

Folosirea datelor provenite de la contoarele Smart in clasificarea consumatorilor



SCOP

Clasificarea consumatorilor in clase reprezentative caracterizate de profiluri tip de sarcina obtinute pe baza masuratorilor asigurate prin intermediul contoarelor smart.

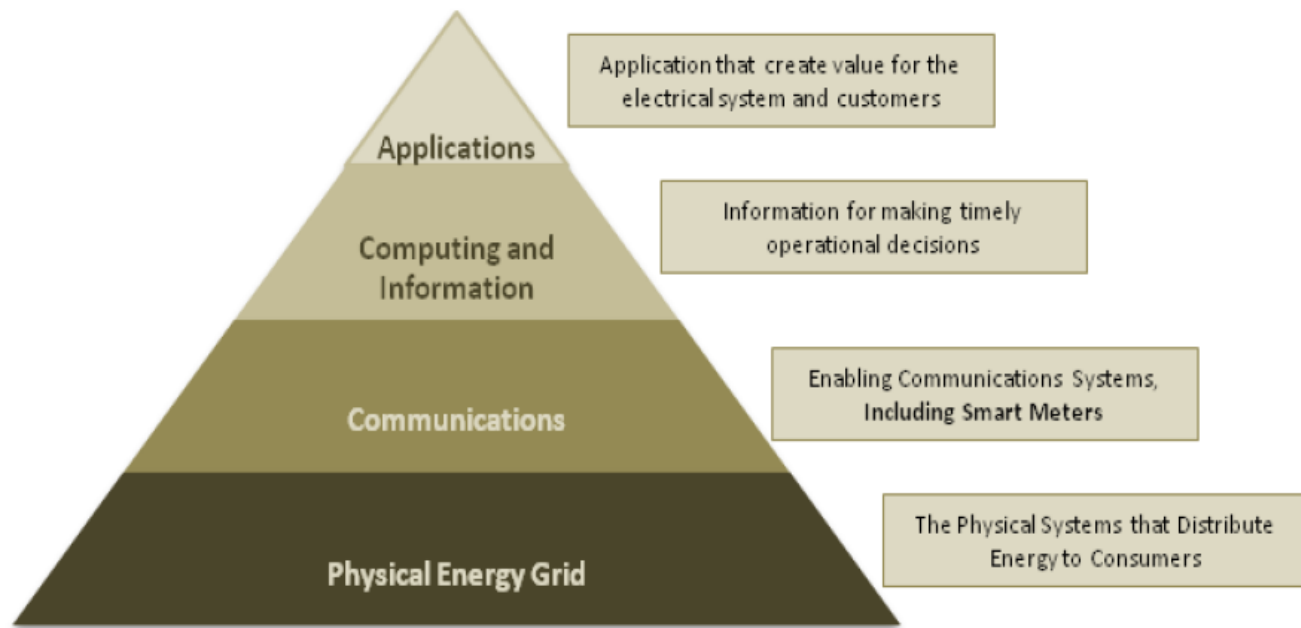
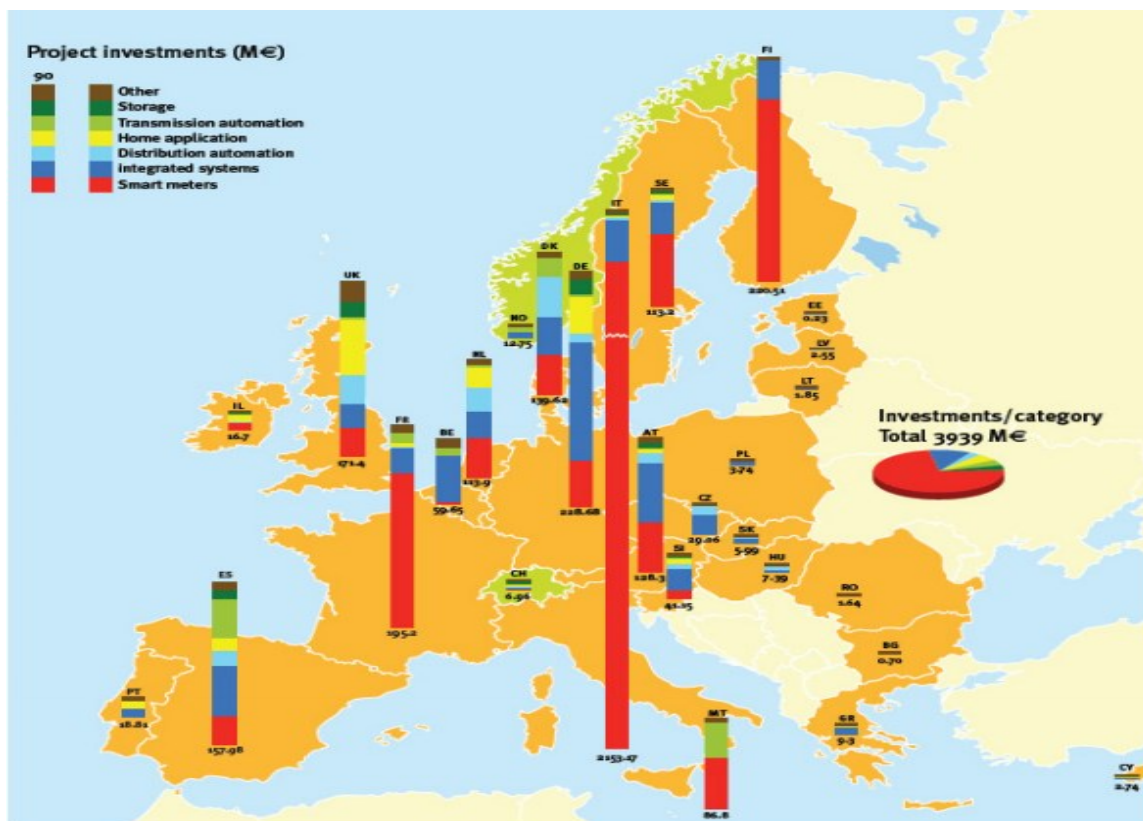


Fig. 1. Infrastructura generala a unei retele inteligente

Proiecte Smart Grids in Europa



219 proiecte la sfarsitul
anului 2012

Buget total
peste 5 miliarde euro

Aproximativ 27% proiecte
Smart Metering.

Use of data from smart meters in optimal operation of distribution systems

Instalarea contoarelor inteligente in Europa

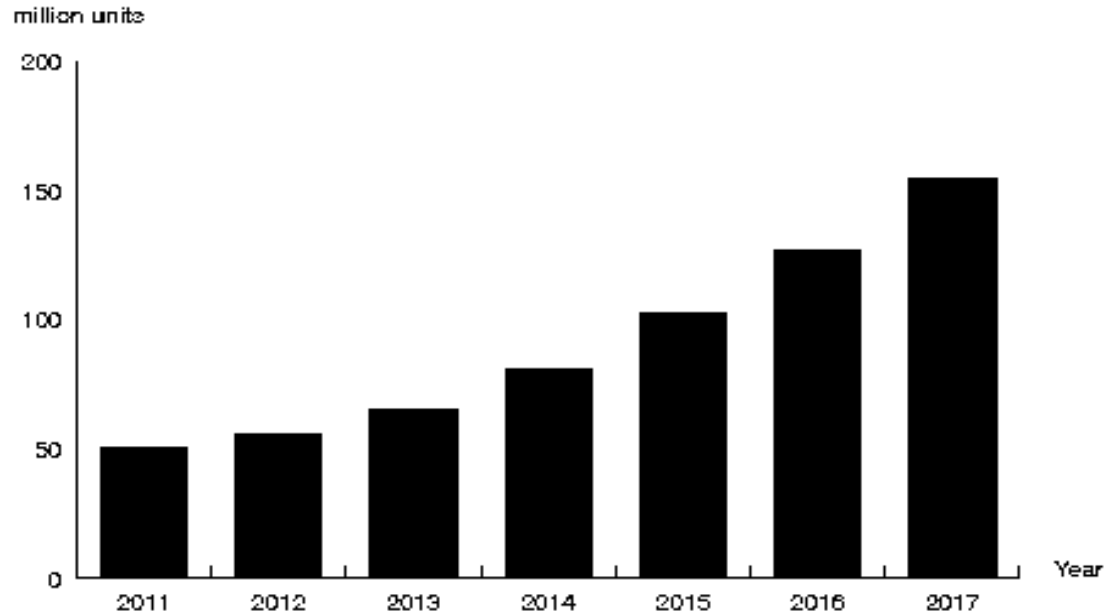


Fig.3. Instalarea contoarelor inteligente in EU27+2 orizont de timp 2011–2017

Instalarea contoarelor inteligente in Romania (sfarsitul anului 2012)

Consumers Category	Consumers number	Smart meters installed [pc.]	Smart meters installed [%]
Public Consumers (Larger non-residential consumers)	20000	9700	(48.5 %)
Small and Medium Non-Residential consumers	600000	-	0
Residential Consumers	8380000	34300	0.4 %
Total	9000000	44000	0.48 %

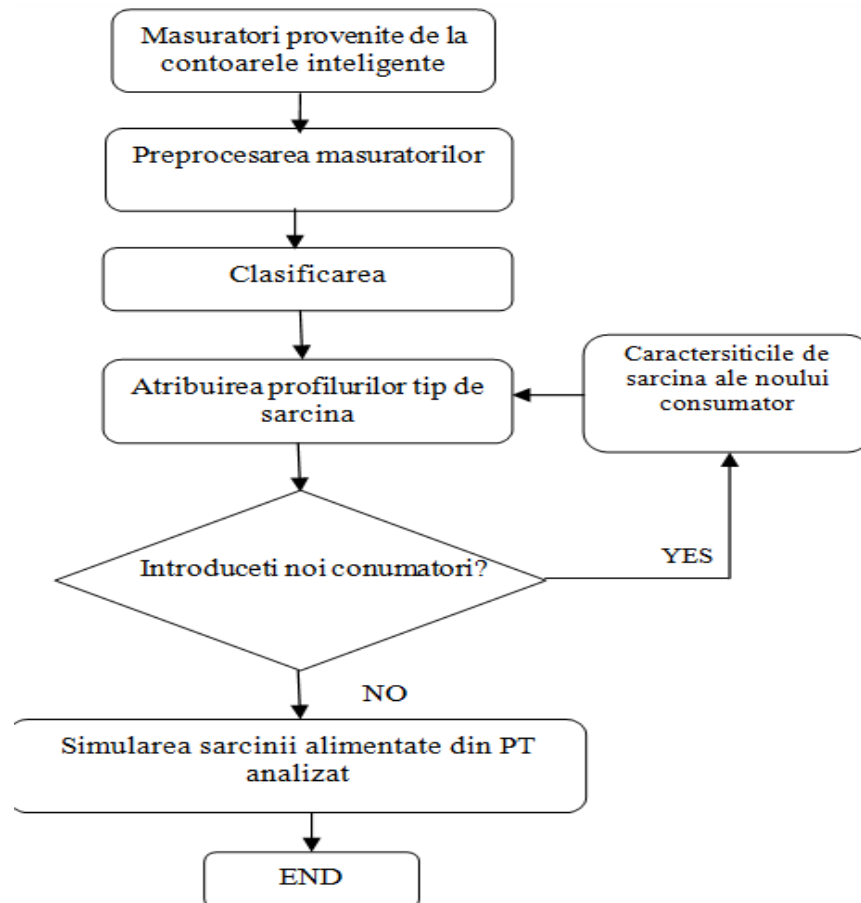
Contoarele inteligente sunt disponibile

Reprezentare foarte incerta a consumului prin intermediul contoarelor smart.

* ANRE report

Use of data from smart meters in optimal operation of distribution systems

ALGORITM PENTRU ESTIMAREA SARCINILOR DIN NODURILE RETELELOR ELECTRICE



Simularea sarcinii alimentate din PT

$$P_S^h = \sum_{i=1}^{N_C} n_i W_{med\ i} p_i^h + \sqrt{\sum_{i=1}^{N_C} n_i (W_{med\ i} \sigma_i^h)^2}, [kW]$$

P^h – sarcina transformatorului la ora h , [kW];

n_i - numarul de consumatori din clusterul i ;

$W_{med\ i}$ – energia medie a consumatorilor din clusterul i , [kWh];

p_i – factorul mediu de sarcina al consumatorilor din clusterul i , [kW/kWh];

σ_i – dispersia factorului de sarcina al consumatorilor din clusterul i , [kW/kWh];

N_C – numarul consumatorilor alimentati din PT, care nu au contoare inteligente instalate.

STUDIU DE CAZ

A. Baza de date

87 profiluri de sarcina corespunzatoare unor mici consumatori rezidentiali dintr-o retea de distributie rurala dotati cu contoare inteligente.

Caracteristici: energia zilnica, sarcina medie, sarcina maxima.

B. Preprocesarea

Excluderea consumatorilor cu valori lipsa in profilurile de sarcina, valori mari sau consum de energie zilnic egal cu 0.

74 consumatori au fost pastrati in baza de date.

C. Clasificarea

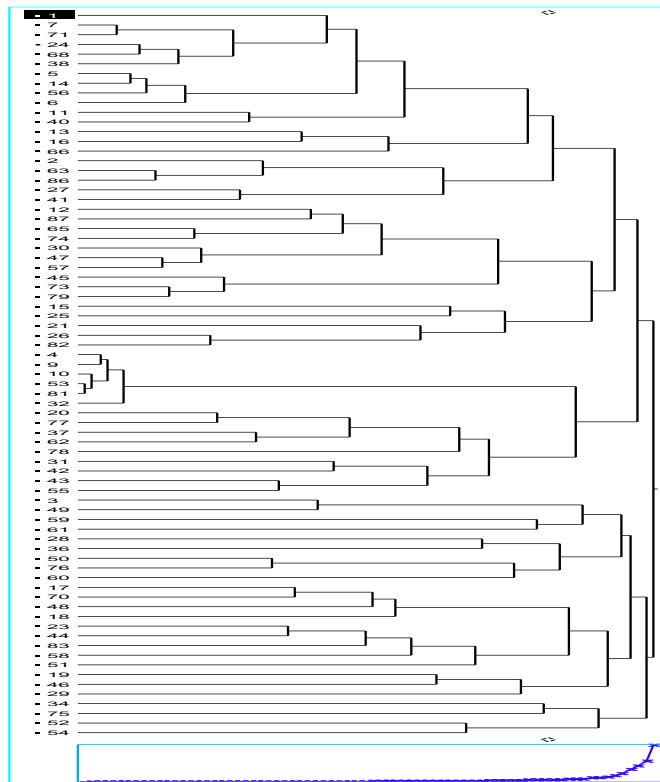


Fig. 5. Dendrograma procesului de clustering

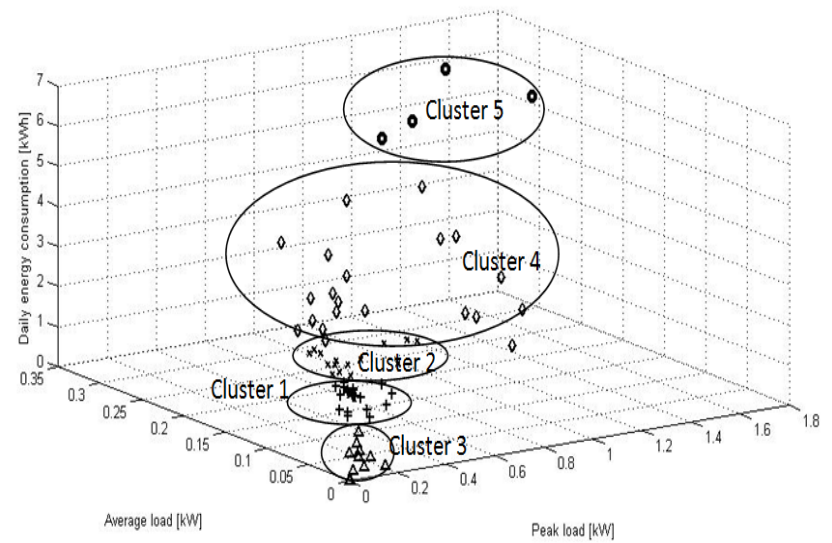


Fig. 6. Reprezentarea clusterelor

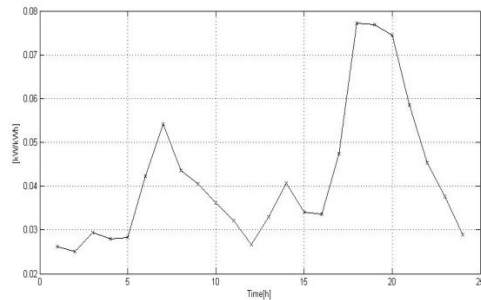
CASE STUDY

Caracteristicile clustrelor

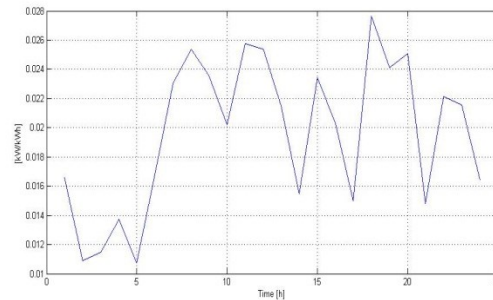
Cluster	No. consumers	Peak load [kW]	Average load [kW]	Daily energy consumption [kWh]
C1	20	0.233	0.060	1.35
C2	15	0.313	0.089	2.05
C3	14	0.072	0.011	0.25
C4	21	0.605	0.138	3.08
C5	4	1.273	0.262	5.87

CASE STUDY

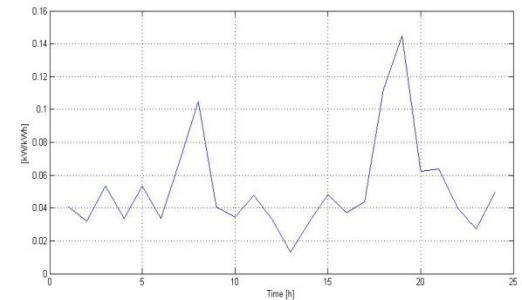
D. Atribuirea profilurilor tip de sarcina



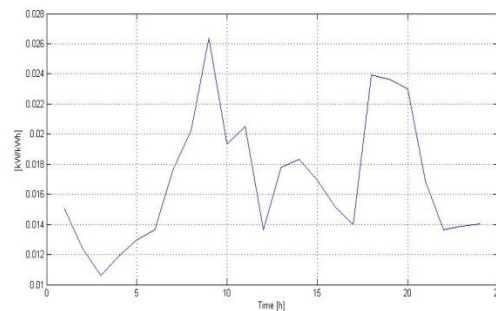
Profilul tip pentru clusterul C1.



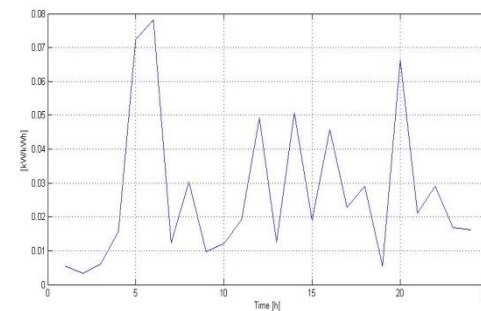
Profilul tip pentru clusterul C2.



Profilul tip pentru clusterul C3.



Profilul tip pentru clusterul C4.



Profilul tip pentru clusterul C5.

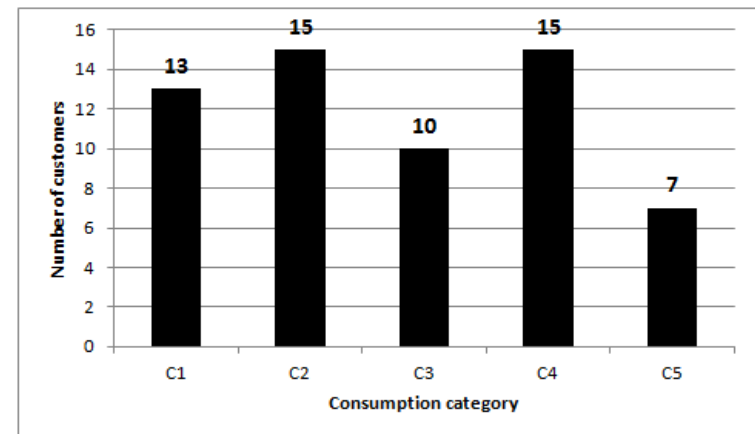
CASE STUDY

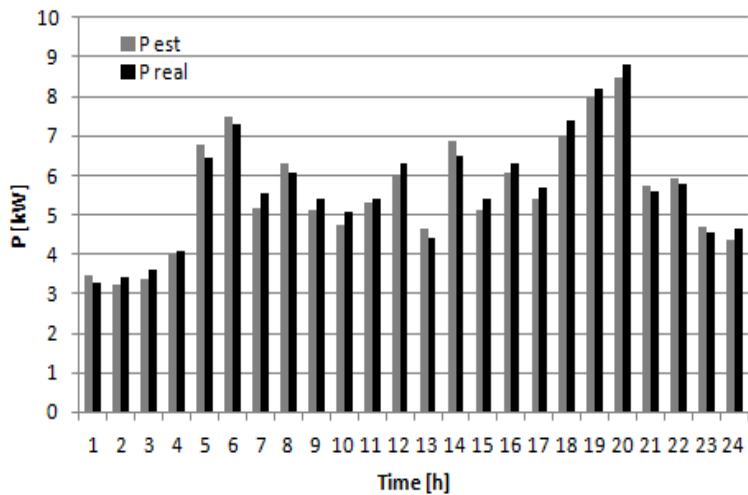
Testarea

Baza de date

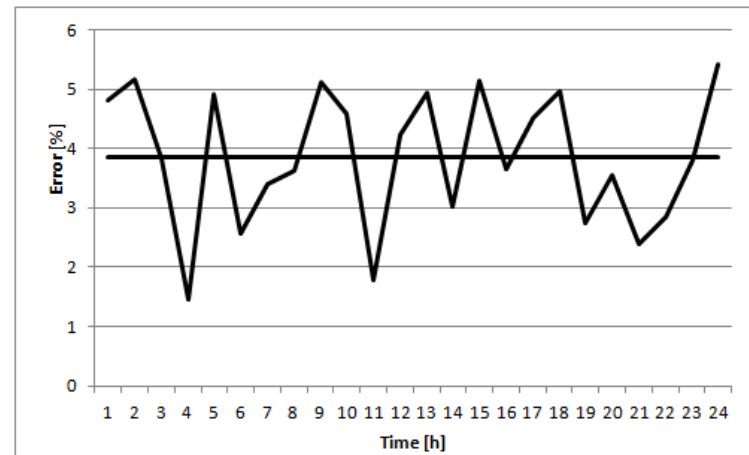
60 mici consumatori rurali alimentati dintr-un PT (20/0.4 kV) echipat cu un trafo de 40 kVA.

Fiecare consumator a fost atribuit unui cluster in functie de caracteristicile de sarcina.





Sarcina reala si simulata a PT analizat



Erorile orare de estimare a sarcinii din PT analizat (valoarea medie 3.85%)