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Asistencija regulativi i reformi energetskog sektora

Data analysis

- Introduction -

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Sarajevo, 19 June 2012

Bosnia and Herzegovina (BiH) Regulatory and Energy Assistance Project (REAP)

USAID Contract No. EPP-I-00-03-00004-00, Task Order 5

Implemented by Advanced Engineering Associates International, Inc.

This presentation is made possible by support from the American People sponsored by the United States Agency for International Development (USAID). The contents are the sole responsibility of the author/s and do not necessarily reflect the views of USAID or the United States Government.



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Asistencija regulativi i reformi energetskog sektora

- **Enables expansion (transfer) of gained „knowledge“ on sample by means of metering to the complete category and and to the system by using different mathematical tools.**
- **Mathematical tools:**
 - **Statistical techniques,**
 - **Advanced artificial intelligence techniques.**



Precondition for quality data analysis:

- **Conducted sample validation (average consumption of the sample compared with the total average consumption of each group and stratum).**
- **Removed obvious errors (lack of data and/or unacceptable min/max loads).**
- **Conducted data editing and formatted final base for analysis.**
- **Knowing the main statistical analysis.**



The purpose of data analysis is to show that each diagram (sub-class/class diagram) influences the total diagram of the system!

Analysis can be done for individual customer, sub-class/class, time period (week, month, season) and according to the type of day (work day, Saturday, Sunday**, special days).**



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Data analysis in the narrow sense includes:

- **Calculation of typical factors that describe characteristics of diagram,**
- **Formation of load diagram.**



For the observed time period, on the basis of load diagram it is possible to:

- **Identify P_{max}** (customer, sub-class, class, consumption area)
- **Identify P_{min}** (customer, sub-class, class, consumption area)
- **Determine P_{min}/P_{max}** (customer, sub-class, class, consumption area)
- **Determine P_{sr}** (ratio of total energy in the observed period and that period; may be determined for customer, sub-class, class, consumption area)



Factors that described customer classes/consumption area

- 1. Load factor** (ratio of mean value of capacity and max. Value of capacity sub-class, categories, consumption area in a determined time period)
- 2. Coincident factor within the sub-class/class** (ratio max load of sub-class/class and the amount of non-coincident load of customers within sub-class/class)
- 3. Factor of load share** (ratio of load sub-class/class in the period of max system load and max load sub-class/class)
- 4. Coincident factor of sub-class/class in the system** (ratio of sub-class/class load in the period of max system load and max system load)



Example of table for characteristic information

Type of cust	Type of day	Pmax (kW)	Pmin (kW)	Psr (kW)	Factors				
					1.	2.	3.	4.	5.
Dom.	work								
	Sat								
	Sun								
Comm ercial.	work								
	Sat								
	Sun								
....									



Load diagrams for each category for observed customers

- **Diagrams present typical behavior of subclass/class both on the shape and amplitude.**
- **Some of the following types can be determined:**



- **Diagram for each class of customers is defined in the beginning of research ;**
- **Diagram for each class of customers is normalized in relation to the total consumption - the share of category in the total consumption of the system;**
- **Diagram for each class of customer is normalized in relation to the consumption of the group - relationship between diagram of the class and the total average consumption of the group;**
- **Diagram of the group – this type of diagram makes easier the evaluation of each group/subgroup of customers and consequently, confirms the agreement on energy balance.**



Advanced techniques

- **In addition to the primary statistical analyses it is possible to work on more complex statistical analyses which are based on the establishment of the relationship between variable of interest and auxillary variable (i) - regression models**
- **Load modelling – advanced techniques of artificial intelligence**