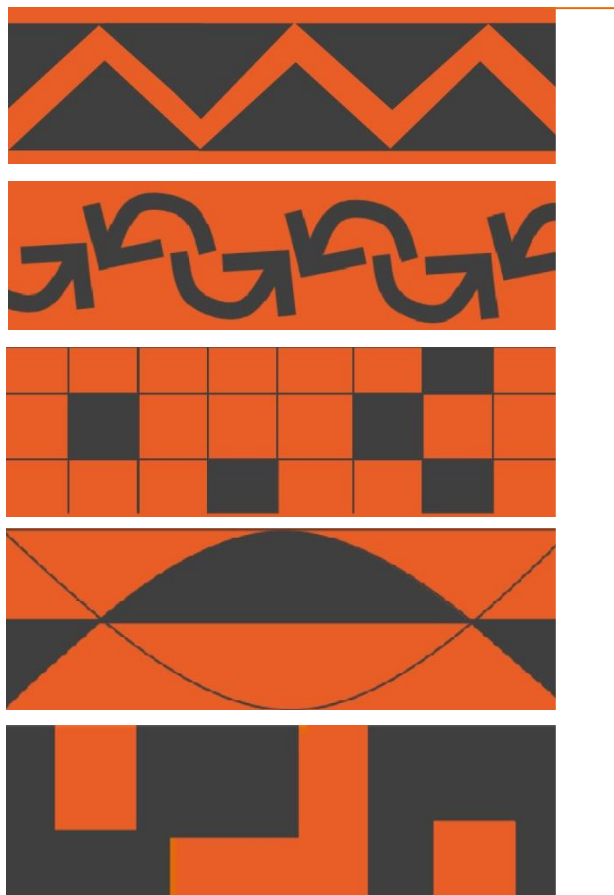
## Moving onwards

- a wide range of possibilities for **dynamic, time-sensitive energy demand research** across multiple timescales and resolutions
- a wider lexicon of time-related concepts and theory
- socio-technical & socio-natural interplay
- deepening policy and practical relevance – for scenarios & modelling; low carbon transition policies; active demand management; smart grids....  
**All objects for STS study in their own right**

Is based on 3 linked propositions

These propositions underpin 5 research themes.

- 1 How and why do end use practices vary
- 2 How and why do end use practices change over time
- 3 How do infrastructures of supply and demand shape end use practices
- 4 What are the implications for normality, need and entitlement
- 5 How is energy demand, constituted, transformed and steered?



1 Energy is used in the course of accomplishing social practices.

2 Social practices and energy demand are shaped by infrastructures and institutions.

3 These systems reproduce interpretations of need and entitlement, and of normal and acceptable ways of life.

Research within these themes allows us to:

Identify and explore new opportunities for **demand** management at different scales.

Achieve a step change in how energy **demand** is understood and managed.

Confront fundamental issues of **demand**: what is energy for?