

ROENERGY

20-22 iunie 2012, BUCURESTI

Specialisti si “specialisti” in Energii regenerabile

Octavian Capatina,
IPA Bucuresti, sucursala cluj Napoca
<http://automation.ro>

Momentul actual

- Cateva repere tehnologii, preturi

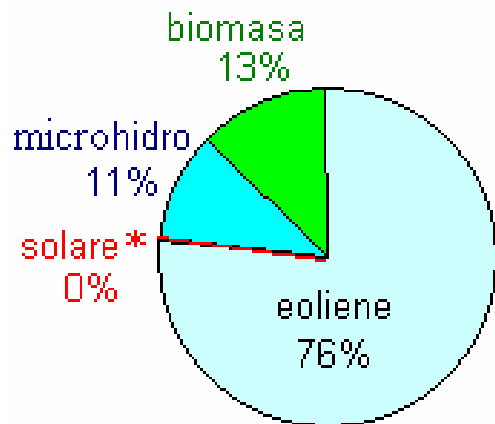
Cateva exemple de proaste practici

- Evaluare eoliana
- Evaluare solara

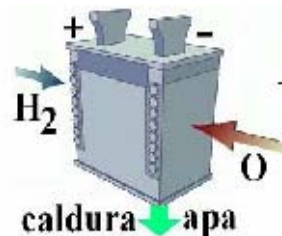
Kogaion si facilitati CAD

Automatizarea in energetica MOMENTUL

Regenerabile 2011



* solar ~100MWh



2009



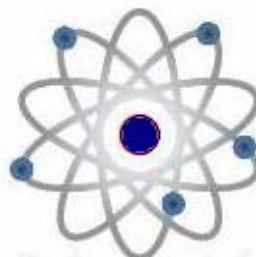
W T Controls

1969



Gas Turbine Controls

1900



Nuclear Controls

1948



Steam Turbine Controls

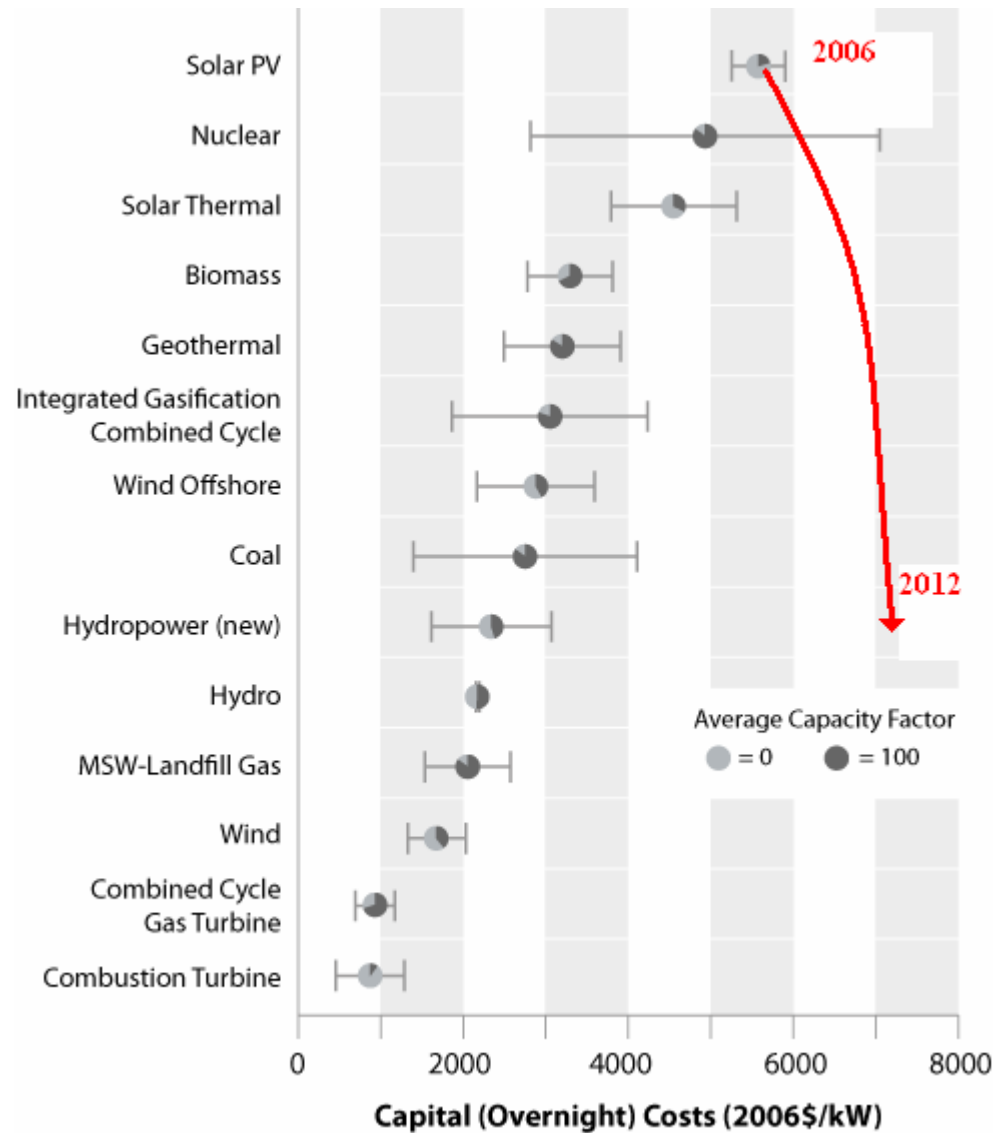
MAINE



2003

Specialisti in Energii regenerabile

Pretul tehnologiilor regenerabile

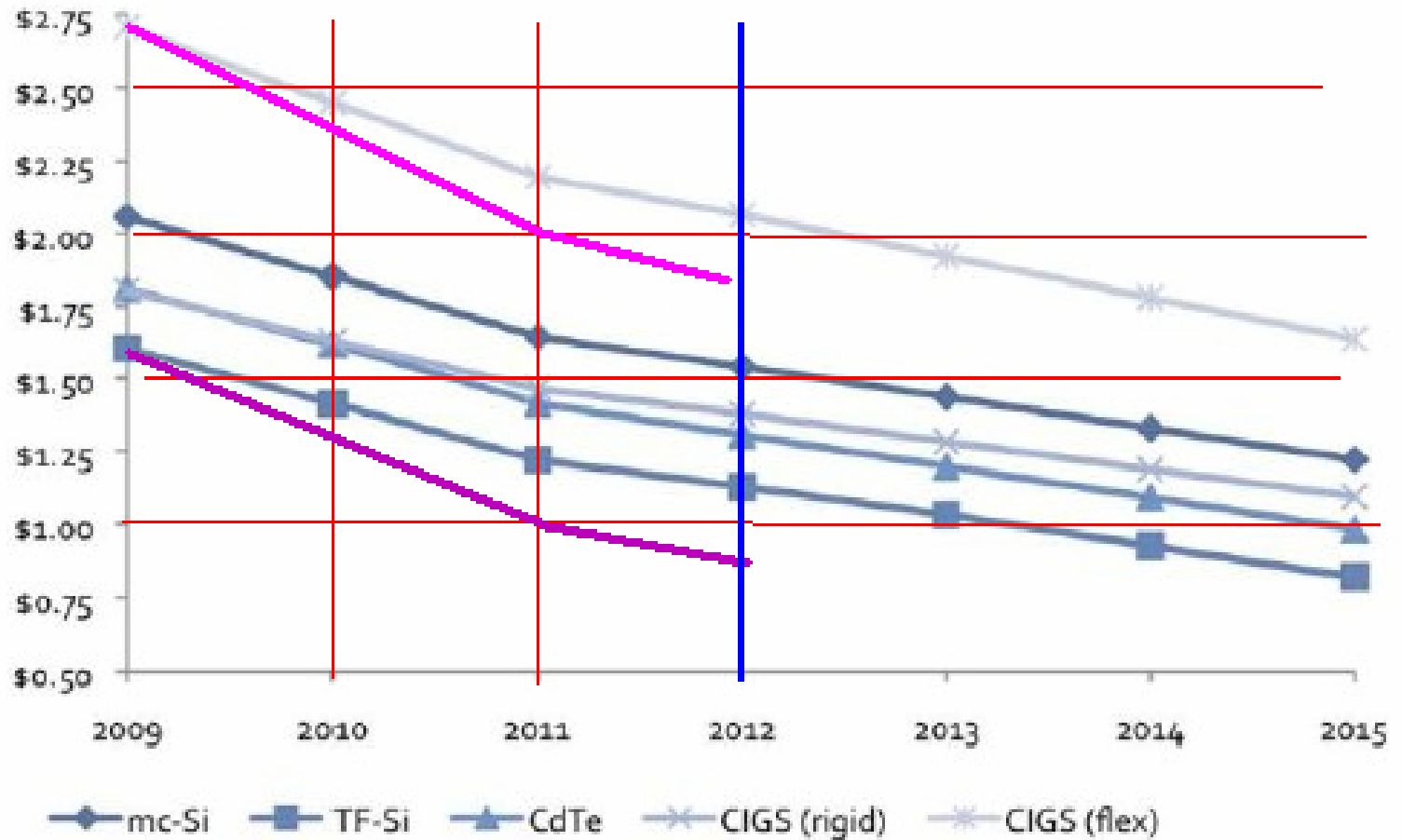


Specialisti si "specialisti" in Energii regenerabile

Evolutia pretului tehnologiilor fotovoltaice

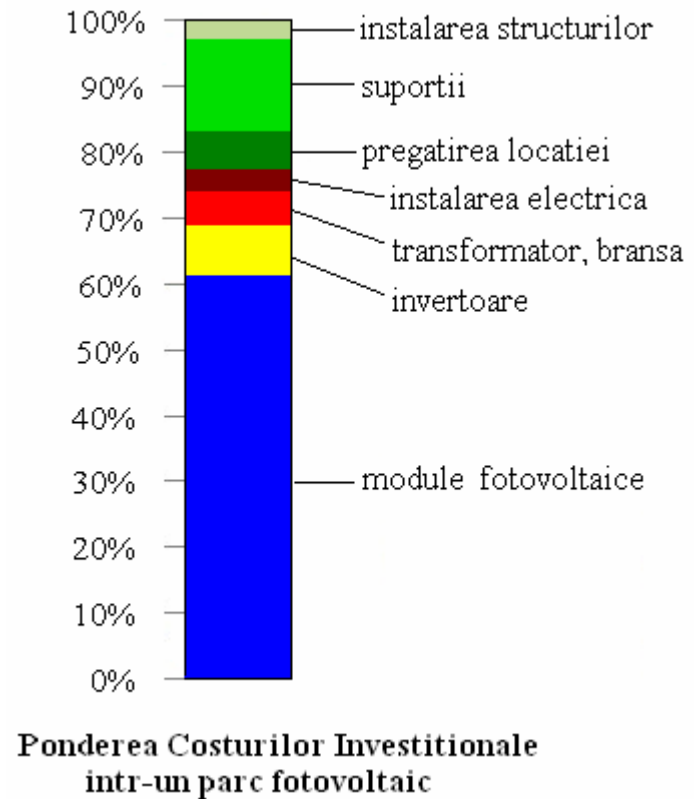
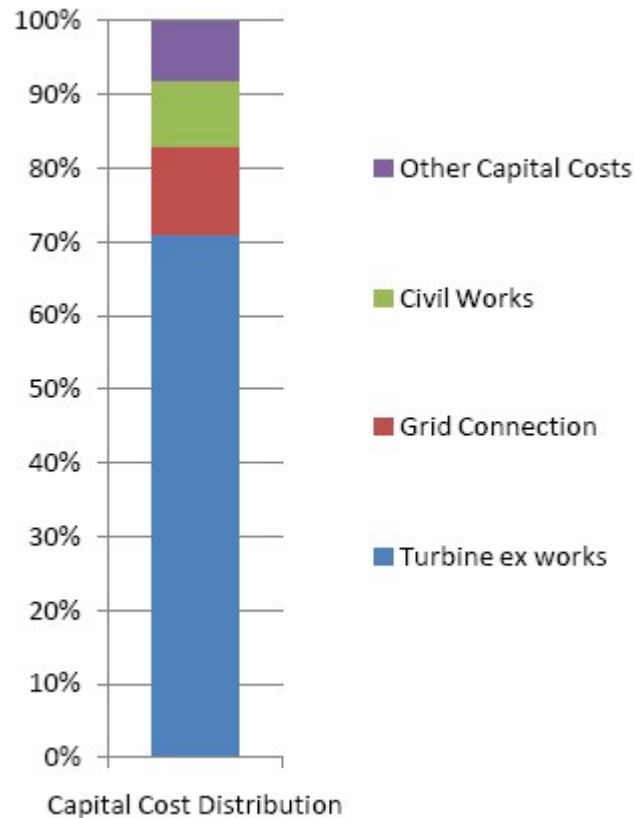
Nuante albastru estimari 2009

Nuante mov realizari



Specialisti si "specialisti" in Energii regenerabile

Anatomia preturilor in eolian si fotovoltaic



Specialisti si “specialisti” in Energii regenerabile

In aporetica germana este foarte consolidat si uzitat un adevar simplu: *Sa te fereasca Cel de Sus de “specialistul” binevoitor*

Intre altii Goethe zicea: *Es ist nichts schrecklicher als eine unwissenschaftliche tätigkeit.*

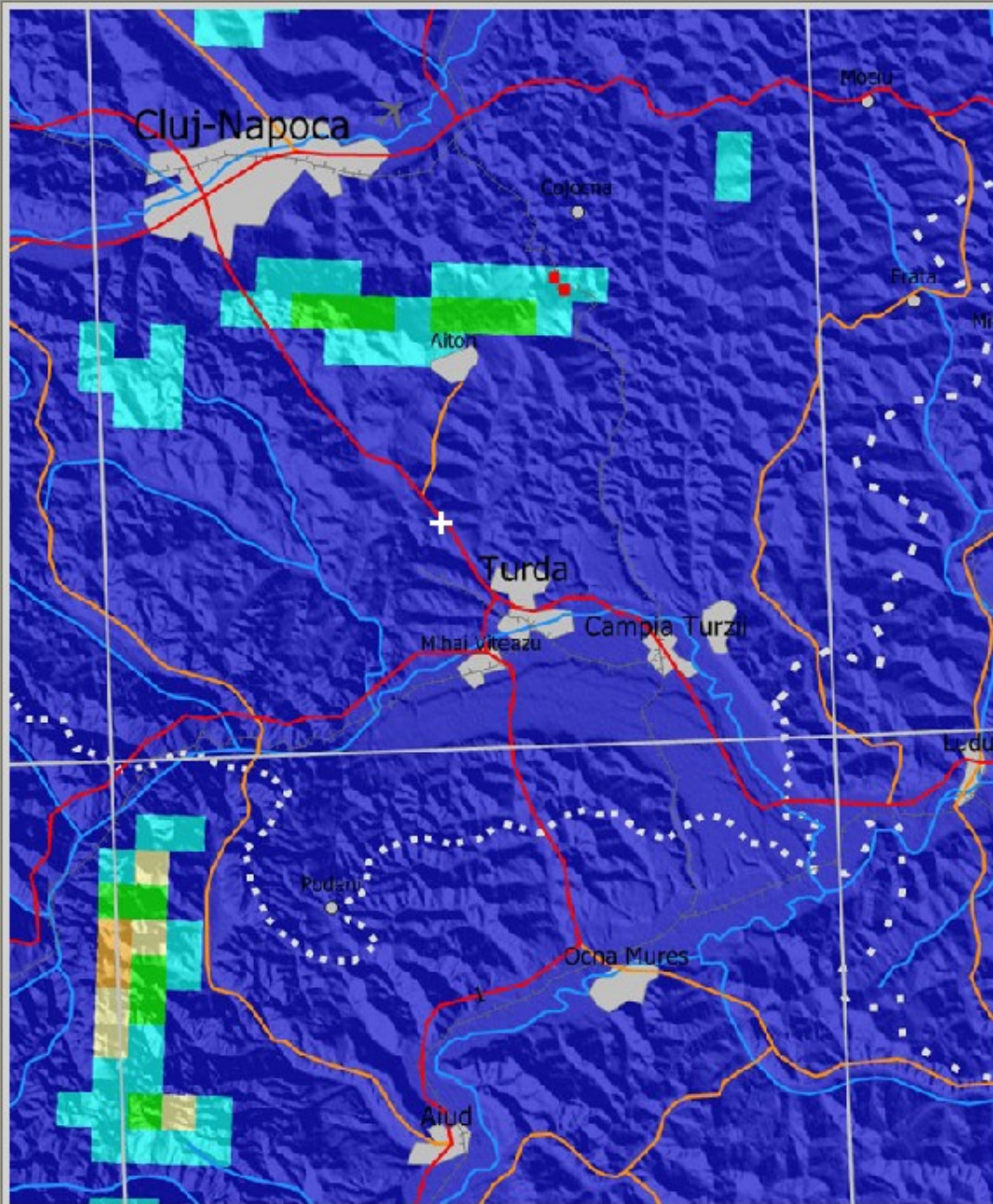
Nu voi exemple ca

Cateva exemple

Specialisti si “specialisti” in Energii regenerabile



Specialisti si "specialisti" in Energii regenerabile (Dabagau)



Select a GWS Meso Project

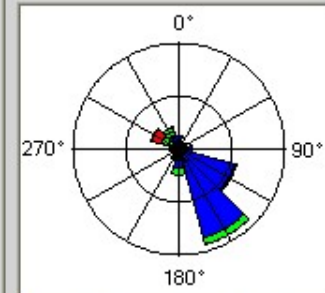
Project 10-15N

Clear Project List

Height 60 m

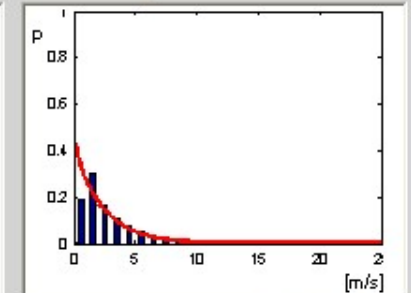
Show Map

Wind Rose



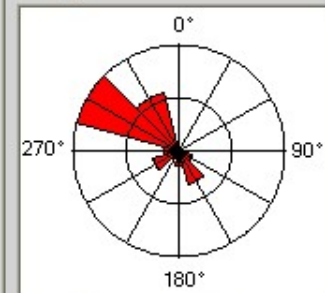
Mean Wind Velocity: 2,9 m/s

Wind Velocity Distribution *



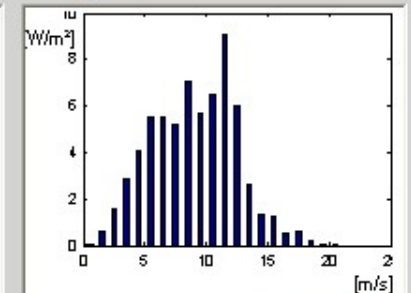
* weibull fitted

Energy Rose



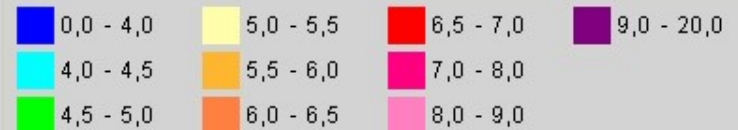
Total Energy: 66 W/m²

Energy Distribution *

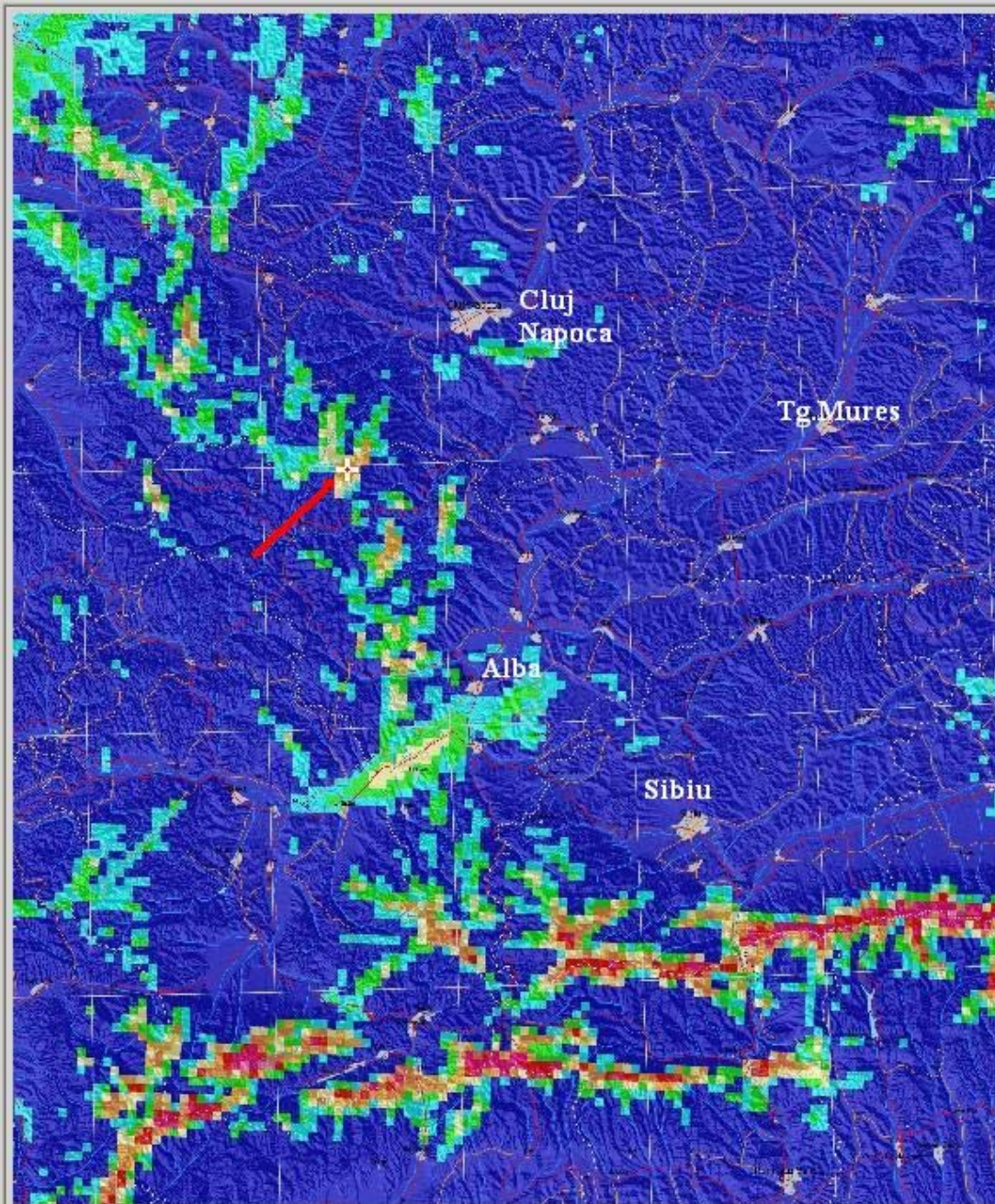


* weibull fitted

Legend: Wind Velocity [m/s]



Specialisti in Energii regenerabile (Muntele Mare)



Select a GWS Meso Project

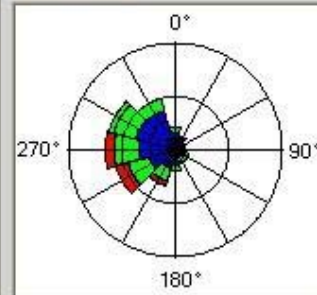
Project 10-15N

Clear Project List

Height 60 m

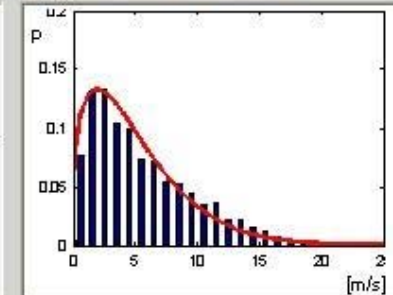
Show Map

Wind Rose



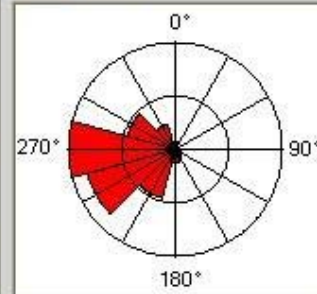
Mean Wind Velocity: 6,7 m/s

Wind Velocity Distribution *



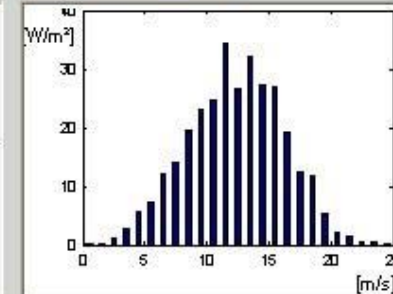
* weibull fitted

Energy Rose



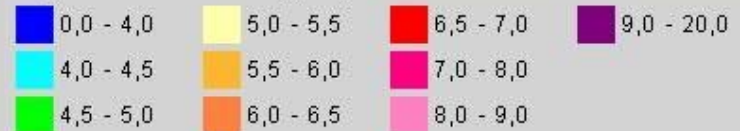
Total Energy: 311 W/m²

Energy Distribution *



* weibull fitted

Legend: Wind Velocity [m/s]



date pentru Muntele Mare @60 ds

SQESITA

Windnode Report

Report for node at geographic location (latitude longitude): [47.00908 22.32633]

Main result for 60 m a.g.l				Main result for 120 m a.g.l.			
Mean wind speed (m/s)	A (m/s)	k	Energy (W/m ²)	Mean wind speed (m/s)	A (m/s)	k	Energy W/m ²
5.0	3.4	1.45	52	5.8	5.5	1.56	185

Din nou Grenital!

Windnode Report

Report for node at geographic location (latitude longitude): [47.00908 22.32633]

Main result for 60 m a.g.l				Main result for 120 m a.g.l.			
Mean wind speed (m/s)	A (m/s)	k	Energy (W/m ²)	Mean wind speed (m/s)	A (m/s)	k	Energy W/m ²
5.0	5.5	1.54	196	5.7	6.2	1.51	287

Ultima! / 3.11.2010

Windnode Report

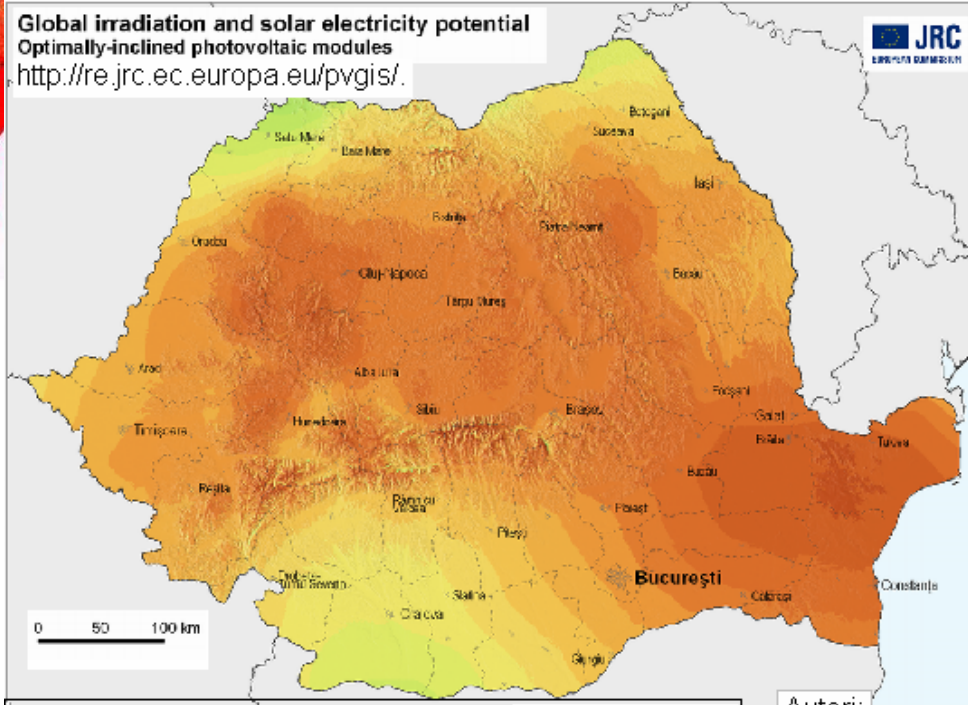
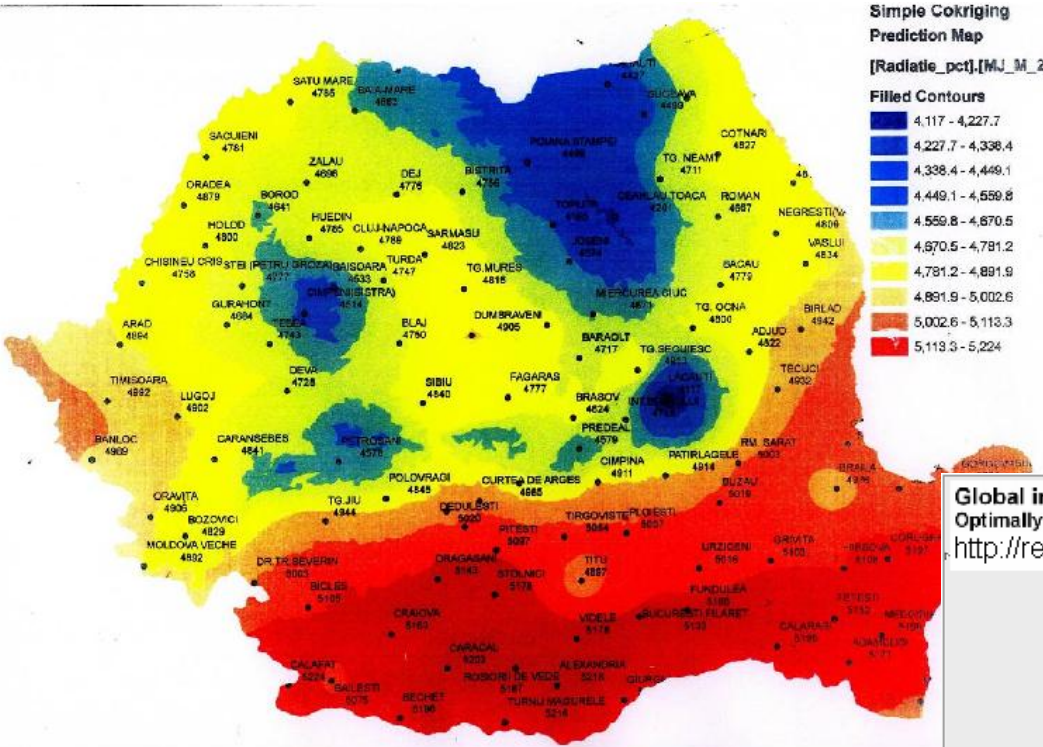
Report for node at geographic location (latitude longitude): [47.00908 22.32633]

Main result for 60 m a.g.l				Main result for 120 m a.g.l.			
Mean wind speed (m/s)	A (m/s)	k	Energy (W/m ²)	Mean wind speed (m/s)	A (m/s)	k	Energy W/m ²
4.5	4.9	1.56	133	5.2	5.8	1.57	215



Our core services are certified by Germanischer Lloyd to DIN ISO 9001. In our third year of operation, we became the first wind energy consulting firm to be accredited in the world to the DIN EN ISO 17025 standard.

Specialisti si "specialisti" in Energii regenerabile



Corectura:

Climate –SAF PVGIS

(Classic PVGIS)

Radiatia globala anuală
1350 1400 1450 1500 1550 1600 1650 kwh/mp

1013 1050 1088 1125 1163 1200 1238 kwh

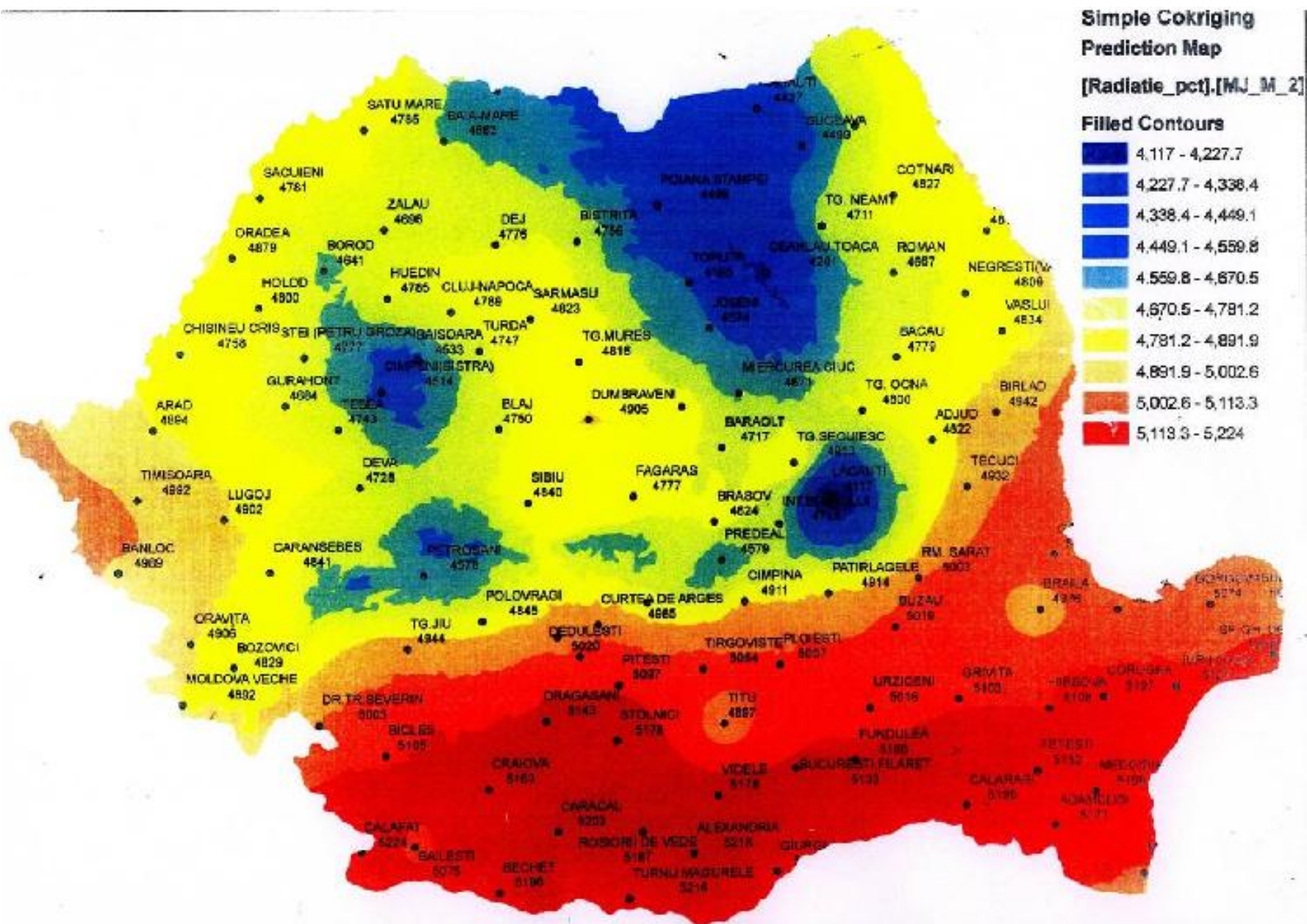
Energia el. anuală produsă de un sistem de 1KW_{varf} cu rand 0,75%

Autori:

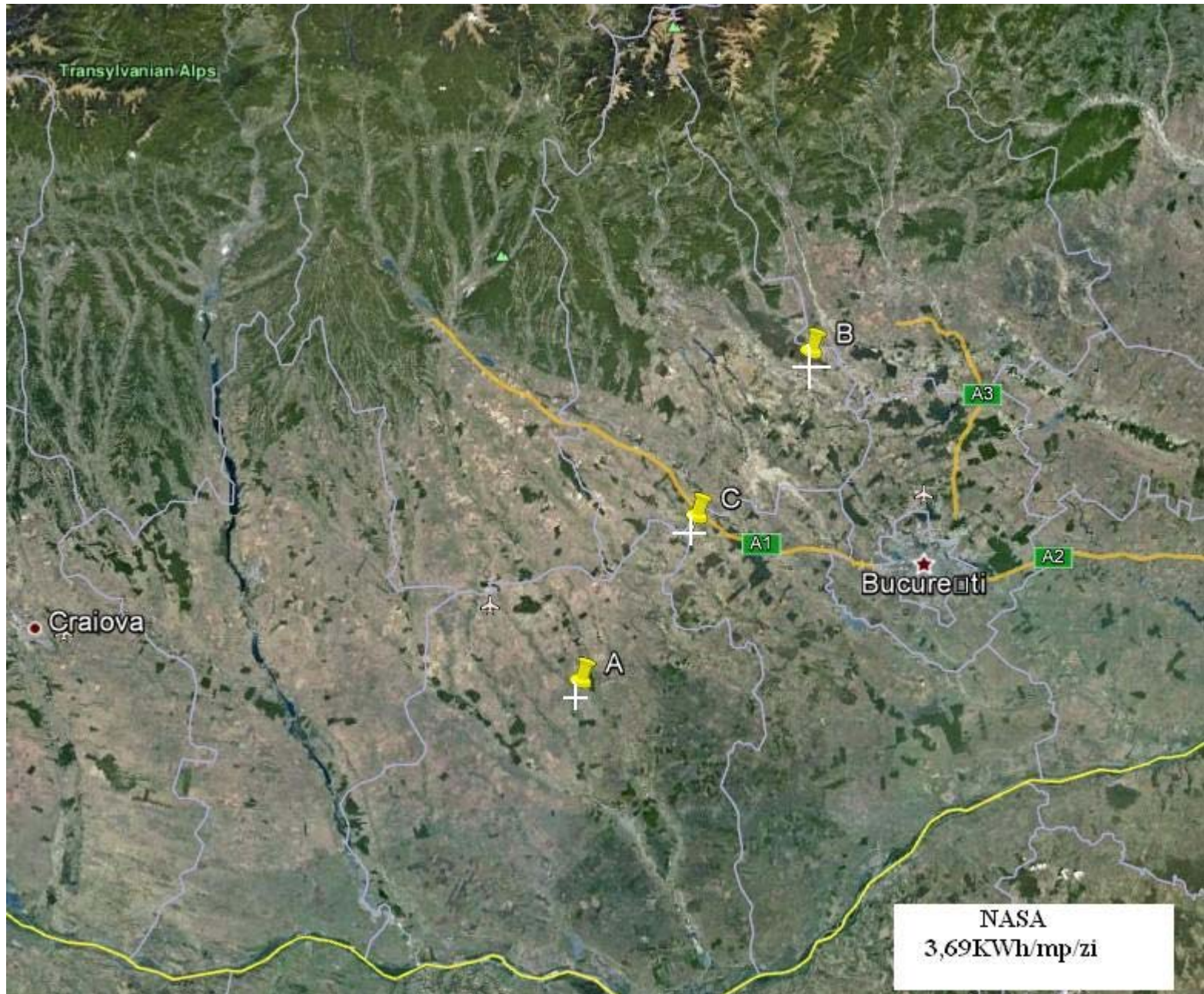
Șuri M, Huld.T.A

Dunlop E.D, Ossenbrink.H.A

Specialisti si "specialisti" in Energii regenerabile



Specialisti si "specialisti" in Energii regenerabile



Specialisti si “specialisti” in Energie regenerabile



NASA Surface meteorology and Solar Energy - Available Tables



Latitude **44.8** / Longitude **25.8** was chosen.

Geometry Information

Northern boundary
45

Western boundary
25

Center
Latitude **44.5**
Longitude **25.5**

Eastern boundary
26

Southern boundary
44

Elevation: **313** meters
taken from the
NASA GEOS-4
model elevation

Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications:

Monthly Averaged Insolation Incident On A Horizontal Surface (kWh/m²/day)

Lat 44.8 Lon 25.8	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
22-year Average	1.53	2.34	3.45	4.38	5.53	6.08	6.05	5.43	4.07	2.62	1.59	1.22	3.69

Specialisti si “specialisti” in Energie regenerabile



NASA Surface meteorology and Solar Energy - Available Tables



Latitude **44.2** / Longitude **25.2** was chosen.

Geometry Information

Northern boundary
45

Western boundary
25

Center
Latitude **44.5**
Longitude **25.5**

Eastern boundary
26

Southern boundary
44

Elevation: **313** meters
taken from the
NASA GEOS-4
model elevation

Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications:

Monthly Averaged Insolation Incident On A Horizontal Surface (kWh/m²/day)

Lat 44.2 Lon 25.2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
22-year Average	1.53	2.34	3.45	4.38	5.53	6.08	6.05	5.43	4.07	2.62	1.59	1.22	3.69

Specialisti si “specialisti” in Energie regenerabile



NASA Surface meteorology and Solar Energy - Available Tables



Latitude **44.5** / Longitude **25.5** was chosen.

Geometry Information

Northern boundary
45

Center
Latitude **44.5**
Longitude **25.5**

Western boundary
25

Eastern boundary
26

Southern boundary
44

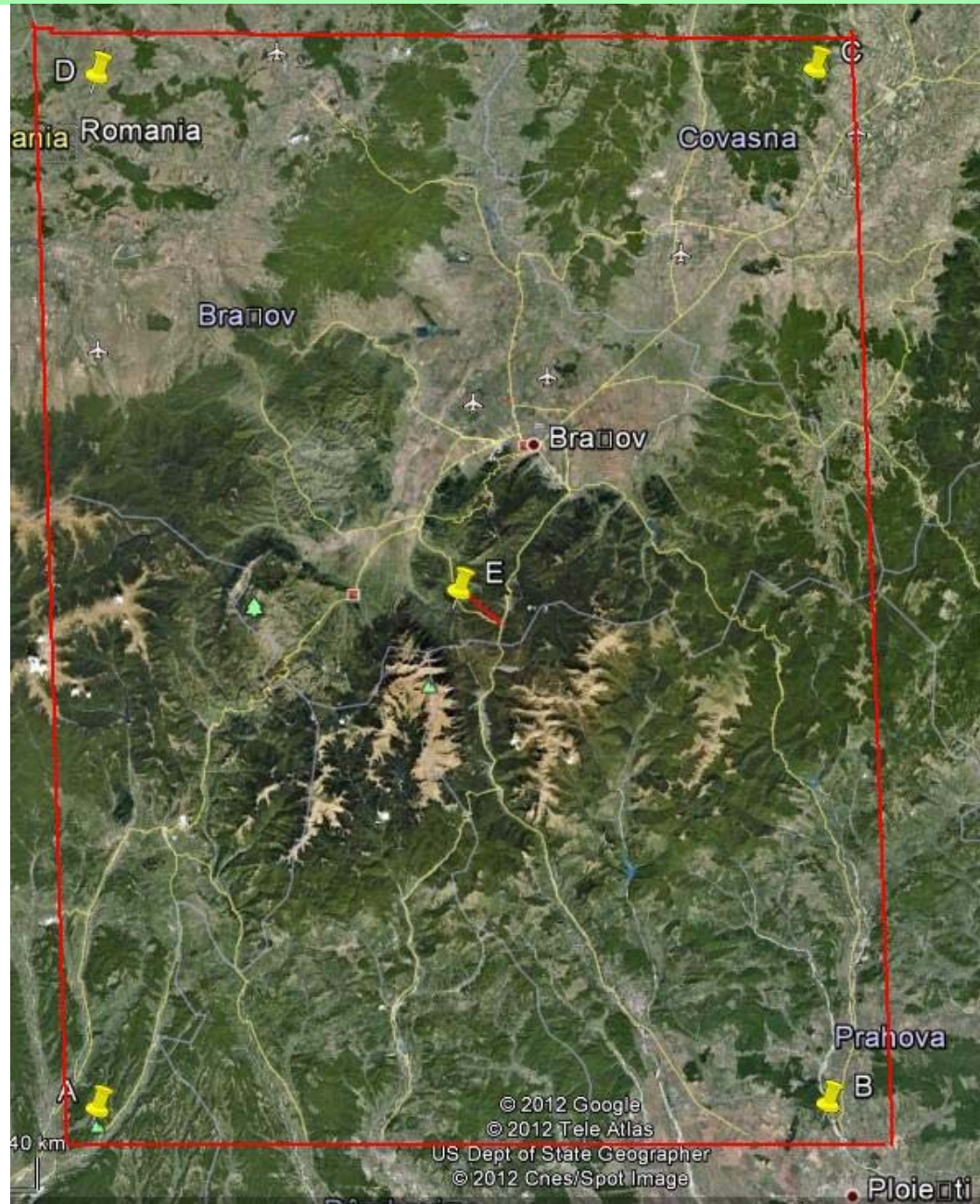
Elevation: **313** meters
taken from the
NASA GEOS-4
model elevation

Parameters for Sizing and Pointing of Solar Panels and for Solar Thermal Applications:

Monthly Averaged Insolation Incident On A Horizontal Surface (kWh/m²/day)

Lat 44.5 Lon 25.5	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
22-year Average	1.53	2.34	3.45	4.38	5.53	6.08	6.05	5.43	4.07	2.62	1.59	1.22	3.69

Specialisti si “specialisti” in Energii regenerabile



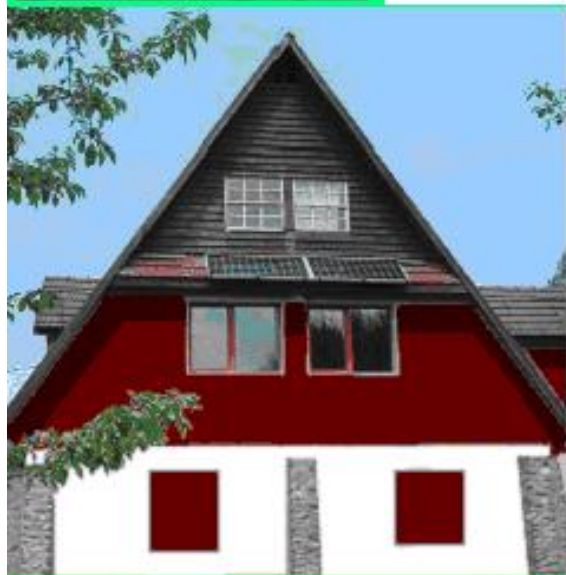
Un institut din Bucuresti primeste fonduri nerambursabile pentru o dotare cu o instalatie fotovoltaica izolata cu conservare pe acumuloare, si specialisti fiind indica in CS tipul de panou nepotrivit!

- Panouri pentru sisteme fotovoltaice izolate cu conservare prin baterii

Proiect de parc fotovoltaic la T... de 3MW

- **Viteza ?:**
demarat in 2008 / licitatie
pt executie pe 7 mai ac
- **Eficienta ?:**
~12 mil euro





07-May-2012

SIMULARE SISTEM FV. IZOLAT

generare 
 tiparire 
 inapoi 
spre calcul economic

locatie: Tunsu

Altitudine [m]	100
Temp medie/an [C]	10
Radiatie[kwh/m ² /zi]	3.3
cadere [m]	1
debit [l/s]	20
A [m/s]	3
k	1.7
h masura [m]	10
h butuc [m]	12
obstacol echiv [m]	0.1

pretW 1.1 pretW 0.01 pretW 0 pretW 0 pretAh 2 pretW 0.3

nr pan sol in serie 1 nr incarc 1 nr t hidro 0 nr t vant 0 nr bat in serie 2 nr inv 1

nr seri in ll 2 nr seri in ll 1



tip panou	ETMS-195
1 P [w]	195.0
2 Ue [V]	36.94
3 Ie [A]	5.28
4 Ugol [V]	45.33
5 efic. [%]	15.27
6 lung[mm]	1580.0
7 lat [mm]	808.0
8 gros[mm]	50.0

incarcator	parteTN1k5
1 P [kw]	1.3
2 Tps min [V]	30.0
3 Tps max [...]	45.0
4 Ipmx [A]	30.0
5 Tbat [V]	24.0
6 Tbatmin [V]	21.0
7 Tbatmax [V]	30.0
8 rand [%]	90.0

tip bat	Varta90ah
1 C(20h)[Ah]	90.0
2 C(5h)[Ah]	70.0
3 Tens [V]	12.0
4 lung [mm]	329.0
5 lat [mm]	172.0
6 inalt[mm]	215.0
7 greut[kg]	22.0

tip inv	TN1k5-24
1 P[kw]	1.5
2 Ui min[V]	21.0
3 Ui max[V]	30.0
4 Ue[V]	230.0
5 THD [%]	3.0
6 frecv[Hz]	50.0
7 rand [%]	90.0

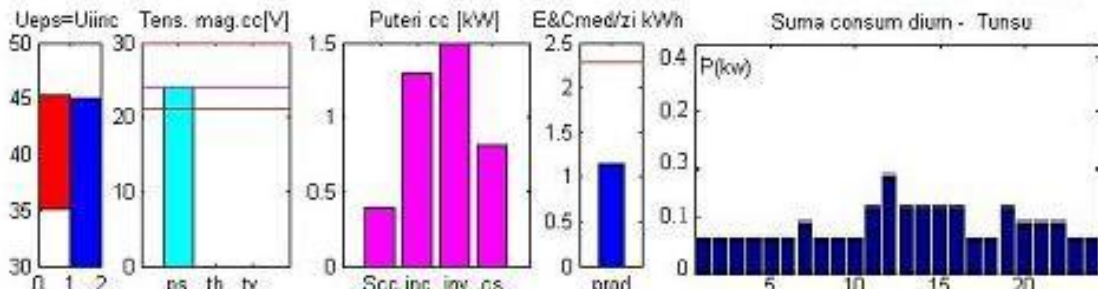
KWinc: solara 0.39 hidro 0 vant 0

MWh/an: E. solara 0.47 E. hidro 0 E. vant 0

Ecc. produsa 0.47 Eca. livrata 0.42

Asig max 0.5 Cm [kwh/zi] 2.28 Em [kwh/zi] 1.15

C bat [kwh] 1.68 I.e. [zie] 0.74



Octavian Capatina

08-May-2012

Configurator sistem hibrid izolat - EFARM

latitudine	[m]	100
temperatura medie/an	[C]	10
iradiatie	[kwh/mp/zi]	3.3
inaltime	[m]	1
debit	[l/s]	20
velocitate vana	[m/s]	3
coeficient de scurgere		1.7
inaltime masura	[m]	10
inaltime cutec	[m]	12
inaltime col echiv	[m]	0.1

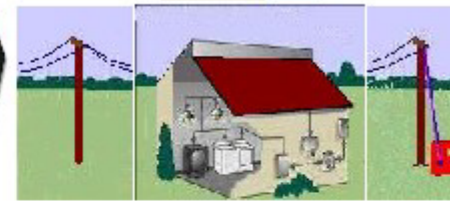
generare
 tiparire
 inapoi

spre calcul economic

pret/w 1.1 pret/w 0.01 pret/w 0 pret/w 0 pret/Ah 2 pret/w 0.3

nr p sol in serie 1 nr incarc 1 nr t hidro 0 nr t vant 0 nr bat in serie 2 nr inv 1

nr serii in II 3 nr serii in II 1



tip panou	CQ275p
1 P [w]	275.0
2 Ue [V]	35.54
3 Ie [A]	8.28
4 Ugol [V]	43.8
5 efic. [%]	14.17
6 lung [mm]	1956.0
7 lat [mm]	992.0
8 gros [mm]	50.0

incarcator	parte TN1k5
1 P [kw]	1.3
2 Tps min [V]	30.0
3 Tps max [V]	45.0
4 Ipmx [A]	30.0
5 Tbat [V]	24.0
6 Tbatmin [V]	21.0
7 Tbatmax [V]	30.0
8 rand [%]	90.0

tip bat	Varta90ah
1 C(20h)[Ah]	90.0
2 C(5h)[Ah]	70.0
3 Tens [V]	12.0
4 lung [mm]	329.0
5 lat [mm]	172.0
6 inal [mm]	215.0
7 greut [Kg]	22.0

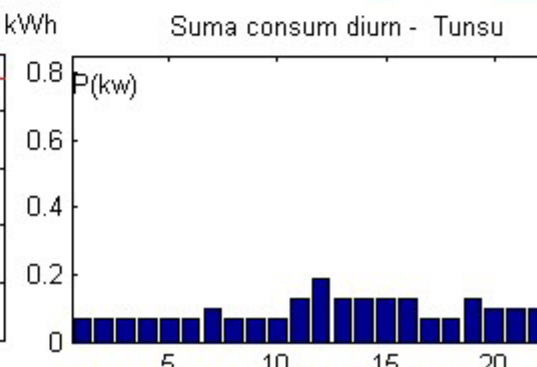
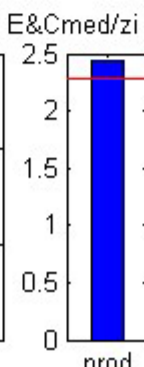
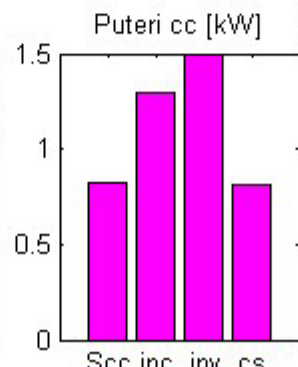
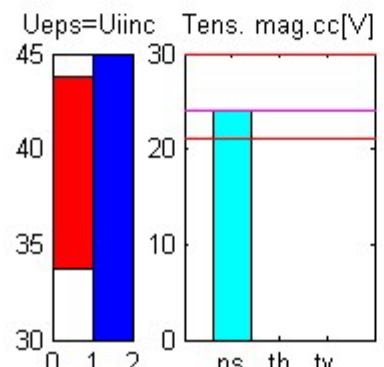
tip inv	TN1k5
1 P [Kw]	
2 Ui min [V]	2
3 Ui max [V]	3
4 Ue [V]	23
5 THD [%]	
6 frecv [Hz]	5
7 rand [%]	9

kW inst solara 0.825
 MWh/an E. solara 0.99

hidro 0
 E. hidro 0

vant 0
 E. vant 0

Asig max 1.07 C m [kwh/zi] 2.28 E m [kw] 2.44
 E cc. produsa 0.99 E.ca livrata 0.89 C bat [kvah] 1.68 I. e. [] 0.74



Conditii de simulare la Sacuieu (Bh) 1000m alt, 10°C.,
 - potential la 50m ds cu ST (cW 5,96m/s k-1,69 si Vm=5,3m/s),
 turbina Vestas V90 (h_{butuc}=82m)
 dimensiunea echiv. a obstacolelor la sol 0,5m

10-Oct-2011 Vant, locatie, turbina, costuri, venituri, VNA, RIR



Tiparire
 Generare
 Inapoi

locatia	altitudine	temp / an	h butuc	h masura	fac. scara	coef. forma	Dim. obst		
SACUIEU	100	7	100	50	6.82	1.69	0.4		
Turbina	cost echip	% instalare	% O&M	cost autoriz	durata pr	rata disc	pret MWh	pret CV	an PIF
V100	1.2	30	1.3	0.15	20	5	52	54.6	2012
	euro/w	din valoarea turbinei		euro/w			durata de stimulare cf L220 modif. 15ani		

Put turb. [Kw]

1800

cost initial (mii)

3078

fact capacitate %

41.61

energie MWh/an

6561.84

pret integral/MWh

109.33

Venit net/an (mii)

689.326

RIR [%]

9737

are [ani]

47

re act [ani]

17

VC

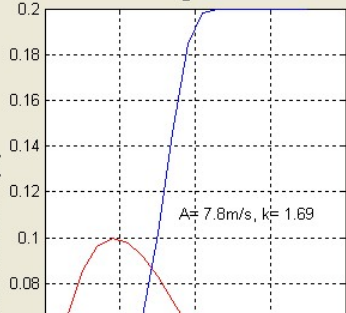
7.05



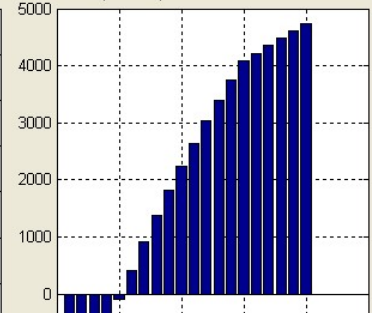
Generare

Tiparire

PD la SACUIEU @100m & ft a V100



VNA(mii euro) la o rata de discountare de:5%



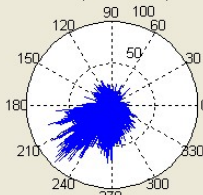
anul	VNA(mii e...)
1 an PIF	-3078.0
2	-2421.5
3	-1796.26
4	-1200.79
5	-633.68
6	-93.58
7	420.81
8	910.7
9	1377.26
10	1821.61
11	2244.79
12	2647.83
13	3031.67

10-Oct-2011 Extragere coef. W., densit. putere din S.T.

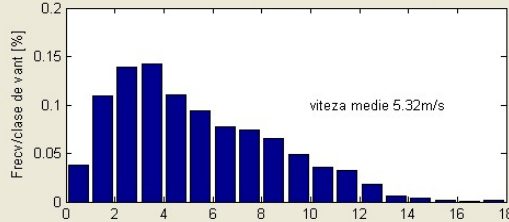
SACUIEU	1100	6.5	50	10	2008	sacuieu50	sacuieu50
Locatie	Altitudine	Temperatura	h mas	T esant (min)	Perioada	viteza vant	directie vant

A(m/s)= 5.97 K= 1.69

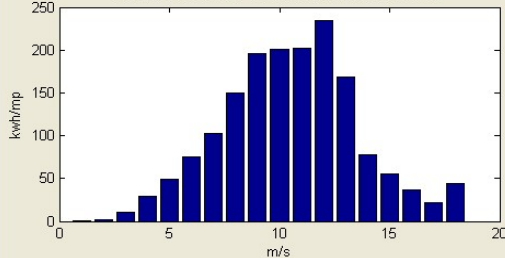
Roza vanturilor la SACUIEU, altit. 1100m, h. mas. = 50m, din 2008



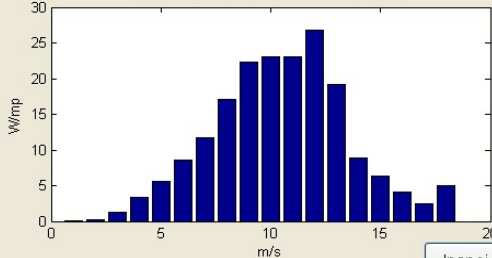
Distrib. vantului la SACUIEU, altit. 1100m, h mas.= 50m, din 2008



Energia vantului/mp: 1656KWh, pe durata: 8760ore



Densitatea de putere a vantului: 189W/mp,



Inapoi

	UTILITAR	Estimare Energie anuala (Gwh)	OBSERV.
	Kogaion v1.01	3,954	Estimare la Cernauti ca fiind localit. din RETSCR. cu potentialul cel mai apropiat de Sacuieu (Bh): 3,6m/s fata de 3,5m/s la 10m ds
	RETSCEEN	4,037	
	DWIA	4,009	
	Homer 2.68	3,967	

Eficienta economica a sistemului hibrid izolat - EFARM

08-May-2012

euroMWh	52	euroCV	57	an PIF	2012
---------	----	--------	----	--------	------

nr CV	6	nr CV	1	nr CV	1.50
preMWh	1.1	preMWh	0	preMWh	0
% inv in s	70	% inv in s	40	% inv in s	70
nr bat in serie	1	nr bat in serie	2	nr bat in serie	2
nr seti in B	3	nr seti in B	3	nr seti in B	3

preMWh	2	preMWh	0.3
% inv stoc	90	% inv stoc	90
nr inv	1	nr inv	1
nr seti in B	1	nr seti in B	1

tip panou	Uj:java.lan...	tip bat	ninca	tip bat	ntbat	tip inv	ntriv
1 P [w]	275.0	1 P [w]	1.3	1 C (Wh) [Ah]	90.0	1 P [w]	1.5
2 Ue [V]	24.0	2 Ue [V]	30.0	2 C (Sh) [Ah]	70.0	2 Ue [V]	21.0
3 I [A]	0.28	3 I [A]	45.0	3 Tens [V]	12.0	3 Ue [V]	20.0
4 I [mm]	42.8	4 I [mm]	329.0	4 Ue [V]	172.0	4 Ue [V]	230.0
5 I [mm]	14.17	5 I [mm]	24.0	5 I [mm]	172.0	5 I [mm]	3.0
6 I [mm]	1956.0	6 I [mm]	21.0	6 I [mm]	215.0	6 I [mm]	50.0
7 I [mm]	992.0	7 I [mm]	30.0	7 I [mm]	22.0	7 I [mm]	90.0
8 I [mm]	90.0	8 I [mm]	90.0				

Cm [kWh/24h] 2.20 Em [kWh/24h] 2.44 Asg max 1.07 C bat [kWh] 1.60 I. e. [L/24h] 0.74

Energie [MWh] pe an solar 0.95 hidro 0 vant 0 E.c.c prod. / an [MWh] 0.99 E.c.a [kWh/24h] / an [MWh] 0.99

cost investie [euro] 1206 0 0 14 400 400 Cost inv. [euro] 2516

cost investie/kWh prod. in 15 an 0.131 NaN NaN euro / kWh [MWh] 0.248

Termen de recuperare fara CV [ani] 47.75 Termen de recuperare cu CV [ani] 6.2 calculat pe 15ani (cf. L220/2008)