



EmpowerMed

# Do-It-Yourself: Smart Meter *Manual*



69



Work package: 4  
Work package leader: IREC  
Responsible partner: IREC  
Deliverable 4.2: DIY Smart meter manual

Authors: Lluç Canals Casals & Mariana C. Jiménez Martínez

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## PREAMBLE

This manual explains the different steps needed to correctly run the DIY Smart Meter tool.

This tool aims to inform of the best tariff choice that the household has to decrease the electricity bill without necessarily do any change in the behaviour and, when possible, it suggests some tips and hints that the household might follow to yet present higher savings.

The process can be summarized in several steps to read the results:

- 1) Fill the survey
- 2) Have access to the smart meter
- 3) Collect the data
- 4) Run the program
- 5) Observe the results



# 1 Folder organization

Being a semi-automated tool that uses a specifically developed software for the EmpowerMed project, to run the Do-It-Yourself (DIY) smart meter tool, it is important to first organize the PC folders correctly.

- Save the *DIY\_tool.exe* file and the *tool\_files* folder in the base folder
- Save the *cuestionario.xls* file in the base folder
- Add a new empty folder named: *dades\_anuals*
- Add another empty folder named: *resultat\_enquesta*

Once this is done, you can begin with the steps written in following sections of the manual.

## 2 Getting access to market data

The DIY smart meter tool will automatically connect with Red Eléctrica Española (REE)'s web services to obtain the costs associated with the electricity tariffs available in the regulated market and, in this way, calculate the household's electrical bill. To do so, REE requires a personal token that must be requested by sending an email to [consultasios@ree.es](mailto:consultasios@ree.es). No specific information is needed to obtain it and it takes between one to two working days to obtain an answer.

Once the token is provided, copy and paste it into the *Token.txt* file contained inside the *tool\_files* folder and save the changes. As an example, if the token is ABCDEFGHIJKLMNOPQ12345678890, the *Token.txt* file should look as shown in Figure 1.

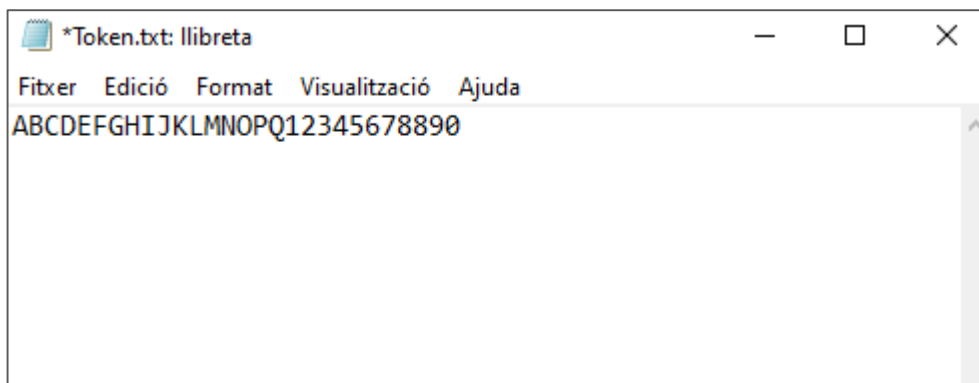


Figure 1: Example of the *Token.txt* filled with a personal token.

This process should be done only one time. No other file in the *tool\_files* folder should be modified or deleted. Otherwise, the tool functioning might be compromised.

### 3 Filling the survey

The DIY smart meter tool needs some relevant information about the person to clearly state the energy reduction possibilities and to present the governmental economic helps available. To do so, an on-line survey using *google forms* (Figure 2 shows an screenshot of the survey) has been developed which asks several kind of issues divided in 10 sections:

- Personal data
- Occupancy data
- Household data
- Contracted energy services
- Comfort perception
- Natural ventilation
- Heating system
- Cooling system
- Equipment and devices
- Other energy poverty related questions

Figure 2: Screenshot of the on-line survey available at <https://forms.gle/rQhVv1xfE9DTtNU16>

The survey is quite longer than what might be necessary for the specific use of the smart meter, but it was decided to do it in this way for two reasons:

- To use the same survey for the DIY smart meter and the Thermal comfort action executed by IREC. Thus, filling one survey for all the actions.
- To be able to collect representative data that could be further use to compare with other actions and pilot sites.

Once the survey is filled, answers can be discharged in an \*.csv file. This process is done by going to the answers section of the google forms, left click to the green database icon or the 3 dots visible in Figure 3 top and then selecting download \*.csv file as shown in Figure 3 bottom.

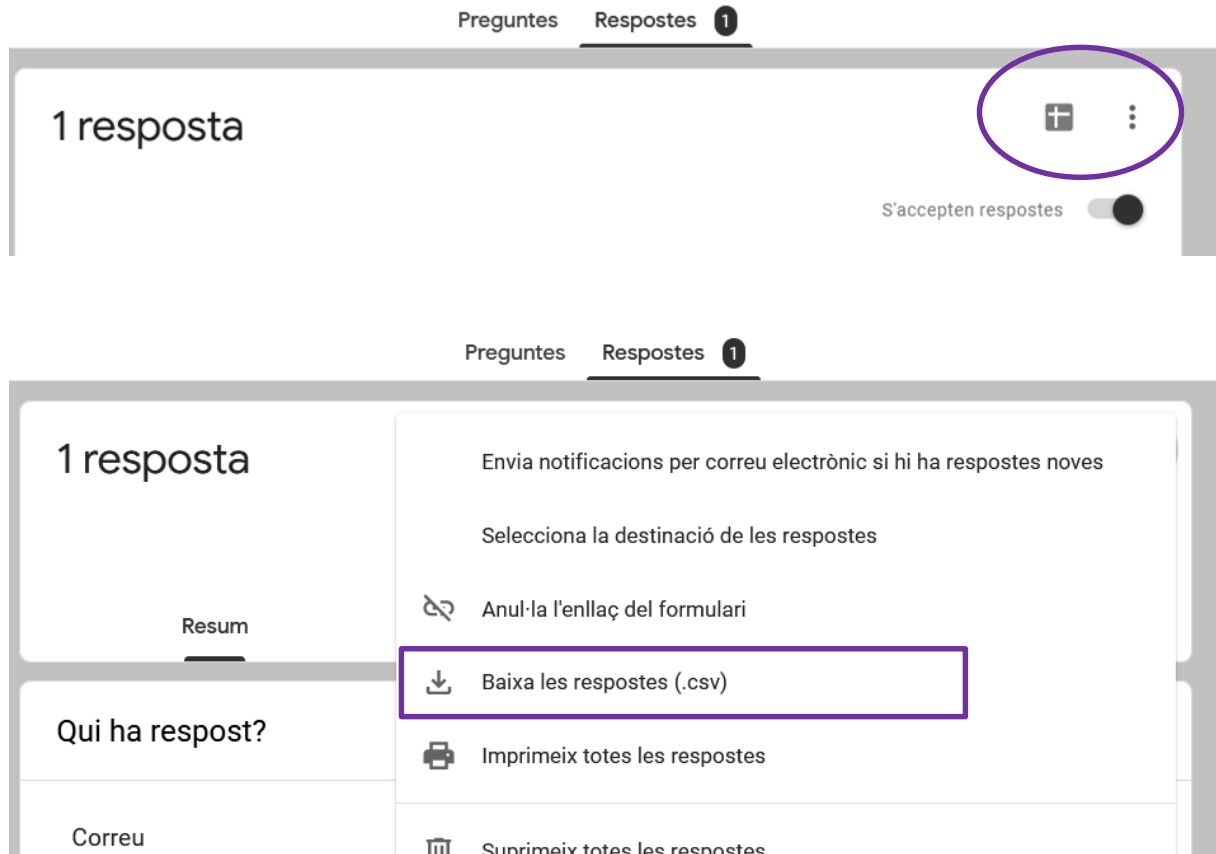


Figure 3: Screenshot of the icons (top) and how to download the answers (bottom).

This file should be saved in the *resultats\_enquesta* folder.

Note that nothing should be done to this file.

Note also that this file has the answers of all the surveys passed, so the same document might serve for all the people that has filled the survey.



## 4 Obtaining the smart meter data

This section presents the process to obtain the data from the smart meter. This section describes the different steps needed to follow in order to gather all the necessary data in the *questionario.xls* file before running the tool.

In Catalonia the vast majority of the territory is controlled by e-distribución (Distribution System Operator company from Endesa), thus, almost all the information related to each smart meter is accessible to the private area of e-distribución website, where the person having the contract can introduce its identification number and password.

<https://zonaprivada.edistribucion.com/areaprivada/s/login/?language=es&startURL=%2Fareaprivada%2Fs%2F&ec=302>

If the owner of the contract had never accessed this page, a registration form should be filled, by giving the following information:

- Usual profile: Select consumer
- Particular or legal representative: Select particular
- Name, surnames, NIF, email, telephone number, language of communication.
- Complete address,
- Attach a scan or picture of your NIF

The activation of the access might take several hours, reason why this process cannot be conducted during the collective assemblies and either they have already access or the process should be done afterwards.

### 4.1 Contract information

Once accessed, the user should first click on “tus suministros” from the selection panel (Figure 4) to identify several of the information related to the contract conditions.

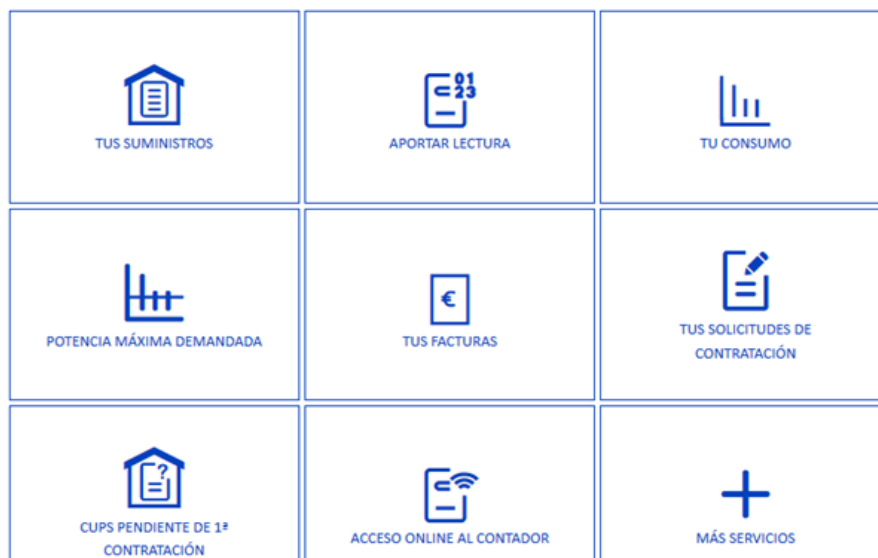


Figure 4: Panel of options given by endesa distribución to consult data

A list of all the contracts related to this person appear indicating the CUPS Number (unique for each installation), the number of contract, the location, the postal code, the address, the retailer company, the tension (normally BT from Low Tension in Spanish) and the tariff contracted.

By doing a click on the contract number, you access the details of it. For the project, the following information is relevant:

- Retailer (Comercializadora)
- Tariff (Tarifa)
- Mode of power billing (Modo de facturación de potencia)
- Power Contract (Potencia contratada)

Please, add this information into the excel file *questionario.xls* that goes with the tool and click the "home" icon of the website to go back into the initial panel (Figure 4).

## 4.2 Maximum Power Demand

The next step is to click on the maximum power demand icon (*consultar potencia máxima*) in the panel (Figure 4) and, once the list of CUPS related to the person appears, click on the consult box of the one to analyze (Figure 5).

CUPS	POBLACIÓN	C.P.	DIRECCIÓN	
ES003 [REDACTED]	SANT JUST DESVERN	08960	VIOLETA PARRA [REDACTED] SANT JUST DESVERN, BARCELONA	<a href="#">Consultar potencia demandada</a>

< ANTERIOR **1** SIGUIENTE >

Figure 5: List of CUPS related to the person identified

Once inside, the website presents the results in both graphical and numbers, as shown in Figure 6. Please note the maximum value in the excel file *questionario.xls*.

Potencias Máximas Registradas

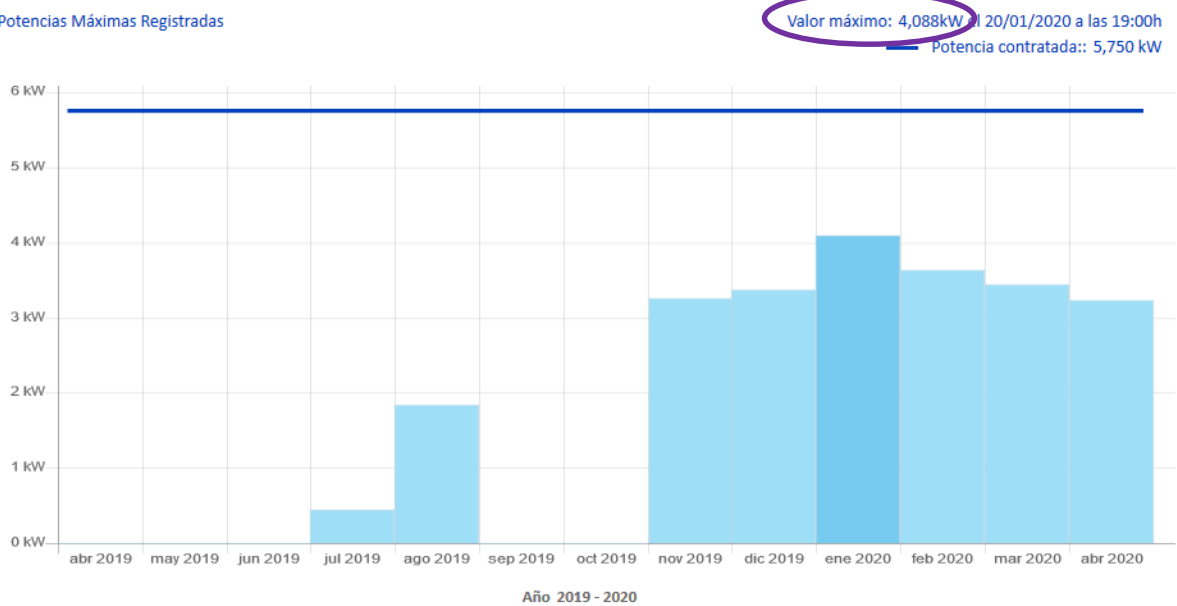


Figure 6: Example of the maximum power per month and the power contracted

### 4.3 Yearly consumption

To obtain the yearly consumption it is necessary to click on the "tu consumo" button in the initial panel (Figure 4). Note that although using one year's data is strongly recommended, the tool can work with any other time frame.

There are two possibilities to obtain the consumption curves of the dwelling linked to the smart meter. The faster one is to download them at once, using the massive curve discharge (marked with the upper purple circle in Figure 7). The second option is to consult it month by month by doing a click in the "consult curve" button (marked with the lower purple circle in Figure 7).

## Tu Consumo

### Consulta de curvas de consumo

Aquí puedes visualizar la representación gráfica de tus curvas de carga para el período seleccionado. También podrás consultar y descargar los datos de consumo del suministro seleccionado.

#### Servicios

> Descarga masiva de curvas

Selecciona la persona o razón social para hacer la consulta

APLICAR

> Filtros

CUPS	INICIO CONTRATO	FIN CONTRATO	DIRECCIÓN
ES00	09-jul.-2019		VIOLETA PARRA JUST DESVERN, BARCELONA

< ANTERIOR 1 SIGUIENTE >

Consultar Curva

Figure 7: Consumption curve download possibilities

### Massive discharge

By selecting massive discharge, the user will enter into a page where the CUPS number should be selected together with the time frame to analyze (initial and end month and year). Then the user should click on the request discharge button.

After some minutes, the file should appear, having the possibility to download it. Even though the website seems stuck while downloading data, pressing F5 or refreshing your browser after some seconds could help to finally see the results. This file is the one that the DIY smart meter tool will use to analyze the possibilities of bill savings.

Note that this process does not always work and sometimes it presents some problems both in the discharging process or the file might skip some days of data. That's why it is suggested that the user should follow the month by month discharge option.

### Month by month discharge

Although much slower, this option is, by far, more reliable. After doing click on the "Consultar curva" button, the user will see (by default) the consumption information of the last day uploaded to the website, which should be similar to the one presented in Figure 8.

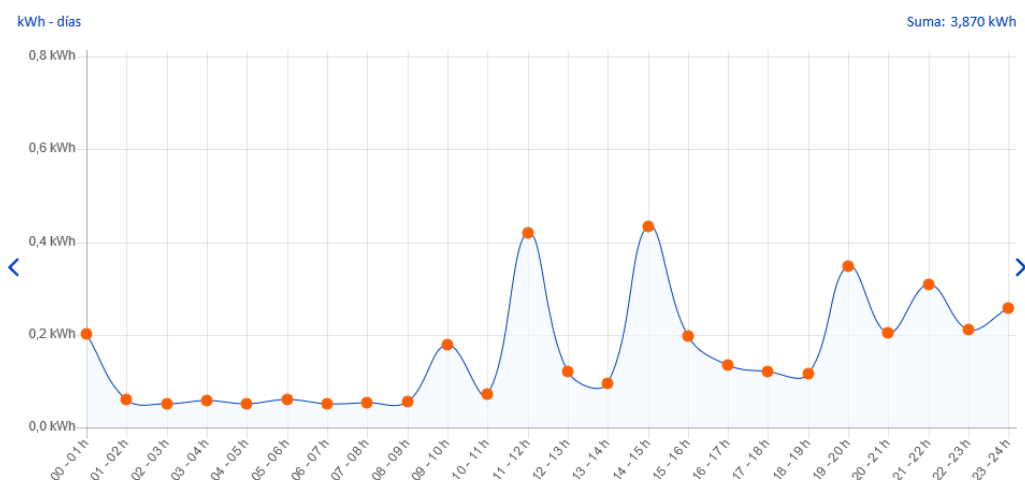


Figure 8: Example of the consumption curve of one day

To obtain the information of each month, the user should click on the option “avanzado” and select the initial and end date. This process does not allow to select more than 60 days. Thus, to ensure a correct collection of data, the user should then download the data month by month.

The image that appears is similar to the one before but, instead of hours, the figure presents the total consumption of electricity per day. It is possible, then, to see the hourly data in a table format (Figure 9) by doing click on the “datos horarios y descarga” button.

	01/03	02/03	03/03	04/03	05/03	06/03	07/03
00 - 01 h	0,101	0,157	0,113	0,087	0,050	0,054	0,035
01 - 02 h	0,023	0,098	0,067	0,038	0,029	0,019	0,093
02 - 03 h	0,092	0,090	0,082	0,030	0,028	0,042	0,024
03 - 04 h	0,023	0,072	0,097	0,019	0,050	0,055	0,062
04 - 05 h	0,094	0,011	0,031	0,088	0,048	0,024	0,038
05 - 06 h	0,023	0,028	0,040	0,062	0,029	0,039	0,062
06 - 07 h	0,093	0,150	0,127	0,043	0,125	0,058	0,022

Figure 9: Table with the hourly consumption of data per day presented in the website

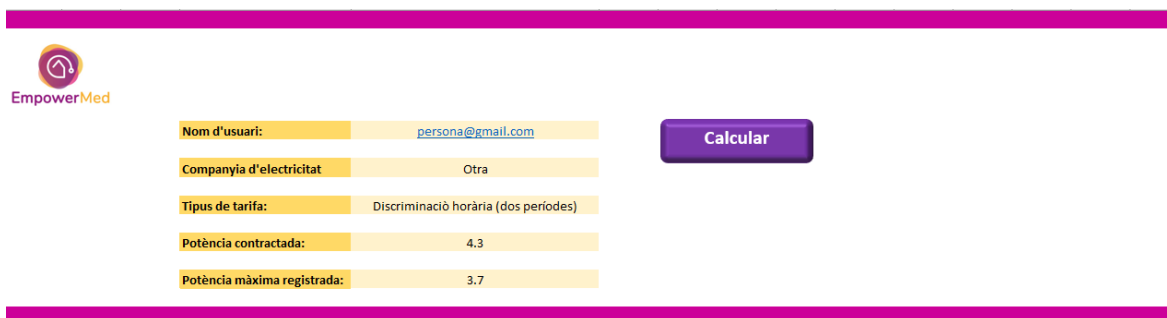
To discharge these data, scroll down until the bottom of the page and click the button “Descargar \*CSV consumo”. This will discharge and \*.CSV file with the data in the format used by the tool and also by other systems such as facturaluz CNMC. The file will be named with the number CUPS plus the initial and end date and should be saved to the *dades\_anuals* folder.

**ALERT:** The tool **won't work** using the other button (descargar tabla de consumos).

## 5 Run the tool and results

Once all the data is collected from the survey and the website, it is possible to run the DIY smart meter tool.

To do so, please open the *questionario.xls* file. Make sure that all the squares are complete and press the run (*Calcular*) button (Figure 10). This will automatically execute the DIY smart meter tool that will use the information stored in the different folders described in the previous sections



The screenshot shows the EmpowerMed interface. It features a logo on the left and a form with the following fields:

Nom d'usuari:	persona@gmail.com	Calcular
Companyia d'electricitat	Otra	
Típus de tarifa:	Discriminació horària (dos períodes)	
Potència contractada:	4.3	
Potència màxima registrada:	3.7	

Figure 10: Screenshot of the *questionario.xls* file

The results of the tool are presented in a two-page report (see Annex I) that is stored automatically as a \*.pdf in the same folder where the energy consumption data was stored. The first page presents the basic information on how much economic savings one might obtain doing very simple actions such as changing tariff and power contracted.

The second page is related to the consumption patterns. In there, the energy consumption peaks for winter and summer are identified, which can be useful to give advice on possible energy consumption pattern changes that might also help to reduce the energy bill. Additionally, we identify the minimum consumption of the building in comparison to what is expected to be "necessary" in average households. This is useful to identify if there are connected devices while not in-use (stand-by, etc...) (and its correspondent amount of energy) that can be completely switched off to save energy and, thus, money.

## Annex 1: Example of an automatic report.



**Jaume:**



**Ahorra**

**hasta 86€ al año.**

• Con tu tarifa y potencia actual gastas 501€/año.



**Baja**

**tu potencia contratada a 4.5 kW.**

• Tu potencia actual es de 5.5 kW.

• Ahorrarás hasta 38 €/año.



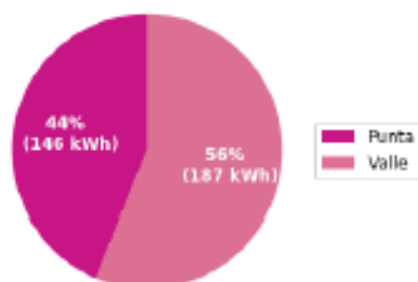
**Cambia**

**tu tarifa a 2.0DHA.**

• Pasa a mercado regulado, ahorrarás y podrás acceder a ayudas para disminuir aún más tu factura eléctrica.

• Con esta nueva tarifa podrás ahorrar hasta 48 €/año.

Así se ve tu consumo para cada periodo:



Solicita el BONO SOCIAL y ahorra hasta 104 € más.

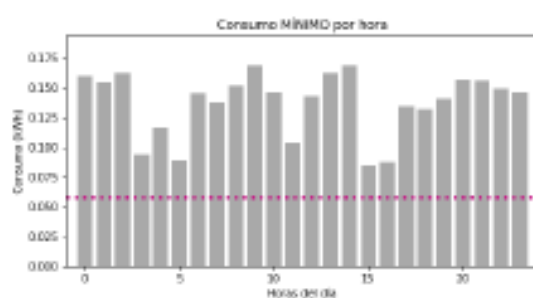
Recuerda: el IRER te protege al evitar desconexiones.

## ¡Conoce más sobre tu consumo eléctrico!

### Algunos consejos útiles:

Es posible que algunos aparatos eléctricos consuman energía aun cuando no lo uses. Desconectarlos podría representarte un ahorro extra de hasta 8 €/año.

Muy probablemente tu demanda máxima se registra a las 7:00, 19:00 o 12:00. Puedes disminuir tu potencia desplazando algunas de tus actividades a otros horarios. Conversa con tu asesor energético para definir posibles estrategias de ahorro.



### Así se ve tu consumo según la temporada del año:



Invierno  
Sin datos para la temporada de invierno.

¡Gracias, esperamos que esta información sea de utilidad!

*Nota: Existen planes para cambiar las tarifas de electricidad actuales en la primavera de 2021. Pregunta a tu asesor energético como afectará esto a tus opciones de ahorro.*



# DYI – data collection questionnaire



This small survey is a file card with the purpose of following up your case and the adequate management of data. Filling it in won't take you more than 10 minutes.

## Personal data

**Name:** .....  
(Your name is only needed for internal organisation, you can use a nickname if preferred)

**e-mail:** .....

**City/Town:** ..... **City code:** .....

**Street and number:** .....  
(No need to specify floor or door number.)

**01. Gender:**             Man                             Woman                             Other/Non binary

**Mobile phone:** .....

### 02. What is the level of completed formal education?

- Less than primary education
- Primary education
- Secondary education
- Short-cycle tertiary education
- Bachelor or equivalent
- Master or equivalent
- Doctoral or equivalent

## Household situation

### 03. Specify the number of people in the household depending on age and gender:

Age/Gender	Woman	Man	Other/non binary
Minors (0-17)			
Adults (18-64)			
Elderly (65 +)			

### 04. What type of household are you?

- Single-person household
- Couple with children
- Couple without children
- Single-parent family
- Two or more non-familiar persons
- Other

**05. Are you a recipient of public social welfare?**             Yes             No

**06. Are you accommodated in social housing?**             Yes             No

### 07. Thinking of your household's total income, is your household able to make ends meet, that is pay your usual expenses...

- With great difficulty
- Fairly easily
- With difficulty
- Easily
- With some difficulty
- Very easily



# DYI – data collection questionnaire



EmpowerMed

Insulation on windows and doors					
Thermal insulation of walls					
Time switch					
Replacement of old doors and windows with new ones					
Water saving aerators					
Biomass heating system					
Solar systems					

**If you answered No or Maybe, can you explain why?**

**O16. Do you use any renewable energy sources at home?**  Yes  No

**O17. If yes, what?**

- Solar thermal
- Solar photovoltaics
- Geothermal
- Renewable electricity supply contract
- Biomass
- Wind
- Biogas
- Other (please describe): \_\_\_\_\_

**O18. Do you have any of the following problems in your dwelling?**

- Leaking roof
- Rot in window frames or floor
- Damp walls/floors/foundation
- Draught from windows or doors

**O19. Does your dwelling have any isolation?**

- Walls
- Floor
- Other (please describe): \_\_\_\_\_
- No isolation
- Roof
- All
- I do not know

## Comfort and heating/cooling equipment

**O20. How would you assess your summer thermal comfort?**

1    2    3    4    5    6    7    8    9    10  
Unsatisfactory Completely satisfactory

**O21. How would you assess your winter thermal comfort?**

1    2    3    4    5    6    7    8    9    10  
Unsatisfactory Completely satisfactory

**O22. What heating system do you have in your dwelling?**

- Pre-payment meter for electricity
- Pre-payment meter for heating
- Gas heating
- District or (building) central heating
- Petroleum/oil heating
- None
- Electric heating
- Bottled gas heating
- Air pump heating
- Coal heating
- Firewood heating
- Other (please describe): \_\_\_\_\_

**O23. What cooling system do you have in your dwelling?**

- Fan
- Air conditioning in a room
- Centralized system
- None
- Mobile air conditioning
- Air conditioning in more than one room
- Other (please describe): \_\_\_\_\_

## Energy bill

**O24. What is the situation of your supplies?**

	Supply is contracted under my/our name	Supply is contracted under someone else's name	Irregular connection	Supply cut warning	Supply already disconnected	I have accumulated debt	Does not apply / I don't have this supply or service
Water							
Electricity							
Gas							
Heating							

**O25. In order to be able to pay for electricity, heating or other energy use in the home, has your household been forced to do the following in the last 12 months?**

- Cut back on food purchases
- Cut back on lighting
- Cut back on electrical appliance use
- Cut back on use of warm water
- Cut back on basic expenses (e.g. medicines)
- Reduced window opening and ventilation

**O26. Can your household afford to keep its home adequately warm?**  Yes  No

**O27. Can your household keep home comfortably cool during summer time?**

- Yes  No

**O28. In the last twelve months, has the household been in arrears, i.e. has been unable to pay on time due to financial difficulties for utility bills (heating, electricity, gas, water, etc.) for the main dwelling?**  Yes  No

**O34. Under whose name are contracts with energy and water suppliers in your household?**  Woman  Man  Both



**O32. For at least the past six months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been ...**

- Severely limited
- Limited but not severely
- Not limited at all
- Don't know
- Prefer not to answer

O33.

Over the last two weeks:	All the time	Most of the time	More than half of the time	Less than half of the time	Some of the time	At no time
I have felt cheerful and in good spirits						
I have felt calm and relaxed						
I have felt active and vigorous						
I woke up feeling fresh and rested						
My daily life has been filled with things that interest me						

## Explicit consent for the management of data

[Add text based on the general text and country specific requirements]

**Date and place**.....

**Signature (or check if the form is virtual)** .....



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