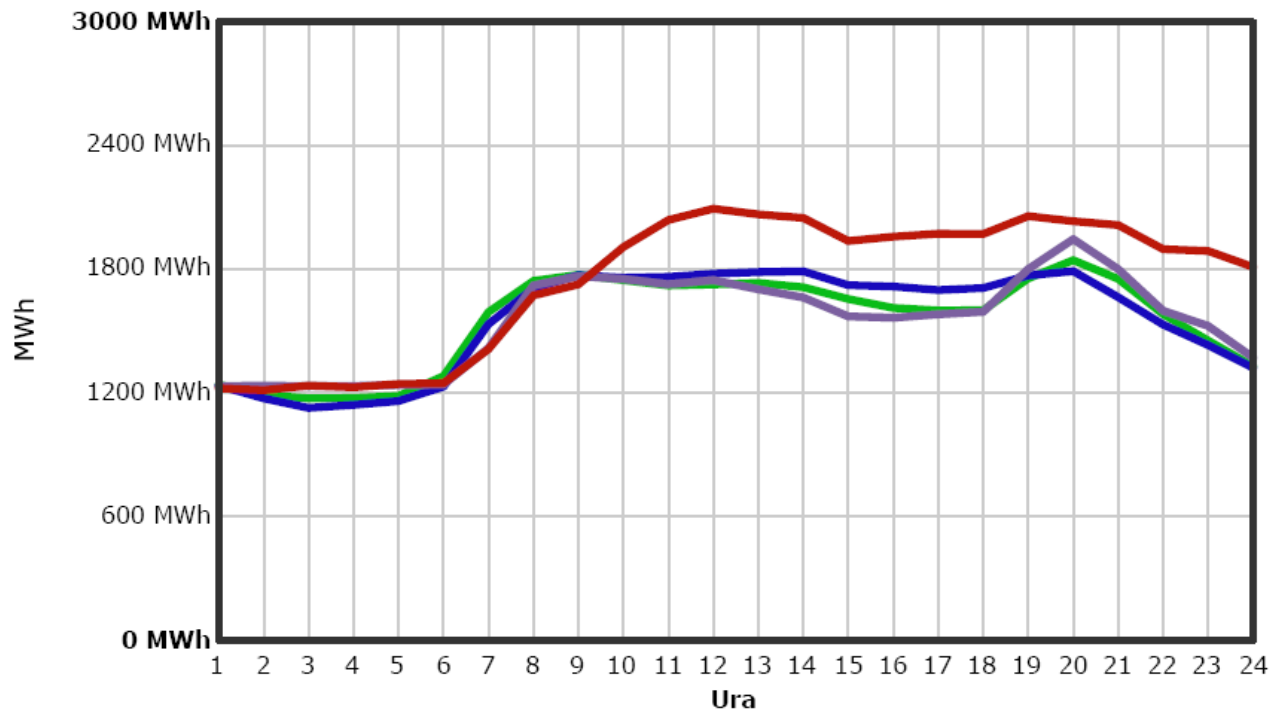


# Shranjevanje energije in energijske pretvorbe ter Nekaj energetskega scenarijev za Slovenijo

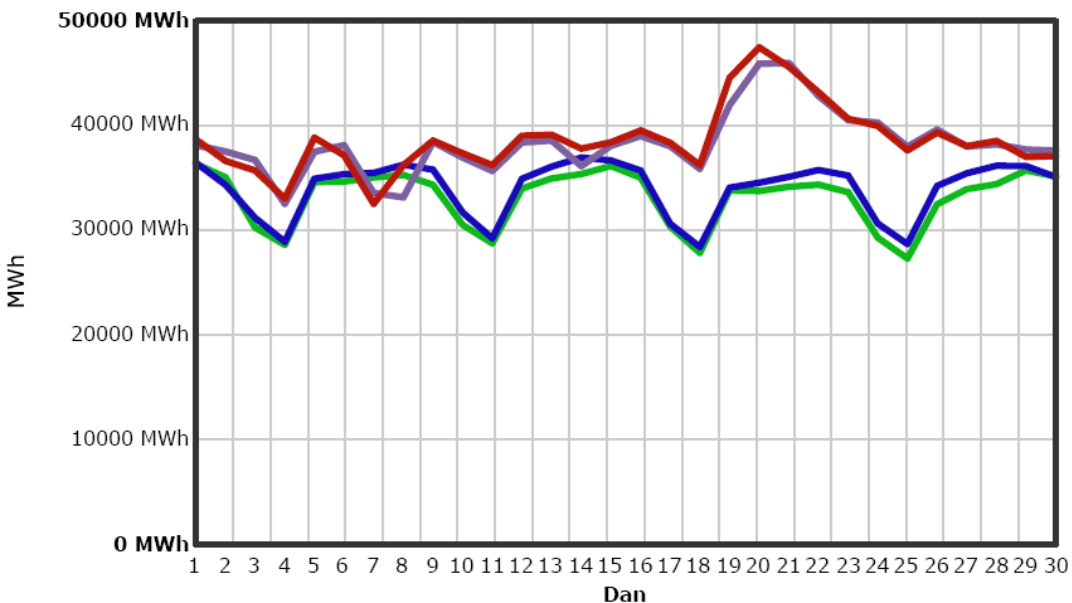
dnevna proizvodnja in poraba  
elektrike 20.10.2011 (MWh/h)



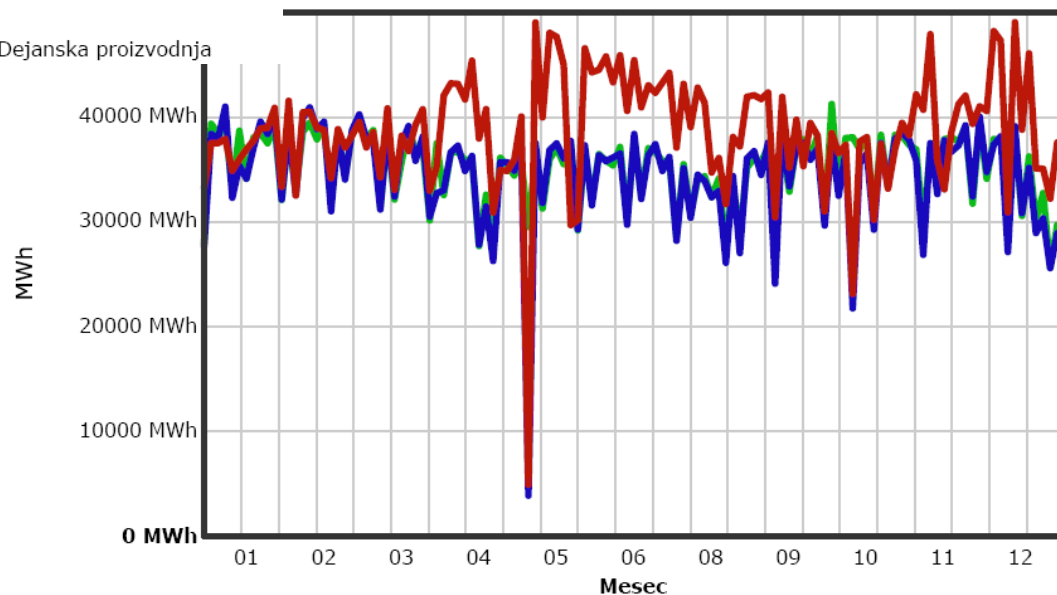
vir: [www.eles.si](http://www.eles.si)

● Predviden prevzem ● Dejanski prevzem ● Predvidena proizvodnja ● Dejanska proizvodnja

## mesečna proizvodnja in poraba elektrike september 2011 (MWh/dan)



● Predviden prevzem ● Dejanski prevzem ● Predvidena proizvodnja ● Dejanska proizvodnja



● Predviden prevzem ● Dejanski prevzem ● Predvidena proizvodnja ● Dejanska proizvodnja

## letna proizvodnja in poraba elektrike 2008 (MWh/dan)

# Zbiralniki energije

## Kemični, elektrokemični

- vodik: pridobivanje z elektrolizo: izkoristek 0.5-0.8, gorivne celice izkoristek 0.5-0.7
- baterije praznjenje/polnjenje 0.8-0.9 (Li-ionske)

## Biološki

- hrana

## Električni

- kondenzator

## Mehanski

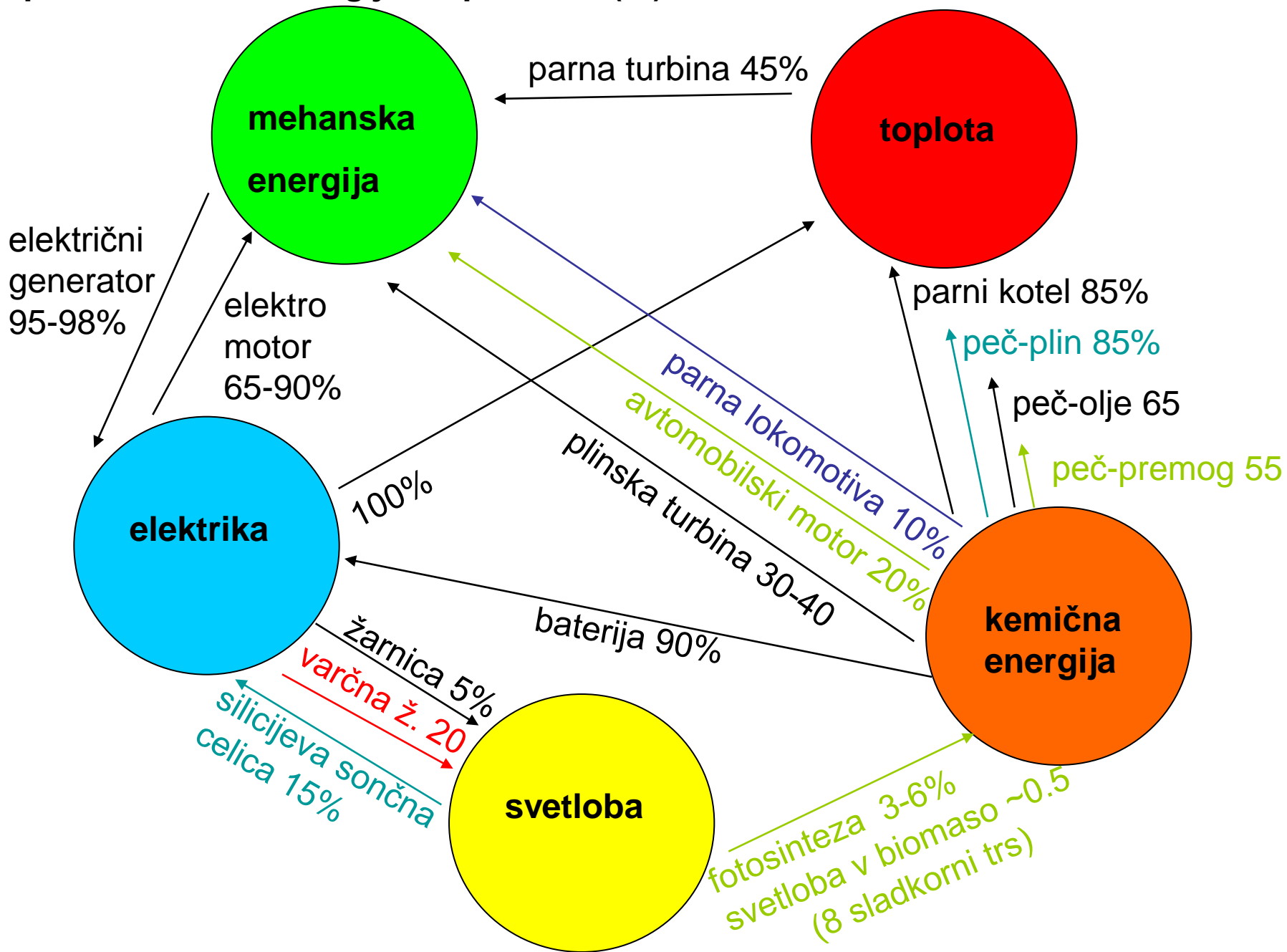
- vztrajnik, stisnjen zrak

## Toplotni

- kamen, tla, voda



# Tipični izkoristki energijskih pretvorb (%)



# DENAR

## 2010

ocene so narejene za ZDA

Za ostale dele sveta so lahko številke tudi precej drugačne.

Odvisno od razpoložljivosti virov.

**Table 1. Estimated Levelized Cost of New Generation Resources, 2016.**

2010

2009

Plant Type	Capacity Factor (%)	U.S. Average Levelized Costs (2009 \$/megawatthour) for Plants Entering Service in 2016					Total System Levelized Cost	Total System Levelized Cost (hour) for
		Levelized Capital Cost	Fixed O&M	Variable O&M (including fuel)	<del>Transmission Investment</del> 2011	Total System Levelized Cost		
Conventional Coal	85	65.3	3.9	24.3	97.7	94.8	100.4	
Advanced Coal	85	74.6	7.9	25.7	110.9	109.4	110.5	
Advanced Coal with CCS	85	92.7	9.2	33.1	138.8	136.2	129.3	
Natural Gas-fired								
Conventional Combined Cycle	87	17.5	1.9	45.6	66.1	66.1	83.1	
Advanced Combined Cycle	87	17.9	1.9	42.1	63.1	63.1	79.3	
Advanced CC with CCS	87	34.6	3.9	49.6	90.1	89.3	113.3	
Conventional Combustion Turbine	30	45.8	3.7	71.5	127.9	124.5	139.5	
Advanced Combustion Turbine	30	31.6	5.5	62.9	101.8	103.5	123.5	
Advanced Nuclear	90	90.1	11.1	11.7	111.4	113.9	119.0	
Wind	34	83.9	9.6	0.0	96.0	97.0	149.3	
Wind – Offshore	34	209.3	28.1	0.0		243.2	191.1	
Solar PV <sup>1</sup>	25	194.6	12.1	0.0	152.7	210.7	396.1	
Solar Thermal	18	259.4	46.6	0.0	242.0	311.8	256.6	
Geothermal	92	79.3	11.9	9.5	98.2	101.7	115.7	
Biomass	83	55.3	13.7	42.3	115.4	112.5	111.0	
Hydro	52	74.5	3.8	6.3	88.9	86.4	119.9	

<sup>1</sup> Costs are expressed in terms of net AC power available to the grid for the installed capacity.

Source: Energy Information Administration, Annual Energy Outlook 2011, December 2010, DOE/EIA-0383(2010)

Energy Information Administration, Annual Energy Outlook 2012, DOE-EIA-0383(2012)

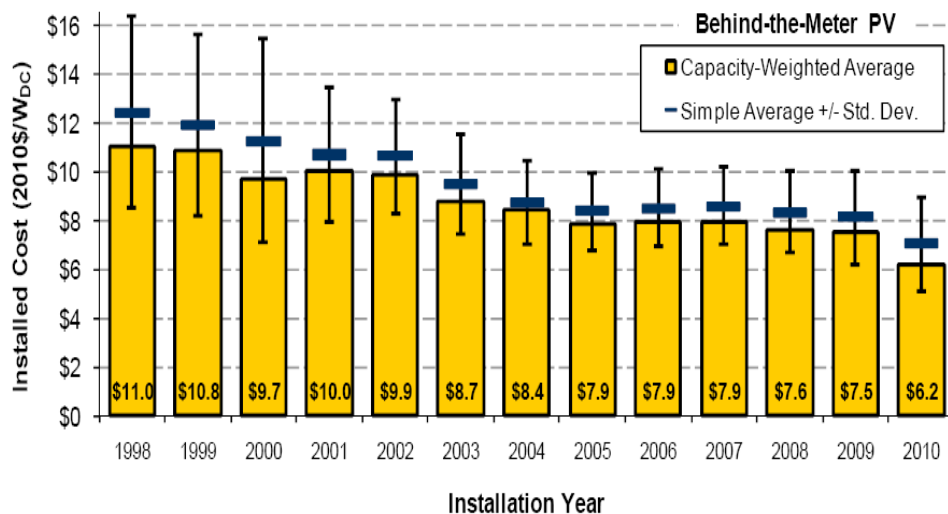
# DENAR

Oktober 2011: študija za Veliko Britanijo:

"Of the three large scale low carbon technologies, the costs estimated by nuclear planning consultant Arup are GBP 130 per megawatt hour for offshore wind, GBP 95 per megawatt hour for gas with carbon capture , and GBP 66 per megawatt hour for nuclear."

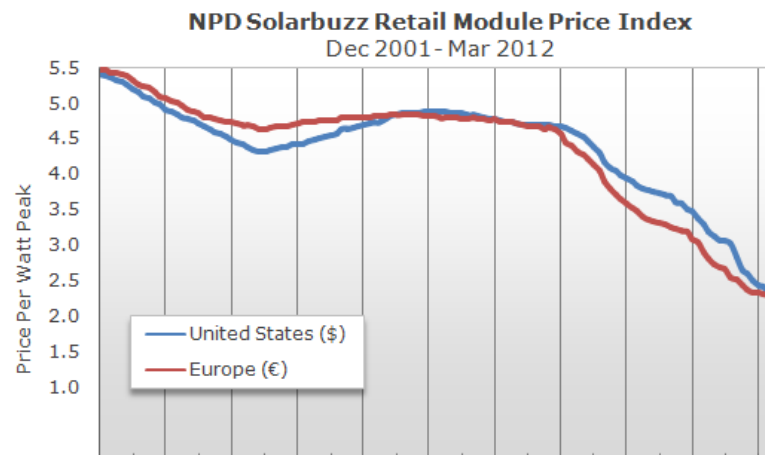
NucNet News in Brief / No. 213 / 14th October 2011

## DENAR: ELEKTRIKA IZ SONCA



Notes: See Table 1 for behind-the-meter PV sample size by installation year.

Figure 6. Average Installed Cost over Time for Behind-the-Meter PV



v 2010/11 v ZDA polovico cene predstavlja sam FV panel, polovico pa instalacija!

# Faktor energetskega donosa

Energetski amortizacijski faktor - čas delovanja elektrarne, v katerem proizvede energijo, ki se porabi v vseh fazah obratovalne dobe (od ekstrakcije gradbenega materiala in goriva, gradnje, do obratovanja in razgradnje).

## Energetski amortizacijski faktor v mesecih:

premog	3-4	
zemeljski plin	1	(kombinirani cikel)
jedrska elektrarna	3	(PWR 1300 MW, brez recikliranja goriva)
hidroelektrarna	14	
vetrna elektrarna	7-16	(1 MW vetrnica)
fotovoltaika	70-100	

## Faktor energetskega donosa (= energ. amort. faktor / življenska doba):

jedrska elektrarna	160 - 240
termoelektrarna - premog	90 - 120
plinska termoelektrarna	300 - 400
velika hidroelektrarna	100 - 200
mala hidroelektrarna	40 - 100
vetrna elektrarna	10 - 50
fotovoltaika	2 - 8

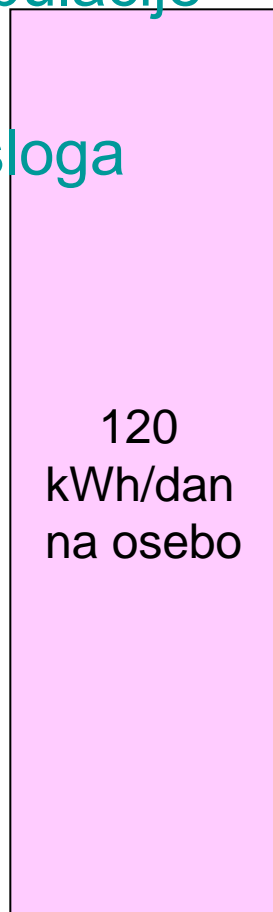
<http://www.sealnet.org/2006/02/energy-yield-factors-for-generation-of.html>

# Kako pripraviti brezogljčni NEP

NEP - Nacionalni Energetski Program

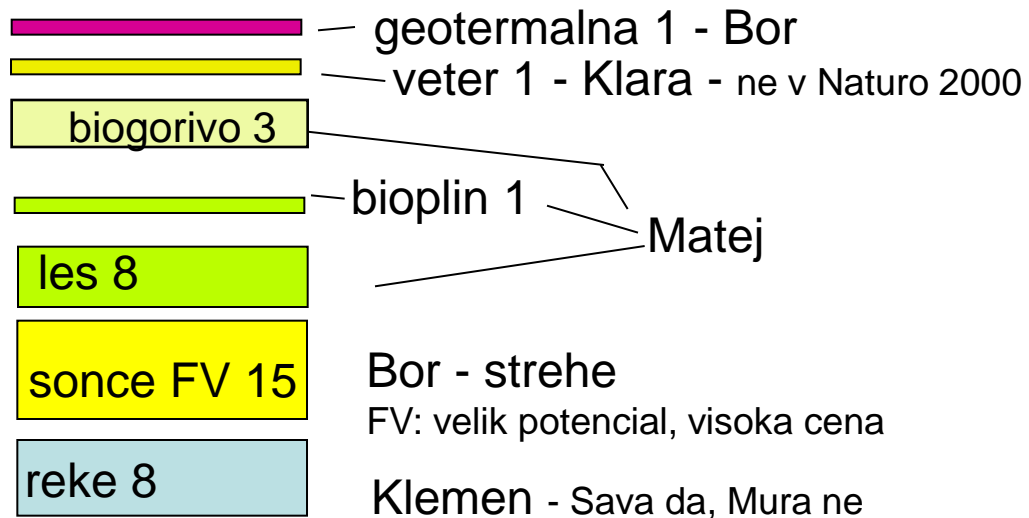
## Poraba:

- zmanjšanje populacije
- sprememba življenjskega sloga
- tehnologija, učinkovitost



## Oskrba:

- jedrska energija
- plin
- "čist premog"
- uvoz obnovljive energije drugih držav





# Sprememba življenskega sloga

(=genetsko spreminjanje organizmov)



homo sapiens

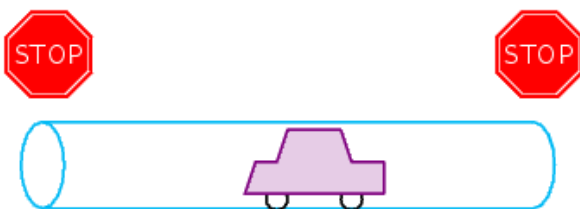
homo sapiens z vgrajenim genom za zmanjšano porabo energije (David MacKay)



## Why transport uses energy



● Air resistance

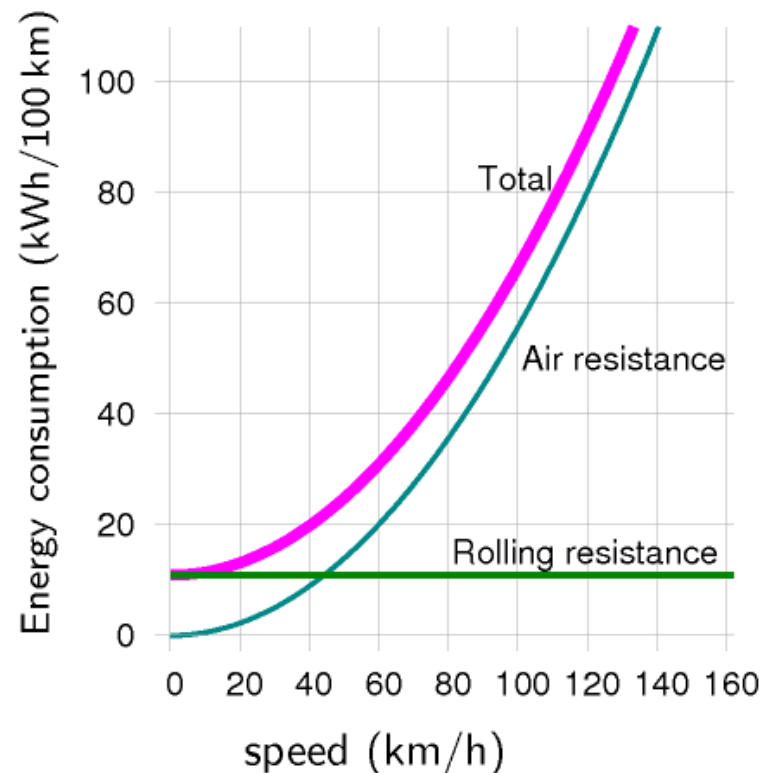


● Acceleration/deceleration

● Rolling resistance

● Engine inefficiency

● internal combustion is 25% efficient



Povzeto po MacKay-u:

- povprečen avto 80 kWh na 100 km

- električni avto - 15 kWh/100 km (Tesla)

Predlog (MacKay) - elektrifikacija transporta

# Tehnologija, učinkovitost - ogrevanje

1) zmanjšanje temperature

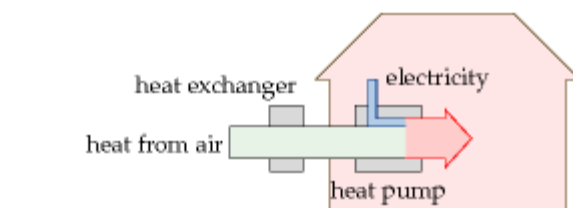
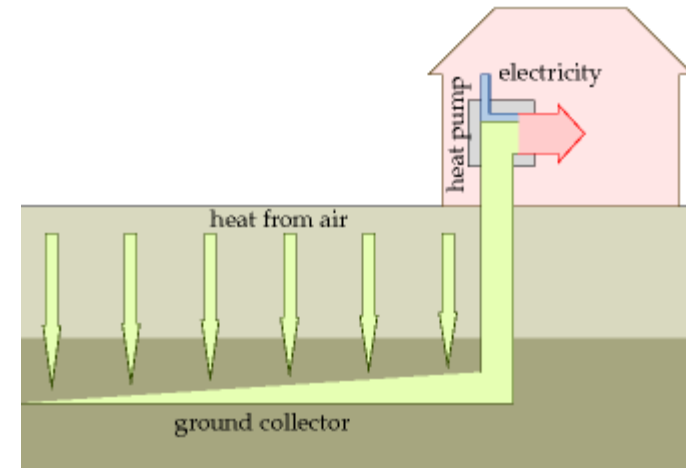


2) izolacija stavb



3) ogrevanje z elektriko -  
toplotne črpalke (zrak-voda)  
(zrak-zrak)

biomasa - les



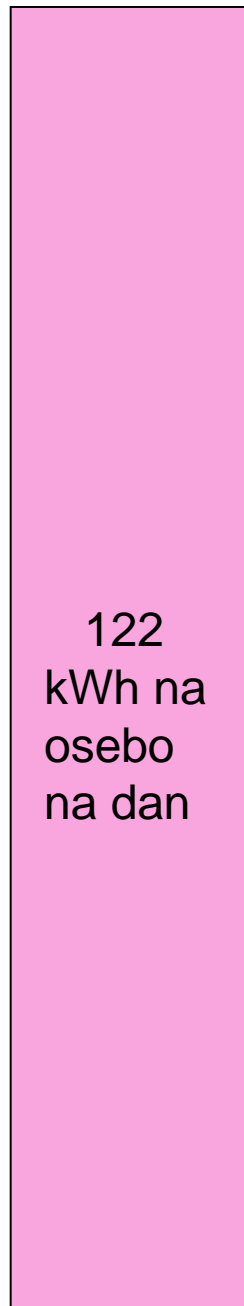
Slike:

<http://tell.fll.purdue.edu/JapanProj/FLClipart/Medical.html>

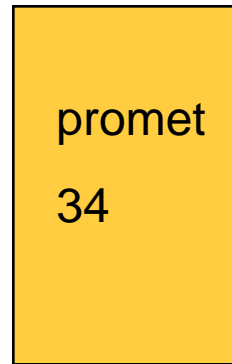
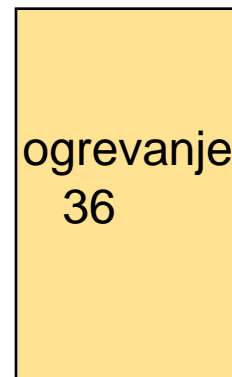
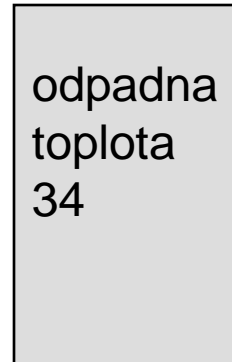
<http://epsom-ewellenergy.org.uk/2008/11/11/insulation-in-the-home/>  
MacKay

SLO  
energija  
brez  
izpustov  
CO<sub>2</sub>

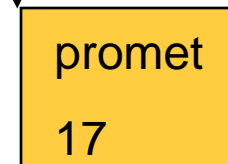
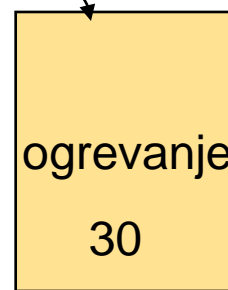
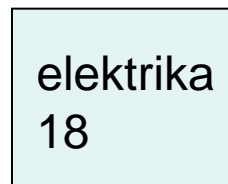
NEP  
Nacionalni  
Energetski  
Program



Poraba



Tehnologija,  
učinkovitost



Ključne ideje

boljša izolacija  
toplotne črpalke  
2 m<sup>2</sup> kolektorjev/os  
izkoristiti 80%  
prirastka

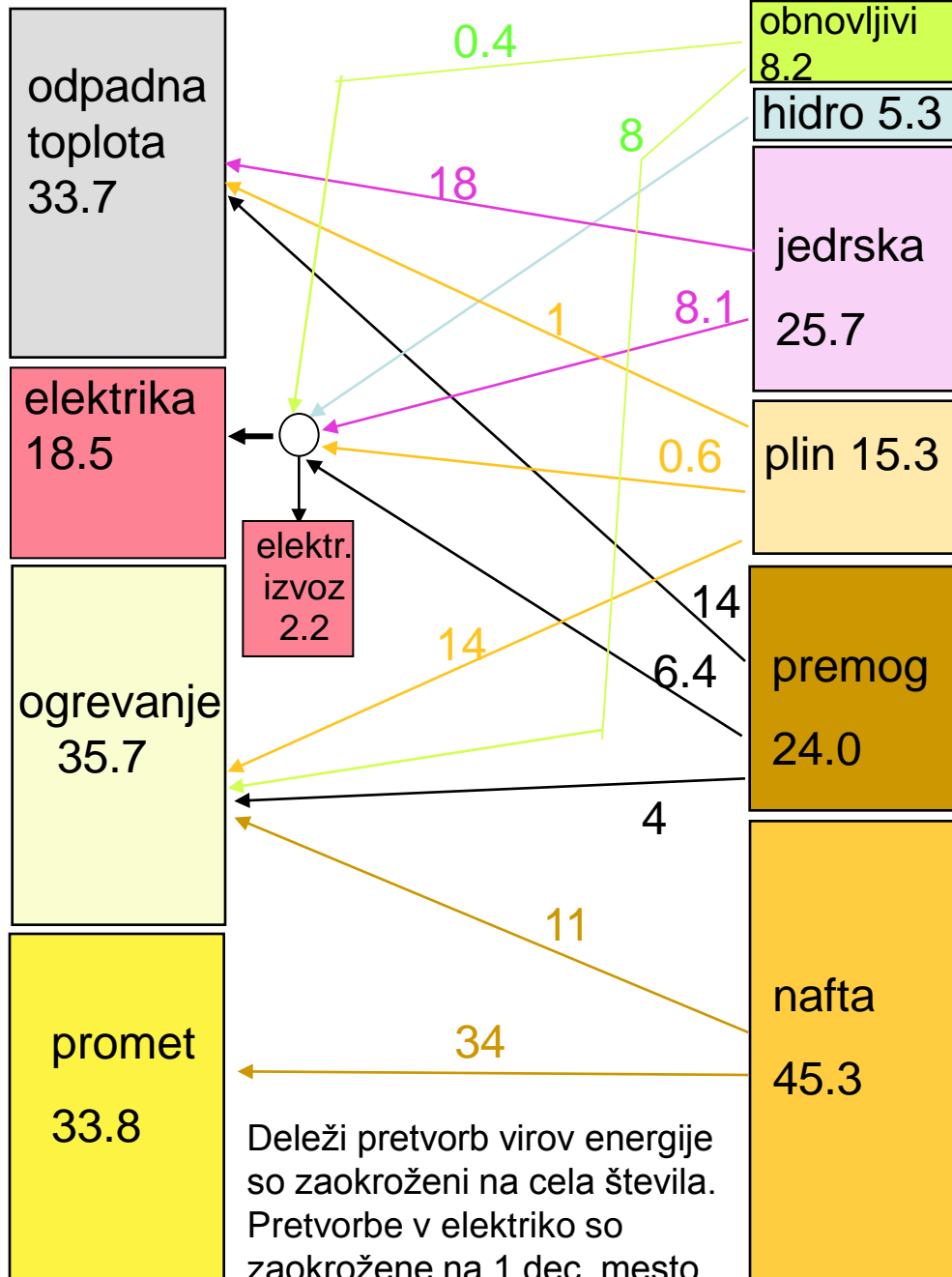
5% površine SLO  
za tovorni promet  
električna vozila

# SLO Poraba 2008

## Viri

SLO  
poraba  
energije

122  
kWh na  
osebo  
na dan



**odpadna toplota:**  
vključena je  
lastna raba  
elektrarn (1.4) in  
izgube koristne  
toplote (0.6)

**Poraba elektrike**  
vsebuje tudi 1.1  
izgub v elektr.  
omrežju

**ogrevanje =**  
ogrevanje+  
kmetijstvo+  
industrija  
(neelektrična  
poraba)

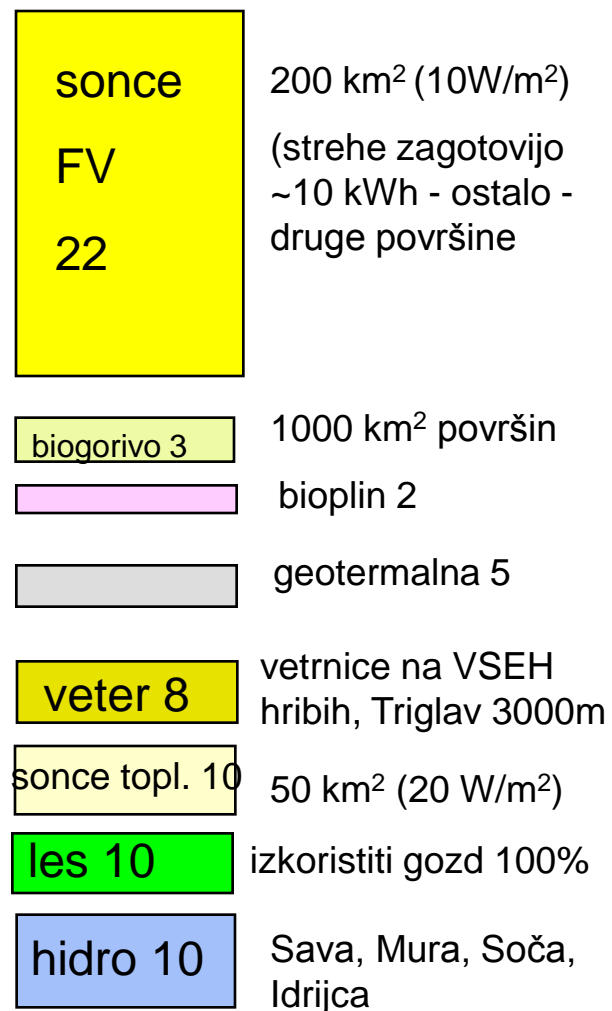
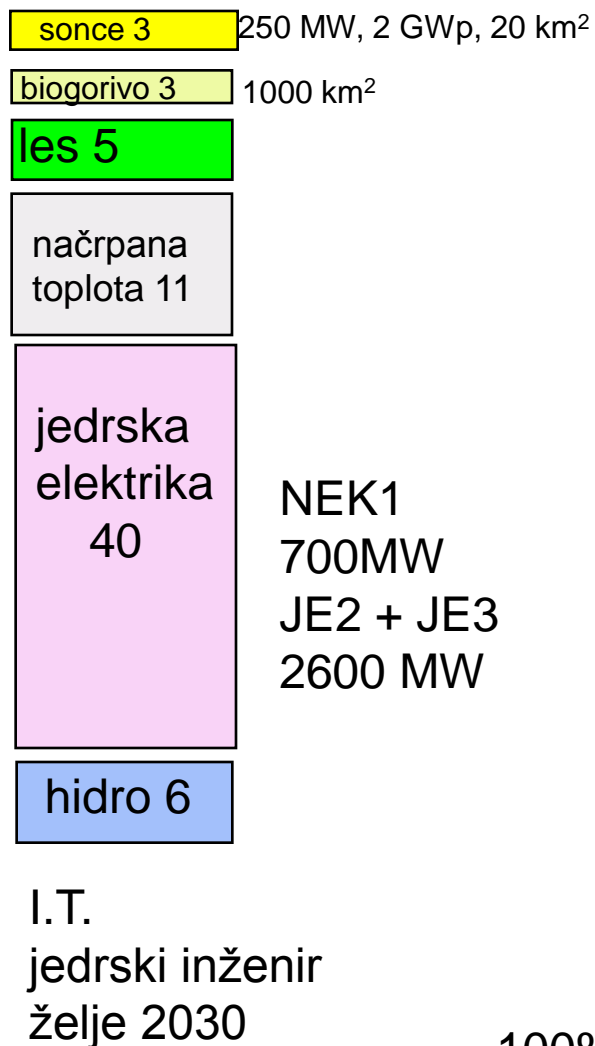
**Izgube elektrike  
in koristne  
toplote** pri  
transformaciji niso  
napisane

vir:  
statistični  
letopis  
2009

# Nekaj energetskih načrtov (kWh/dan/osebo)



I.T. napoved 2020



100% obnovljivi,  
lastni viri - zeleno  
za vsako ceno