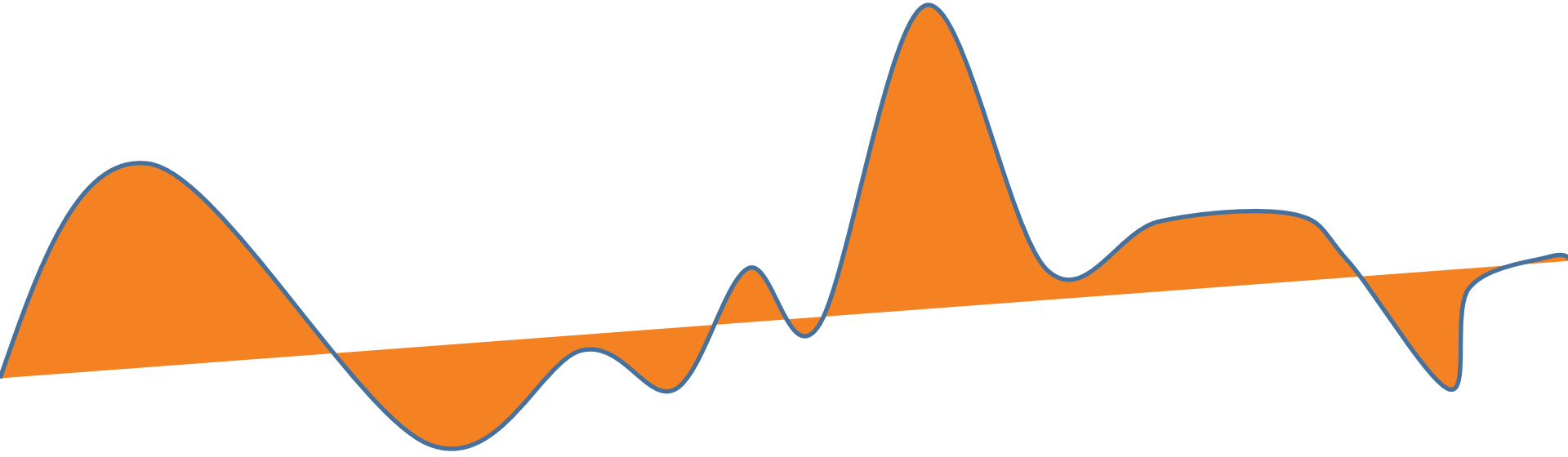
“Shifting Routines, Changing Demand”:
A workshop on the dynamics of household energy demand during daily and network peaks



DEMAND
DYNAMICS OF ENERGY, MOBILITY AND DEMAND

Research Councils UK
Energy
For a Low Carbon Future

2-2:15pm Welcome

Wifi network

Name: DEMAND

Password: shifting

(Better than eduroam!)

Professor Gordon Walker, Co-Director, DEMAND Centre

Yolande Strengers, Centre for Urban Research, RMIT University, Australia

Ben Anderson, Sustainable Energy Research Centre, University of Southampton

Mike Hazas, School of Computing and Communications, Lancaster University

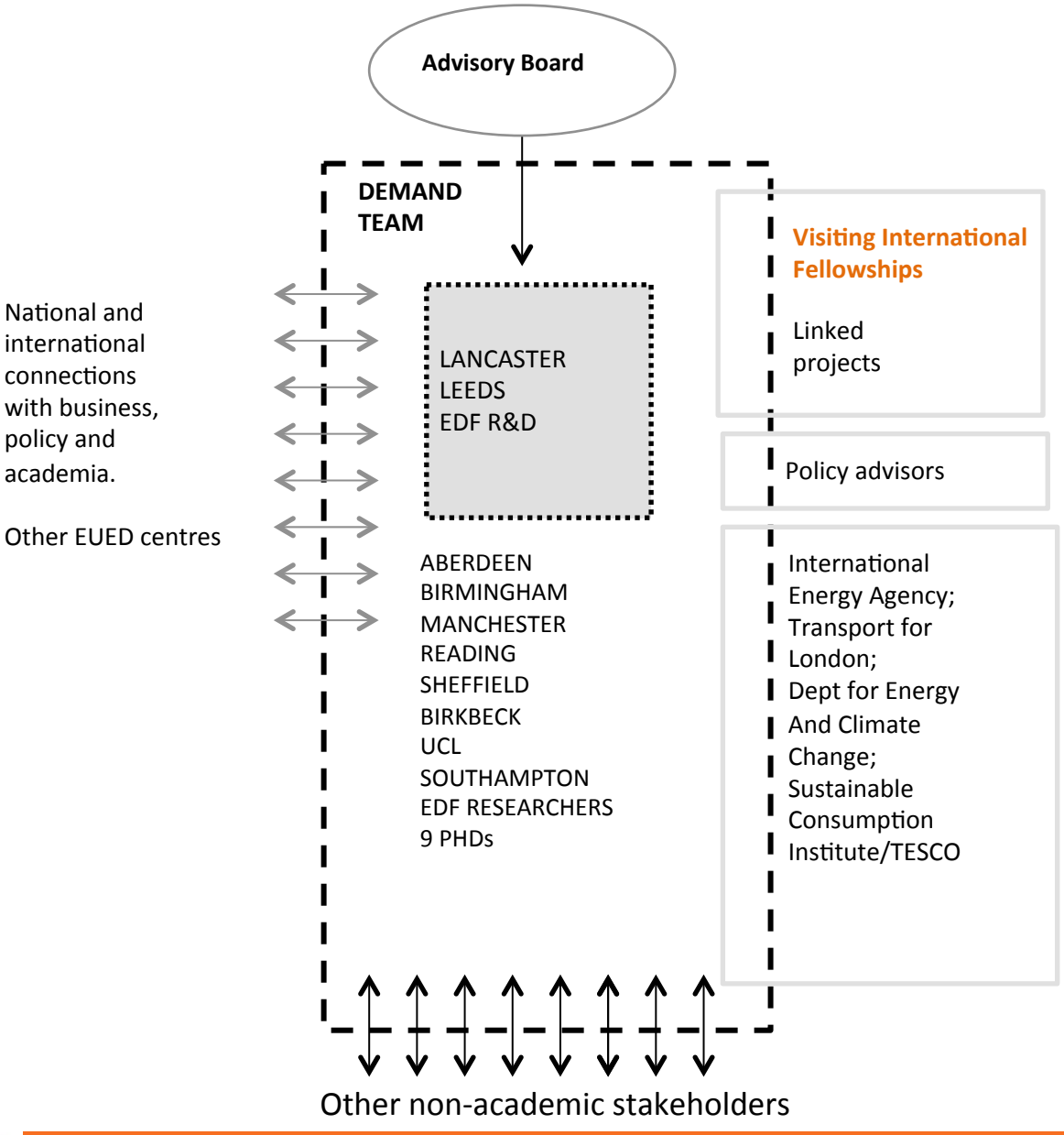
DEMAND
DYNAMICS OF ENERGY, MOBILITY AND DEMAND

5 Years 2013-2018

One of 6 End Use Energy Demand Centres

www.demand.ac.uk

@DEMAND_CENTRE



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Is based on 3 linked propositions

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.

These propositions underpin 5 research themes.

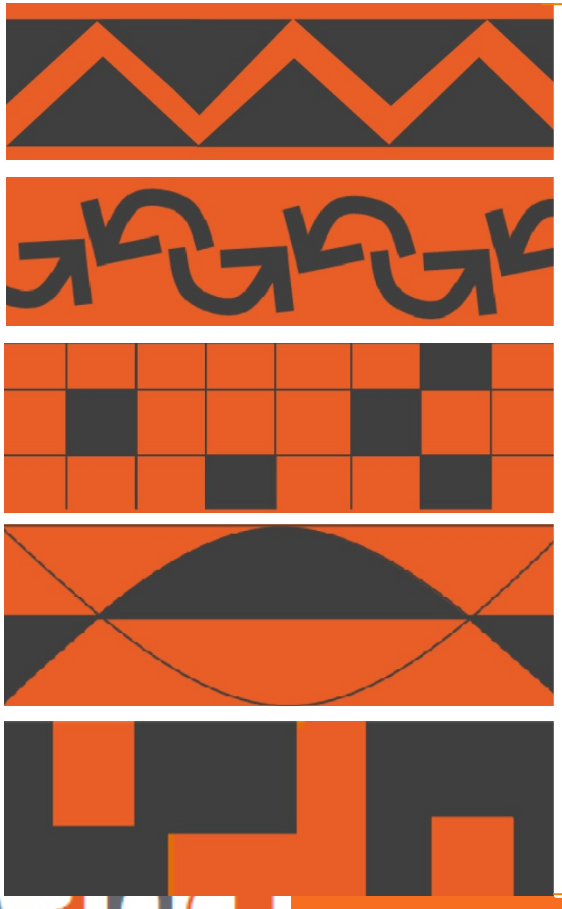
1 How and why do end use practices vary

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?



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?

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Research Councils UK Energy For a Low Carbon Future

Workshop aims

Partially informed by the convenors' close analyses of both UK and Australian household data, this workshop aims to provoke reflection and discussion on:

- How and why energy-demanding routines are shifting in time and space, and the impacts of these changes on peak demand and CO_2 emissions
- How demand managers are attempting to shift routines (and to what extent, and in what sense, this is (and is not) working)
- What other programs and policies might shift routines to reduce demand

Workshop overview

Day 1: Introductions
Framing the problem (UK & Australian insights)
What have we missed?
What's already shifting and why?
Over drinks: Matching demand management challenges to provocative responses

Day 2: Discuss demand management challenges & responses (from drinks)
Shifting routine/ changing demand challenges
Responding to key challenges
Reflection on provocative experiments
Next steps

What's in & what's out?

What's linked?

- Basically, everything

What's in?

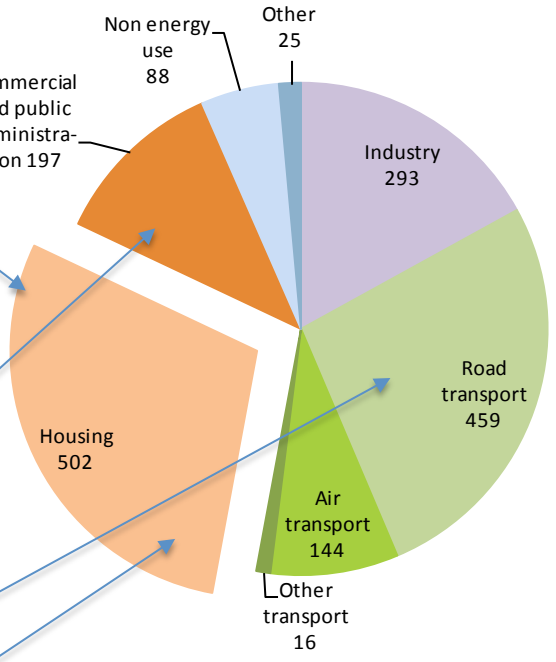
- All 'domestic energy uses'
- But especially those where timing matters

Presumably cooking fits here?

But use of a take-away has a bit here

And here

And probably here



Graph 1a: Final energy consumption by sector 2012 (UK, TWh, Total 1,724 TWh)

DECC, 2013 (UK Housing Factfile)

Interventions

We'll be encountering a variety of interventions during the workshop

All inspired by 'traditional' demand management strategies

Aim to provoke reflection and discussion on demand shifting

Intervention: Drink time-of-use (TOU) charging

Currency: Sticker dots. (Colour does not matter.)

Total individual allowance: Five dots

Peak price: Three dots

Off-peak: One dot

Includes: Tea, coffee, hot water and juice. Cold tap water is free.

Time usage grids will be provided near the coffee.

Record time-of-use by placing your dot in the appropriate square.

During peak periods, **stack three dots.**

Drink TOU charging: Peak periods

Wednesday 3:45-4:15pm

Thursday 10:30-11:00am

Peak demand is anticipated during the breaks.

Hot drinks available prior to the breaks.

2:15-2:45pm Introductions

Who are you?

Where are you from?

Why are you here?

How does your work relate to shifting routines/ changing demand?

= 2 mins each

2:45-3:15pm: Framing the problem: UK and Australian perspectives

How flexible is demand?

Why do we need to shift it?

How is it already shifting?

How else could we think about shifting it?

3:15-3:45pm: What have we missed? Gathering perspectives

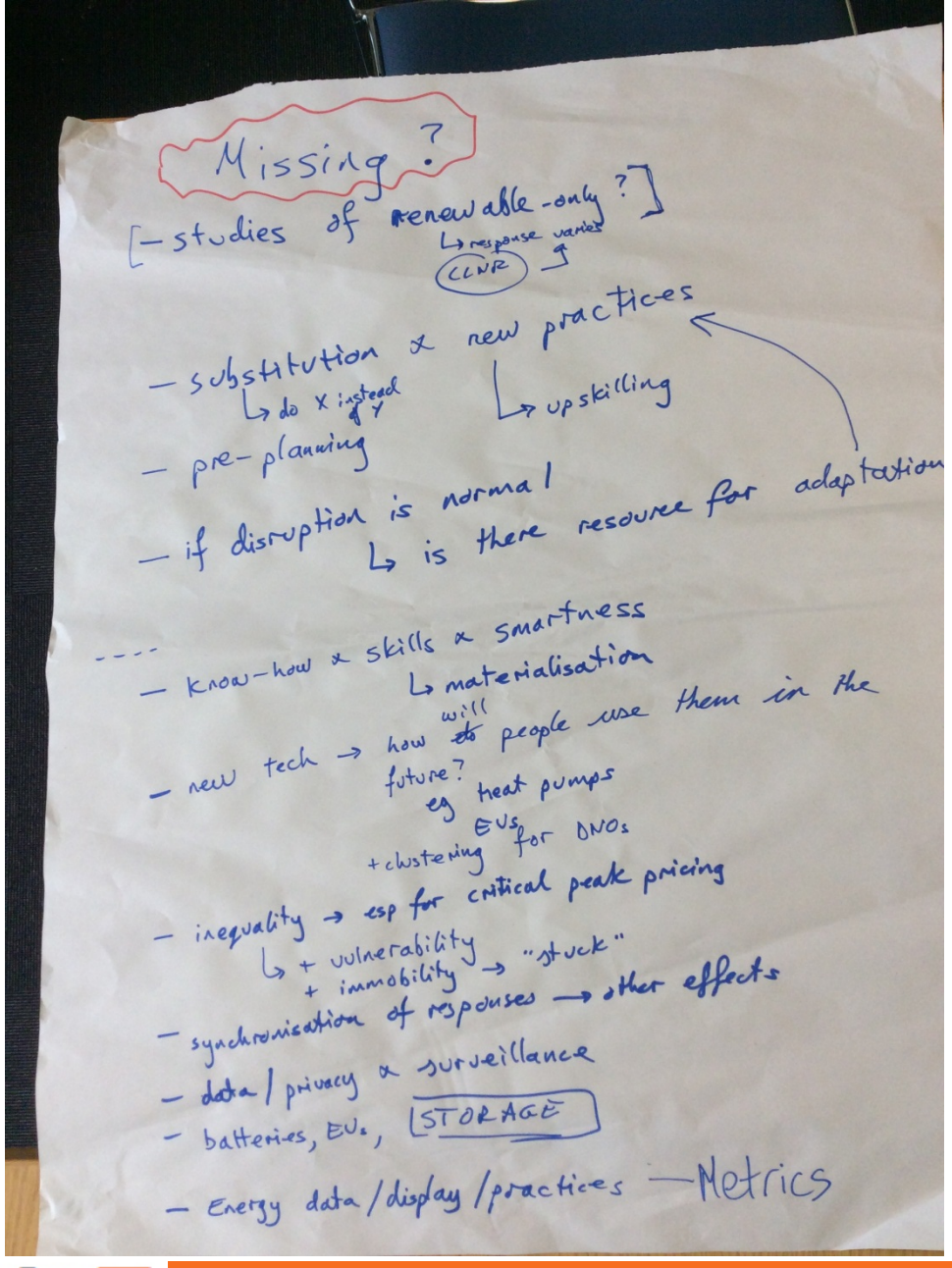
Afternoon tea with TOU charging up next!

Open group discussion

- Questions regarding the presentations?

- What have we missed?
  - How else is energy demand changing that is not captured here?
  - Are there any other aspects of the problem we have missed?
  - What else do we need to take into consideration?

= 30 mins


Missing?
[– studies of renewable-only?
↳ response variation
CLNR
– substitution & new practices
↳ do X instead of Y
↳ upskilling
– pre-planning
– if disruption is normal
↳ is there resource for adaptation
– know-how & skills & smartness
↳ materialisation
– new tech → how will people use them in the future?
eg heat pumps
EVs for DNOs
+ clustering
– inequality → esp for critical peak pricing
↳ + vulnerability
+ immobility → "stuck"
– synchronisation of responses → other effects
– data / privacy & surveillance
– batteries, EVs, STORAGE
– Energy data / display / practices – Metrics

- collective activities

- Can we model practices?

- Who loses out through shifting?
  - gendered consequences?

- Why not let the lights go out?
  ↳ what is the norm & why?

- Should we distinguish services from usage (load on grid) → reading via storage [no need for light]

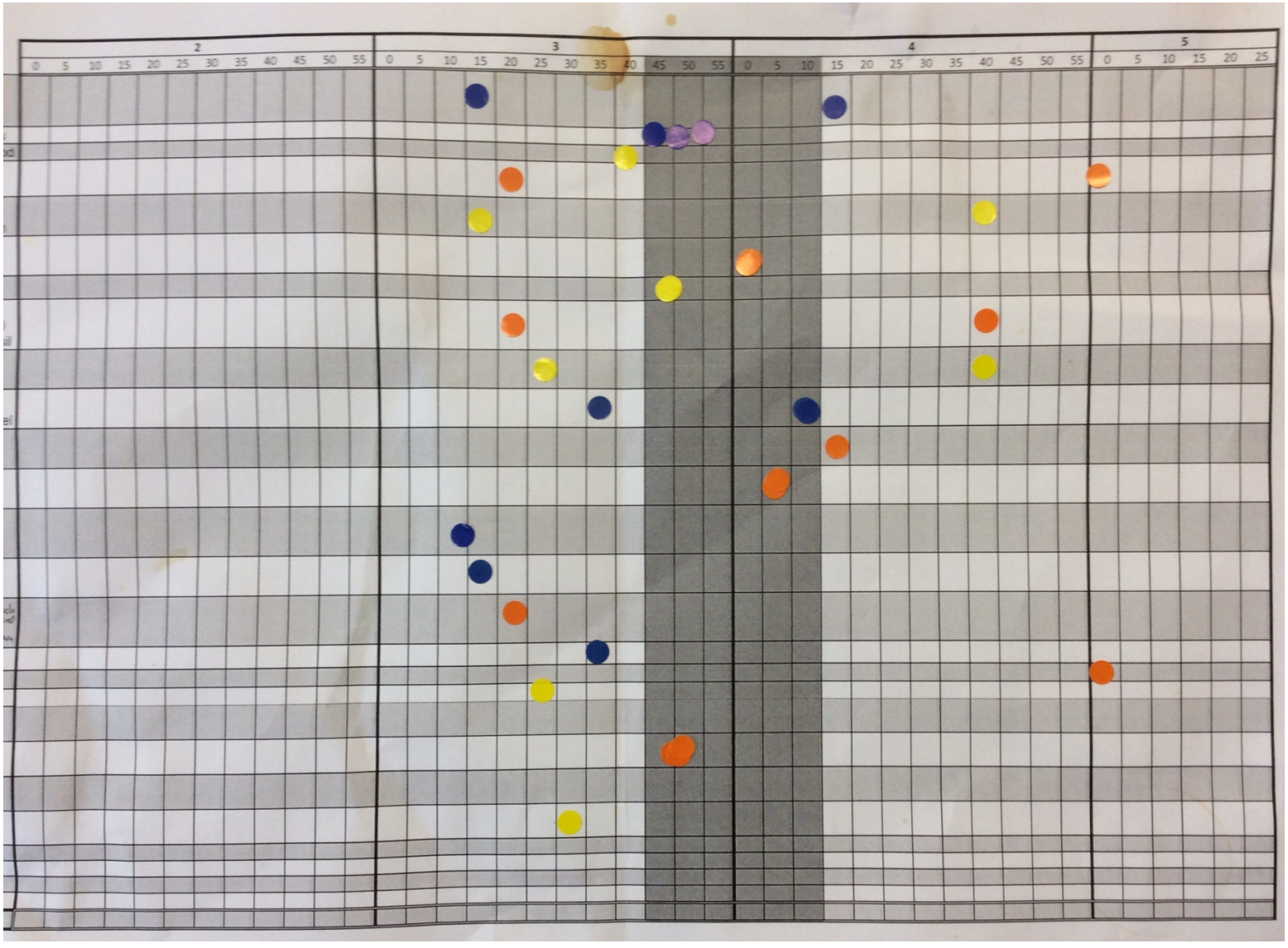
What else is missing?

3:45-4:15pm: Afternoon tea

TOU charging in place!

3 dots for hot drink during the ‘official’ break time

TOU drink charging demand profile (Day 1)



4:15-5:30pm: What's already shifting and why?

You will need to make lists/ notes on the butchers' paper!

Part I of IV: Split into 4 groups

	Group #	
What events or conditions already cause disruptions/ shifts in household routines/ practices that are relevant for energy demand?	1	2
What household routines/ practices are discretionary/ non-discretionary?	3	4

You will have to explain your list to another group!

= 15 mins

4:15-5:30pm: What's already shifting and why?

Part II of IV: Get together as below & explain your notes to each other and then **swap** lists/notes

	Group #	
What events or conditions already cause disruptions/ shifts in household routines/ practices that are relevant for energy demand?	1	2
What household routines/ practices are discretionary/ non-discretionary?	3	4

= 5 mins per group including discussion time

4:15-5:30pm: What's already shifting and why?

Part III of IV: In your original groups but with your **new** list…

	Group #
How could you envisage intervening in what you've been given (to serve a demand management agenda)? What existing demand management initiatives might work in the context of what is already shifting/ not shifting?	All

You will have 5 minutes to report back **your top 3** in…

= 20 mins

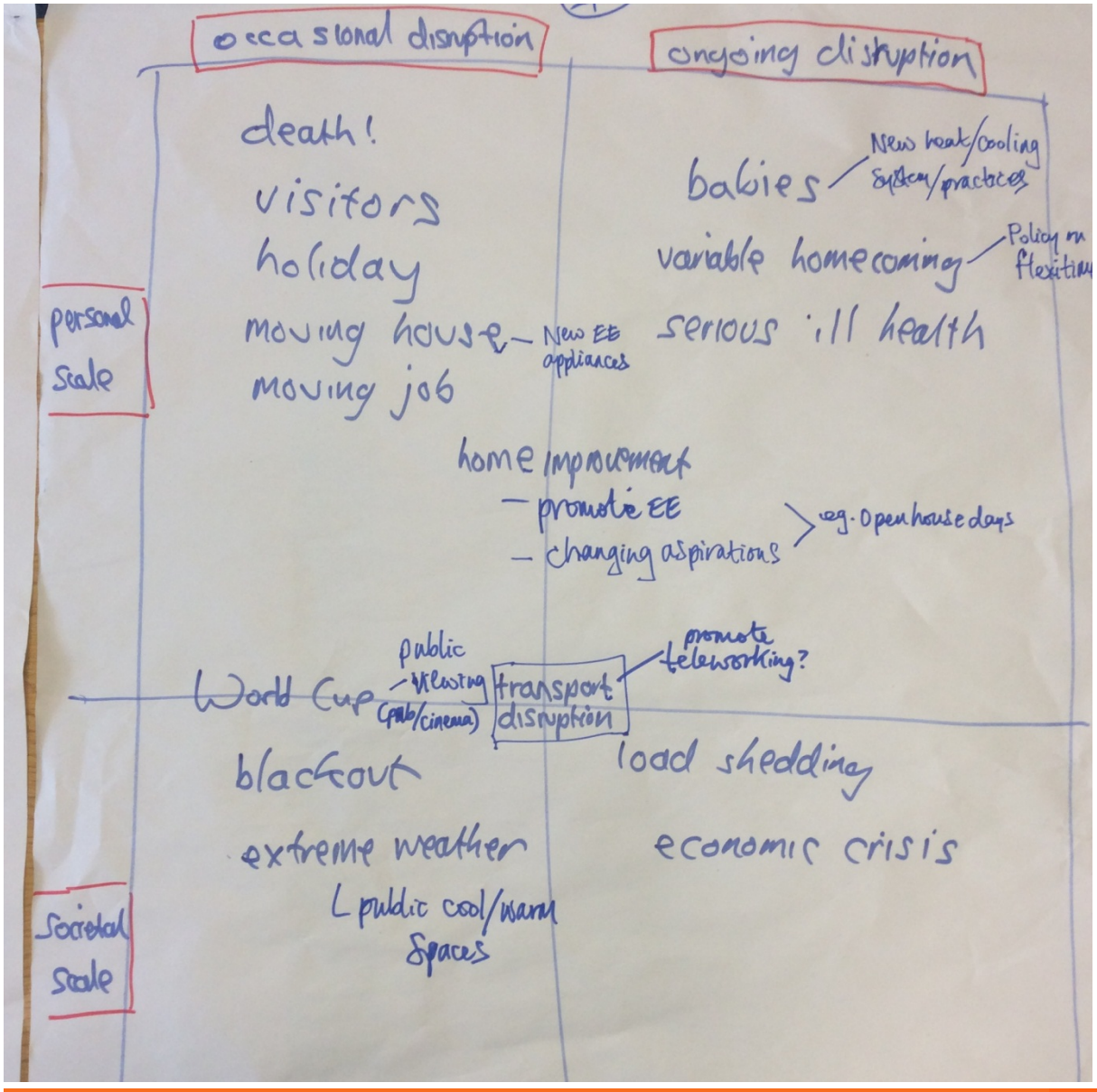
4:15-5:30pm: What's already shifting and why?

Part IV: In your original groups but with your **new** list…

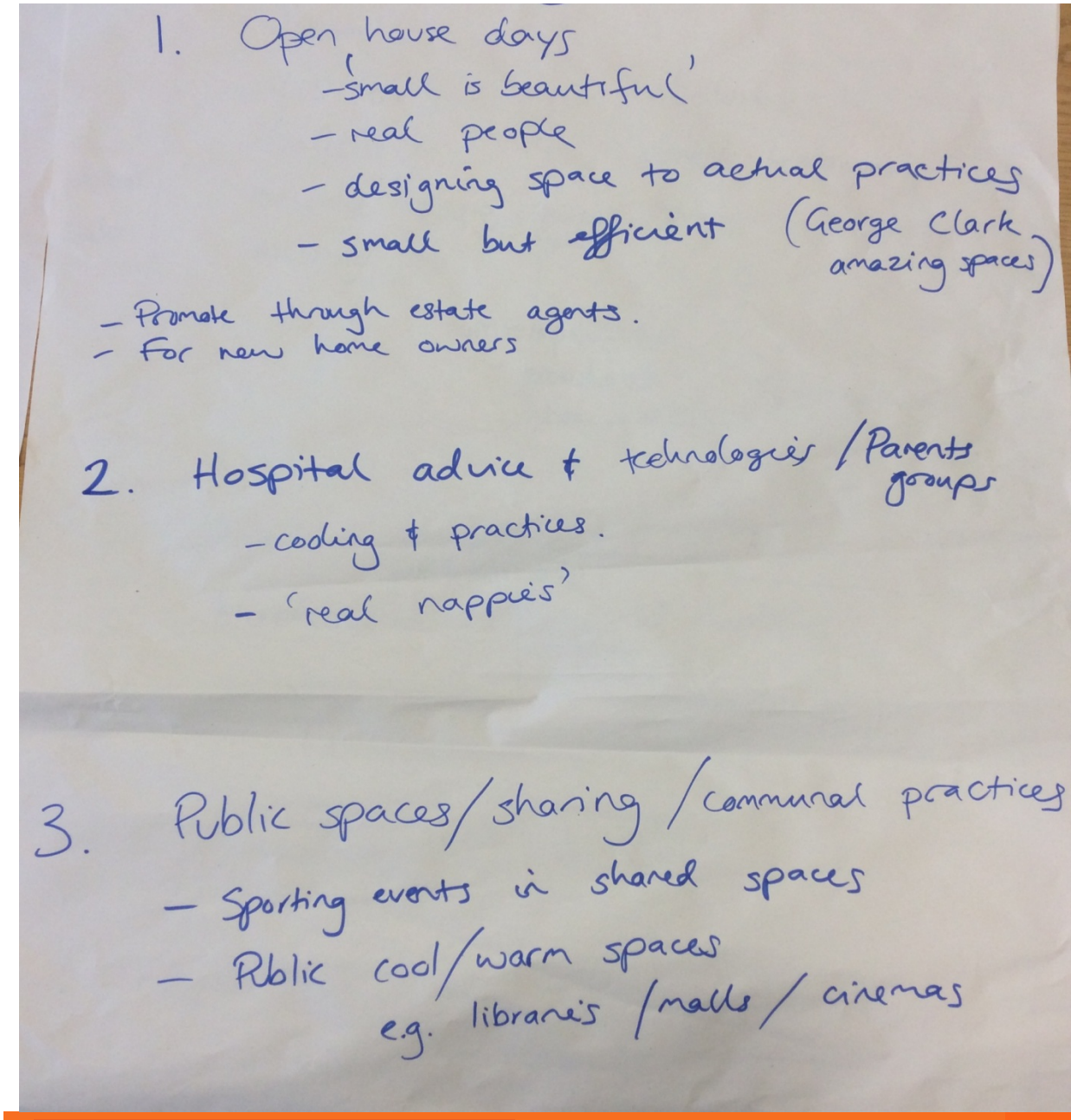
	Group #
Report back on 3 top ideas for intervention/ demand management strategies	All

= 5 mins per group including discussion time

Group 4: what already causes shifts and disruptions?



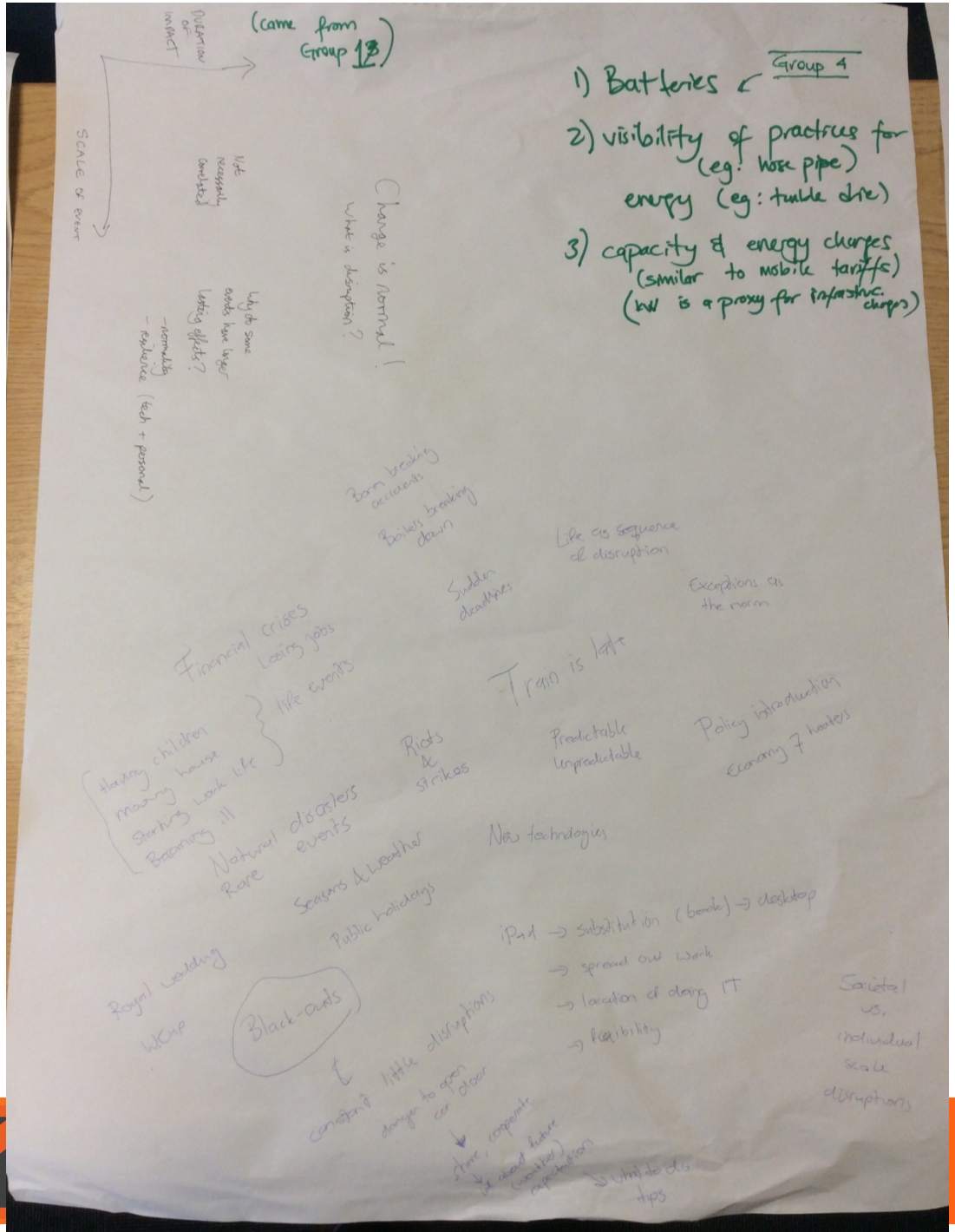
Group 1: how could you intervene in these existing shifts and disruptions?



Group 1: what already causes shifts and disruptions?

AND

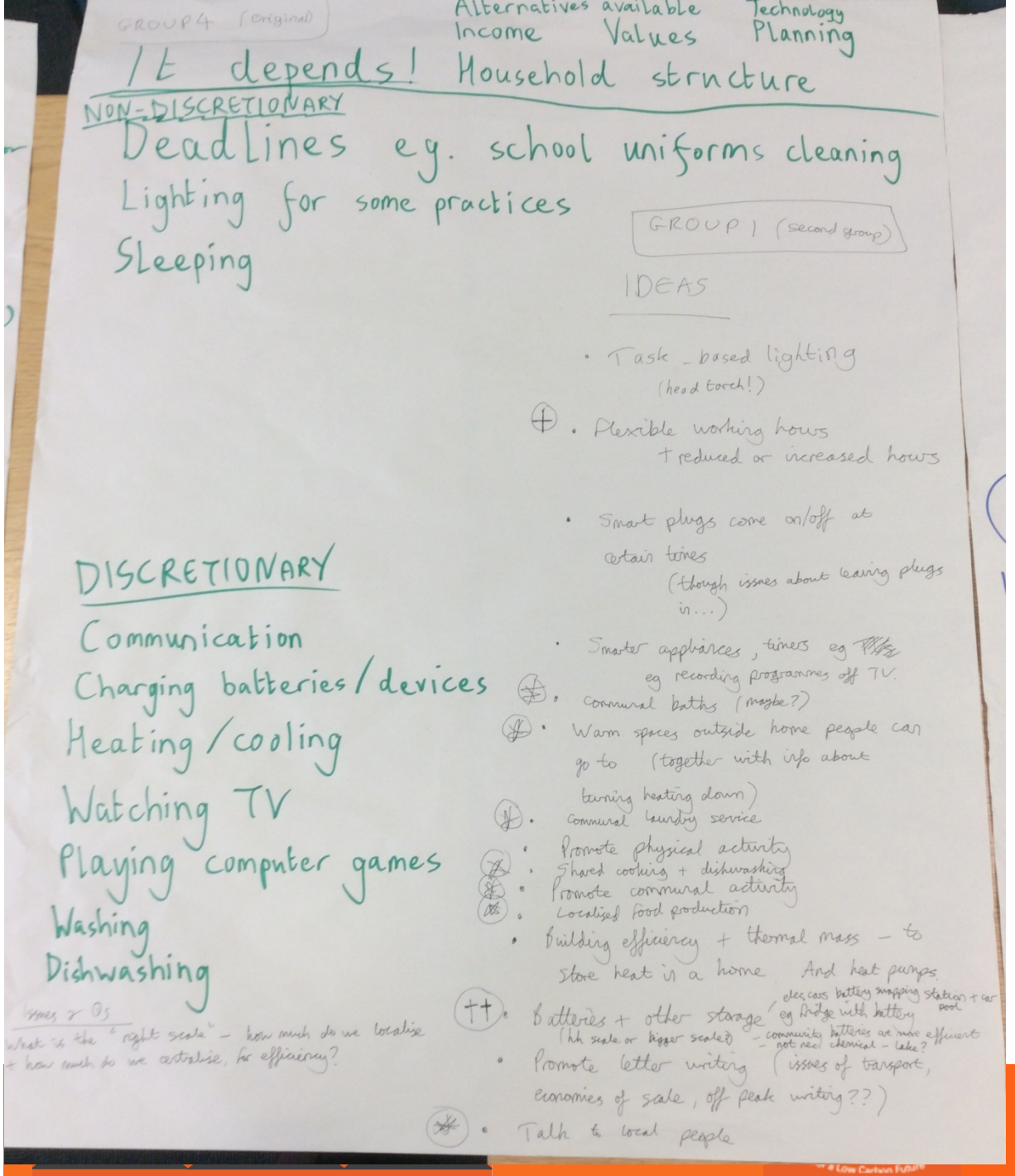
Group 4: how could you intervene in these existing shifts and disruptions?



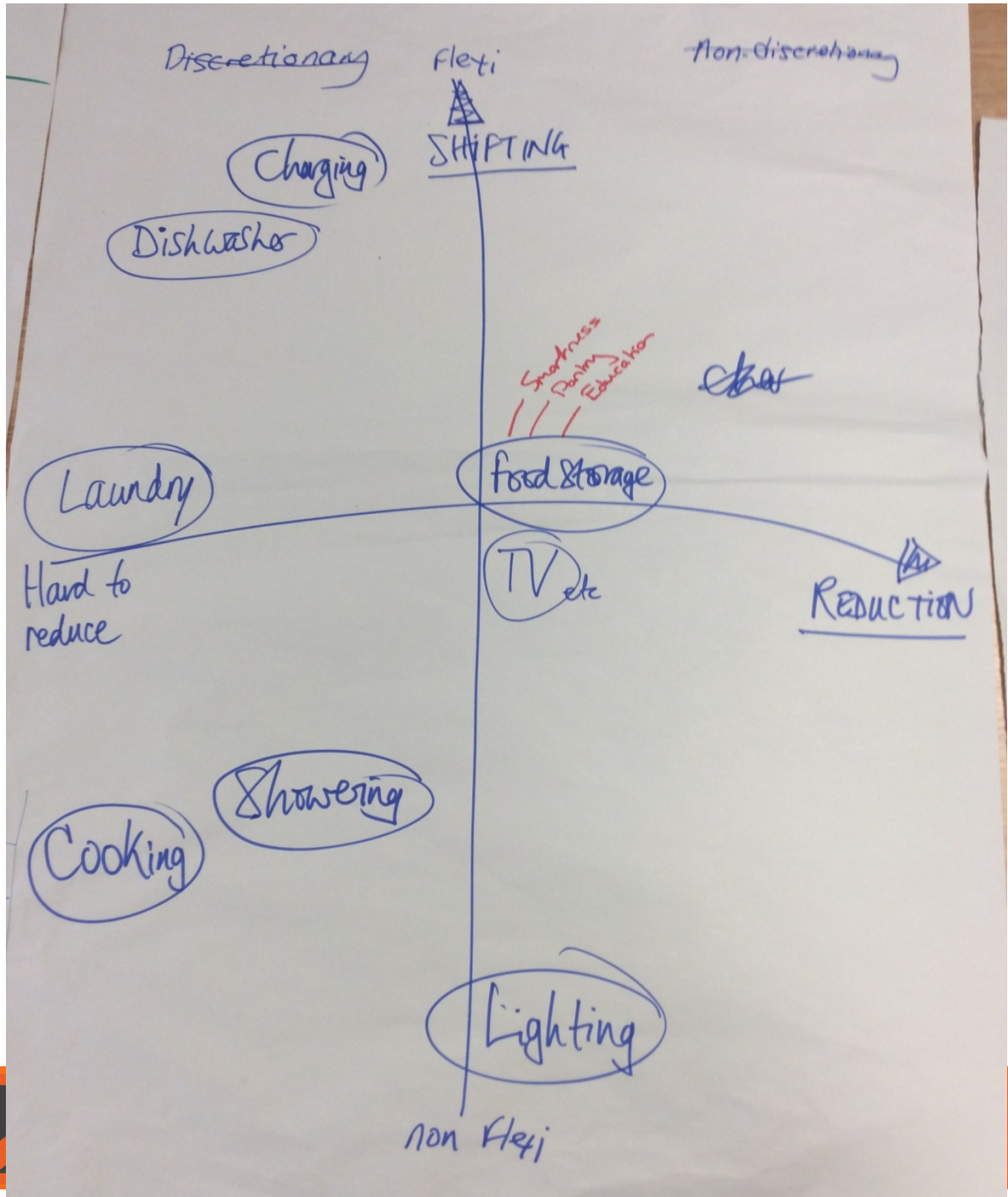
Group 2: what practices are discretionary/ non-discretionary?

AND

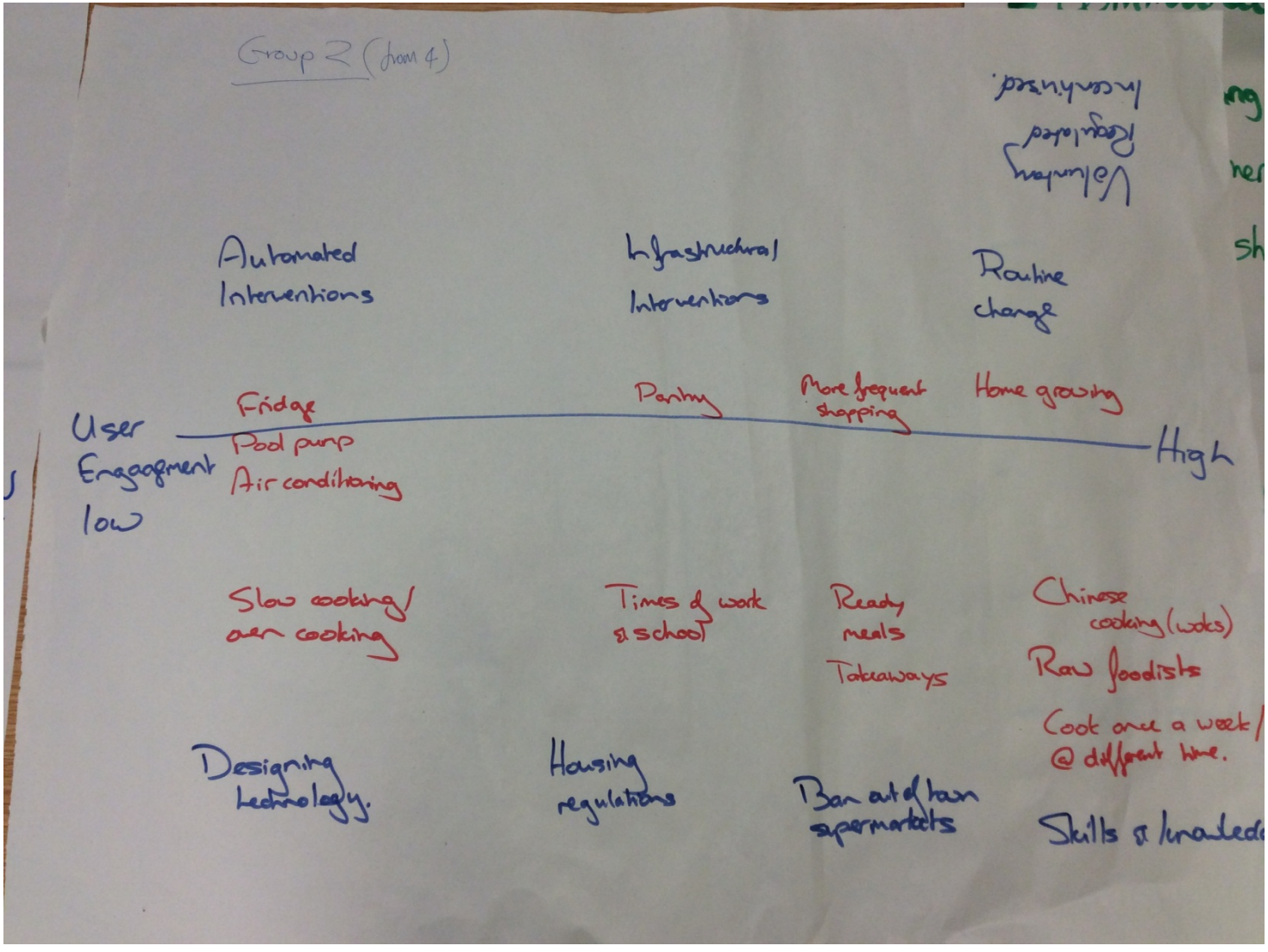
Group 3: how could you intervene in these practices?



Group 3: what practices are discretionary/ non-discretionary?



Group 2: how could you intervene in these practices?



Drinks and dinner activity

Each of you has been given a sticker. **Wear it proudly!**

Responses in BLACK, challenges in RED.

By collaborating with others, you must figure out:

- How responses might fit with challenges. And, why?
- What (combinations of) responses are appropriate, impractical, or possibly counterproductive?

We have plenty of time. (Drinks 5:45-6:45pm; Dinner 7-8pm)

Talk to as many other people as you can! Discuss and reflect.

Be ready to report what you found in a plenary tomorrow morning.

Intervention: Incentivised Community Reduction Scheme

Objective: Reduce our workshop's electricity and data demand by at least 20%

	Wednesday actual	Thursday maximum
Electricity	2235 watt-hours	1788 watt-hours
Wifi data	1632 megabytes	1306 megabytes

Incentive for success: Juice, and CAKE!

Otherwise: Tap water (and no cake)

9-9:15am Update from Day 1

TOU charging still in place

10:30-11:00am

Don’t forget about our 20% reduction target (and cake).

9:15-9:45: Challenges and responses

Get into your groups from the previous evening:

1. Shifting daily afternoon/ evening peak demand
2. Managing critical peaks in heatwaves/coldsnaps
3. Shifting daily morning peak demand
4. Reducing demand overall
5. Spreading demand over the week/year

People with responses can still swap groups!

Responses (matched to challenges)

- Reservation/quota system for iPlayer/Netflix/Hulu
- Afternoon cinema tickets are nearly free
- Stagger household member working hours & promote night shiftwork
- Promote/standardise single cup kettles
- Only broadcast East Enders at lunchtime
- Install/promote dog and cat doors in homes with pets
- Promote/provide cool & warm vests for infants
- £500 yearly surcharge for owning an air-conditioner or heater
- Promote brisk showers, pools and water games
- Enact a winter thermal underwear entitlement
- Standardise washing machines that start at 3am
- Work with Marks and Spencer to promote seasonally-appropriate clothing
- Install more walls and doors; outlaw open plan
- Promote snacking, BBQs and uncooked food
- Provide free Tupperware
- Re-open and build public libraries with heating/cooling
- Bring back Laundry Monday

9:15-9:45: Challenges and responses

You have **10 minutes** to discuss how effectively your responses address the challenge:

- Why did you think these challenges and responses go together?
- What did you think about these strategies? Are they realistic/ feasible?
- How else might you address these challenges?

Make sure you write down your ideas!

= 10 mins

You will have 4 minutes to discuss with larger group…

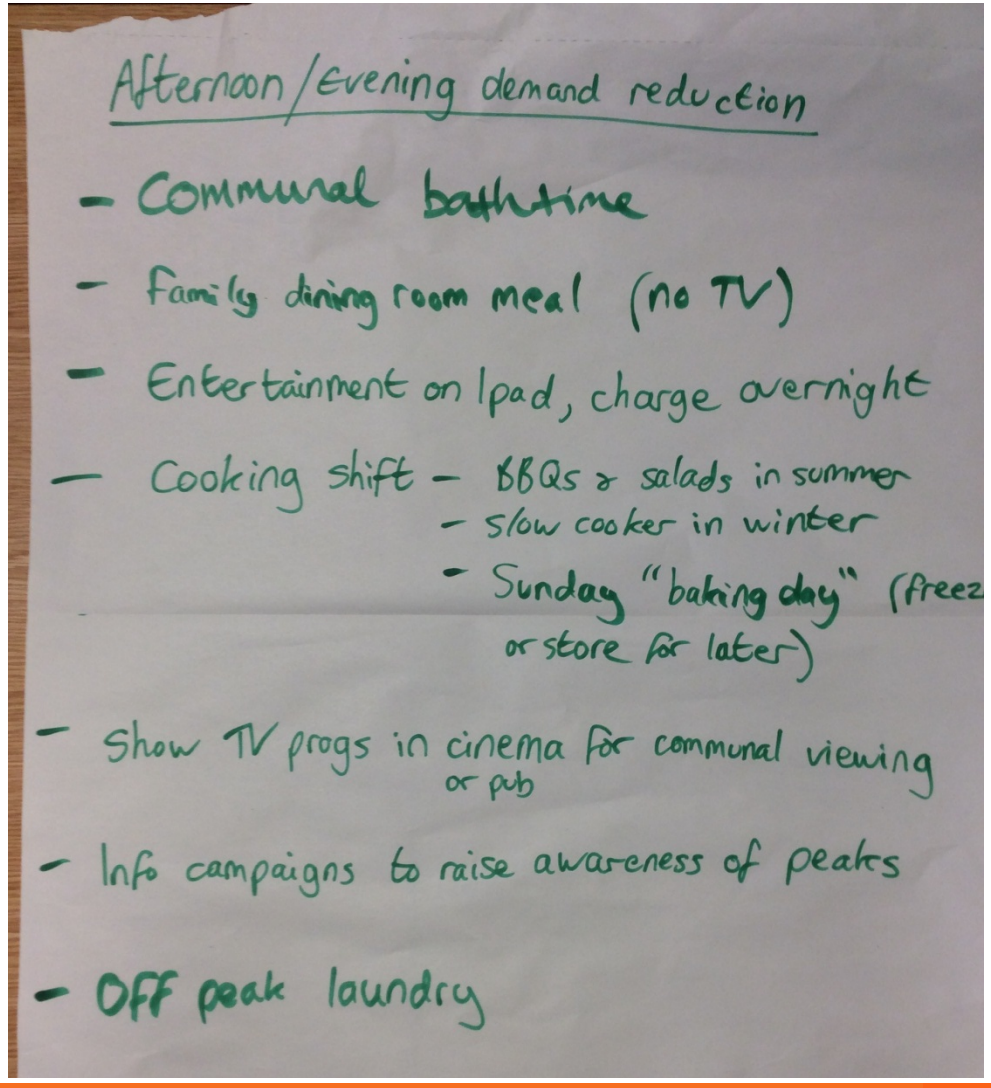
9:15-9:45: Challenges and responses

5 groups report back on the responses to their challenges:

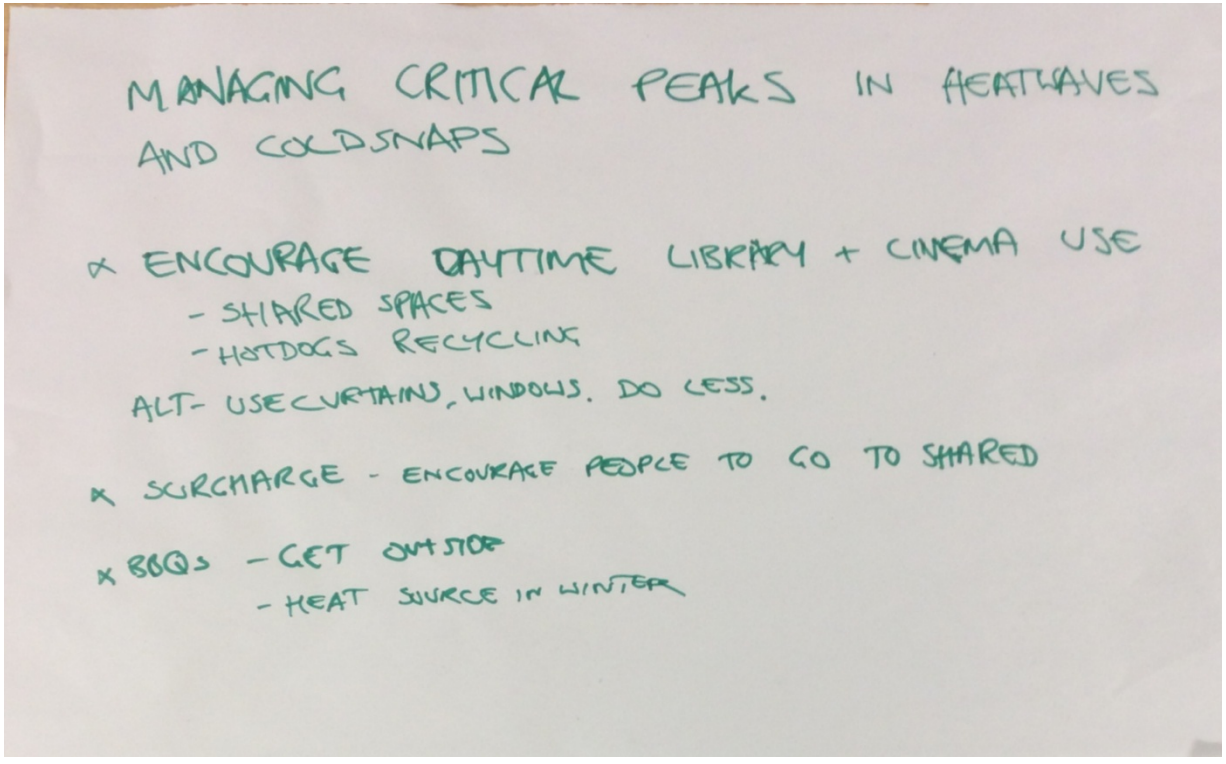
- Why did you think these challenges and responses go together?
- What did you think about these strategies? Are they realistic/ feasible?
- How else might you address these challenges?

= 4 mins per group including discussion

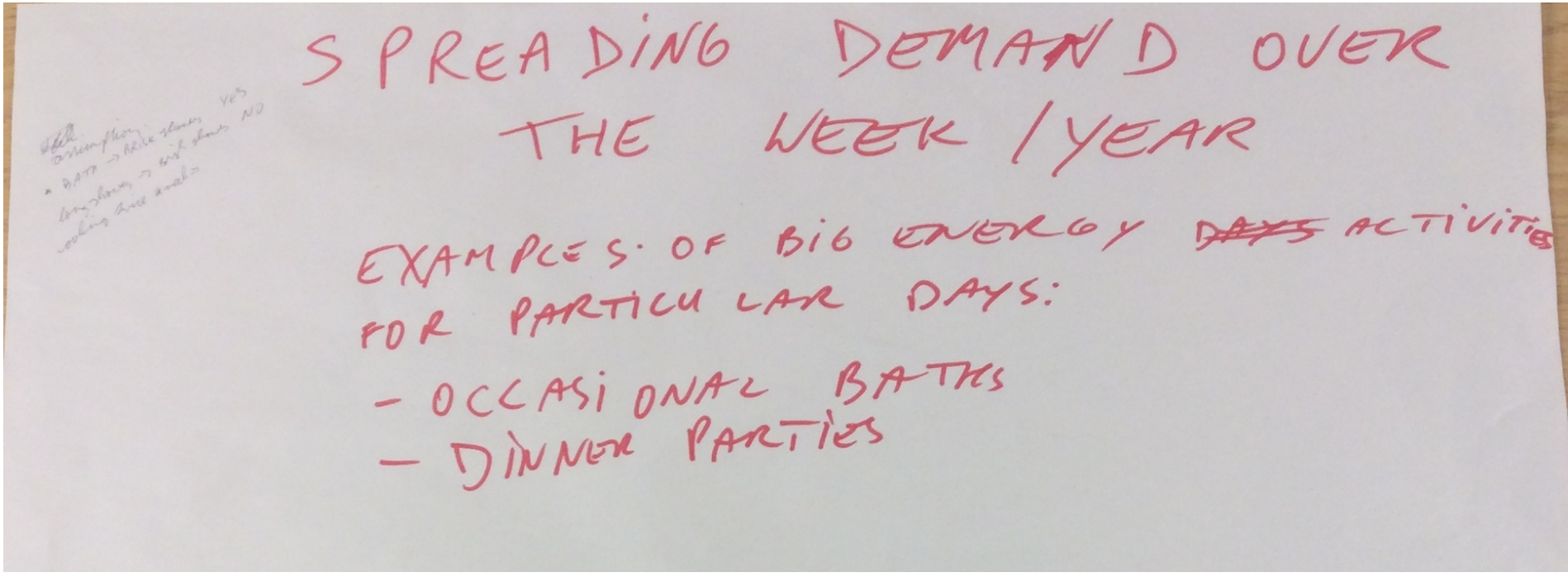
1. Shifting daily afternoon/ evening peak demand (other ideas)



2. Managing critical peaks in heatwaves/ coldsnaps (other ideas)



5. Spreading demand over the week/ year (other ideas)



9:45-10:10am: Top challenges for shifting routines/ changing demand

Split in 4 groups

Make sure you write down your ideas!

What do you think are the top 3 challenges for **shifting** household routines/ demand?

Discuss and prioritise challenges in terms of their significance for household demand management

You will have 5 minutes to report back & discuss with larger group…

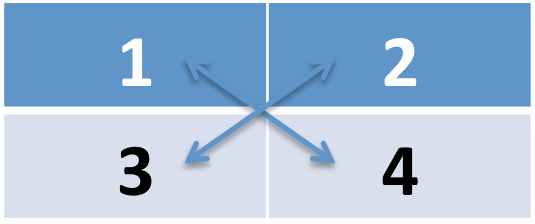
= 25 mins

10:10-10:30am: Top challenges for shifting routines/ changing demand

You have 5 minutes to report back on your top challenges for shifting routines/ changing demand and discuss with the wider group.

= 20 mins

SWAP!



Changing venues

What were our perceptions upon arriving?

The built environment?

How did we respond?

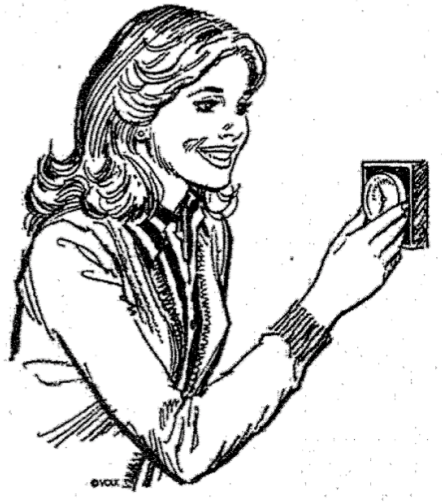
Wednesday after lunch	21.5°
Wednesday before drinks	23.5°
Thursday morning	24.1°
Thursday morning (foyer)	21.0°

How did this change experiences, meanings and doings of/for the workshop?

Intervention: Cool Uni

Meant to stimulate thinking on:

- Automated heating/cooling gone wrong
- Hotter summers in the UK, and a building stock which wasn't built for it
- The adaptive model for thermal comfort



Possibilities in Cool Uni

Open the door/windows

Alter clothing

Relocate

Cold drinks

Just get on with life; become absorbed by other “doings”

Shaped by materials and infrastructures:

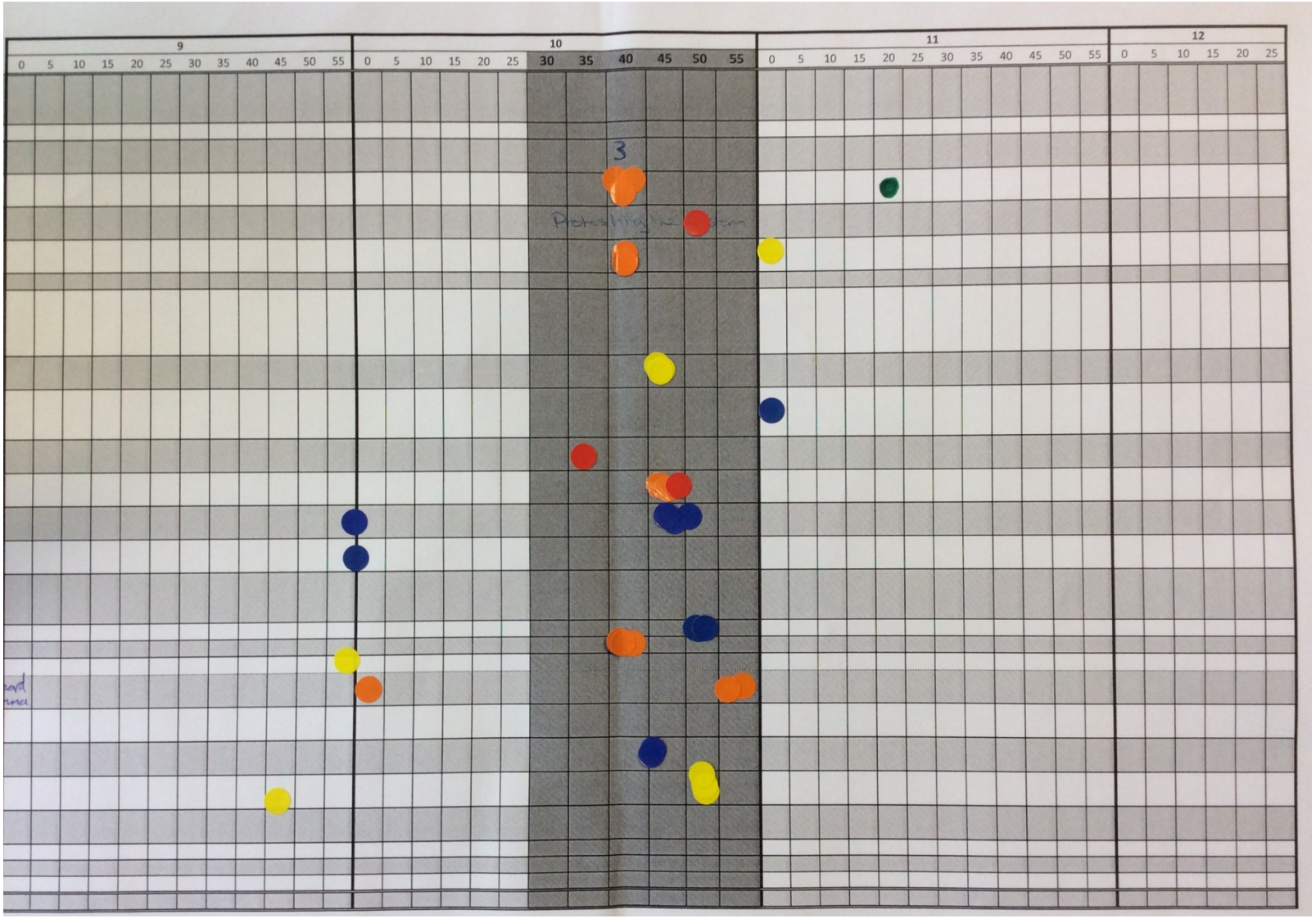
- windows (locked)
- air conditioning (controls obscured)
- clothing’s practical availability, and socially appropriate possibilities

10:30-11:00am: Morning tea

TOU charging in place!

3 dots for hot drink during the ‘official’ break time

TOU drink charging demand profile (Day 2)



11:00-11:25am: Responding to key challenges

Keeping the same groups and using your **new** list of prioritised challenges…

You may need to make notes!

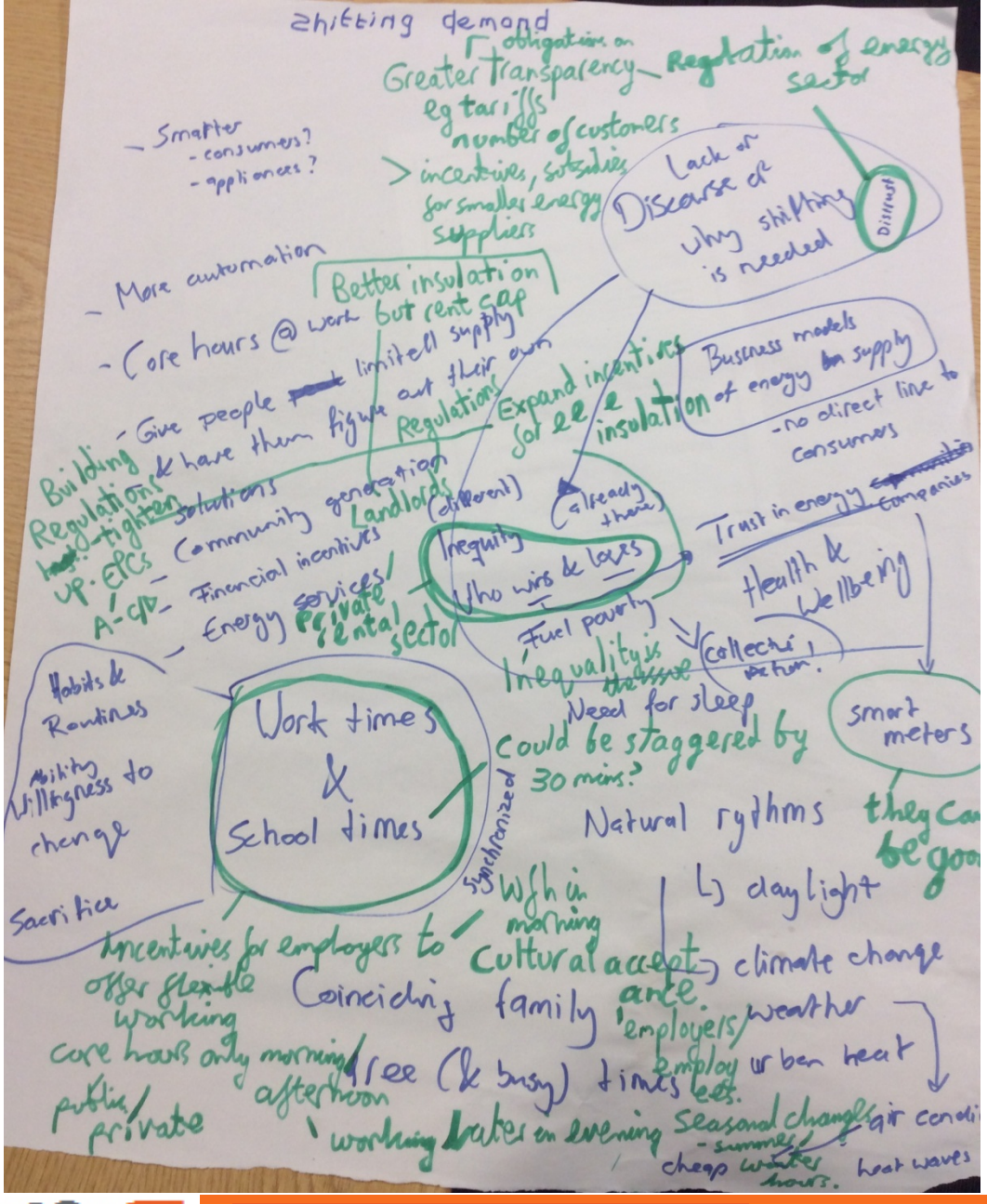
What strategies, approaches or responses do you think would help address them?

Do not be afraid to innovate!

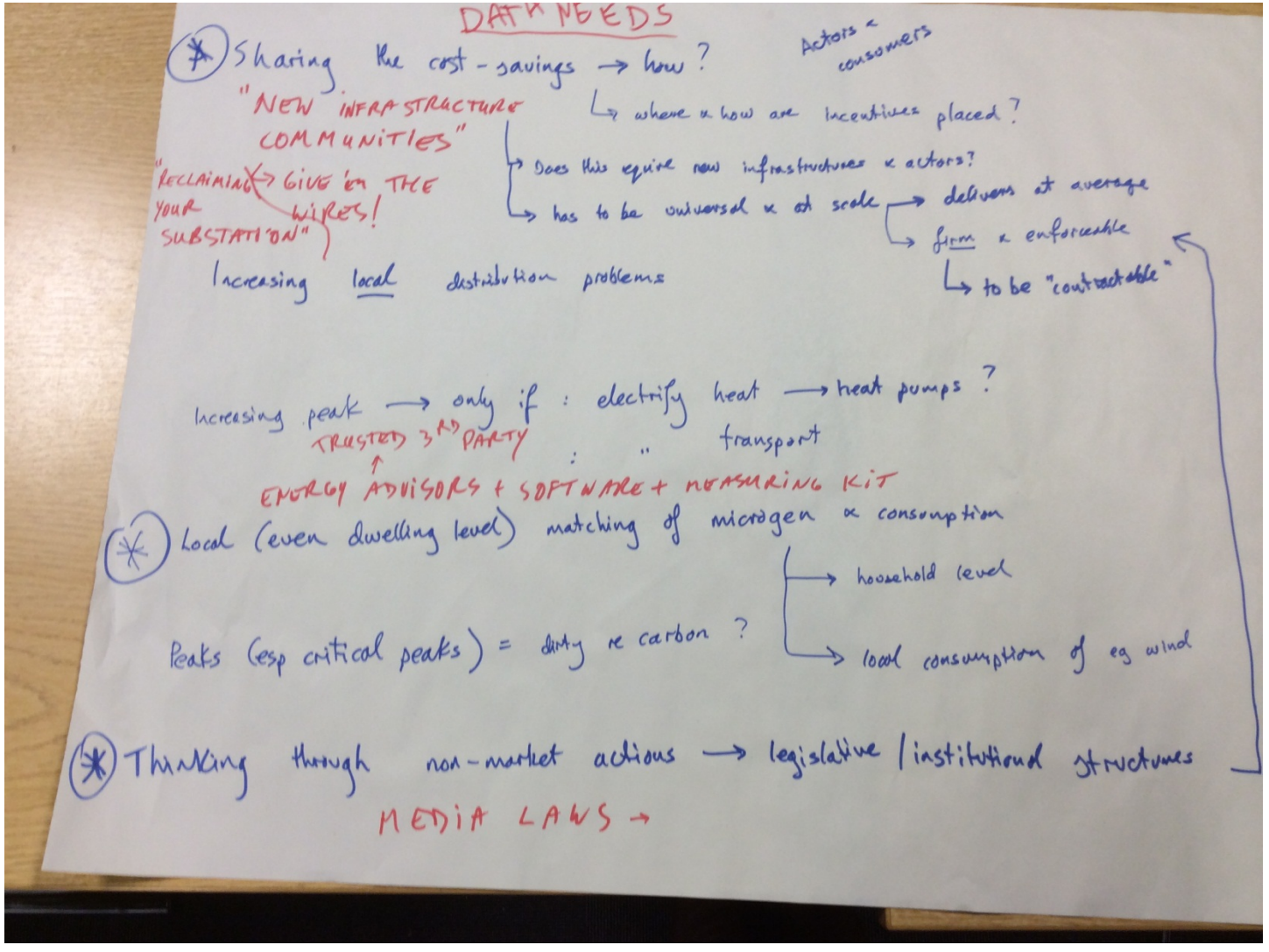
You will have 5 minutes to report back…

= 25 mins

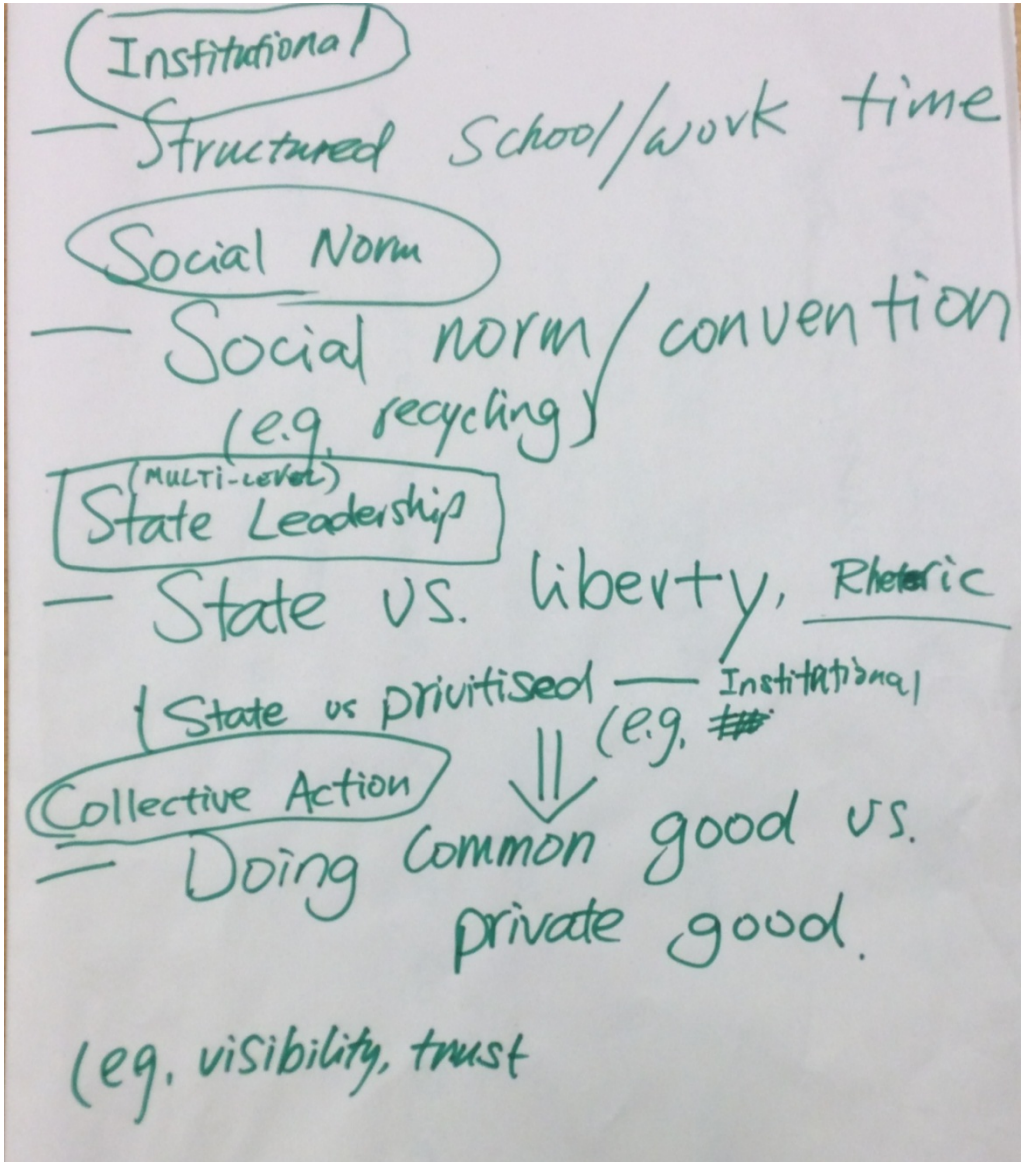
Key challenges and strategies



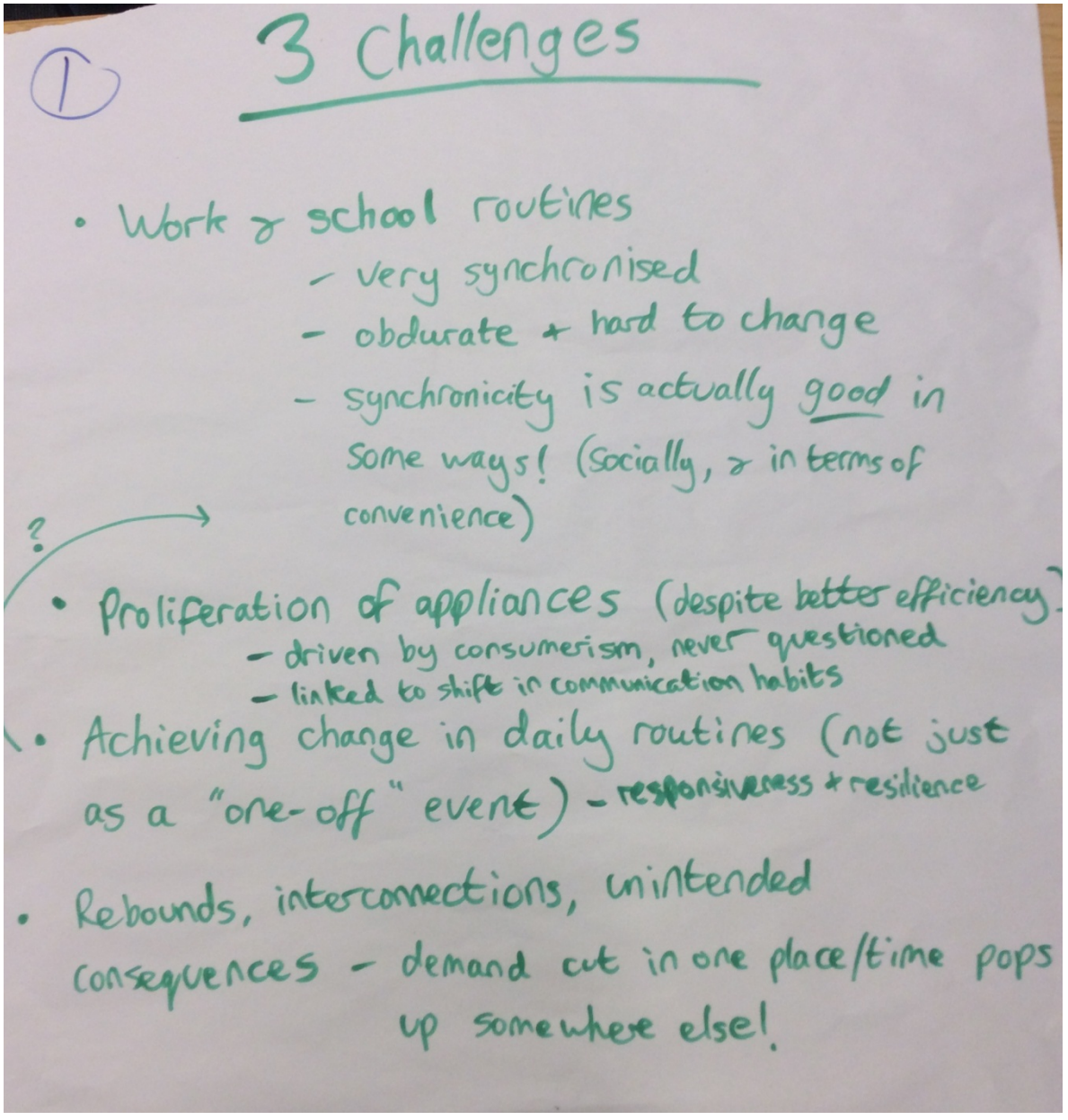
Key challenges and strategies



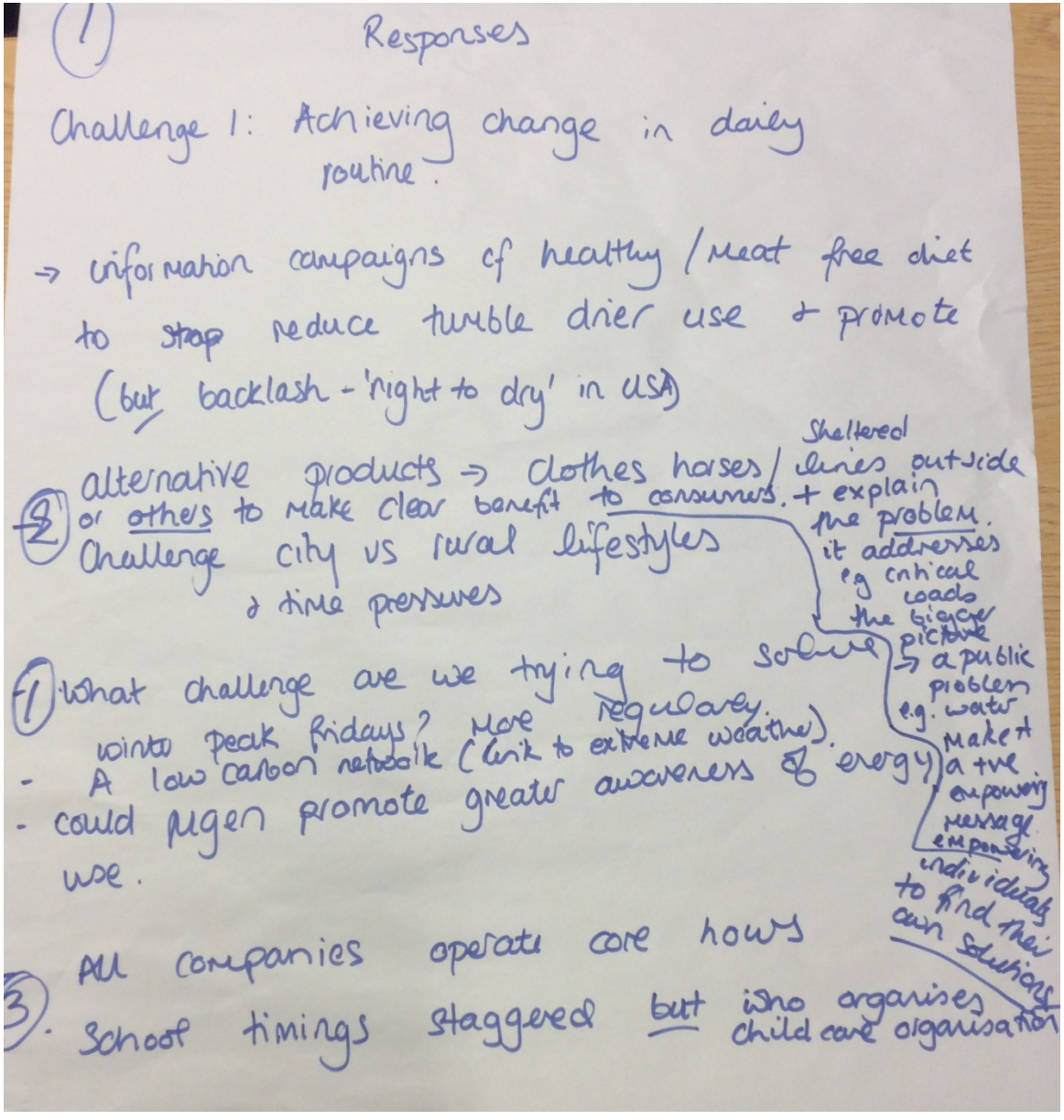
Key challenges



Key challenges



Key responses



11:25-11:45am: Responding to key challenges

Report back on suggested strategies, approaches, responses

= 5 mins per group

Intervention: SocketSaver

Each socket was only on for one out of every two hours.

At any given time, half the sockets provided no power.

Rolling blackouts

"[A] shutdown where electricity delivery is stopped for non-overlapping periods of time over different parts of the distribution region."

Reflecting on SocketSaver

It was unadvertised. How did we find out about it?

How did we respond or adapt?

Any increase or decrease in local demand? (i.e. in the workshop room)

How did demand shift outside the workshop, in time and space?

Interventions summary

Our intervention	Traditional demand management interventions
Drink time-of-use charging	TOU pricing
Incentivised community reduction scheme	Consumption/ social feedback (in-home displays, phone aps and website portals), targets and incentives.
Cool Uni	(Dysfunctional) automated heating and cooling of buildings and homes; direct load control of heating/cooling technologies.
SocketSaver	Rolling blackouts. Direct load control of home appliances

11:45-12:30pm: Reflection on the interventions

Open group discussion about the experiments:

- Reflections, thoughts, surprises?
- How relevant and realistic are these approaches for households?
- How do these approaches relate to others we have discussed during the workshop?

Some observations

Drink TOU open rebellion in the morning break

No one has plugged anything in today

Organiser guilt about some interventions (particularly Cool Uni)

Intervention: Incentivised Community Reduction Scheme

Objective: Reduce our workshop's electricity and data demand by at least 20%

	Wednesday actual	Thursday maximum	Thursday actual
Electricity	2235 watt-hours	1788 watt-hours	440 watt-hours
Wifi data	1632 megabytes	1306 megabytes	541 megabytes

Keeping in mind the following facts:

- The display is lower power. Screen yesterday: 330 W, projector today: 180 W
- Shorter duration of measurement: 4.2 hours yesterday, 2.75 hours today.

Success! Cake!

Shifting Routines, Changing Demand

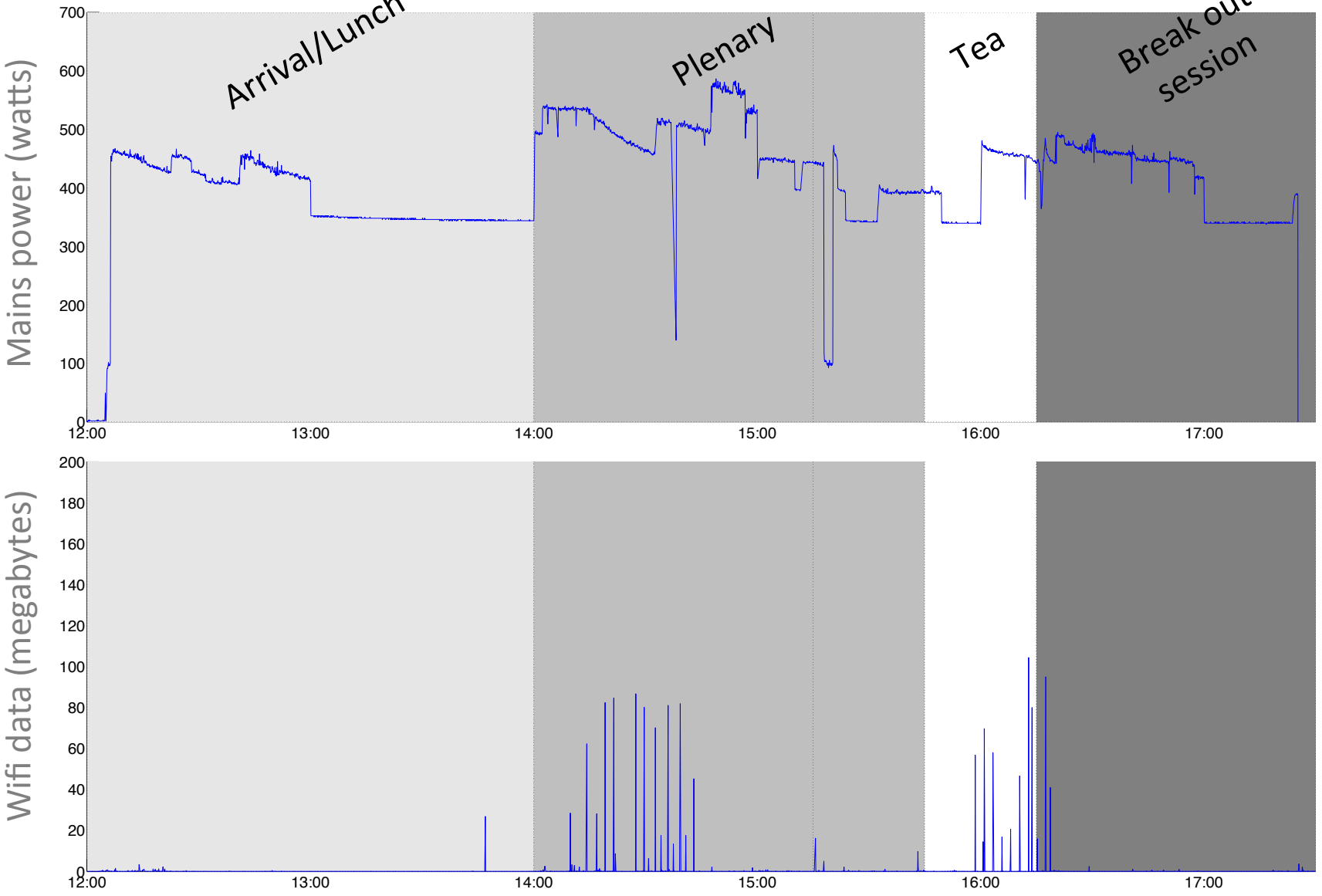
Electrical energy and data demand at the workshop

Some notes to help with interpretation of the graphs:

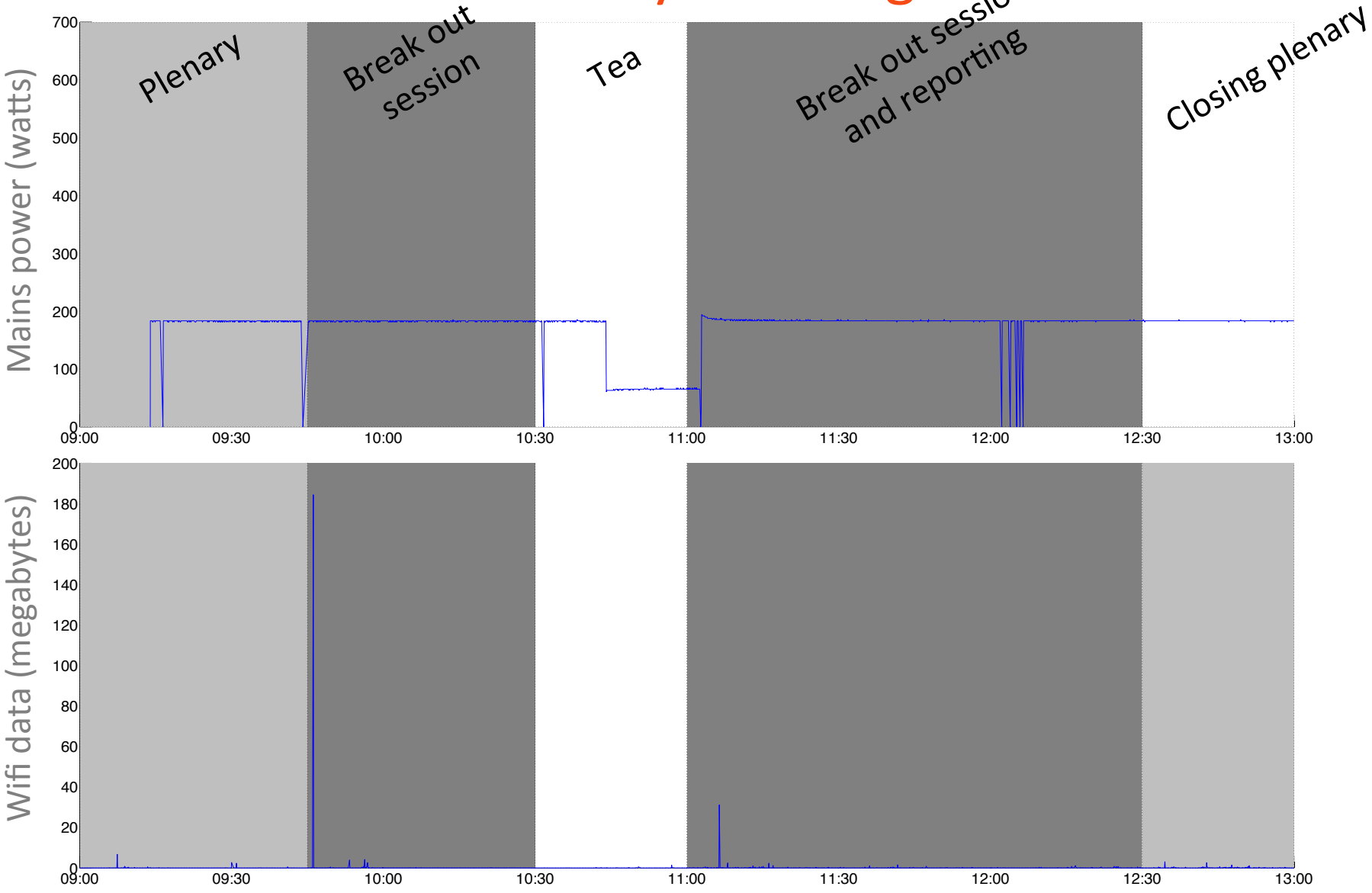
- Mains sockets were monitored with “Plugwise” sensors; wifi data was counted using “OpenFlow”
- Displays caused the baseload visible in the mains power: Wednesday’s screen (330 W) and Thursday’s projector (180 W)
- Laptop and phone chargers were plugged into sockets on Wednesday
- Steps up/down of the mains power, at the top of the hour, were caused by our “SocketSaver” intervention (rolling blackouts)
- On Thursday there was much less mains and wifi activity, mostly because of efforts at reduction to meet the target set in the “Incentivised Community Reduction Scheme”

Credit for graphs and analysis goes to Oliver Bates, the workshop’s Interventions Chair

Wednesday afternoon



Thursday morning



12:30-1pm: Wrap-up, next steps

What have we learnt?

What do we still need to know?

What should we do next?

Do we get cake?

Everyone = 1 minute