PROMOTE MSc

UNIT DESCRIPTOR – PHYSICS 5

Unit Title	**Stand-by mode**
Topic	Energy
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Aims of unit	Saving energy in the household by knowing the energy consumption of electric household appliances in standby mode.
Indicative Content	Using the EMU; calculating energy; investigating possibilities of reducing energy consumption.
Resources needed	EMU (energy- and power measuring device).
Teachers notes	Plan sufficient time.

Stand by to waste energy – work sheet (students)

Energy consumption of households generally increases – in Austria as well as in any other highly industrialized country. The number of electric household appliances, the number of electronic and digital equipment, and also the number of households (particularly one-person-households) increase - all adding to more and more energy being consumed.

Question: As we know, energy can not be "consumed" or "wasted", but it remains constant in a closed system. Why do we talk about "wasting energy" or "energy consumption" nevertheless?

We all have a lot of electric and electronic equipment at home. Some of it we do not use too often – the blender, the vacuum-cleaner, the bread-baking-machine. When they are not in use, they are usually switched off, disconnected from electric power, and stored away. But some of the equipment we use almost daily – the TV, the DVD- or video-player, the computer, the satellite-receiver, the radio, the CD-player, the printer, the answering-machine etc. So most of these are always plugged in, always waiting for us to work with them – and normally not completely switched off, but in stand-by-mode. This is usually shown by a little (usually red) light that's on. Now, that tiny red light could not use much energy – or could it?

Task: Find out how many pieces of equipment are in stand-by-mode in your home. How many hours every day are they in stand-by?

Probably you found quite a lot of machines with the little red light in your households. Now, the red light alone would probably not use up much energy. But of course there must be more "on" then just the red light – how else could your TV react when you press the button on the remote? So, every piece of equipment that's in stand-by-mode uses energy – for the remote control receiver, for showing the time, for remembering your last DVD, for storing the last phone number. And if you think about it – how often do you really need one of these features?

The energy consumption in stand-by-mode differs from machine to machine. Newer devices are normally more efficient than older ones.

Task: Look at your stand-by-devices at home and try to find out how much energy they use in stand-by-mode. Look in the manual, the internet, or ask sales people in stores.

Of course you could save energy by reducing your daily TV consumption by one hour, watching one DVD less per week, or not listening to the latest hits on CD one more time. Yes, we know, you have heard that about a dozen times from your parents. And, yes, that would be a very good method to save energy. But for starters you could try this: Disconnect every piece of equipment whose stand-by mode you do not really need from the power supply. Some devices have buttons to switch them completely off (most TV's have), while with others you probably have to pull the plug. You can still watch TV or a DVD whenever you want – just walk to the player and push the button back in or plug it in again. You can save energy – without much changing of behaviour or loss of convenience. You think that's not worth it and adds up to nothing? Let's see!

Task: Find out how much money you can save in a year by switching devices completely off (or disconnect them from power) instead of using the stand-by mode. The figure shows the average energy consumption for some devices. Find out the consumption in kWh and call your power company (or look the information up in the internet) for a price quote

Average energy consumption of devices in stand-by-mode		
Device	Energy consumption (W)	Stand-by-time per day (hrs)
TV (new)	1 – 4	20
TV (old)	10	20
Receiver	5	23
Video-player	4	23
DVD-player	1 – 3	20
Radio	3 – 7	19
Computer	5	20
Screen	2 – 5	20
Printer	3 – 6	23
Cordless phone	1	23
Phone adapter	< 1	23
Answering machine	< 1	24

A study showed that an average Austrian household can save about 37 € (50 US$) every year by just switching off stand-by-devices! If that was to be done by every Austrian household, the energy saved would add up to an amount of 900 million kWh. That's the electricity annually produced by an entire power plant!

Stand by to waste energy – info sheet (teacher)

This project can be done without much effort and shows some surprising results (one of them is that they can use maths and physics to save money). It gives room for discussions about the difference between energy, work, electricity, voltage, and other terms that are likely to be confused in everyday life. It also gives them the opportunity to think about other ways of reducing their energy consumption or general environmental protection. The tasks can also be tackled in group work and do not need to be restricted to their own households. Possible extensions would be:

Task: Look at stand-by-devices at school. Find out how much money the school could save by switching them off completely.

Task: Make a list of stand-by-devices whose stand-by-function you use a) daily b) a couple of times per week c) a couple of times per month d) rarely or never.

Task: Make a survey amongst friends or family of how much energy (or money) they guess can be saved by switching off stand-by-devices.

Task: Take pictures of stand-by-devices and find out how much energy they use in stand-by-mode and how much money can be saved by switching them off completely. Design posters with this information and put them on display in the school building.