Deliverable D.3.2: [Energy consumption and review tool for vulnerable consumers]

WP3: [Adaptation of energy monitoring tool]
Task 3.2: [Energy consumption and review tool for vulnerable consumers]

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Alphéeis, coordinator

AISFOR (Italy), Ecoserveis (Spain), NEA (UK), PIM (Malta),
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1 Presentation of SMART-UP Project

The overarching aim of SMART-UP is to encourage the active use of smart meters and in-home Displays (IHDs) by vulnerable customers, in those Member States where the roll-out of Smart Meters has been embarked upon. Indeed, previous studies have shown that Smart Meters do not lead to energy savings in the residential sector unless households actively use them and are encouraged to modify their everyday practices. Our project intends to fill in this gap, while also raising awareness on demand response services.

SMART-UP is developing a training program for installers, social workers and other frontline staff in contact with vulnerable people, so that they can inform vulnerable consumers about the benefits brought about by smart metering and energy efficiency. SMART-UP will also train outreach staff on how to advise vulnerable households on how to use their Smart Meter and In Home Display (IHD) units (where fitted) to best effect, each time they are in contact with them. This will ensure that the vulnerable and low-income households receive one-to-one and on-going support.

The training packages will be tested and improved before dissemination amongst the major stakeholders involved in smart meter deployment (DSOs, energy utilities, installers...). From 50 to 100 installers or other frontline staff will receive training in each project partner’s country. Each of them will deliver face-to-face advice to 10 to 20 households, in order to reach 1,000 households in each country. DSO and energy utilities (depending on the national context) will be involved to provide the necessary support for this experiment and to ensure further dissemination of the training packages.

Besides empowering vulnerable consumers, the project will serve to get some feedback on their specific needs and on the ways to appropriately communicate with them and help them take profit of smart metering. The project will also help gather data on how much energy can be potentially saved if vulnerable households are empowered to make the best use of the opportunities that Smart Metering offers.

2 Context and Objectives

Work Package 3 titled “Adaptation of energy monitoring tool” runs from months: 1-31, and is lead by Projects in Motion (PiM) in collaboration with ALPHEEIS, NEA, ECOSERVEIS and AISFOR. The main aim of this work package is to review existing paper-based energy monitoring tools developed elsewhere and to adapt these to an easy-to-use tool suitable for the target group of vulnerable consumers and people at risk of fuel poverty. This tool will effectively help targeted households/consumers to monitor their consumption over the course of the project and beyond. Representatives of the stakeholders previously identified (WP2) will be invited at a national steering group meeting to review the adapted tool and receive training in its proper use with the target group. The feedback received at the steering group meeting and training fed into the final version of the adapted monitoring tool.

The roll out process is different in each country and the way stakeholders reach vulnerable consumers vary from one region to the other.

Delays in undertaking the validation and training sessions where noted across all the participating partners and this is primarily due to delays in signing agreements with the stakeholders required in WP2. WP2 involved the identification of key stakeholders (installers and front-line staff) and to reach agreements in principle of their support and participation in this project. The objective of this work package is to ensure appropriate stakeholders are involved form the start and that all the legalities...
agreements between installers, front-line staff and project partners) are addressed, agreed and signed at the beginning of the project. This deliverable under WP2 resulted to be more complex than originally expected, primarily due to hesitation and novelty of the energy poverty topic, and related data protection issues when dealing with public bodies and vulnerable households. This delay was predicted and is in line with the potential risks indicated in the Grant agreement.

2.1 Context of the task

The tasks for WP3 as listed in the Grant agreement include:

- Task 3.1 - Review and adaptation of energy consumption monitoring tool for vulnerable consumers
- Task 3.2 - Organise and host a stakeholder training and steering group meeting
- Task 3.3 - Refine the energy data review tool
- Task 3.4 - Initial and on-going support to stakeholders and target group

Deliverable 3.2 which is the focus of this report, details the work undertaken for Task 3.1 and is explained in better detail in Section 2.2 below, however this deliverable reports on the requirements of Task 3.3 and Task 3.4 which will be reported at a later stage in the project (Month 31).

It is important to note that the above tasks were undertaken in the same order above so as to keep a structured approach towards the development of the tool, its validation by stakeholders and ultimately its use in the field. The execution of the above tasks is documented in the following list of deliverables as listed in the grant agreement:

- D3.1 Report on stakeholder training event in each country (Public - Due Month5)
- **D3.2 Energy consumption and review tool for vulnerable consumers** (Public - Due Month 6)
- D3.3 Feedback on energy monitoring tool (Public - Month 31)

Furthermore, completion of all the above tasks and deliverables in WP3 will lead to the successful achievement of Milestone 2 (MS2) titled ‘Validation of the energy monitoring tool in each country’ in the SMART-UP project.

2.2 Objectives of the task

Deliverable 3.2 deals specifically with the outcomes of Task 3.1 titled “Review and adaptation of energy consumption monitoring tool for vulnerable consumers”.

This Task commits SMART-UP to undertake a comprehensive review exercise of existing paper and Excel-based energy monitoring tools in order to create an energy diary specifically suitable to vulnerable consumers. The intention is that this paper-based energy diary is used to help vulnerable households monitor and document their energy consumption in a simple format, thus enabling them to understand their consumption and to take corrective action where possible towards energy use reduction. The tool is intended to reflect the different local necessities in relation to the technical outputs of smart meters in different partner Member States; and to be accessible to potential low literacy levels. Consequently the paper tool devised should remain user-friendly and simple, while at the same time ensuring that readings displayed on the meter can be easily recorded, and quickly converted to easy and visual statistics over time.
The literature review will include results obtained from WP2, and an other Intelligent Energy Europe projects outputs that might be relevant to this tool. As mentioned earlier, the tool will be adapted by each partner country to reflect the data output choices of the smart meters adopted in that country, in relation with national/regional energy tariff regimes.

The WP Leader was responsible for producing the literature review, and producing templates of the tool which is capable of ensuring comparable results across all participant, while following/reporting progress across the various project partners.

Role of partners: Adaptation of the tool to the country’s context.

In order to explain the context of the objectives, the literature review undertaken in Task 3.1 creates the basis for the following tasks proposed in the WP3 objectives of the Grant Agreement:

Task 3.2 – Organise and host a stakeholder training and steering group meeting
Representatives of the involved stakeholders and frontline staff (identified in WP2) will be invited to attend a stakeholder training and steering group meeting to discuss the energy monitoring tool, its function, and how to guide vulnerable consumers in its proper use. Every partner will organise such a half-day event in his/her country.

Role of partners: Organise and host a stakeholder training and steering group meeting

Task 3.3 - Refine the energy data review tool
Each partner will be responsible for the refinement of the tool for his/her country, with guidance provided by the WP leader. This refinement will be based on the findings and feedback received from the steering group meetings and trainings. Particular attention will be given to reach a good balance between usability of the tool, the level of detail required to adequately inform consumers about their consumption and ways of how to save energy. They will also pay specific attention to users’ literacy and numeracy levels.

Role of partners: Refine the analytical tool that will be used in each country.

Task 3.4 – Initial and on-going support to stakeholders and target group
Partners will ensure adequate on-going monitoring of the use of the tool is in place and instruct frontline staff (meter readers, installers, social workers etc.) on its proper use when approaching vulnerable consumers. Particular attention will be given to literacy and numeracy issues when providing guidance on its use. The WP leader will produce a feedback form that will be circulated to frontline staff by each partner to monitor and record any potential problems and initiate corrective action if necessary.

Role of partners: Contribute to on-going support in his/her country.

2.2.1 Deliverables
This deliverable 3.2 titled “Energy consumption and review tool for vulnerable consumers” documents the literature review undertaken in order to develop the paper-based energy diary. The aim of this review was to build on any previous work in the development of these tools, and to adapt that knowledge to vulnerable households. This document summarises the main outcomes from this review, and any potential limitations. It also presents a first few drafts of this tool, which is then adapted to the partner country specificities, and eventually trialled with local stakeholders as part of the efforts of Task 3.2 - Organise and host a stakeholder training and steering group meeting, and eventually lead to further improvements or changes as part of Task 3.3 - Refine the energy data review tool.
As mentioned earlier, D3.2 also reports on overlaps between other Tasks, namely:

- Task 3.1 - Organise and host a stakeholder training and steering group meeting
- Task 3.3 - Refine the energy data review tool
- Task 3.4 - Initial and on-going support to stakeholders and target group

Work performed

Recent advances in the development of European sustainable energy policies has recently started to find a balance between the reduction of CO2 emissions and the protection of vulnerable households in order to reduce the widening "energy gap" among EU consumers. Research suggests that vulnerable households are more likely to be affected by fuel poverty and to struggle in warming or cooling their homes adequately (Jamasb and Meier, 2010)\(^1\). In this context, vulnerable households include those on low incomes, which typically includes pensioners, female single parents, and benefit recipients. An EU-wide push towards smart-metering has the potential to provide new insight into energy poverty opportunities and challenges.

Further to D3.1, traditionally, electricity metering at a residential level has been conducted at low time resolution, that is either on a monthly or bi-monthly basis. Consequently, policy-makers, energy suppliers and energy service companies have based their energy policies and tariffs on average daily load profiles. However, the increased penetration of smart metering technologies now makes it possible to use more detailed time-use data profiles and provide micro-data on energy use. For instance, the time residential end-users switch lights, how long heating and appliances are kept on, for how long, and at what time they switch them off can help establish personal electricity consumption profiles of specific households and cohorts.

2.3 Background on energy poverty

A household is considered as vulnerable if some of its members are of pensionable age, disabled, chronically sick and families with young children. In the wider context this includes households on very low incomes, pensioners, female single parent households, and benefit recipients. In fact energy poverty has been understood to apply when a consumer’s personal circumstances and characteristics combine with aspects of the market to create situations where he or she is significantly less able than a typical consumer to protect or represent his or her interests in the energy market; and/or significantly more likely than a typical consumer to suffer detriment, or that detriment is likely to be more substantial. However, energy poverty definitions vary between Member States, but London Economics has recently published (Feb 2016)\(^2\) a more comprehensive definition of vulnerable consumers and new methodology for measuring consumer vulnerability and provides new insights into the actual patterns of consumer vulnerability in key markets. This effort distinguishes five dimensions of consumer vulnerability. A vulnerable consumer could be defined as:

- **“A consumer, who, as a result of socio-demographic characteristics, behavioural characteristics, personal situation, or market environment:**
  - Is at higher risk of experiencing negative outcomes in the market;
  - Has limited ability to maximise his/her well-being;
  - Has difficulty in obtaining or assimilating information;
  - Is less able to buy, choose or access suitable products; or

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The incidence of perceived consumer vulnerability varies both across aspects of perceived vulnerability and across countries. Table 1 below indicates the country level share of consumers who feel vulnerable "to a great extent" for any reason and country level combined mean rating of the extent to which those consumers feel vulnerable across the EU 28 (London Economics, 2016).

Note: Results weighted using country weights. EU28 + NO and IS N = 26,653.

Vulnerable households are at especially high risk in terms of being affected by fuel poverty (Defra and BERR, 2008). In particular, three arguments can be made on how low income households differ from other households (Jamasb Tooraj and Meier Helena, 2010), namely:

i. vulnerable households live on lower than average incomes and in order to reach a certain level of comfort or to heat their homes adequately they need to spend a larger share of their income on energy.

ii. these households spend more time at home than households that consist mainly of full time workers and thus use more energy than others.

iii. these households are not able to improve the energy efficiency of their homes, thus the energy efficiency of their homes is lower and their energy using appliances may be less efficient.

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Furthermore, when confronted with an increase in energy costs, lower-income families tend to make “lifestyle cutbacks”, which is in stark contrast to higher-income families which tend to invest in energy conservation measures (Dillman and Dillman, 1983). Furthermore, renters are not likely to invest in energy efficiency and therefore curtailment is the only option to reduce consumption (Black et al, 1985).

More recently, temperature-related mortality is being increasingly studied across both the developed and developing world especially in view of climate change. There is no doubt that ambient temperature has a strong effect on daily all-cause mortality, and can be a serious potential public health concern of direct relevance to vulnerable households both in terms of excessive cold and heat (Cauchi John Paul, 2012).

Whereas financial support and social tariffs paid to vulnerable households remain an important aid, smart metering can play an important part in eradicating fuel poverty and assisting vulnerable households. The assumption is that smart metering can provide consumers with information on the actual energy consumption and might lead to behavioural changes.

SMART-UP attempts to leverage the current roll-out of smart-meters across 5 partner countries, in order to enable vulnerable households leverage the opportunities provided by smart metering and real-time energy consumption patterns. However, even though many people have embraced online and electronic communication, some groups of people are slower to change (Boyer et al., 2001), such as elderly people; people not familiar with new technology; or people who do not have a computer or android device, possibly for financial reasons.

This means that the use of smart metering might exclude these groups, especially if respondents do not have access to computing equipment or internet access (Mehl & Conner, 2012). Consequently, paper-based energy diaries (ED) could be used by people who do not have or have limited access to computers, or are unfamiliar with digital tools (Fell & King, 2012). Paper-based energy diaries have been widely used because they do not need equipment, minimum training is required, they are easy to use; and are portable (Joeri et al., 2013). It is important to note that even where digital recording is possible, paper-based diaries may still be useful. This last point is particularly relevant to vulnerable households which tend to be somewhat afflicted by the digital-divide and illiteracy.

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7 Cauchi John Paul (2012). Temperature-Related Mortality in the Maltese Islands. Investigating the association between air temperature and health outcomes, in the Maltese. Unpublished paper in partial fulfilment of an MSc in Public Health at the London School of Hygiene & Tropical medicine. Islands in the period 1992-2010
In view of the above, a paper-based tool in the form of an energy diary was deemed necessary in order to provide a more inclusive and accessible way of self-reporting wherein households could record their individual activities. An energy diary can be a cost and time-effective method for studying energy activities, and also a non-intrusive method of gathering respondents’ data. Other advantages of this approach include collecting energy-related activities in greater detail across all ages, and helping households to better understand their energy use.

2.4 Energy diaries literature review

The issue of how to measure residential electricity demand and how it is used has recently been a major focus of policy makers engaged with vulnerable households. One emerging approach has been to monitor habitants’ practices in the household, in order to establish links between residential electricity demand and human behaviour. This approach tends to rely primarily on measured time-use survey data, and originate from various academic disciplines, including energy econometrics, electrical engineering, sociology of practice, environmental psychology and household economics.

The analysis of household energy consumption patterns usually involves the assessment of technical setups in homes, and of people behaviors. The intention is to examine the relationship between people activities, how they use their appliances, and their electric consumption. Energy diaries are a good tool to collect self-reported data on a household’s frequency and duration of appliance use and the final energy consumption. The literature indicates that while questionnaires can provide consistent information on energy consumption in households, however energy diaries can provide reliable information about when this energy is consumed (Daubin, 2013).12

Since this project relies heavily on the acquisition of quality data through participation, it is essential to follow proper steps to engage and relate to participants, and making them aware of the importance of their role in the research. The literature shows that there are a number of strategies that can be employed prior to data collection in order to address potential weaknesses of TUDs (Ocampo 2015)13:

- The researcher spends time with respondents talking them through the ED process and to respond to questions (Iida et al., 2012).14
- The researcher becomes a story teller, effectively teaching participants which activities result in energy consumption through real world examples, as sometimes this information is not clear to participants (Cames & Brohmann, 2003).15
- Sending respondents text reminders for data recording (Mehl & Conner, 2012).16
- Providing monetary compensation for the respondents’ time and asking the respondent to sign a statement of commitment to fill out the diary in order to increase compliance (Mehl & Conner, 2012).

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15 Cames, M., & Brohmann, B. (2003). Options and potentials of energy diaries: energy diaries as a tool for identifying potential energy savings through behavioural changes. Time to turn down energy demand, 1079–1090.
The researcher ensures that respondents understand the benefits of the research so that they have a personal commitment to it (Lai et al., 2013). In this way, respondents learn how accurate information will aid the study outcomes (Mehl & Conner, 2012).

The literature review suggested that a number of key features are essential for the design of an energy diary. These include:

- activities to be recorded,
- time intervals,
- days of recording,
- and strategies to overcome compliance problems.

Similarly, aspects regarding wording of questions, predefined list of activities or open-ended answers, instructions, definitions, and layout and formatting features where also considered in the final data collection design in order to help reduce bias (Jones, 2003).

Other important considerations in the design of any Time-Use or Energy Diary are (Ocampo, 2015):

- user-friendly design;
- reducing participants’ burden in completing the diary;
- the validity and reliability of the data provided;
- literacy rate of the participants; and willingness of the chosen participants to complete them.

### 2.5 Existing energy diaries

Quite a bit of research has been undertaken in order to better understand energy consumption behaviour in households, and many different forms of time-use or energy diaries have been developed in order to capture this information accurately.

Designing the time-use diary initially drew from different features provided by the literature about generic energy diaries (ED). Consequently, Task 3.1 developed and assessed a number of draft energy diaries based on a literature review of similar diaries used by partners like NEA, related FP7 projects and elsewhere. Some relevant examples include the following:

**Existing energy monitoring tools for households (paper-based)**

1. TESCO – Track your home energy use.
   
   [http://www.dgfi.org/Caring%20for%20the%20Environment%20Documents/Track%20your%20home’s%20energy%20use.pdf](http://www.dgfi.org/Caring%20for%20the%20Environment%20Documents/Track%20your%20home’s%20energy%20use.pdf)

2. Integration of Active Learning and Energy Monitoring with School Curriculum (ACTIVE LEARNING).
   

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   http://learningtogive.org/lessons/unit527/lesson1.html

4. REACH – Reduce energy use and change habits.  

**Existing energy monitoring tools for households (online / computer)**

1. European Citizens Climate Cup  
   http://www.theclimatecup.eu/

2. Persuasive force of children through education (FEEDU). Energy Diary  

3. Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe -  
   http://remodece.isr.uc.pt/

4. Energy neighbourhood  
   http://www.energyneighbourhoods.eu/en_ie

5. Peer-to-peer Education for Youths on Smart Use of Information and Communication Technologies  
   http://www.useitsmartly.com/toolbox/

6. EnergyXchange  

7. Sust-it. Simply efficient shopping  
   http://www.sust-it.net/running-costs-of-old-appliances.php

8. Intelligent use of energy at school (IUSES)  
   http://www.iuses.eu/downloads.php

9. Recycling Centers  
   http://www.recyclingcenters.org/ecological_footprint_calculators.php#homes_businesses

    http://www.energysavingtrust.org.uk/domestic/energy-saving-quick-wins

**Existing Energy monitoring tools for households (Apps for mobile/tablet without interfaces)**

1. Energy Consumption Analyzer  
   https://play.google.com/store/apps/details?id=at.topfen.ecas

2. SMERTY - Young Energy Efficiency (YEFF)  

3. Smart Meters  

4. Smart Meter  

5. Electricity Meter  

6. SpEne-SP Energy Meter  

7. Meter Readings  

**Related**
2.6 Limitations of time-use studies and energy diaries

According Torriti (2014)20, there are at least six issues which impact the measurement of the timing of residential electricity demand through time use data.

1) time use data is not significant for individual users alone, and higher numbers of aggregate users are necessary for statistical significance;
2) time use data are representative of average days based on typical routines and practice of everyday life, and do not necessarily reflect peak events non-typical days due to either particular weather conditions or rare public events;
3) nation-wide time use surveys are not conducted regularly and typically don’t reflect changes in occupancy patterns over time like the increased dependence on electronic devices;
4) residential demand curves against time and price across developed countries seem to indicate high similarities due to globalisation and similarity in occupancy patterns coupled against improved appliance efficiencies over time (Torriti, 2012) make it harder to identify significant energy saving opportunities;21
5) whilst occupancy for single-person households are relatively easy to measure and model, it becomes harder with vulnerable households which typically involve multiple-person flows can undermine the identification of saving opportunities.

Furthermore, it is important to mention that at the time of writing this report, In-Home displays/devices had just started to penetrate the European market and limited pilot trials have been conducted. Only the UK has decided on a national roll-out including an In-Home display. It is expected that IHD’s would provide for more accurate data collation especially for vulnerable households in the near future.

On a similar note, it is critical for this project to take stock of findings published in a 2012 study by Alahmad et al.22, which attempted to determine whether the feedback provided by real-time energy monitors results in lower residential consumption rates during the 30 days after installation. Although the opinions of the project participants suggested that they took action to reduce their energy consumption as a result of the direct visibility of the real-time data, the actual power consumption data collected from the devices did not support such assertions. While the results indicated that none of the feedback methods provided by real-time devices reduced the rate of energy consumption by a statistically significant amount in comparison to the control groups, previous research has shown that feedback can be useful for short-term energy saving.

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3 Final energy diary outputs

The above review provided the tools necessary to design a paper-based tool that made it easy for participants to engage with the diary, while enabling their personal tracking and understanding of energy use at home. In order to ensure engagement, households were not asked to record too many details about their daily energy patterns, and asked to focus specifically on their energy consumption behaviour, and report it accurately. Following the literature review, and responding to the limitations found with existing energy diaries, the proposed ED aimed to fulfil the following criteria:

- Produces data to understand daily patterns of energy-related behaviour
- Produces data to understand how the energy is consumed in a household context.
- Captures regular household behaviours that occur outside the TUD period.
- Produces reliable and valid data

A first draft of the energy diary was presented by the WP3 leader at the consortium meeting held in Newcastle (UK) on September 12th, 2015. Preliminary feedback received specifically from the SMART-UP partners was noted, and changes made to the drafts accordingly soon after the meeting.

All comments received from partners and their stakeholders where discussed internally during the consortium meeting in Newcastle, via email and skype when clarifications where necessary. The end result is a template of 3 different energy diaries that could be suitable to the vulnerable household in question.

Once the revised drafts where prepared, each project partner was asked to organise a half-day stakeholder training and steering group meeting to which representatives of the involved stakeholders and frontline staff (identified in WP2) would be invited. The aim of this training session was to discuss the energy monitoring tool, its function, and how to guide vulnerable consumers in its proper use. Different countries approached the stakeholder event differently, but in most cases followed the above directions. Partners where then asked to send a 1-page report to the WP leader (PiM) asking partners to follow and document the following steps:

- how you went about organising the internal workshops, the number of people involved, location, etc;
- summarising the main outcomes from each event;
- main barriers and opportunities in each country;
- and feedback received from the participating stakeholders;
- report the main outcomes of the event – indicating the main barriers and opportunities in their country, and any feedback received from the participating stakeholders.

The design of this energy diary also involved respondents’ requirements and feedback throughout the process. The feedback collected through this process has greatly improved the design of the TUD from its first version and will also continue to improve the design for future studies. The feedback and reiteration process undertaken in order to improve the energy-diary developed are detailed in D3.1 - Report on stakeholder training event in each country.

Feedback was received by the WP leader (PiM), changes requested assessed and included in the final reiteration of the paper-based tool outputs. Country specific feedback and requirements are reflected in the sections below.
An electronic version of the Energy Diary tool is available in excel here.

The energy diary developed comprises of 3 different potential tools, including:

1) An electricity consumption and cost diary (3 pages)
2) An electricity consumption and cost diary (2 pages)
3) An appliances running cost tool (1 page)

Please keep in mind that the energy tool should be provided to households that have already been provided with other required documents developed in WP2, namely:

- SMART-UP participant information and Instructions sheet,
- the SMART-UP Informed consent form
- IHD and generic energy-saving tips sheet

The final energy diary templates are presented below, but described in further detail in D3.1 - ‘Energy consumption and review tool for vulnerable consumers’ (Public - Due Month 6).

Partners are expected to make any changes or additions to these templates, in such a way as to suite their constituency. The reporting of the final drafts utilised by the Partner countries will be undertaken in D3.3, and are expected to remain a work in progress until the end of the WP3 timeline which ends in Month 31, and will be reported accordingly at a later stage in the project.
INSTRUCTION SHEET - Your SMART-UP Energy Diary

CALCULATING ENERGY SAVINGS WITH THE HELP OF YOUR SMART METER

The SMART-UP consortium has developed a set of tools that will help you to analyse your home energy consumption in an easy way and helps you to compare it to similar households in your region.

1. The energy consumption diary

The energy consumption diary allows you to keep track of your overall energy consumption at home. Simply enter the energy readings from your smart meter at the end of every month and see how it changes over time and whether your energy saving efforts make a difference.

2. The night energy consumption tool

Are you wasting a lot of money because your appliances are on standby all the time or because your electric heater is an energy guzzler? Find out by using our night energy consumption tool. It will tell you how much electricity you consume while you sleep.

3. Appliances running cost tool

Learning how much our energy use costs is key to understanding how to use less and to saving money. To illustrate this, we have developed an appliance running costs tool which can show you how much it would cost to run a number of different appliances for set amounts of time.

Disclaimer

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Please make sure you refer to the following SMART-UP sheets should you decide to share your data with us:

1. SMART-UP participant information and instructions sheet,
2. the SMART-UP informed consent form
3. JHD and generic energy-saving tips sheet

Should you require further assistance please do not hesitate to get in touch with your SMART-UP contact point.

The National contact for Malta is:

Brian Restall and he can be reached via email on brian.restall@pim.com.mt or on 2142 0852.
## 1.1 - ELECTRICITY CONSUMPTION RECORDING SHEET

Simply take a reading for the total consumption from your smart electricity meter at the end of each month and insert in column A. See smart meter illustration below.

To calculate the consumption deduct the latest reading from a previous reading of your electricity smart meter.

Press this button on your electricity smartmeter until you see TOTAL on the display.

See the Total consumption when taking readings for this exercise.

<table>
<thead>
<tr>
<th>Reading No.</th>
<th>Date of meter reading Day/Month/Year</th>
<th>Meter readings</th>
<th>Reading No.</th>
<th>Date of meter reading Day/Month/Year</th>
<th>Meter readings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>01/03/2015 (example)</td>
<td>6,781</td>
<td>16</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>01/04/2015 (example)</td>
<td>7,156</td>
<td>17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>18</td>
<td></td>
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<td>2</td>
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<tr>
<td>13</td>
<td></td>
<td>30</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>14</td>
<td></td>
<td>31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>
### 1.2 - ELECTRICITY CONSUMPTION AND COST DIARY

What do you need for this exercise? You will need this recording sheet, a pencil, and a calculator.

Simply take a reading for the total consumption from your smart electricity meter at the end of each month. Insert the date in column A and the electricity reading in column B. See smart meter illustration below.

To calculate the costs simply multiply column C (consumption) with column D (cost per unit). Enter the result in column E (Total Cost)

Insert your results for consumption (Column C) and Total Cost (Column E) for each month in the two charts on the next page. Mark results for each month with an X. After you have completed all months the table gives you information about your overall electricity consumption and the costs. It also tells you if you managed to reduce your consumption over the year or if you use more electricity in summer or winter.

#### Electricity readings

<table>
<thead>
<tr>
<th></th>
<th>Date of meter reading Day/Month/Year</th>
<th>Meter readings</th>
<th>Consumption for period (Units) Deduct last meter reading from previous reading ex B2-B1</th>
<th>Cost per unit (£)</th>
<th>Total Cost Calculate C x D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>01/03/2015 (example)</td>
<td>6,781</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>01/04/2015 (example)</td>
<td>7,156</td>
<td>375</td>
<td>€0.125</td>
<td>€147</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>x</td>
<td>€0.125</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>x</td>
<td>€0.125</td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td></td>
<td>x</td>
<td>€0.125</td>
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<tr>
<td>6</td>
<td></td>
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<td>x</td>
<td>€0.125</td>
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<td>7</td>
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<td>x</td>
<td>€0.125</td>
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<td>€0.125</td>
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<tr>
<td>14</td>
<td></td>
<td></td>
<td>x</td>
<td>€0.125</td>
<td></td>
</tr>
</tbody>
</table>

Total: €
1.3 - ELECTRICITY CONSUMPTION DIARY AND CONSUMPTION CHARTS

Electricity consumption
(units/month)

Electricity cost
(Euro/month)

Overview of average daily and monthly energy consumption in a typical Maltese household (in units). Compare your consumption with the average household below.

<table>
<thead>
<tr>
<th>Source of data</th>
<th>Refrigeration</th>
<th>Water heating</th>
<th>TV, HIFI and computers</th>
<th>Lighting and other major appliances</th>
<th>Total per day</th>
<th>Total per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartment</td>
<td>1.94</td>
<td>2.72</td>
<td>1.47</td>
<td>3.21</td>
<td>9.9</td>
<td>299.8</td>
</tr>
<tr>
<td>Maisonette</td>
<td>2.47</td>
<td>2.52</td>
<td>1.5</td>
<td>3.15</td>
<td>10.8</td>
<td>332.8</td>
</tr>
<tr>
<td>Terraced house</td>
<td>2.51</td>
<td>2.87</td>
<td>1.45</td>
<td>3.69</td>
<td>11.0</td>
<td>339.6</td>
</tr>
</tbody>
</table>
### 2.1 - THE NIGHT ENERGY CONSUMPTION TOOL

**Instructions**
1. Take the first reading before going to bed at night and enter the reading from your electricity meter in column (B) of the table below.
2. Take the second reading from your electricity meter right after you wake up. Insert the reading in column (D) below the previous one.
3. Use the subtraction method to calculate the difference between the two readings. Insert the result in column (E). Then multiply the result in column (E) with column (C) to find out how much electricity you use at night and how much this use costs you. Enter the results from columns (C) and (E) in the box on the right.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other data in the grey fields only**: Date of meter reading, Day/Week/Year, Meter readings (in the morning and evening), Consumption for period (combined: meters and meters readings, period meter readings at night), Cost per unit (€), Total Cost (€).
2.2 - MONITOR YOUR NIGHT ELECTRICITY CONSUMPTION TO FIND ENERGY GUZZLERS

Insert your results for consumption from column (C) for each day in the chart below. Mark results for each day with an X. After you have completed all days the table gives you information about your night electricity consumption, tells you if you have hidden energy guzzlers, or if you managed to reduce it.

Electricity consumption (kWh)

Insert your results for costs from column (E) for each day in the chart below. Mark results for each day with an X. After you have completed all days the table gives you information about how much electricity costs you throughout the night.

Electricity cost (Euro)

Try to reduce your contribution to this energy waste:

Tips:
1. Chargers still consume some power even if they are not actually charging a device such as a mobile phone. Switch them off or unplug them if they are not in use.
2. Switch your TV off at the mains when you are not watching it.
3. Make sure that the children are switching off their game consoles when they are not playing with them.

Did you know? Mobile phone chargers that are left on and plugged in but not in use are one of the biggest causes of domestic fires not to mention the wasted energy.

Want to do more? Consider buying a PC or TV powerdown. These devices will ensure that the peripherals to these will be switched off when not required.
### 3 - Calculating the Electric Running Cost of Appliances

**What do you need for this exercise?** You will need this recording sheet, a pencil, a calculator.

**Instructions**

In Watts, we can assume an average unit cost of 12.5 cents /kWh at the moment. You will also need to know what the power rating of your appliances – usually displayed on a label on the appliance itself (on the back or underside), as well as a calculator.

If the label on your appliance says 300W (watts) it would use 300W’s (watts) if it was left on for one hour. If the appliance is displayed in Watts it is easy to convert to kWh’s as there are 1000 watts in a kWh – the formula is below.

Watts x hours = kWhs = cost x 12.5 cents.

Then multiply this by the unit cost (£) of electricity per unit costs are averaged for homes. Have a look at the left-hand side for a number of examples of how much different electrical appliances cost you to run.

<table>
<thead>
<tr>
<th>Location</th>
<th>Description</th>
<th>Power Rating (watts)</th>
<th>Operating Hours</th>
<th>Electricity Consumption (kWh)</th>
<th>Cost per kWh (£)</th>
<th>Electricity Cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Iron (1.3kW)</td>
<td>1.30</td>
<td>1.00</td>
<td>0.125</td>
<td>0.16</td>
</tr>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Kettle (1.8kW)</td>
<td>0.15</td>
<td>0.60</td>
<td>0.125</td>
<td>0.08</td>
</tr>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Electric (grill) (1.5kW)</td>
<td>0.45</td>
<td>1.50</td>
<td>0.125</td>
<td>0.06</td>
</tr>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Fan heater (1500W)</td>
<td>2.00</td>
<td>2.00</td>
<td>0.125</td>
<td>0.25</td>
</tr>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Fridge (200 W)</td>
<td>0.20</td>
<td>19.20</td>
<td>0.125</td>
<td>2.38</td>
</tr>
<tr>
<td>Example</td>
<td>Kitchen</td>
<td>Toaster (1000W)</td>
<td>1.00</td>
<td>24.00</td>
<td>0.125</td>
<td>3.00</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Fan (150 W)</td>
<td>0.15</td>
<td>0.15</td>
<td>0.125</td>
<td>0.02</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Screen TV (200W)</td>
<td>0.11</td>
<td>0.11</td>
<td>0.125</td>
<td>0.01</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Tumble dryer (1.5kW)</td>
<td>0.35</td>
<td>0.50</td>
<td>0.125</td>
<td>0.06</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Hairdryer (1kW)</td>
<td>0.10</td>
<td>1.00</td>
<td>0.125</td>
<td>0.12</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Energy-saving light (9W)</td>
<td>0.09</td>
<td>0.09</td>
<td>0.125</td>
<td>0.01</td>
</tr>
<tr>
<td>Example</td>
<td>Living room</td>
<td>Energy-saving light (15W)</td>
<td>0.015</td>
<td>0.15</td>
<td>0.125</td>
<td>0.02</td>
</tr>
<tr>
<td>Example</td>
<td>Bedroom</td>
<td>Radiator (1kW)</td>
<td>0.22</td>
<td>6.00</td>
<td>0.125</td>
<td>0.75</td>
</tr>
</tbody>
</table>


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