USAID OD AMERIČKOG NARODA | Asistencija regulativi i reformi energetskog sektora

LOAD RESEARCH

Where to use the load research results?

USAID-REAP
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LR Objectives

- **Determining of tariffs – cost allocation (use of distribution capacity)**
- **Balance settlement – determining load profile classes**

Determining tariffs - cost allocation

Excerpt from FERC Draft Rule

Article 47.

(Allocation of revenue requirement)

(2) Allocation of revenue requirement for the electricity distribution to the categories and consumption groups is done based on analysis of marginal costs.

Article 48.

(Analysis of marginal costs)

(7) Revenue per marginal cost of the distribution capacity for a certain category and consumption group is a product of the cumulative marginal cost and peak load of that category and consumption group (non-coincident peak load).

Article 65.

(Implementation of the tariff methodology)

Full implementation of the tariff methodology, which is determined by this Rule, is possible when the following conditions are met:

c) The possibility of implementation of the full load research analyses for the purpose of cost allocation to the categories and consumption groups.

Excerpt from FERC's Draft Rule (continuation)

$$PMT_{Dk} = \sum_{j=1}^{n} MT_{Dkj} * P_{Vj} = \sum_{j=1}^{n} PMT_{Dkj}$$

PMT_{Dk} - prihod po marginalnom trošku distributivnog kapaciteta,

MT_{Dkj} - kumulativni marginalni trošak distributivnog kapaciteta naponskog nivoa,

$j=1,2,3,...,n$,

PMT_{Dkj} - prihod po marginalnom trošku distributivnog kapaciteta j-te kategorije i grupe potrošnje j = 1,2,3,...,n,

P_{Vj} - vršno opterećenje j-te kategorije i grupe potrošnje, j=1,2,3,...,n.

$$k = \frac{PP_{DK}}{PMT_{DK}}$$

$$PP_{Dkj} = k * PMT_{Dkj}$$

$$c_{Dkj} = \frac{PP_{Dkj}}{\sum_{i=1}^{m} P_{Vji}}$$

P_{Vji} - vršno opterećenje i-tog kupca j-te kategorije i grupe potrošnje

How to obtain Pvj? – Ilustration

- **It is technicaly possible for the categories and groups that have their consumption metered (newly-formed groups?)**

- **From ERS' report:**
  - **Load curve for the sample "other consumption" – daily diagram**
  - **The total consumption for the category "other consumption": metered monthly**

How to obtain Pvj? – Illustration (cont'd)

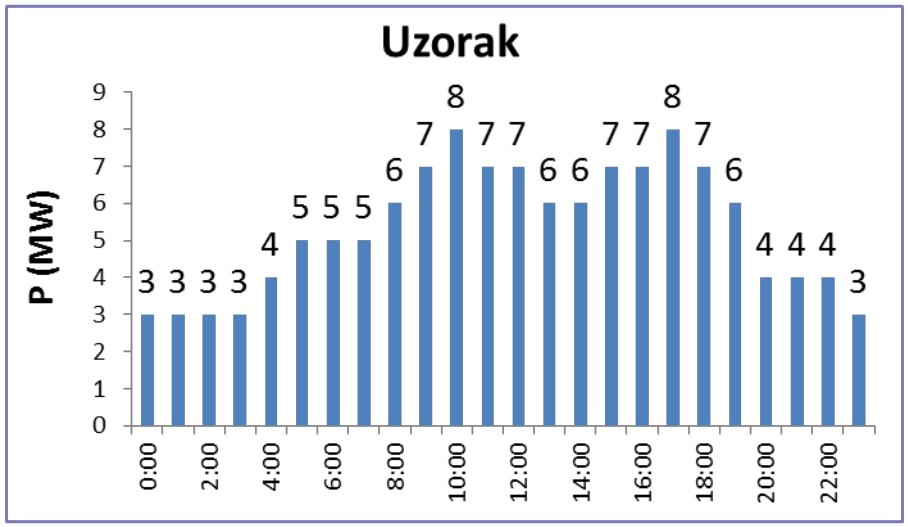
- **The procedure:**
  - **The total consumption for the category "other consumption" reduced to 24 hour consumption (approximated and simplified)**
  - **Development of normalization coefficients based on the daily load diagram**
  - **Application of normalization coefficients to daily consumption**
  - **(The exact procedure requires load diagrams and consumption on monthly/annual level)**
- **The procedure is same for the category of households**
- **This procedure is made only for illustration purposes (approximated and simplified)**

Normalization of load curves for the categories of households and other consumption

- **Testing of accuracy and harmonization of the real consumption with the consumption obtained from the load curve for the same period.**
- **This can be done by consumption groups:**
  - **Data for monthly/annual consumption is available**
  - **Daily diagrams for consumption groups on monthly/annual level is/will be available**
  - **The missing data can be "translated"**
  - **The results of the analysis of the other EPs can be of help**
  - **It is more precise if done on annual/monthly level**

How to normalize a load diagram

h	Uzorak	Norma	Populacija
0:00	3	0.023	1172
1:00	3	0.023	1172
2:00	3	0.023	1172
3:00	3	0.023	1172
4:00	4	0.031	1563
5:00	5	0.039	1953
6:00	5	0.039	1953
7:00	5	0.039	1953
8:00	6	0.047	2344
9:00	7	0.055	2734
10:00	8	0.063	3125
11:00	7	0.055	2734
12:00	7	0.055	2734
13:00	6	0.047	2344
14:00	6	0.047	2344
15:00	7	0.055	2734
16:00	7	0.055	2734
17:00	8	0.063	3125
18:00	7	0.055	2734
19:00	6	0.047	2344
20:00	4	0.031	1563
21:00	4	0.031	1563
22:00	4	0.031	1563
23:00	3	0.023	1172
	128	**1**	**50000**



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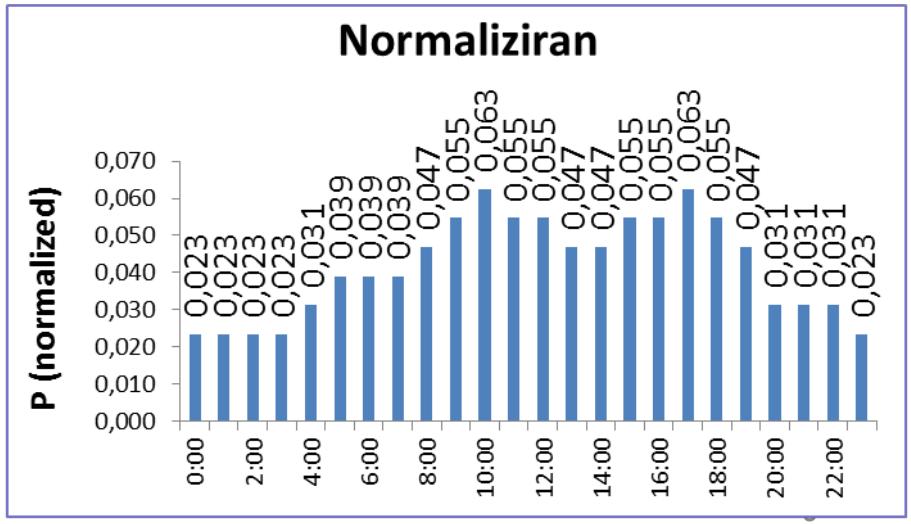

How to obtain population load diagram

h	Uzorak	Norma	Populacija
0:00	3	0.023	1172
1:00	3	0.023	1172
2:00	3	0.023	1172
3:00	3	0.023	1172
4:00	4	0.031	1563
5:00	5	0.039	1953
6:00	5	0.039	1953
7:00	5	0.039	1953
8:00	6	0.047	2344
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17:00	8	0.063	3125
18:00	7	0.055	2734
19:00	6	0.047	2344
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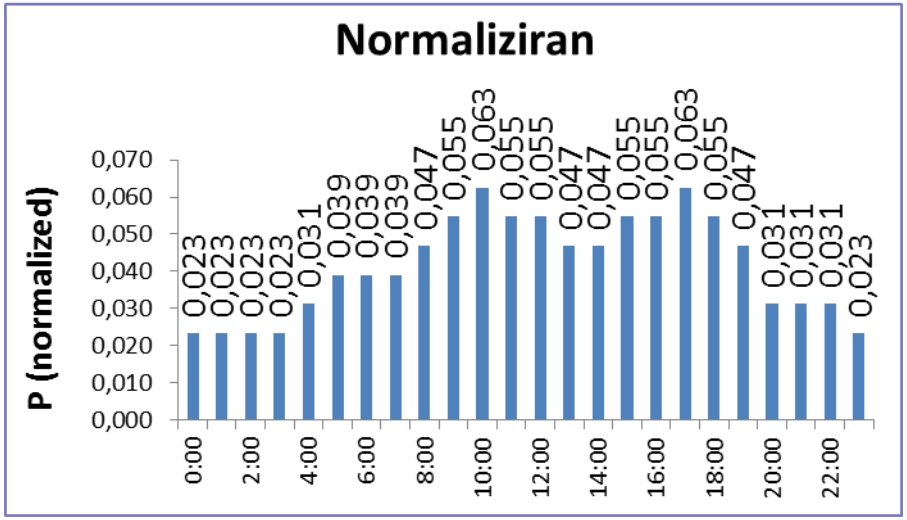
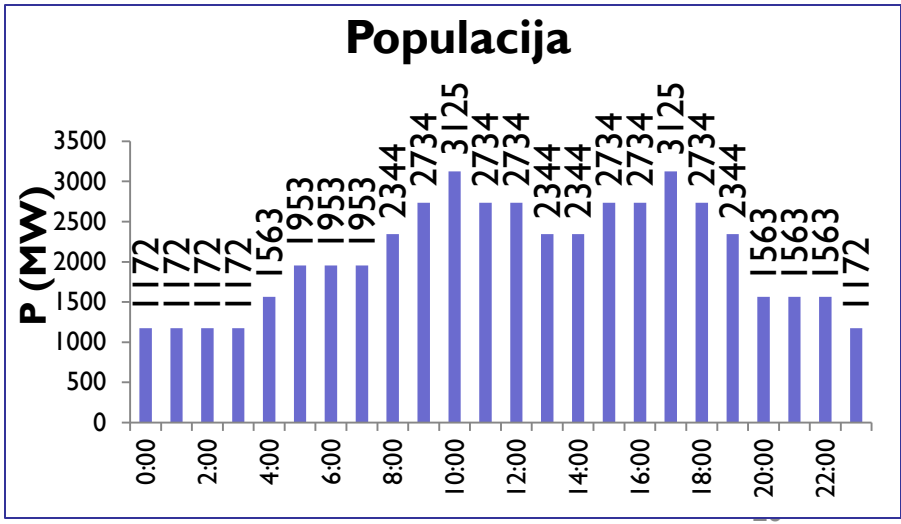
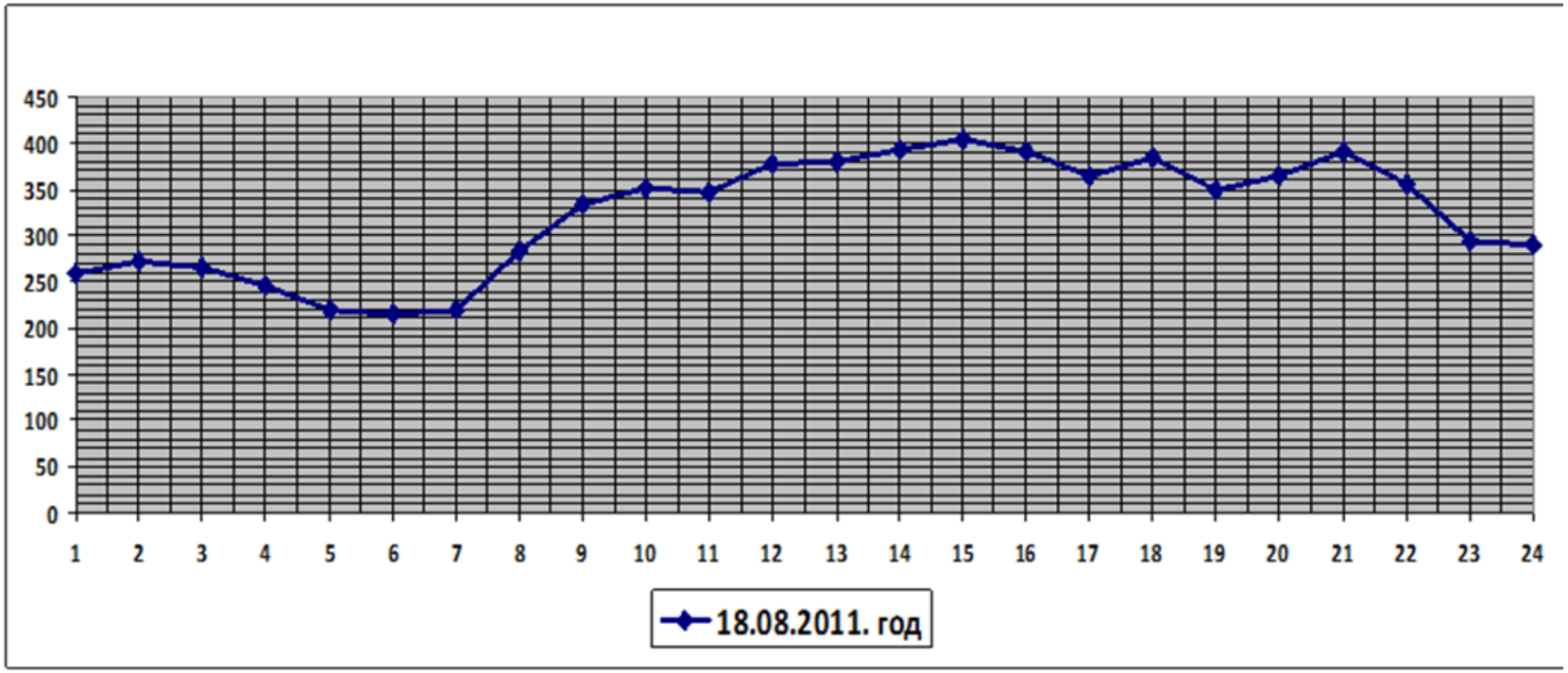
21:00	4	0.031	1563
22:00	4	0.031	1563
23:00	3	0.023	1172
	128	**1**	**50000**



Pomnoženo sa 50000 kWh



Normalization of load curves for the category of other consumption in ERS



Normalization of load curves for the category of households in ERS

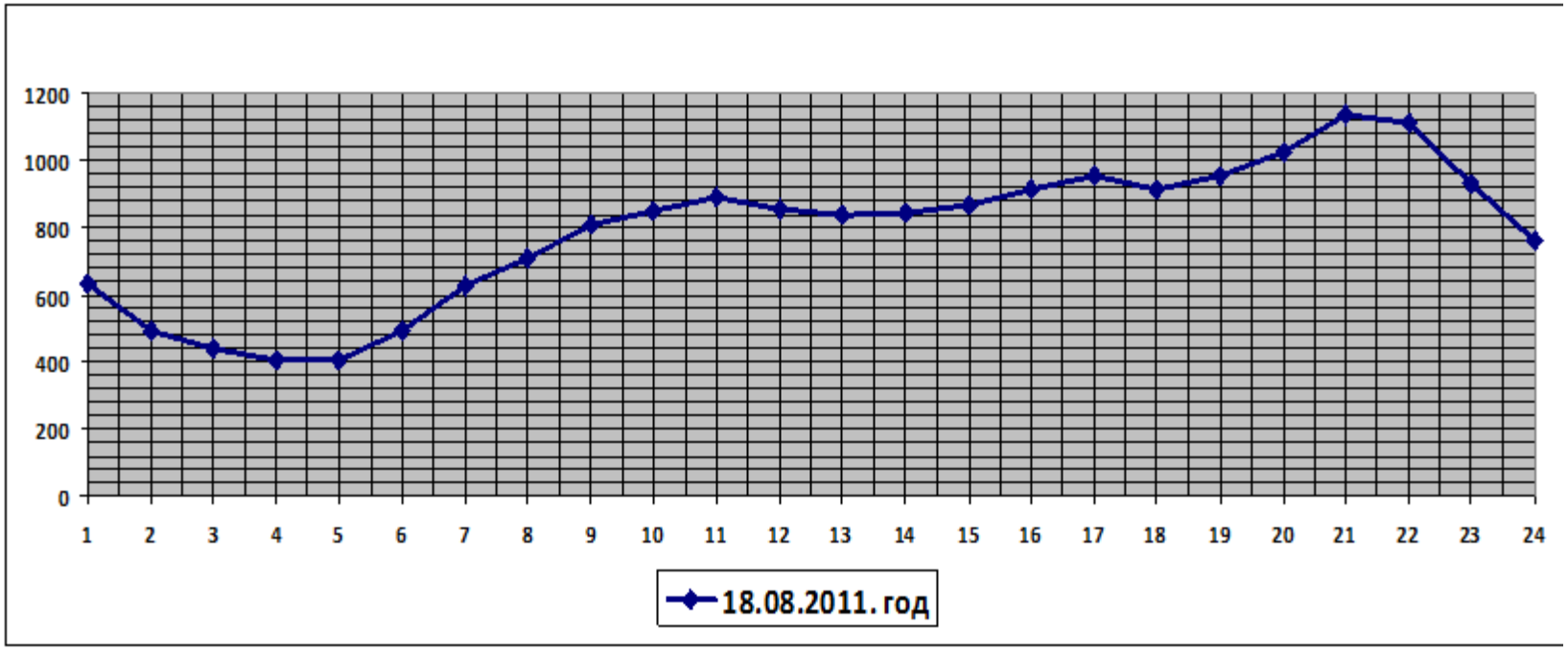


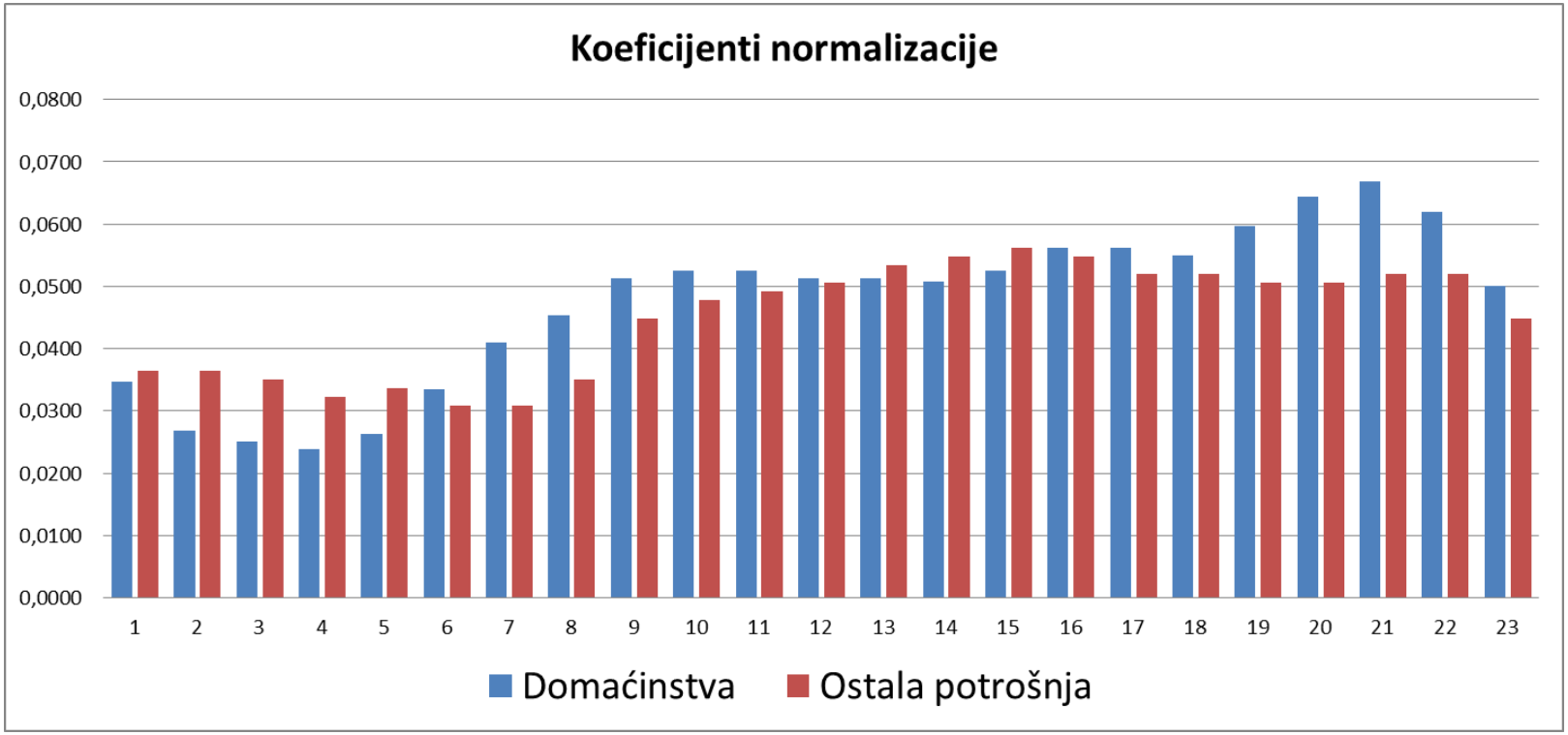
Table of Normalization coefficients for households

	Coef.. Normaliz.	Normalized data
1	0,0346	145664,93
2	0,0268	112827,17
3	0,0250	105249,23
4	0,0239	100618,26
5	0,0263	110722,18
6	0,0334	140612,96
7	0,0410	172608,73
8	0,0453	190711,60
9	0,0512	215550,41
10	0,0525	221023,37
11	0,0525	221023,37
12	0,0512	215550,41
13	0,0512	215550,41
14	0,0507	213445,43
15	0,0525	221023,37
16	0,0561	236179,26
17	0,0561	236179,26
18	0,0549	231127,30
19	0,0597	251335,15
20	0,0644	271122,00
21	0,0668	281225,93
22	0,0620	261018,08
23	0,0500	210498,45

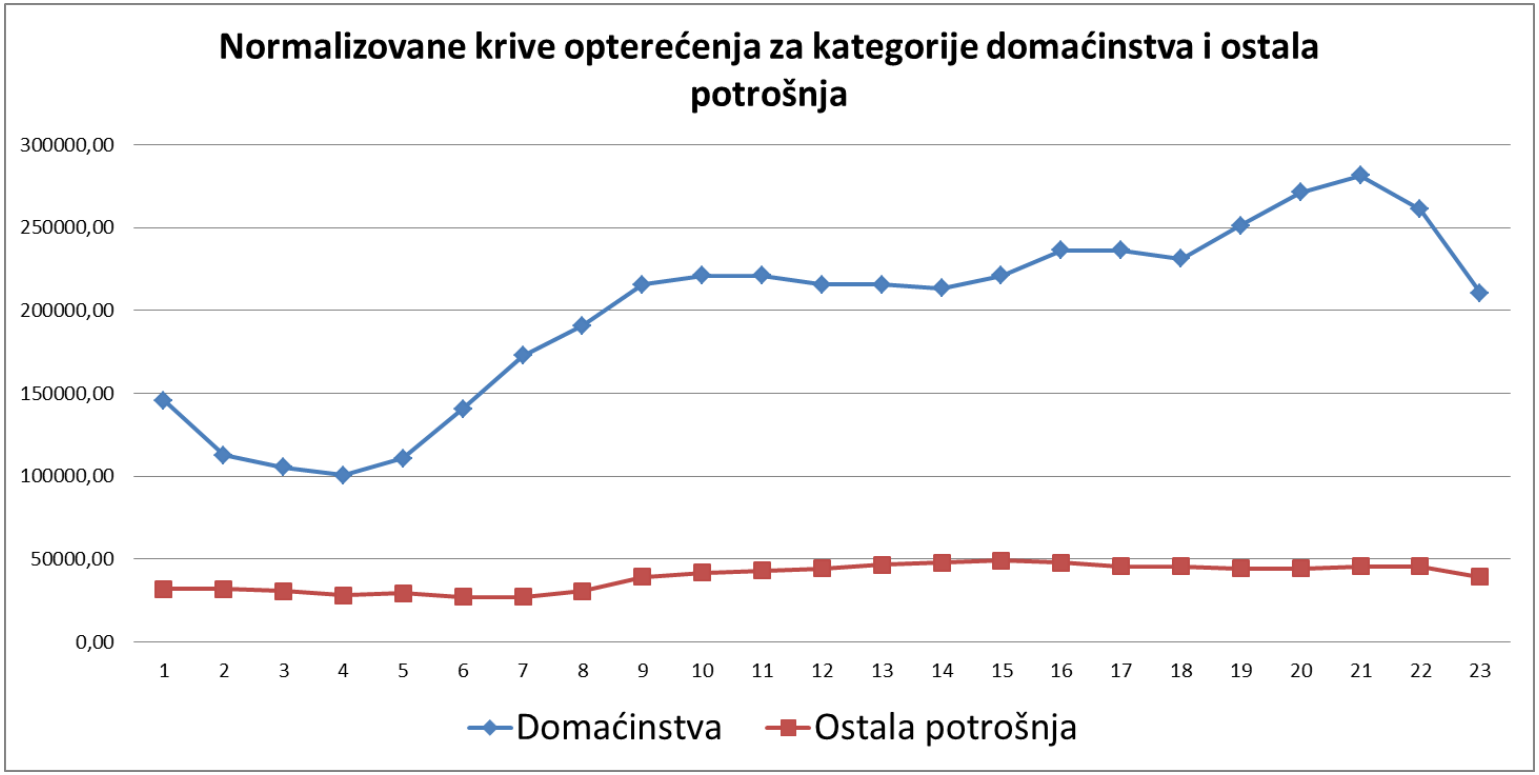
Table of Normalization coefficients for other consumption

	Coef.. Normali.	Normalized data
1	0,0365	32005,025
2	0,0365	32005,025
3	0,0351	30777,435
4	0,0323	28322,255
5	0,0337	29549,845
6	0,0309	27094,665
7	0,0309	27094,665
8	0,0351	30777,435
9	0,0449	39370,565
10	0,0477	41825,745
11	0,0491	43053,335
12	0,0505	44280,925
13	0,0533	46736,105
14	0,0547	47963,695
15	0,0561	49191,285
16	0,0547	47963,695
17	0,0519	45508,515
18	0,0519	45508,515
19	0,0505	44280,925
20	0,0505	44280,925
21	0,0519	45508,515
22	0,0519	45508,515
23	0,0449	39370,565

Table of Normalization coefficients for households and other consumption



Normalized load curves for households and other consumption

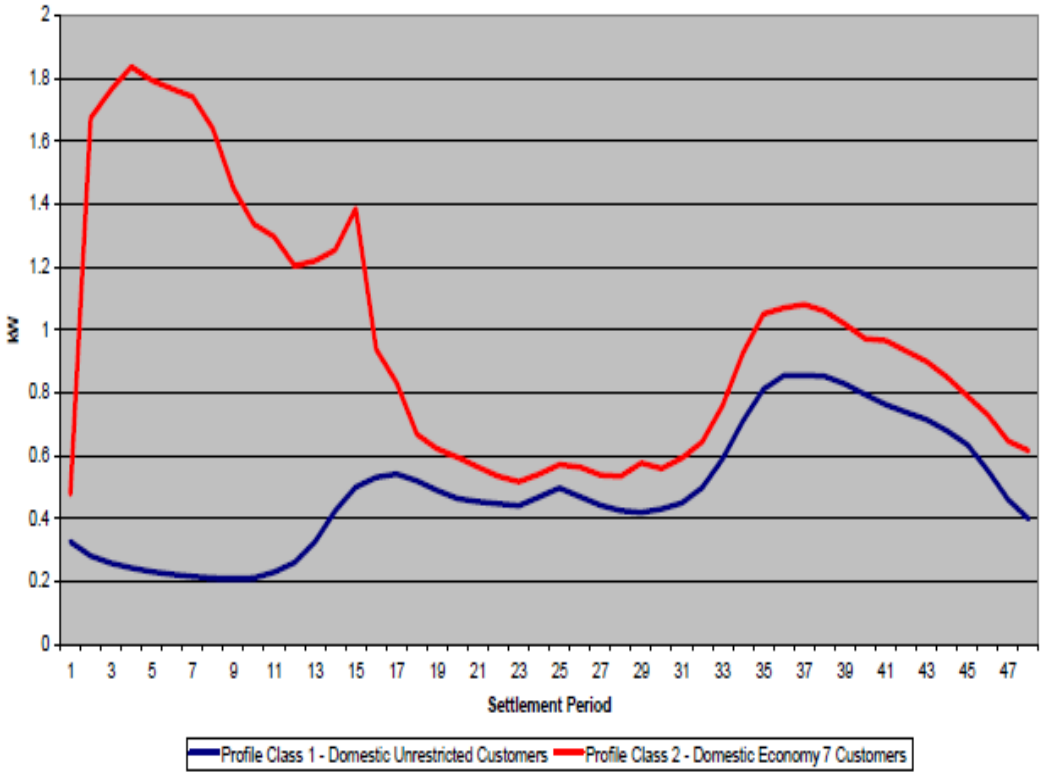


Balance Settlement – determining load profile classes

Determining load profile classes

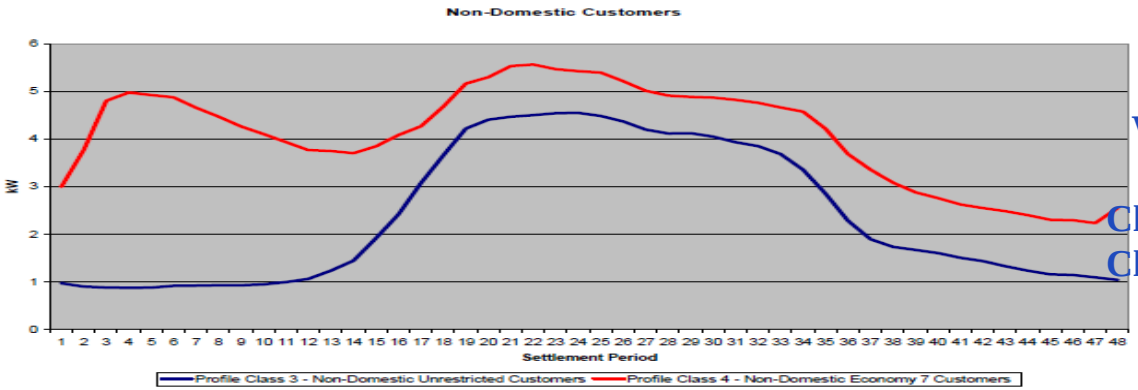
- Is used for the needs of balance settlement that includes all customers
- International practice is different when it comes to the number of classes
- It ranges from two classes (households and other consumption) up to eight classes (UK)

Load curves for some customer categories in UK



Households – two classes

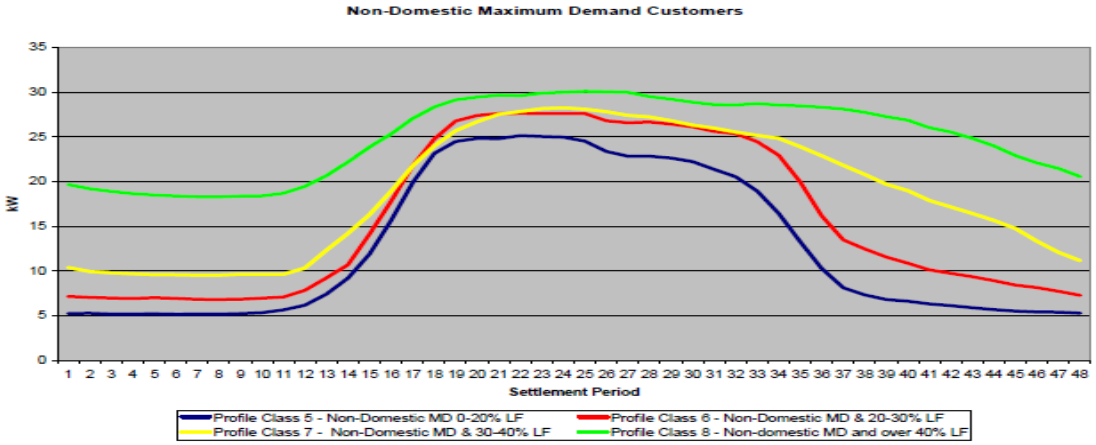
Load curves for the category of other consumption in UK



Without capacity metering:

Class 3: "no limit"
Class 4: "economic"

$$LF = \frac{\text{Annual Consumption(kWh)}}{\text{Maximum Demand (kW)} * \text{Number of Hours in the Year}} * 100$$



With capacity metering:

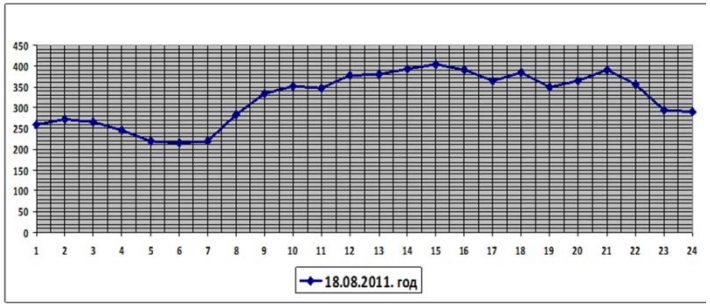
Class 5: LF < 20%
Class 6: 20% < LF < 30%
Class 7: 30% < LF < 40%
Class 8: LF > 40%

Illustrated approach to determining of classes

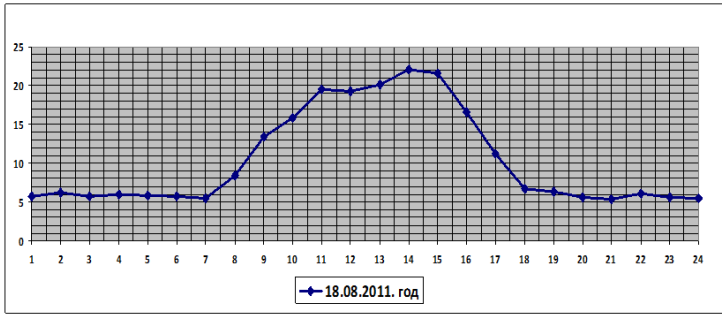
- **Data used from ERS Report**
  - **August and December 2011**
- **The risk of simplification (day instead of year) and inadequate amount of data**
- **Analyzed consumption groups:**

Ostala potrošnja DSO
Adm. Službe
Trg. I Zanati
Usl. Dj.
Vasp-obr.dj.
Ugostiteljstvo
Banke
Mala preduz.

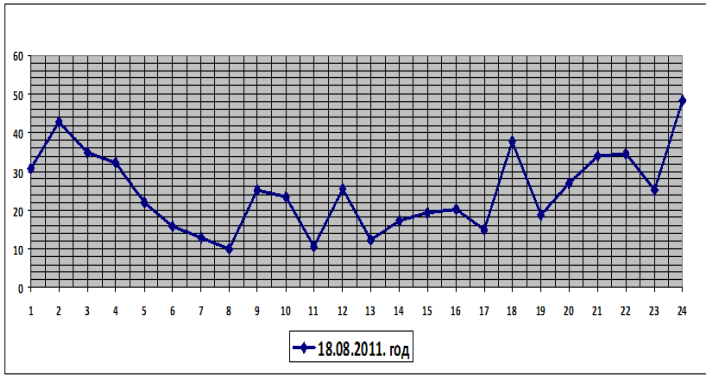
Illustration of the approach to determining of classes (cont'd)



Other consumption DSO



Administrative services



Mala Small manufacturing companies

Illustration of the approach for determining of new classes (cont'd)

- **Load factor was calculated from daily diagrams and the following values were obtained :**

Grupa	*LF decembar*	*LF august*
Ostala potrošnja DSO	*0,76*	*0,77*
Adm. Službe	*0,57*	*0,48*
Trg. I Zanati	*0,52*	*0,64*
Usl. Dj.	*0,59*	*0,31*
Vasp-obr.dj.		*0,29*
Ugostiteljstvo	*0,76*	*0,76*
Banke		*0,45*
Mala preduz.	*0,57*	*0,49*

Illustration of the approach for determining of new classes (cont'd)

Possible profile classes:

0 <Profile class 1: < 0,4

0,4 <Profile class 2 < 0,6

0,6<Profile class 3

Grupa	*Klasa decembar*	*Klasa august*
Ostala potrošnja DSO	*3*	*3*
Adm. Službe	*2*	*2*
Trg. I Zanati	*2*	*3*
Usl. Dj.	*2*	*1*
Vasp-obr.dj.		*1*
Ugostiteljstvo	*3*	*3*
Banke		*2*
Mala preduz.		*2*

What to do in the transition period until 1.1.2015

- **Focus on determining profile classes according to the applicable tariff system in order to have them ready after the finalization of the load research process.**
  - **Households one/two classes?**
  - **Other consumption two classes?**

- **Continue working on defining potential new classes along with determining of new categories and consumption groups so that they can be applied from 1.1.2015.**

Proposals

1. **Tariffs: Direct load research towards obtaining data on peak load for the existing categories and groups and submit them to the regulators as the input for development of tariffs**

   Reasons:

   a. **Databases do not enable extraction of the total consumption of other customers except for those divided according to the existing categories and groups?**

   b. **Considering bullet a, it is not possible to obtain precise alternative load curves for new categories and groups**

2. **Define load profile classes according to the approach from bullet 1**

   a. **Households one/two classes**

   b. **Other consumption two classes**

Proposal (cont'd)

3. Develop and implement coding system for customers (metering places) according to EIC code – partially implemented in BiH. Harmonize with EUROSTAT.

4. Organize the databases by 2015 in order for them to be used in load research and possible definition of new categories and customer groups.

5. Analyze load curves for specific customers (small consumption) in order to assess possible impact on curve shape for the load of the category and group.

HVALA !