

Heating controls and energy meters

Lessons from experience

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with contributions from Ann, Fabre, Tom

What we will talk about

- What heating controls should I have?
- What will 'smart' heating controls do for me?
- Why should I keep track of my energy use?
- Should I get a smart meter?
- Should I switch to a time of use electricity tariff?

How do heating controls save energy?

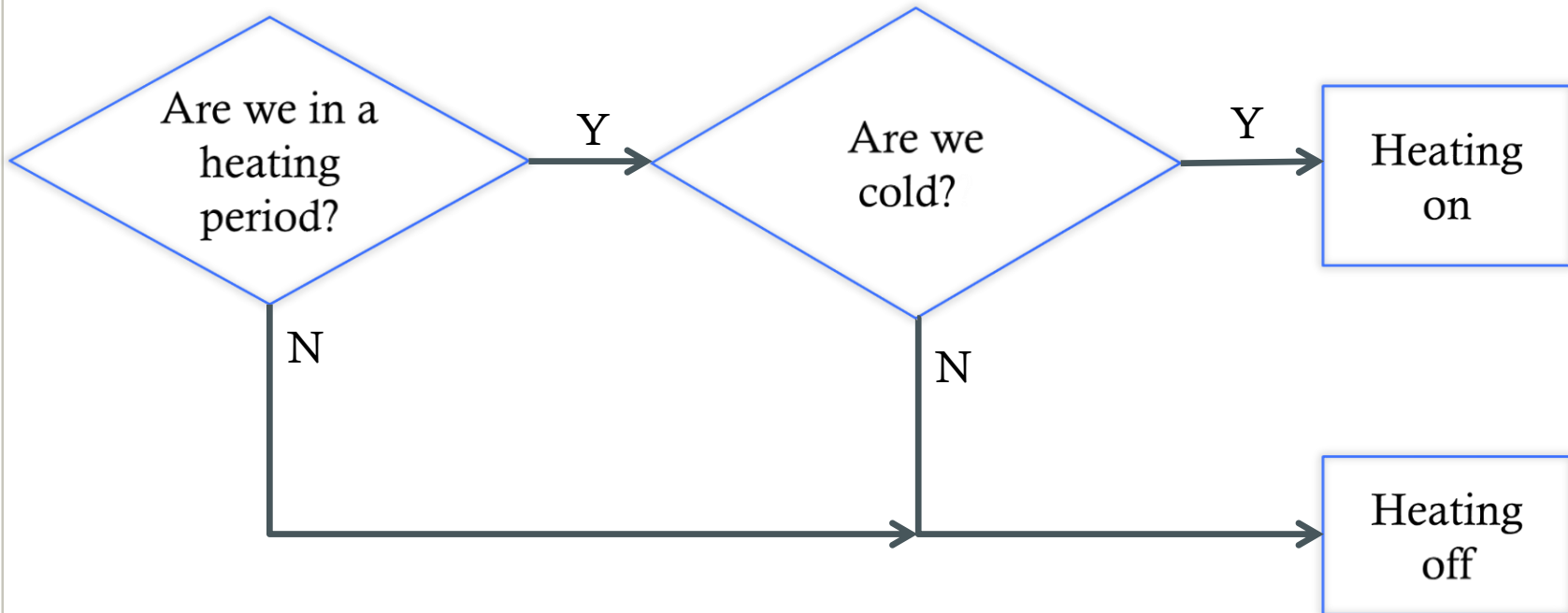
- Control heating
 - When
 - Where
 - How much
- Turn the boiler off when you don't need heat
 - Avoids wasteful cycling
- Keep the boiler running efficiently
 - Low temperatures help condensing boilers

Is your home
overheated?

Minimum heating controls in new homes (central heating)

- Programmer/timer
- Temperature controls (e.g. TRVs)
- At least 2 heating zones for large homes
 - With separate timers and temperature controls
 - And independent interlock
- Hot water cylinders
 - Cylinder thermostat and separate zone

Boiler on/off



- Independent timer and temperature control for each zone
- Conventional TRVs control water flow but not the interlock

Thermostat in the hall?

	Hall cold	Hall hot
Living room cold	On	Off – but I am cold
Living room hot	On –unnecessary heating	Off

Solutions

- Fiddle with the TRVs but leave the hall radiator on all the time, leave doors open to the hall (and hope)
- Use the thermostat to turn the boiler on and off
- Multiple zones – thermostat and timer for each
- Zone per room with smart TRVS

Other smart heating features

- Multiple heating periods, weekday/weekend
- Short time boost
- Optimum start (weather forecasts)
- Weather compensation (heating curve)
- Holiday mode
- Interlock with door/window
- Geolocation – Are you at home? Which room?

Are they worth having?

- Discussion with Ann and Fabre

“Smart” Thermostats

The players

tado°

NETATMO

ONNL® 

 geo

smarter energy



nest



heatmiser® 

HIVE

climote™



GENIUS
home

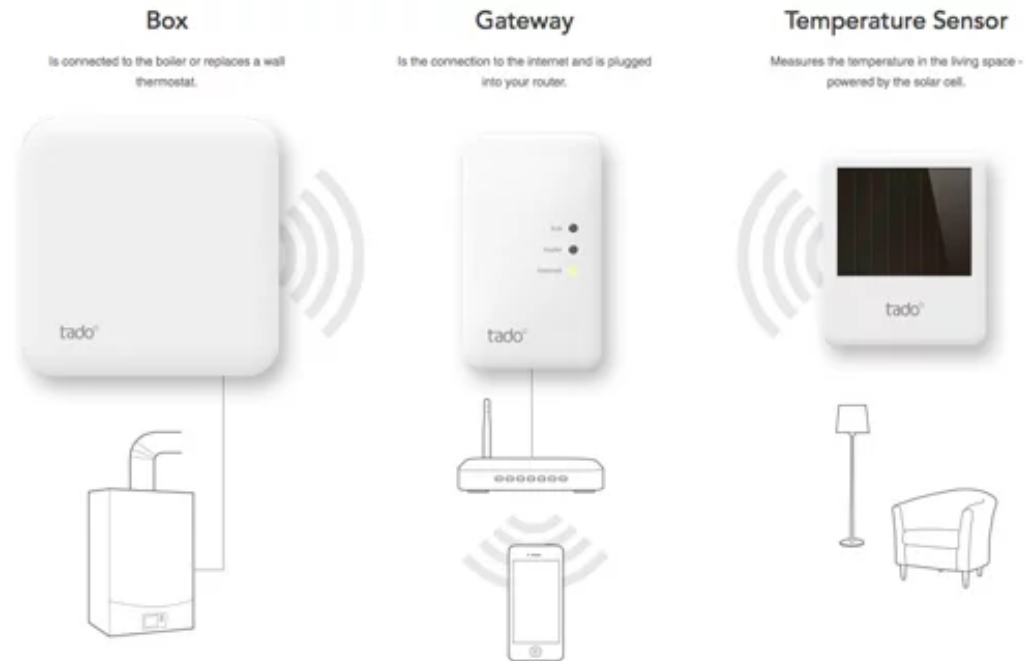
SALUS®
CONTROLS

Honeywell

Common Functionality

System Components

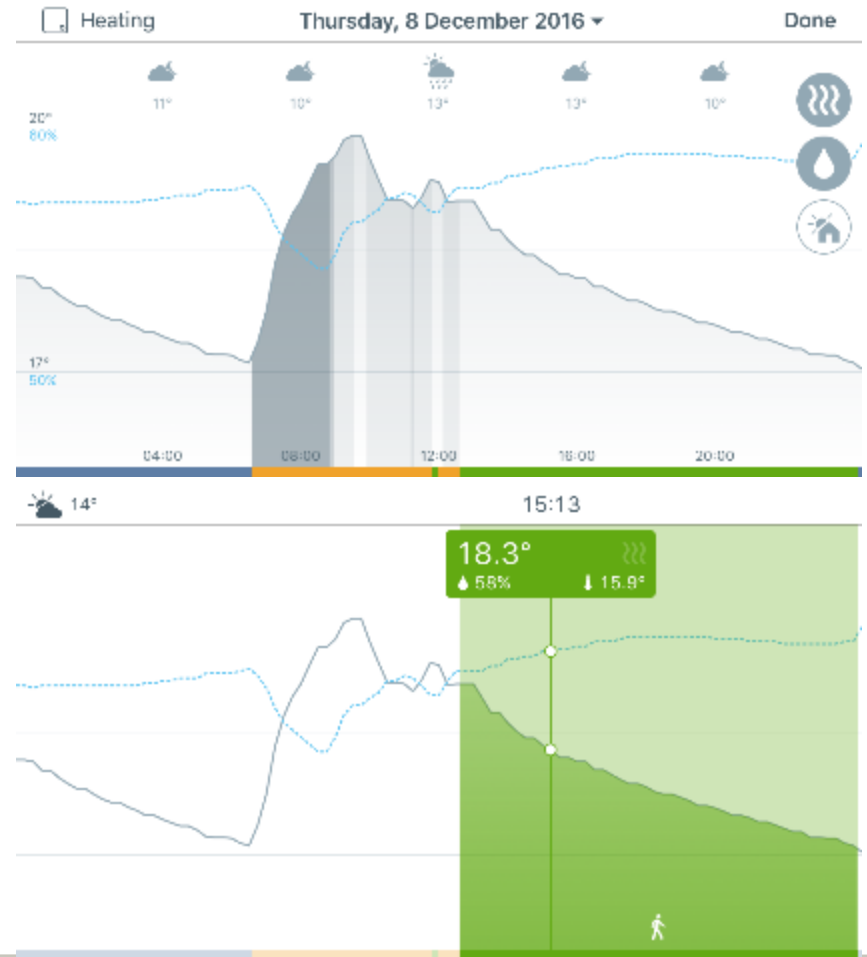
- Relay
 - Wired to boiler or heating system
- Gateway / Hub
 - Connected to Internet router
- Temperature sensor
 - Embedded or standalone
- Touchscreen or physical controls
 - Status and temperature
 - Instant boost



Common Functionality

Web & Phone apps

- Remote controlling
- Instant temperature boost
- Scheduling
- Monitoring and reporting
- General Settings



Common Functionality

“Secondary” Zoning

- “Primary” zoning = multiple distinct heating systems
- “Secondary” zoning = bringing (some) of the advantages of zoning where the central heating system does not offer it, without major retrofit work
 - Smart TRVs

tado°



Honeywell



Feature Comparison

Product	HW	Zoning with TRVs	Motion Sensing	Geo-location	Weather monitoring	Learning	IoT
tado	✓	✓	(✓)	✓	✓	✓	✓
Nest	✓		✓	✓	✓	✓	✓
Hive	✓			(✓)			✓
Honeywell evoHome	✓	✓	(✓)				✓
Heatmiser Neo	✓			✓			✓
Netatmo		✓					✓
(Heat) Genius	✓	✓	✓			✓	✓
Climote	✓						

Smart Thermostat – Why and is it worth it?

- Save Money
 - Save Energy
 - Monitoring
 - Remote control
 - Smarts
 - Geo-location or Presence sensing
 - Learning
 - Schedule
 - Building
 - Secondary Zoning
 - Weather monitoring
 - Open window detection
- Convenience:
Set and Forget

Smart Thermostat – Ask yourself...

- What heating system(s) do you have? *Before: combi-boiler, Now: too many*
- What controls do you currently have? *Before: wireless thermostat, Now: multiple*
- How do you use them? How conscientiously? *Me: fairly, but I often forget, Her: not*
- How much routine do you have in a normal week? *Before: none, Now: more*
- How much are you currently using for the size of your house? *Before: avg, Now: ?*
- What is your primary goal? *Saving Energy*
- Do you have a smartphone? *Yes*
- What is your tolerance level for gadgets? *Me: high, Her: low*
- How important is the “cool” factor? *Me: high, Her: not*
- Is it the same for everyone in the house?

Why should I keep track?

- Will I get a surprise with my next energy bill?
- How much has my new XXX reduced my consumption? (need to monitor before as well as after)
- Am I using electricity unnecessarily?
- Could I save money if I switched to a time of use tariff?
- Can I save money
- If I got solar panels, how much free electricity will I use?
 - a. without battery storage
 - b. with storage

How frequently?

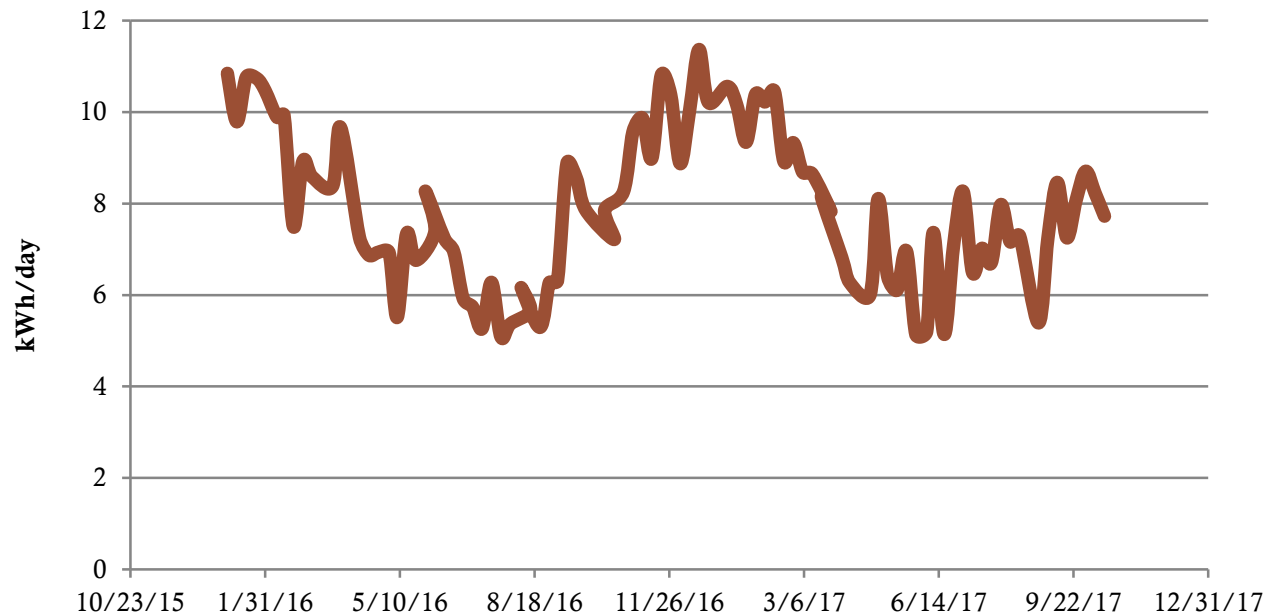
- Quarterly is hopeless (and most bills are estimates anyway)
- Monthly – enough to keep track and avoid some surprises
- Weekly – better
- Hourly – for time of use tariff/solar calculations. Can monitor overnight base load.
- 10 minutes – maybe some disaggregation possible



Manual monitoring electricity

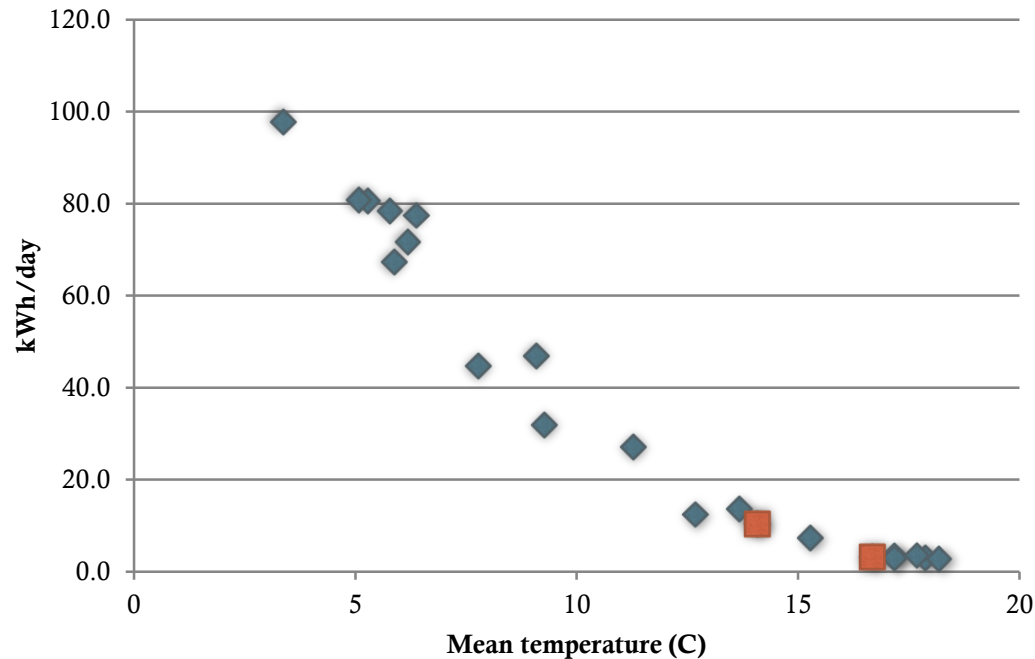
Weather dependent
because of solar
panels.

To measure usage
need to know
generation and
export.



Electricity monitored more or less weekly -
Spreadsheet available

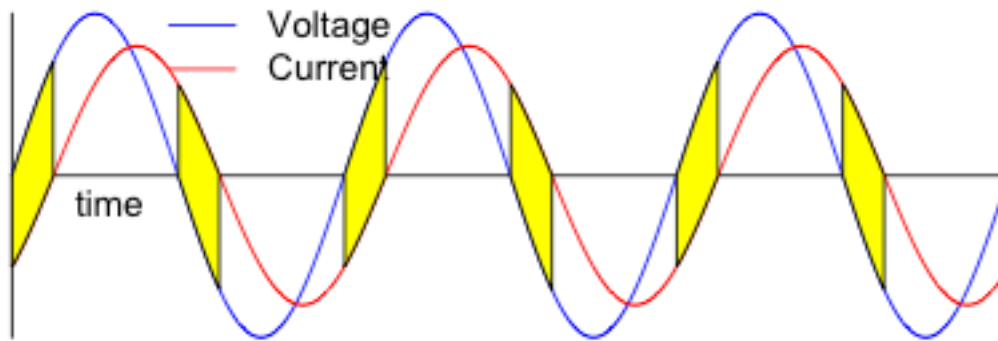
Manual monitoring gas



Interpolate weekly readings to months so can use monthly mean temperatures from MET office East Anglia.

Clip on vs pulse

Clip on monitor (current clamp) measures current only and assumes voltage is in phase. This tends to over-estimate energy use.



In the yellow phases, voltage and current are opposite sign, you are giving power back to the grid.

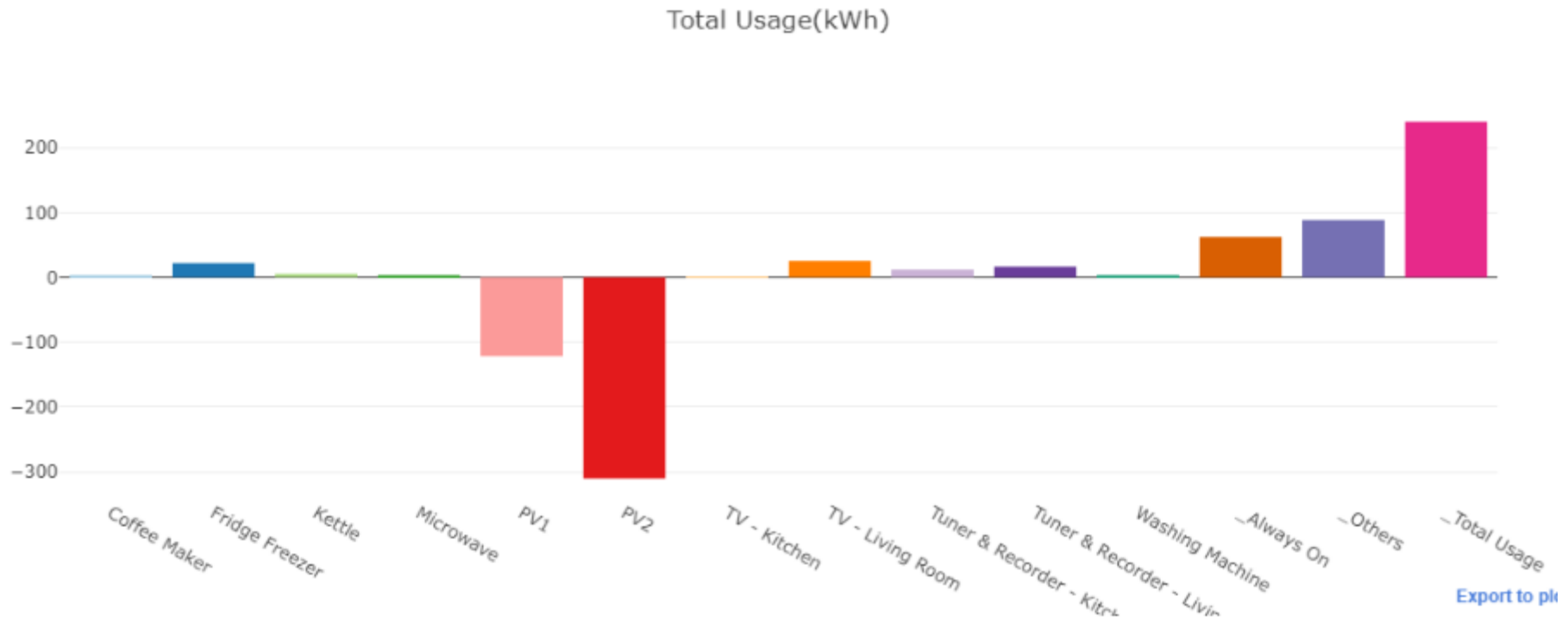
Pulse counting meter

- Modern meters have an led light that flashes.
- Each flash represents one 1Wh.
- The faster it flashes, the more power you are using.
- This is as accurate as your meter.



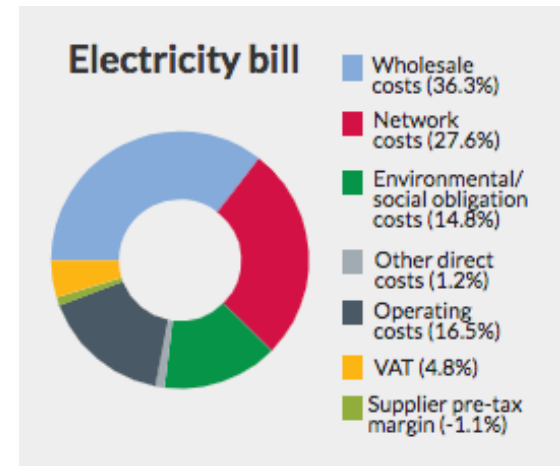
Picture from
<http://openenergymonitor.blogspot.co.uk/2015/06/optical-utility-meter-led-pulse-sensor.html>

Informetis Trial August



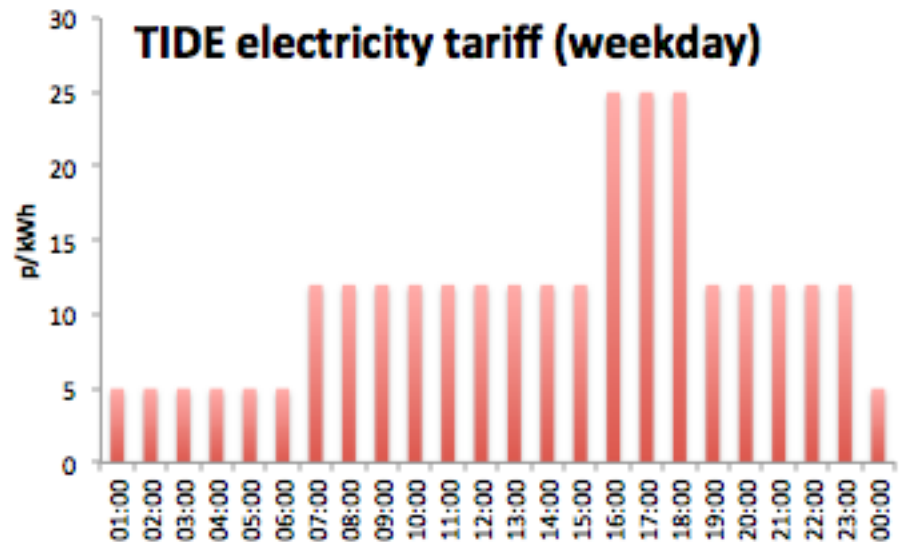
Peak demand

- Electricity demand is increasing
 - Electric cars
 - Electric heat pumps
- Peak demand drives infrastructure costs
 - Generation capacity needed
 - Renewables/storage costs relate to capacity
 - Transmission/distribution capacity needed
- Need to keep peak demand as low as possible – saves money for everyone!



Time of use tariffs

- High peak time tariff encourages load shifting e.g. TIDE (Green Energy)
 - High 4-7pm
 - Low 11pm-7pm
 - Medium the rest of the time
- Shiftable loads
 - Electric car charging
 - Heat pumps (with thermal storage)
 - Washing
- Voluntary



Over to Tom

Smart meters

- Advantages
 - Monitoring your gas and electricity consumption
 - Accurate real time in house display
 - half hour stored centrally, 10 seconds for electricity updates on IHD
 - OVO offers you historical graphs through your account interface on the web.
 - Enables TOU tariffs
- Need to wait for SMETS2 for excellent security and interoperability
- Issues causing inaccurate readings are very unlikely to affect you

Questions answered?

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Thank you

- More advice at www.transitioncambridge.org/faqs
- Spreadsheets for monitoring available – just ask
- Thanks to Fabre, Ann and Tom
- Questions?

Other Cosy Cambridge Events

Insulation

Wed 25th Oct

Alternative Energy

Tue 31st Oct

The Human Library

Thu 2nd Nov

All 7:30-9:30pm

St Barnabas Church



Thermal Imaging training

Tue 7th Nov

Thu 7th Dec

Mon 15th Jan

All 7:30-9:30pm

St Barnabas Church



Free,
booking essential:
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