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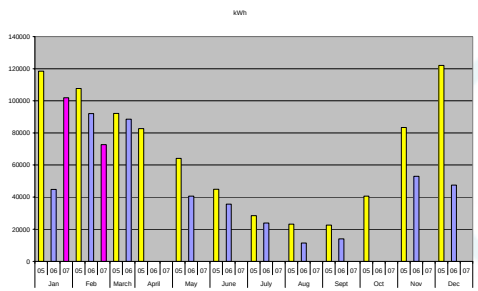
Carbon Academy Ambassador Training

Ade Williams & Al Brunker
Global Action Plan

Jamie Agombar
Ethical & Environmental Manager
NUS Services



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Announcements

- Welcome
- Fire alarm procedure; toilets
- Informal so please chip in & ask questions
- This presentation will be available online next week

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Global Action Plan

The practical environmental charity

“the best organisation to engage people in environmental change”
Jonathon Porritt, Chair of the Sustainable Development Commission

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Aims for today

- **Demonstrate** the big £££ savings
- **Equip** you with background knowledge on energy efficiency
- **Outline** the key opportunities as identified by pilots
- **Develop** practical auditing skills

- *Not* covering climate change – see an *Inconvenient truth*
- *Not* covering new builds / advanced technology – a focus on quick and easy wins

Context

- Global warming
- Energy costs going up
- Increasing financial challenges for SUs
- *Never* a better time to save energy!

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NUS Services

- The commercial arm of the NUS
- A successful purchasing consortium
- Consultancy and programmes; Ent's and NUS Extra.
- 25% owned by NUS; 75% owned by 236 shareholder students' unions
- A not-for-profit democratic company led by student volunteers

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Ethical & Environmental Committee

- One of three committees
- Established 1995
- 4 students, 3 staff: elected at NUS Services Convention
- Ethical & Environmental Coordinator since 1996

Remit

- 45% time suppliers
- 45% time greening unions
- 10% time ensuring we practice what we preach

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Greening Unions

- Environmental audits
- Sound Impact Awards
- Carbon Academy

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The environmental impact of students' unions

Our membership

- 236 Unions; 233 shops and 473 bars + offices
- 80% do not pay for utilities (44 we know of do)

Our footprint

33 environmental audits in 30 months:

- Lots common good practice
- Lots common bad practice (ventilation; lights for cleaners; ice machines)
- Exemplary bad practice (thermostat in roof; windows painted black)

- Lots of inefficient technology
  - Tungsten filament lighting
  - Electric heating and poor insulation
  - Washrooms (water has CO_2 burden too!)

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Energy data

1. Through audits we found £364k savings through no or low cost actions = approx 12% of utilities.
2. Energy / water data from 22 separately metered unions. Average 624 t/CO_2/year. 12% = 75 t/CO2/year.

   236 members x 624 t/CO2/year = **147,000 t/CO2/year**
   236 x 75 = **17,700 t/CO2/year** being wasted!!

- 147,000 t/CO2/year = planting 750,000 trees…
  …726 football pitches. 12% = 90,000 trees

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The Carbon Academy

national union of students

eauc
The Environmental Association for Universities and Colleges

people & planet
student action on world poverty and the environment

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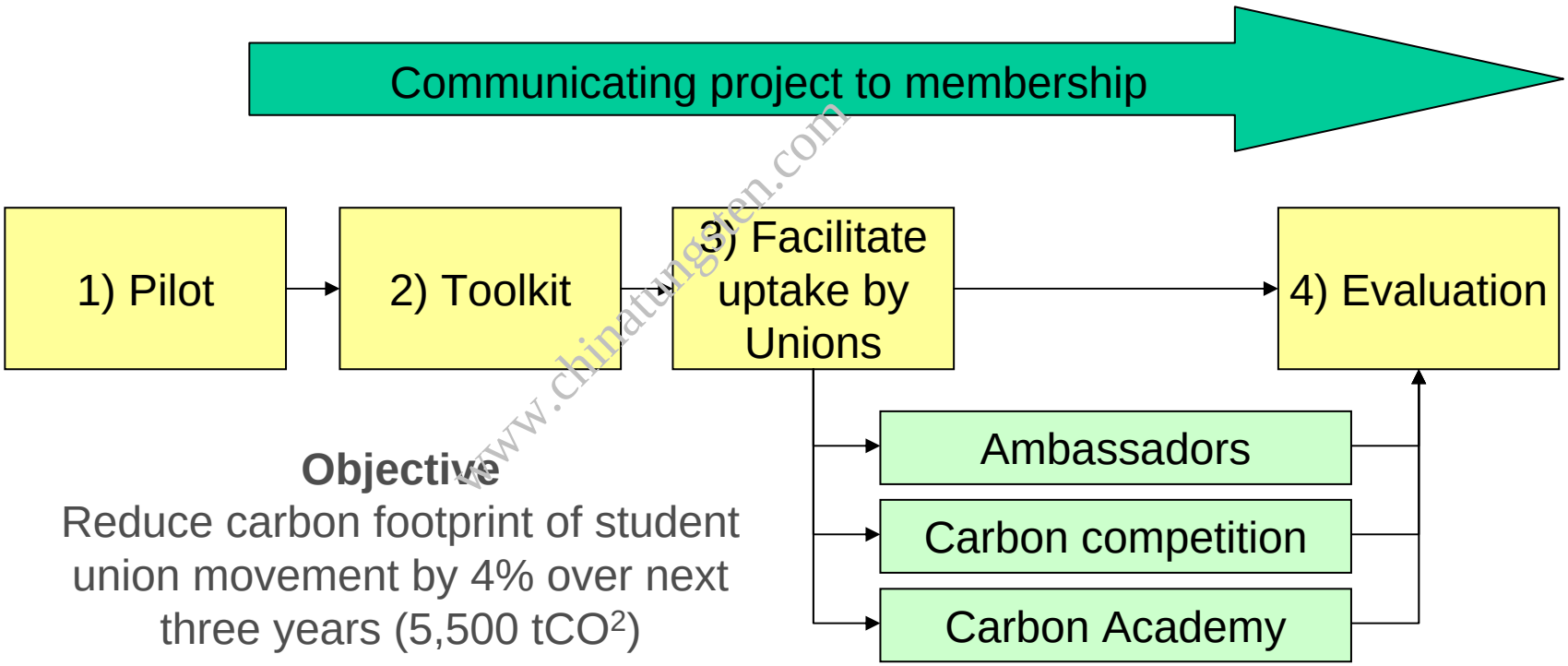
The Carbon Academy



Objective

Reduce carbon footprint of student union movement by 4% over next three years (5,500 tCO^2)

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Key target

- 30 metered unions to take energy saving actions and demonstrate savings
- 50 unmetered unions to take action

Roving champions

Carbon competition

Carbon Academy

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An overview of energy management

Key principles

- **Electricity** is a flow of charged particles.
- **Voltage** is the pressure at which the charged particles are pushed/pulled at, measured in Volts, V. Mains voltage is around 240V. Low voltage is 12V.
- **Current** is the volume of charge particles flowing, measured in Amps, A.
- **Power** is the rate at which an appliance transforms electricity into other forms of energy, measured in Watts (W). NB: W = V x A. 1,000W = 1kW. A 1kW appliance running for one hour uses 1kWh of energy.

All about Wattages

- Many appliances say Wattage

- Some even give kWh estimates per year

- Some don’t say either Wattage or kWh
- If not they usually have a label that shows useful data, typically voltage and amps.
- You can use this to calculate Wattage yourself using W = V x A…

Example: This label is on the bottom of our laptop.
How many Watts could it be using?

W = V x A. 19.5V x 4.62A = 90W

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Energy tracker demonstration

- Actually uses about 38 Watts most of the time
- 80 Watts when charging
- Increases further if fan comes on / if running a DVD
- Therefore maximum possible is 90 Watts
- Energy trackers useful as can monitor actual consumption over time

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Exercise – Wattages of appliances

Mix and match each item with a suitable wattage

1 x standard TFL bulb	10,000 W
1 x energy efficient bulb	3,500 W
Air conditioning cassette	2,500 W
Bottle fridge	2,000 W
Dairy deck fridge	900 W
Electric heater	750 W
Mobile phone charger on standby	100 W
Night club ventilation system	11 W
Water cooler	>1 W

Night club ventilation system	10,000 W
Air conditioning cassette	3,500 W
Dairy deck fridge	2,500 W
Electric heater	2,000 W
Bottle fridge	900 W
Water cooler (NB: when cooling)	750 W
1 x standard bulb	100 W
1 x energy efficient bulb	11 W
Mobile phone charger on standby	>1 W

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What about carbon?

- If you know how many kWh you use (appliances, energy tracker, meter or bills) it is very easy to calculate a ‘carbon footprint’. Can calculate for appliances, buildings, people.
- Energy sources for UK electricity generation (DTI, Aug 2007)

Coal	35.8%	
Natural Gas	38.8%	= Fossil Fuels 76.7%
Other (oil)	2.1%	(produce CO_2)
Nuclear	18.6%	
Renewables	4.7%	

- The average volume of CO_2 released into the atmosphere per kWh of electricity is **0.523 kg** (DEFRA’s new figure).

602 kWh/year x 0.523 kg = 315 kgCO_2/year

So this little fridge is responsible for 0.3 tCO_2/year

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- Lots accurate conversion web pages
  http://actonco2.direct.gov.uk/index.html
- Include gas – gas bills often in kWh too
- Key point of reference: average footprint of a person in the UK is **10 tCO2/year**

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£££ cost of electricity

Union	Elec (kWh)	kg CO_2	Cost	£ per kWh
University of Warwick Students' Union	1,888,993	812,267	£84,490	£0.0447
University of Bristol Union	1,083,450	465,884	£98,500	£0.0909
Loughborough Students' Union	1,325,224	569,846	£98,000	£0.0739
University of London Union	1,367,976	588,230	£132,324	£0.0967
Sheffield Hallam University Union of Students	1,000,000	430,000	£100,000	£0.1000
University of Abertay Dundee Students Association	620,011	266,605	£62,651	£0.1010

- This is 2006 data
- Gone up 65% in last 4 years!!
- Heading one way
- A typical current campus cost is 10p / kWh including CCL and charges
- Consider:
  - Day and night rates
  - Available supply capacity (maximum demand)

602 kWh/year x £0.10 = £60.20 per year

So this little fridge will cost around £60 to run a year

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Focus on ventilation and a/c

Ventilation

- 40W/m^2 threshold for natural ventilation
- Concept of air changes per hour
- Air handling very costly!
  - Desk fan (40W)
  - Nightclub air handling, 20-30 kW (i.e. 500-750 desk fans!)
- Often goes unnoticed
- Usually on a timer; usually wrongly set up. Easy win!
- Not technical, but… principle of variable fan speeds (VSDs) - vary speed by temperature and air quality


www.chinatungsten.com

Air conditioning

- Typically doubles energy consumption if building fully air conditioned
- Never quench hot air with cold air!
- If air con is essential, set to 24ºC and shut windows

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Focus on lighting

- The three types of lighting technology
  - TFLs
  - Fluorescent
  - LED
- GU10 spotlight fittings
- Know your fluorescent tubes
- Placement and best practice

Technology 1) Tungsten filament lamps

- How they work
  Tungsten filament glows in gas. Sometimes a halogen gas
- Advantages
  - Inexpensive to buy
  - Variety of bulb formats (spotlights, floodlights, candle bulbs, colours, etc.)
  - Dimmable
- Disadvantages
  - 100 year old technology! Gives out more heat than light
  - Expensive to run (= very energy inefficient) - going to be banned?
  - Short life (2,000h)
- Uses
  - Flood lights
  - Beams
  - Nightclubs

Technology 2) Fluorescent lights

- How they work
  No filament. Gas gets hot and glows.
- Advantages
  - Cheap to run
  - Good life (10,000h)
  - Not hot but warm
- Disadvantages
  - Splayed light
  - Take time to warm up
  - Most not dimmable
- Uses
  - Offices the world over
  - CFLs now replacing TFLs as the choice in homes

Technology 3) LED lights

- How they work
  One or more LED in single fitting
- Advantages
  - Exceptionally cheap to run
  - Exceptionally long lamp life (30,000h)
- Disadvantages
  - Not very bright
  - Expensive to buy
- Uses
  - Corridors
  - Nightclubs

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GU10 spotlight fittings

- Available as TFL halogen, CFLs and LED
- Specimens at front
- 50w TFL – Shop displays only
- 11w CFL – Bars, washrooms
- 1.2W LED – Peripheral lighting
- Everywhere else use standard fluorescent lamps…

T5, T8 and T12 Fittings

- T12 is the old original tube. Nor comparatively inefficient. Usually found in non-mirrored units
- T8 is more energy efficient
- T5 the most efficient
- All tubes say their wattage on them
- The slimmer the better

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Placement and best practice

- Switches for lights should be in rows along windows
- Label light switches
- Motion sensors
- Light sensors
- Only light rooms if people are in them!

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Calculating energy consumption

Example – Halogen bulbs in a washroom

A union has 44 x 50W tungsten filament halogen bulbs in the male washroom of its nightclub. They are on for eight hours, four nights a week for 31 weeks a year. Assuming an average tariff of £0.09 per KWh, and applying a Climate Change Levy of 0.0043p per KWh, what is the value of the energy they consume in a year? And what is their carbon footprint?

8 hours x 4 days = 32 hours per week.
32 hours per week x 31 weeks = 992 hours per bulb per year.
50 W/hour x 992 hours = 49,600 Watt hours per bulb per year.
49,600/1000 = 49.6 kWh used per bulb per year.
49.6 KWh x £0.09 (cost per KWh) = £4.46 per bulb per year.
49.6 KWh x £0.0043 (CCL per KWh) = £0.21 per bulb per year.
£4.46 + £0.21 = £4.68 per bulb per year
£4.68 x 44 bulbs = £205.80

49.6 kWh x 44 bulbs = 2,182 kWh
2,182 x 0.523 kg = 1,141 kgCO2/year
1,141/1000 = 1.1 tCO2/year

Exercise 1 – Nightclub ventilation

A union nightclub has a 12.5 kW air handling unit that runs at full capacity when on. At present the system is never switched off. The venue is only used three nights a week, 33 weeks a year. The nightclub opens at 10pm and closes at 3am. Assuming an average tariff of £0.1143 per KWh (inclusive of all charges and the CCL), how much will the union save a year by switching it off?

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Exercise 2 – Passport photo machine

A students' union has two identical passport photo machines. Each uses 600W of energy as their minimum demand and is not switched off overnight or at weekends. The union is considering removing one to reduce its carbon footprint. How much energy, carbon and money will they save assuming an average tariff of £0.10 per KWh (inclusive of all charges and the CCL)?

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Answer to Exercise 1 – Nightclub air conditioning

Present maximum cost

24 hours x 7 days = 168 hours per week.
168 hours per week x 52 weeks = 8,736 hours per year.
12,500 W/hour x 8,736 hours = 109,200,000 Watt hours per year.
109,200,000 /1000 = 109,200 kWh used per year.
109,200 KWh x £0.1143 (cost per KWh) = £12,481 per year.

Switching off regime

5 hours x 3 days = 15 hours per week.
15 hours per week x 33 weeks = 495 hours per year.
12,500 W/hour x 495 hours = 6,187,500 Watt hours per year.
6,187,500 /1000 = 6187.5 kWh used per year.
6,187.5 KWh x £0.1143 (cost per KWh) = £707.23 per year

***Maximum* potential saving**

£12,481 - £707.23 = £11,773.77

Answer to Exercise 2 – Passport photo machine

24 hours x 7 days = 168 hours per week.
168 hours per week x 52 weeks = 8,736 hours per year.
400 W/hour x 8,736 hours = 3,494,400 Watt hours per year.
3,494,400 /1000 = 3,494.4 kWh used per year.
3494.4 KWh x £0.10 (cost per KWh) = £349.44 per year.

3,494.4 kWh x 0.523 kg = 1,827.57 kg
1827.57 kg / 1000 = 1.8 tCO2/year

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Time for a break!

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The Carbon Academy Toolkit

- All about the pilots and lessons learned
- 30 mins - Carbon Academy priority action briefing
- 60 mins - Six pilot case studies / plans
- Half a day - Carbon Academy audit checklist
- Branded awareness raising resources
- Download from www.nussl.co.uk

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Six pilot case studies

Loughborough Students' Union

University of Bristol Union

Sheffield Hallam University Union of Students

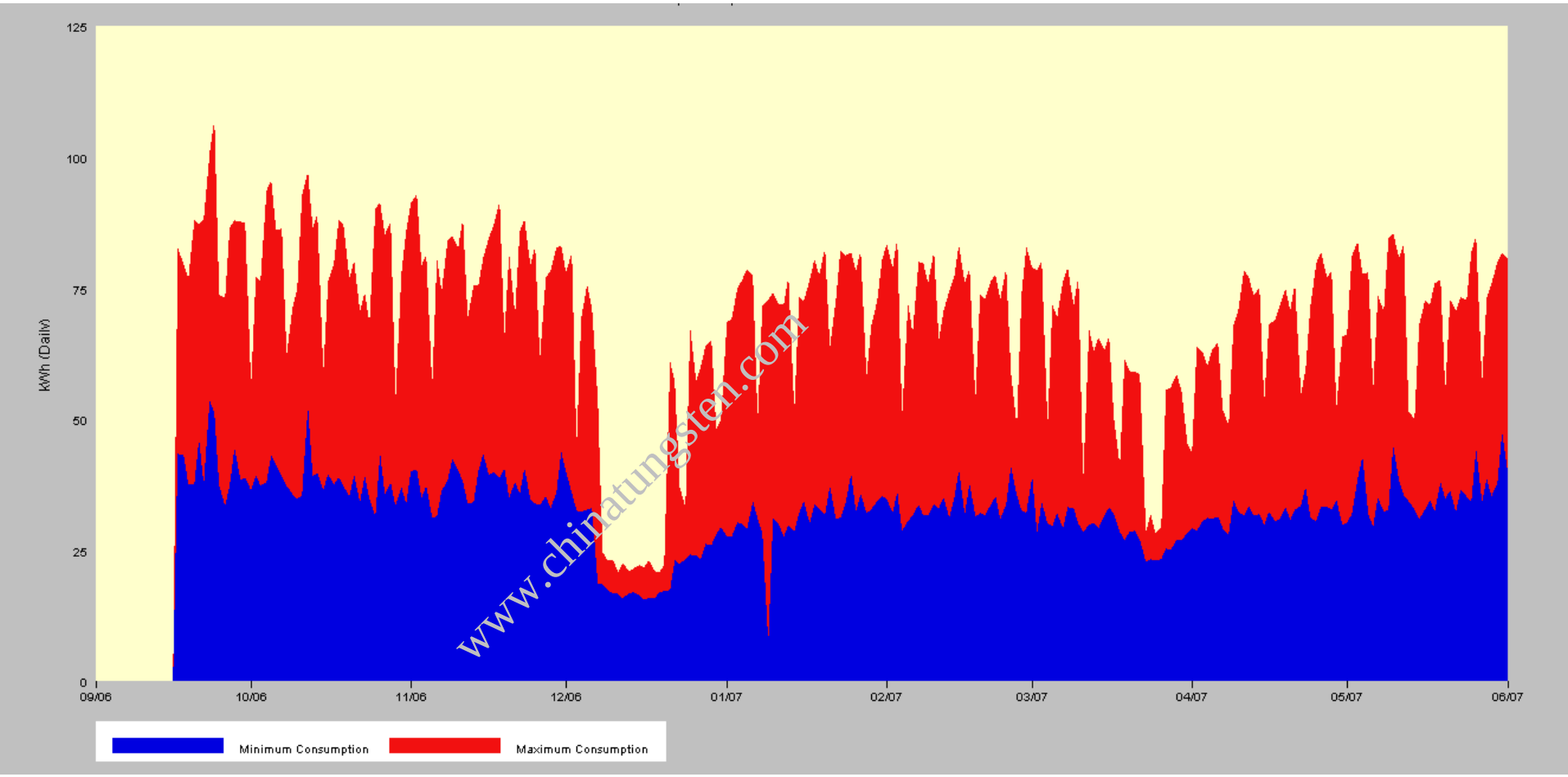
University of Abertay Dundee Students Association

University of Warwick Students' Union

University of London Union


1) Loughborough
• AC in media centre (11.3t, £1.7k)
• T8 to T5 (6.3t, £1k)
SALE
www.chinaringsten.com


www.chinatungsten.com
Glycol (3.2t, £510)


125
100
75
50
25
0
kWh (Daily)
09/06
10/06
11/06
12/06
01/07
02/07
03/07
04/07
05/07
06/07
Minimum Consumption
Maximum Consumption
www.chinatungsten.com


www.zhiguang.com

2) Bristol

- Windows (20.3t, £2.7k)

LERP (18t, £4k) & vacation shutdown (10.4t, £2.2k)

TFLs (11.5t, £1.9k)

Swimming pool timers & cover (36.8t, £5k)


3) Sheffield Hallam
• 248v to 216.2v (56.0t, £12.6k)
www.chinatungsten.com


www.chinatungsten.com

Lights in A, B and C Pods (4.3t, £970)

Motion sensors P-Pod & stores (4.4t, £900)


PAUSE
FEED
CANCEL
PAUSE
RIBBON
MEDIA
POWER
Prodigy Max
PAUSE
FEED
CANCEL
www.chinatungsten.com
28 W on standby!!

4) Abertay

- 4kW emergency lighting (11.27t, £1.7k)


www.chinatungsten.com

BMS (32.1t, £5.7k)

Label light switches (1.7t, £300)


www.chinatungsten.com

5) Warwick

- A/C on BMS (12.4t, £2.2k)
- Passport photo machine (1.0t, £177)


www.chinatungsten.com

- Remove bulbs (0.7t, £130)
- Light sensors (4.8t, £840)

LERP (23.0t, £4k)

6) ULU

- Bottle fridges off and Ecubes (17.0t, £2.6k)

Venue heating / Nightclub cooling (22.0t, £3.3k)

275 x 50W GU10s (19.4t, £3.1k)

Comfort cooling policy (8.6t, £1.3k)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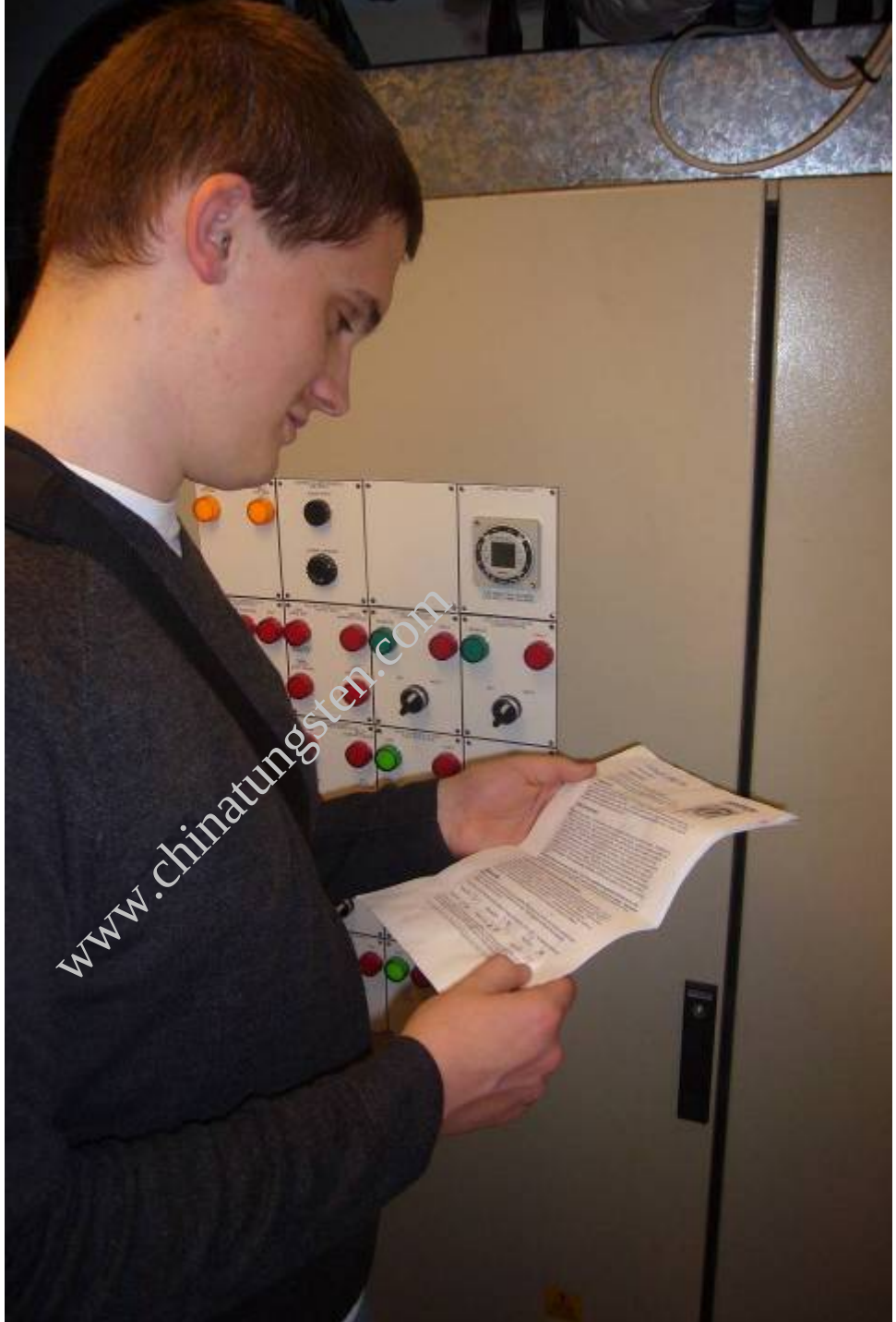
Handmade Sliced


www.chinatungsten.com


www.chinatungsten.com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HEALTHY
230V HEALTHY
CONTROL CIRCUIT
GAS PRESSURE
GAS PRESSURISATION UNIT
OVERRIDE
AUTO
OPEN
AUTO
OVERRIDE
KITCHEN GAS SOLENOID VALVE
Drayton
OFF
TIMED
ONCE
ON
SET ?
ADV
SELECT
KITCHEN PLANT TIMESWITCH
RUN
TRIP
OFF
HAND
AUTO
KITCHEN SUPPLY FAN
RUN
FAIL
OFF
HAND
AUTO
KITCHEN EXTRACT FAN
RUN
TRIP
www.chinatungsten.com

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Targets and progress

	Footprint	Investment	Annual savings	Projected savings tonnes CO2	% reduction in footprint
Loughborough	679.9	£20,375	£9,648	60.6	**8.9**
Bristol	1021.4	£3,606	£23,663	137.1	**13.4**
Sheffield Hallam	433.7	£12,044	£24,624	113.7	**26.2**
Abertay	392.3	£19,554	£16,957	96.3	**24.6**
Warwick	671.1	£4,757	£19,477	107.9	**16.1**
ULU	631.4	£4,420	£28,508	160.1	**25.4**

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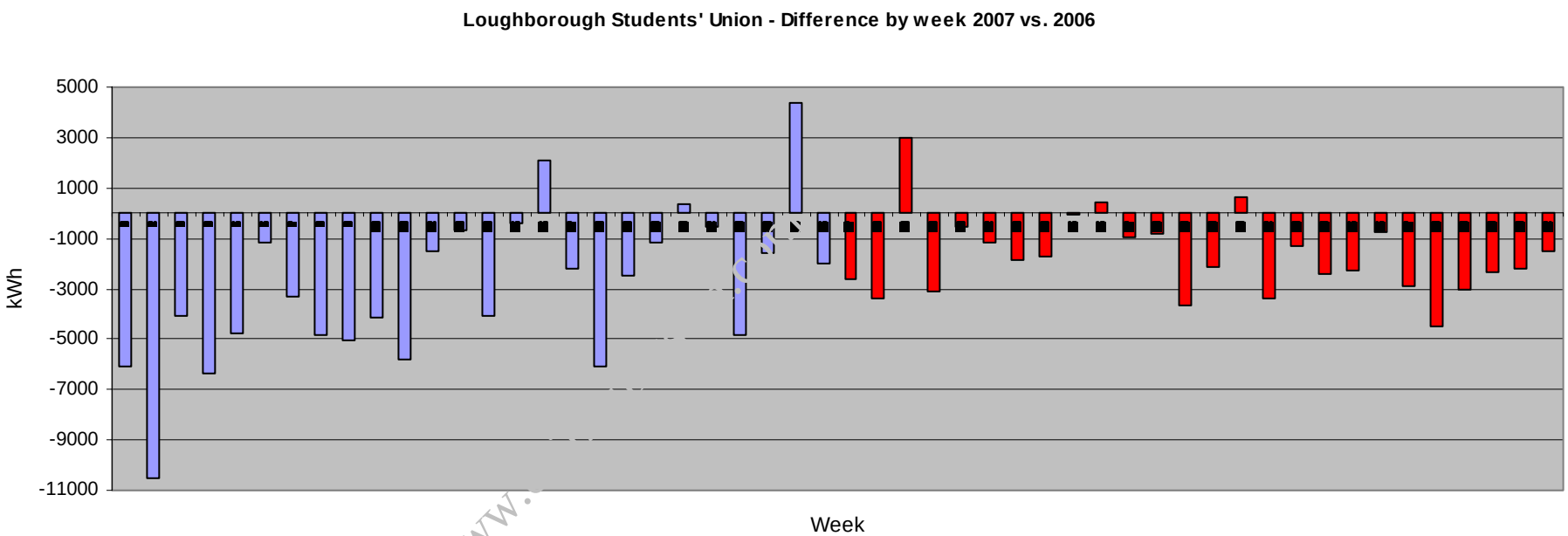
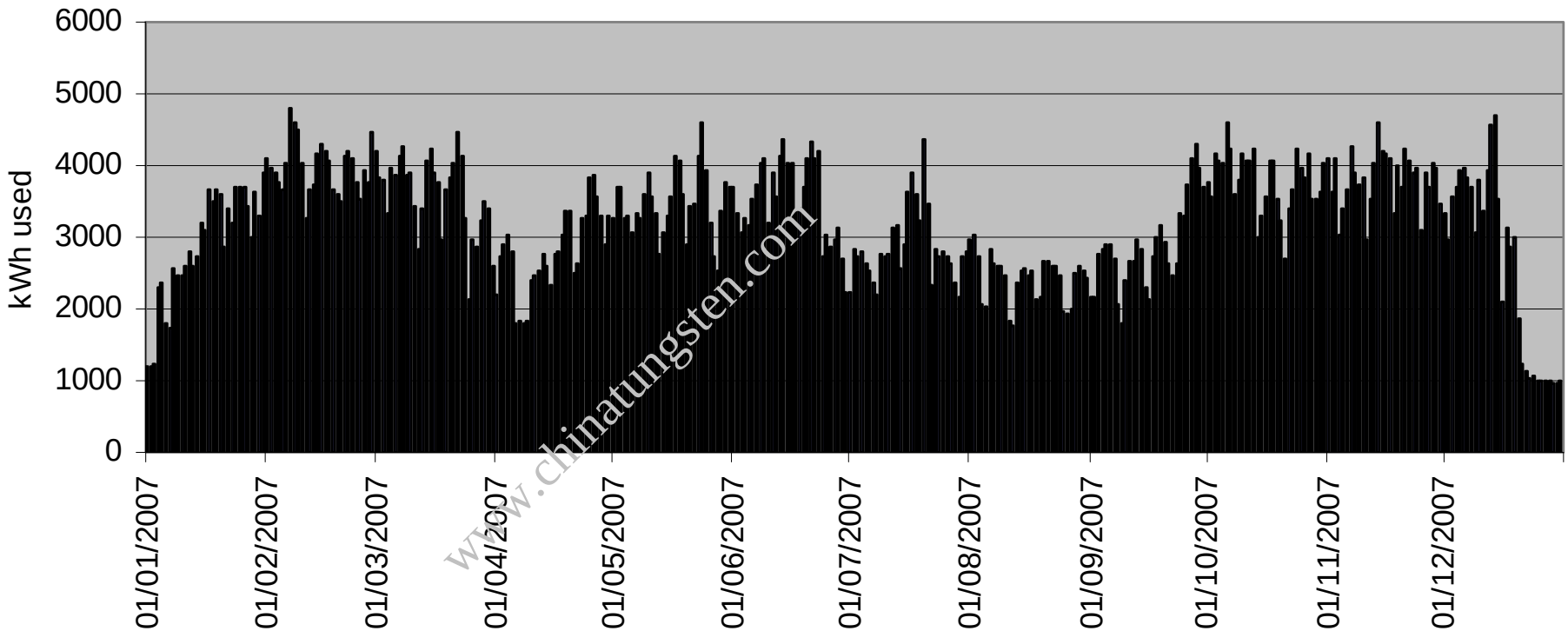


NB: 1,000 kWh = £100


Loughborough Students' Union - Daily energy consumption 2007
kWh used
6000
5000
4000
3000
2000
1000
0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
01/05/2007
01/06/2007
01/07/2007
01/08/2007
01/09/2007
01/10/2007
01/11/2007
01/12/2007
www.chinatungsten.com

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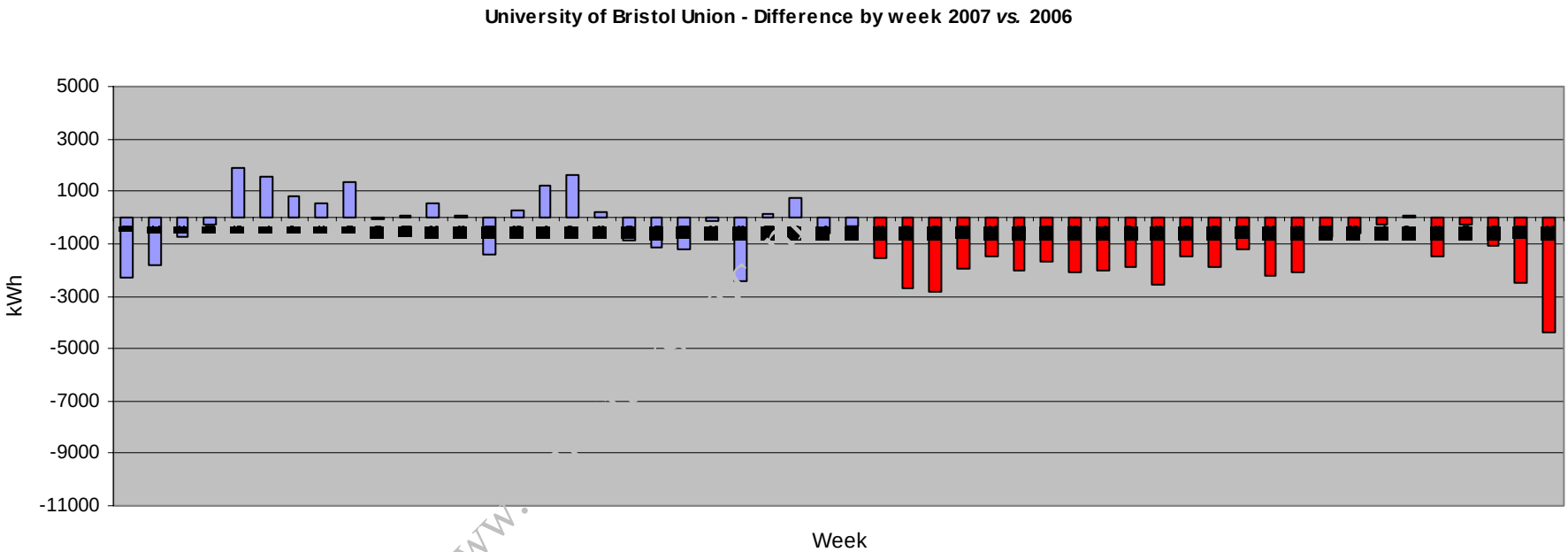

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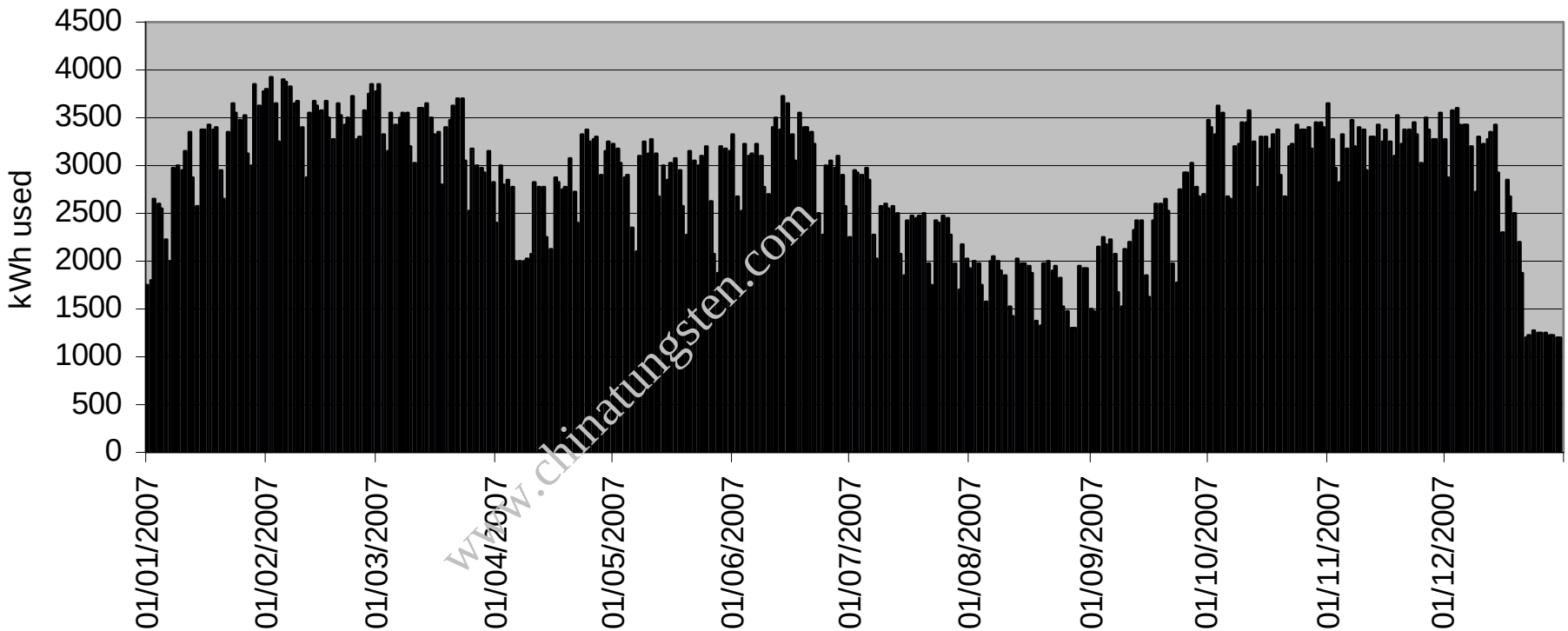
University of Bristol Union - Daily energy consumption 2007
kWh used
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
01/05/2007
01/06/2007
01/07/2007
01/08/2007
01/09/2007
01/10/2007
01/11/2007
01/12/2007
www.chinatungsten.com

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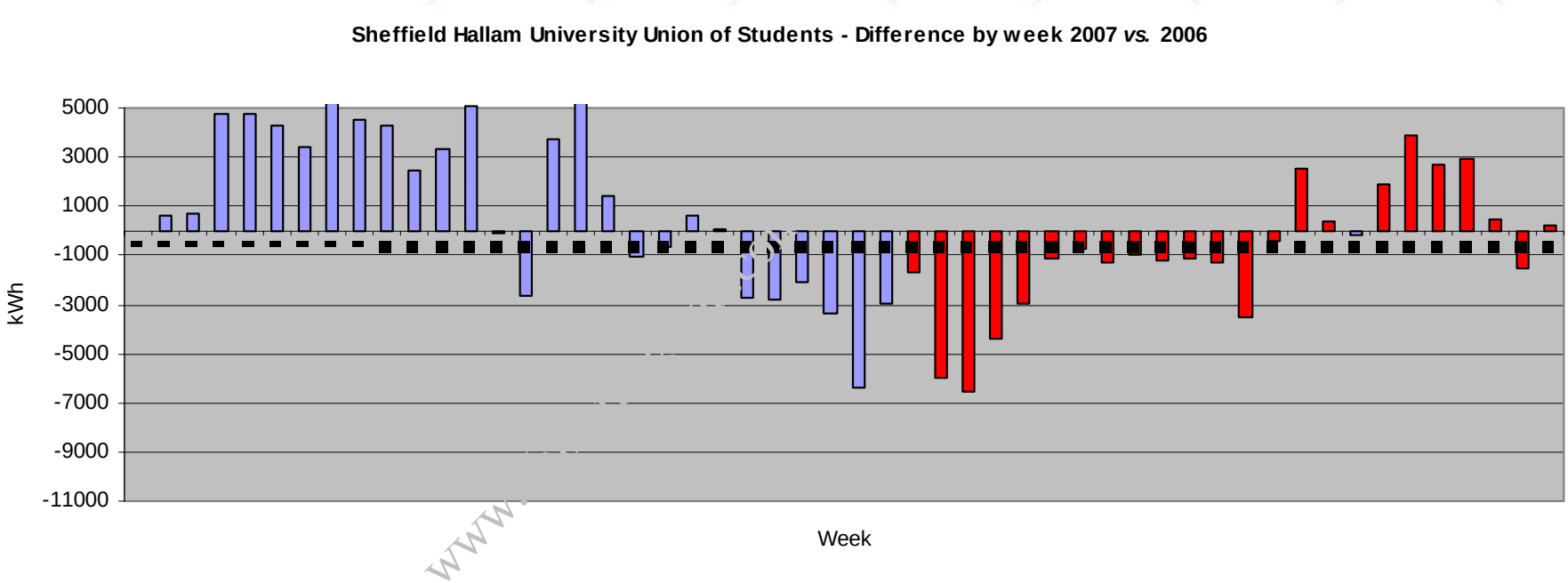

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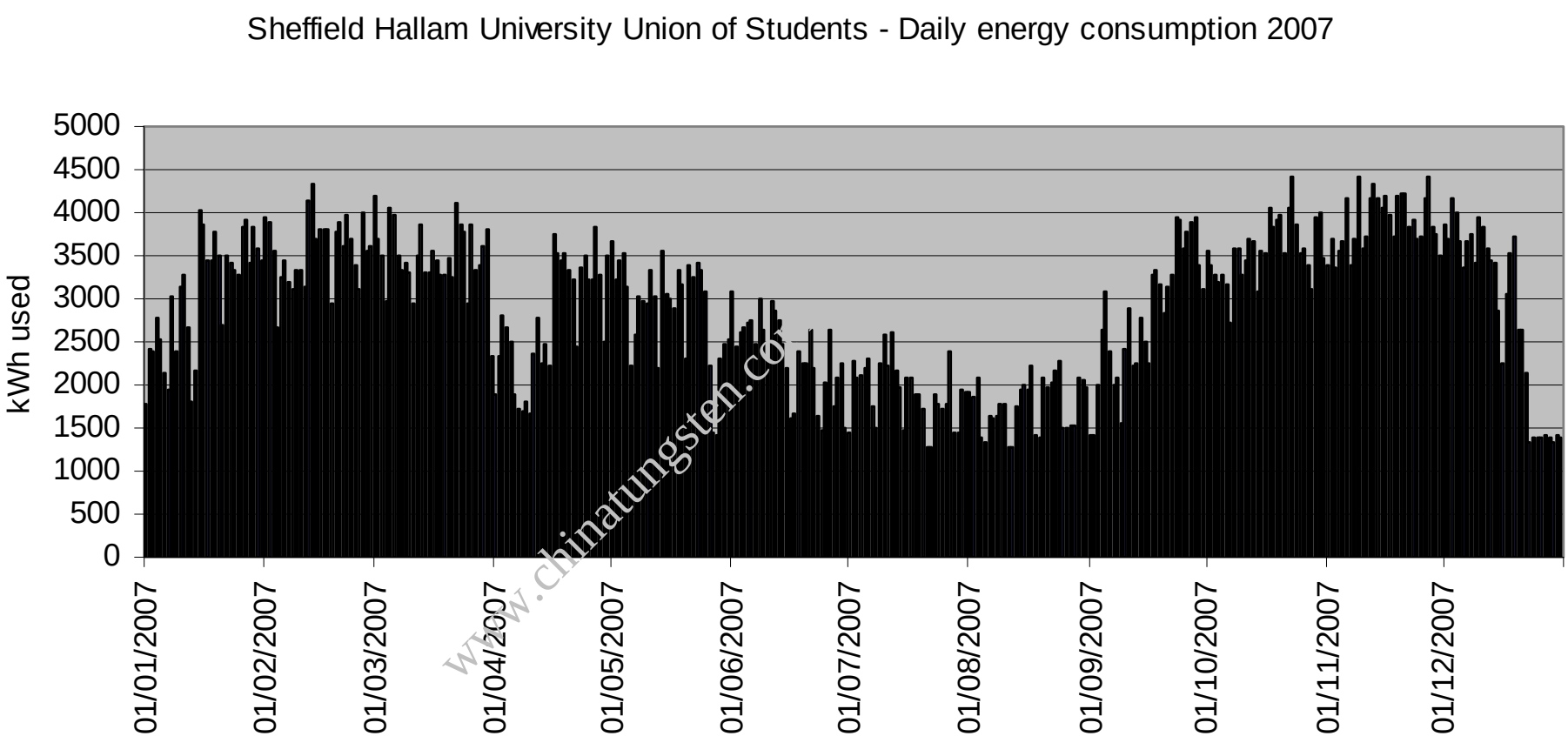
Sheffield Hallam University Union of Students - Daily energy consumption 2007
kWh used
5000
4500
4000
3500
3000
2500
2000
1500
1000
500
0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
01/05/2007
01/06/2007
01/07/2007
01/08/2007
01/09/2007
01/10/2007
01/11/2007
01/12/2007
www.chinatungsten.com

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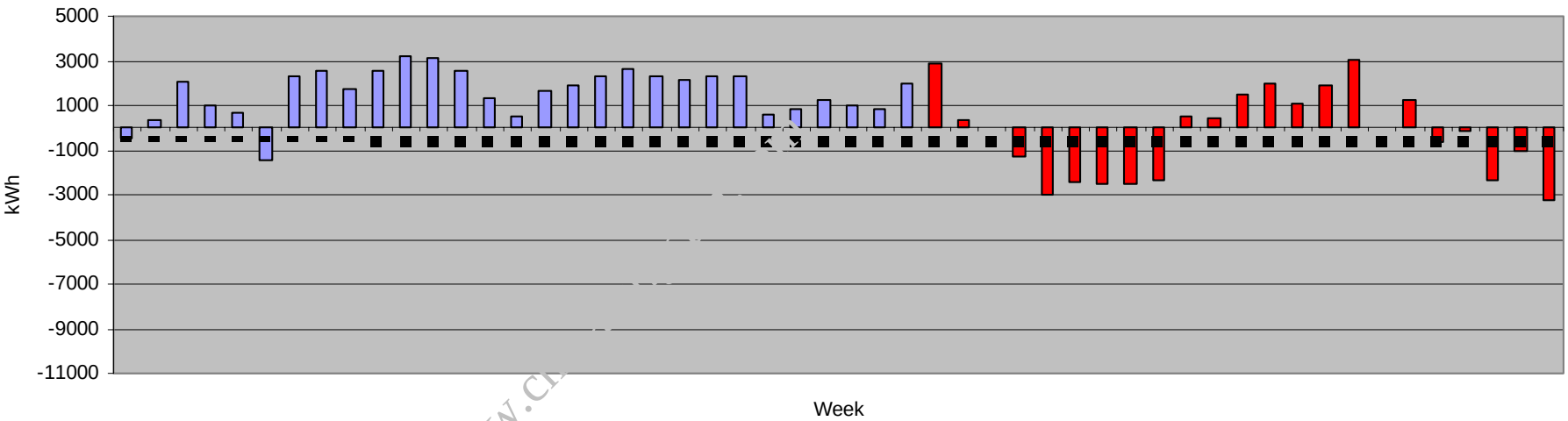
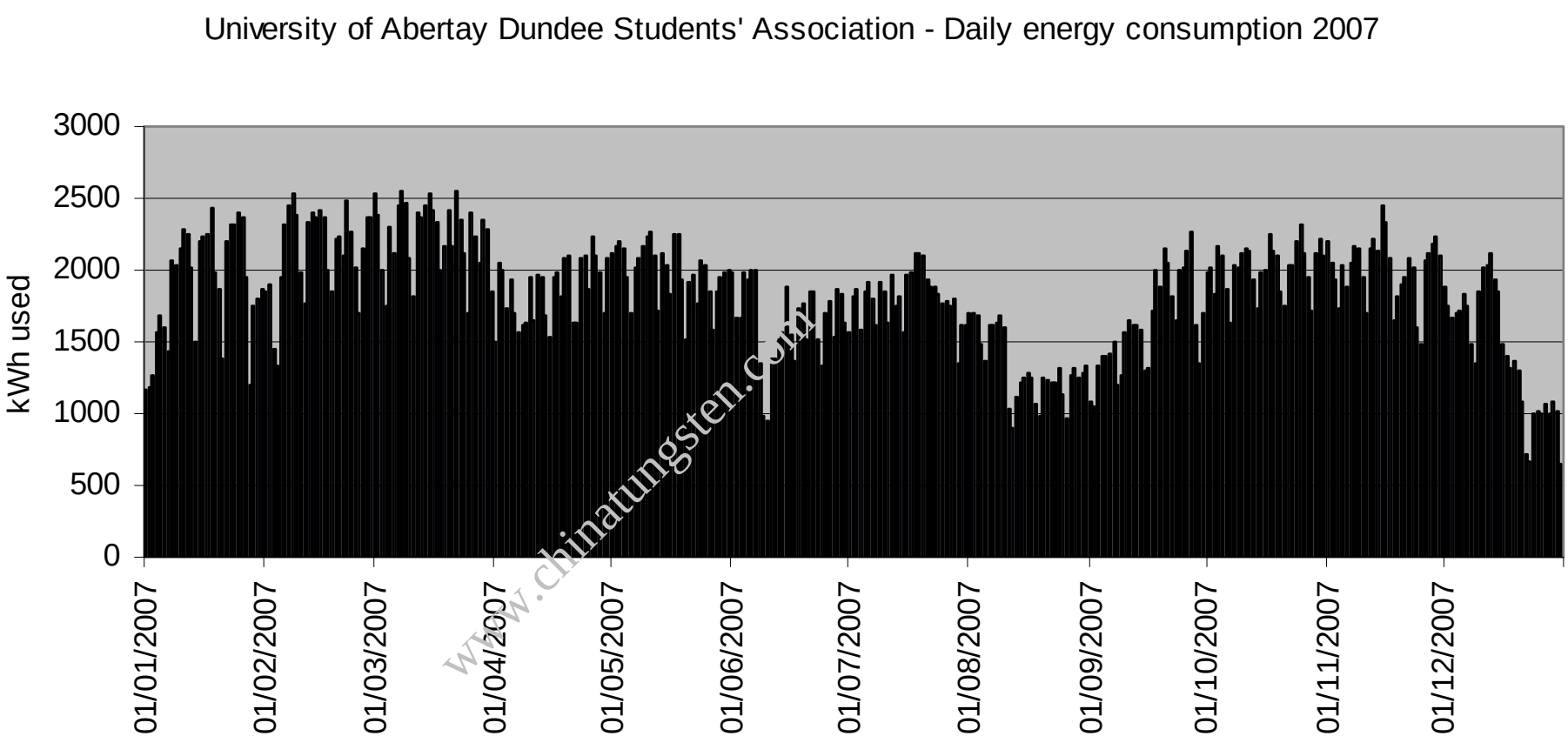
University of Abertay Dundee Students Association - Difference by week 2007 *vs.* 2006



NB: 1,000kWh = £100


University of Abertay Dundee Students' Association - Daily energy consumption 2007
kWh used
3000
2500
2000
1500
1000
500
0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
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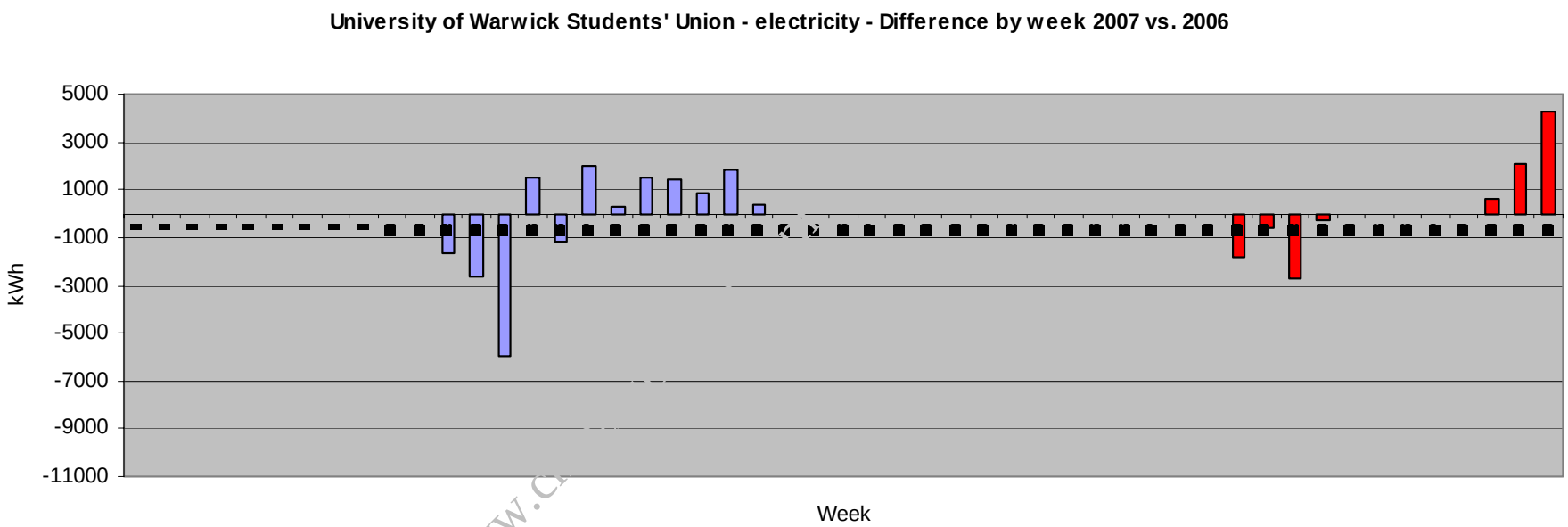

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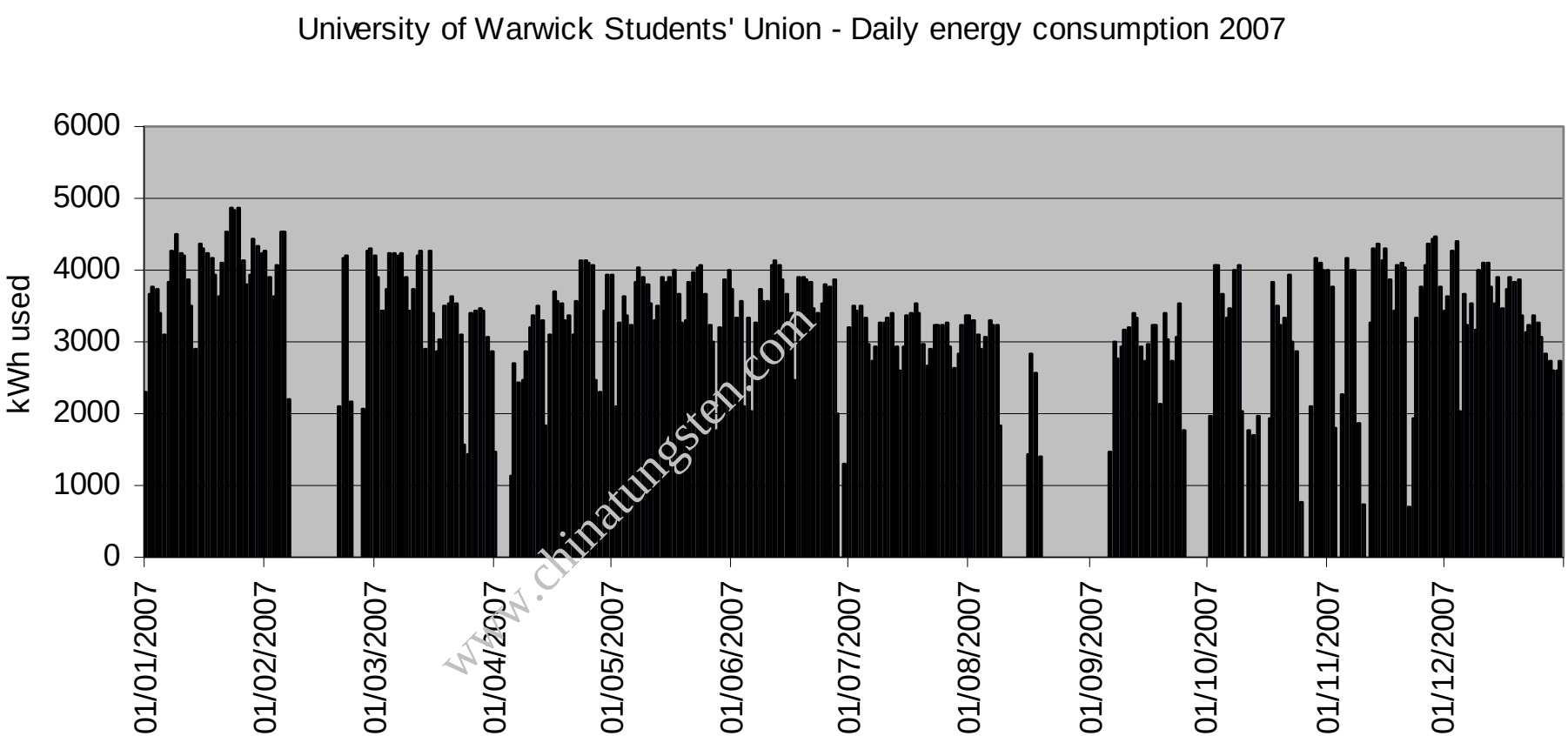
University of Warwick Students' Union - Daily energy consumption 2007
kWh used
6000
5000
4000
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2000
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0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
01/05/2007
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01/07/2007
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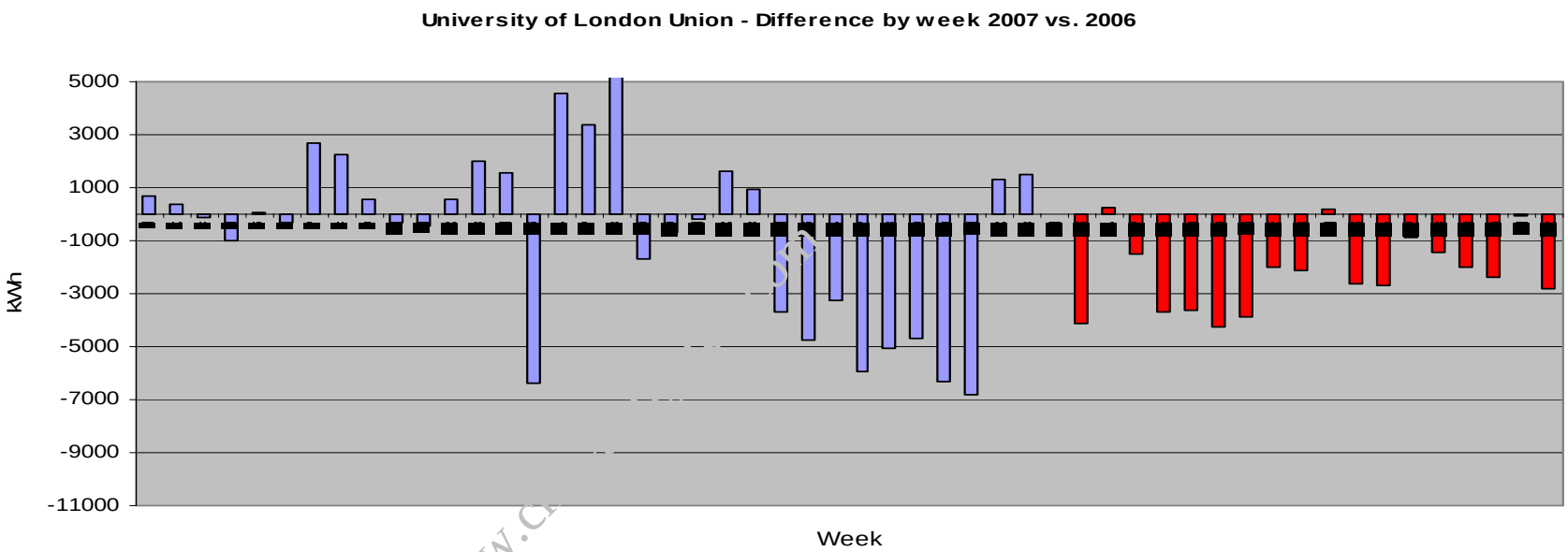
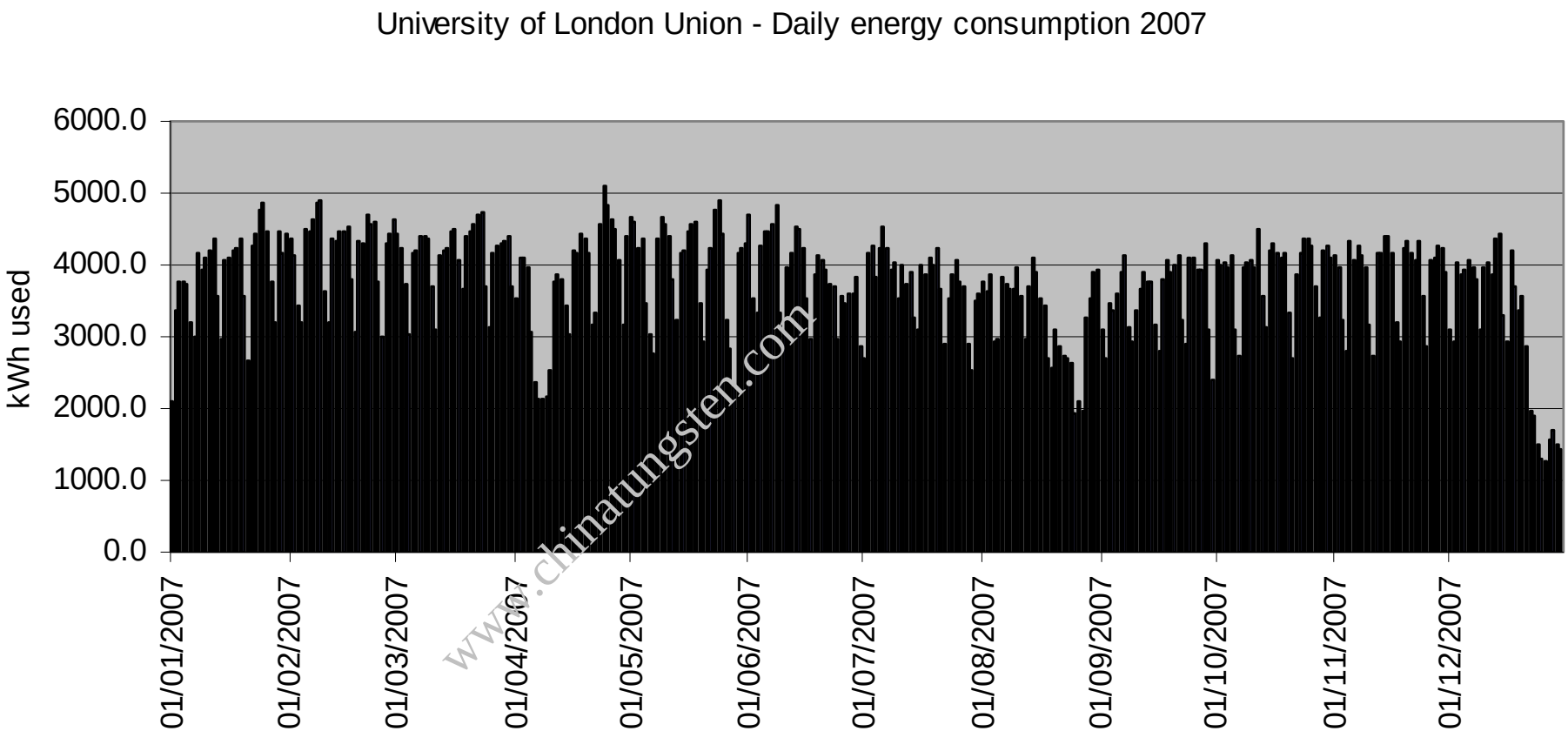
01/10/2007
01/11/2007
01/12/2007
www.chinatungsten.com



NB: 1,000kWh = £100


University of London Union - Daily energy consumption 2007
kWh used
6000.0
5000.0
4000.0
3000.0
2000.0
1000.0
0.0
01/01/2007
01/02/2007
01/03/2007
01/04/2007
01/05/2007
01/06/2007
01/07/2007
01/08/2007
01/09/2007
01/10/2007
01/11/2007
01/12/2007
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The top 20 energy saving opportunities

Equipment

1. Games machines; photo machines; vendors; water coolers; laser printers
2. Personal kettles and fridges

Fridges

3. Location of ice machines
4. 48h rule for bottle fridges
5. Dairy deck blinds

Heating, cooling and ventilation

6. Don’t assume switched off by timers
7. Switch off as early as soon as possible
8. BMS
9. Comfort cooling and heating policy

Lighting

10. Old standard tungsten filament bulbs
11. Halogen GU10 spotlights
12. Cleaners
13. Motion sensors
14. Light sensors
15. Over-lighting
16. Banks of switches

Water

17. All urinals should be regulated

Awareness

18. Nurture a switch off culture

Generic operations

19. Maintenance plan for efficiency. Fan grills and de-icing
20. Lighting & equipment responsibility; Vacation shutdown

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Quick tour looking at energy efficiency

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Time for Lunch!

- Resume at 1:30

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Practical exercise

In groups:

- Look for potential energy savings in one area of the students' union
- Focus on bad practice; make use of audit checklist!!
- We will take photos of what you find…
- … two people from each from to present back – decide before you go.
- 30 mins walk-about; 10 mins preparation time

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Groups feedback

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Questions session

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Assessment (in a minute)

- 10 questions
- Multiple choice
- For savings calculations, show workings
- If you get stuck we can help – raise hand
- If you get 7/10, you can have a Certificate of Achievement to take away!
- Need to submit today. Bring to front when finished
- Before we start…

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Concluding thoughts

- Thanks for coming!
- Go forth and save energy in your union
- An ongoing challenge, not a one off
- Do make use of toolkit. It is there to help
- Contact us if you need help; carbonacademy@nussl.co.uk
- Feedback forms
- Safe journey back