

*Jaromír Čihák*

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Mikrotik

Alternative power

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*Who is Jaromir ?*

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# Jaromír Čihák

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SysDataCom founder  
Mikrotik trainer  
Network enthusiast

someone who know how to levitate  
Mikrotik ->





Why alternative power ?

# Rural relay tower installation

- ❖ Could be install
- ❖ Where is no
- ❖ POWER !

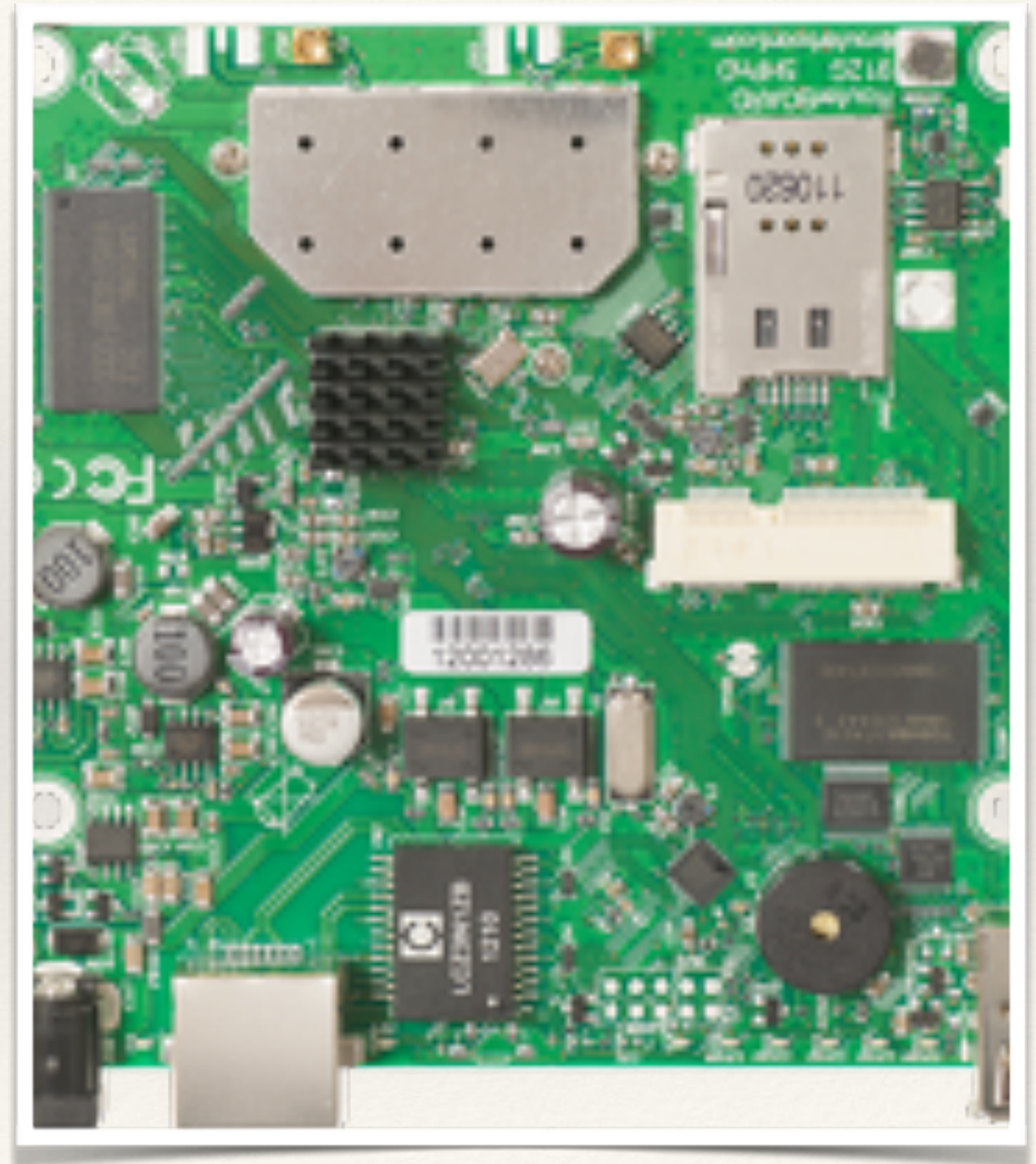




Mikrotik consumption

# RB 912 UAG-5HPnD

- ❖ Consumption
  - ❖ Datasheet 14W
  - ❖ Real 2.5W
  - ❖ Real with LTE modem 4.8W





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# RB 750 UP

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- ❖ Consumption
  - ❖ datasheet 3w
  - ❖ real 3W
- ❖ PoE
  - ❖ 1 port PoE
  - ❖ 2-5 port up to 0,5 A current



# RB 750 UP

- ❖ PoE
  - ❖ priority
  - ❖ firmware
  - ❖ Auto on
  - ❖ Forced on
  - ❖ Off mode

The screenshot shows the 'Interface <ether5\_inet>' configuration window with the 'PoE' tab selected. The 'PoE Out' dropdown is set to 'auto on'. The 'PoE Priority' is set to '1'. The 'PoE Out Current' is '169 mA', 'PoE Out Voltage' is '23.5 V', and 'PoE Out Power' is '3.9 W'. On the right side, there are buttons for 'OK', 'Cancel', 'Apply', 'Disable', 'Comment', 'Torch', 'Blink', 'Reset MAC Address', and 'Reset Counters'. At the bottom, there are status indicators: 'enabled', 'running', 'slave', and 'link ok'.

General	PoE	Ethernet	Status	Overall Stats	...
PoE Out: auto on					
PoE Priority: 1					
PoE Out Current: 169 mA					
PoE Out Voltage: 23.5 V					
PoE Out Power: 3.9 W					

OK

Cancel

Apply

Disable

Comment

Torch

Blink

Reset MAC Address

Reset Counters

enabled

running

slave

link ok



feature	version 1.x	version 2.0
max limit on port	500mA	1A
total limit	2A	2.2A
poe-priority	not available	per port priority adjustable
monitoring	not available	information about each port
PoE in long cable mode	not available	available
Check PoE controller FW version	newer RouterOS	available

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PoE firmware

/interface ethernet poe  
settings upgrade

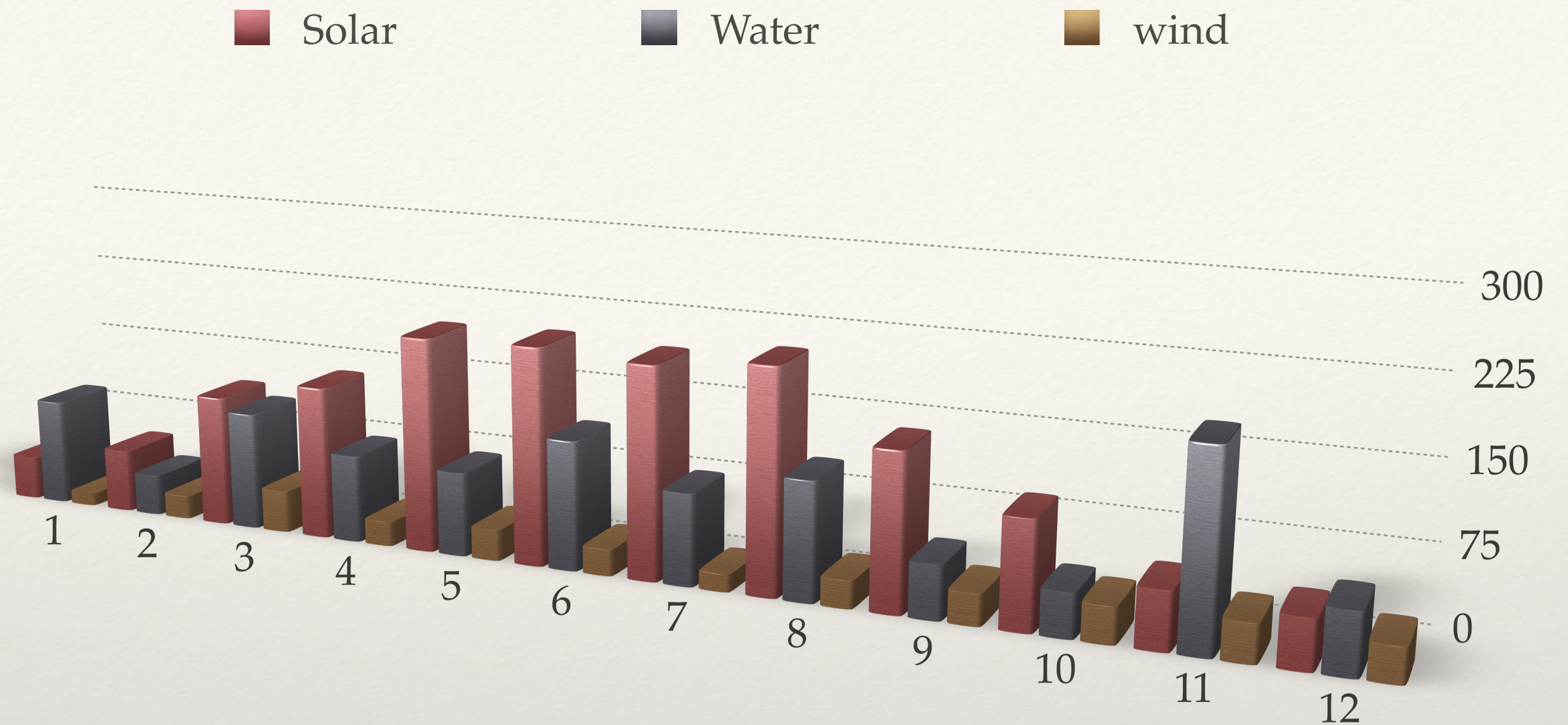
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# Known power alternative

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- ❖ Solar
- ❖ Water
- ❖ Hydrogen
- ❖ Steam
- ❖ ..?

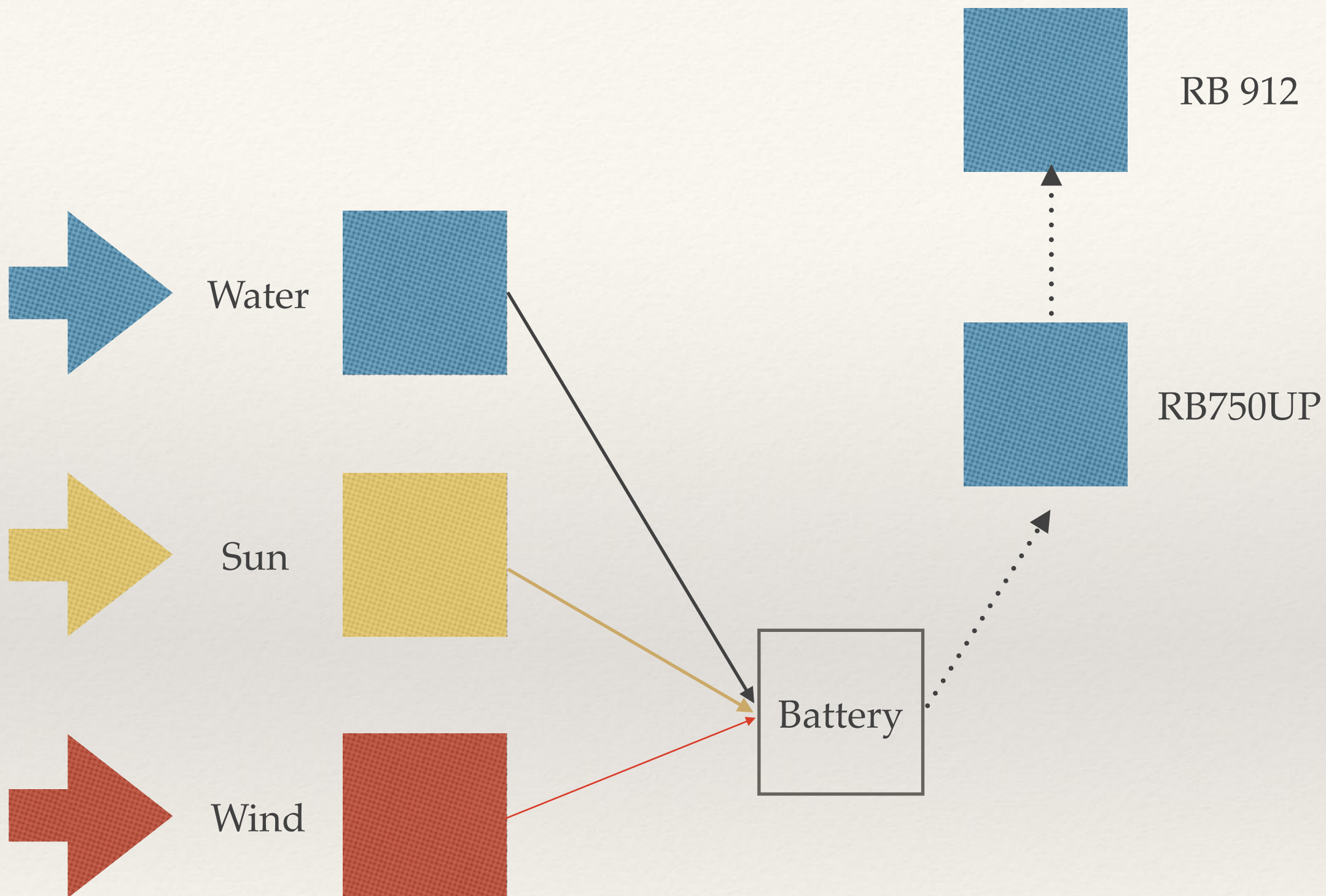




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# Solar - Water - Wind

usable power through year

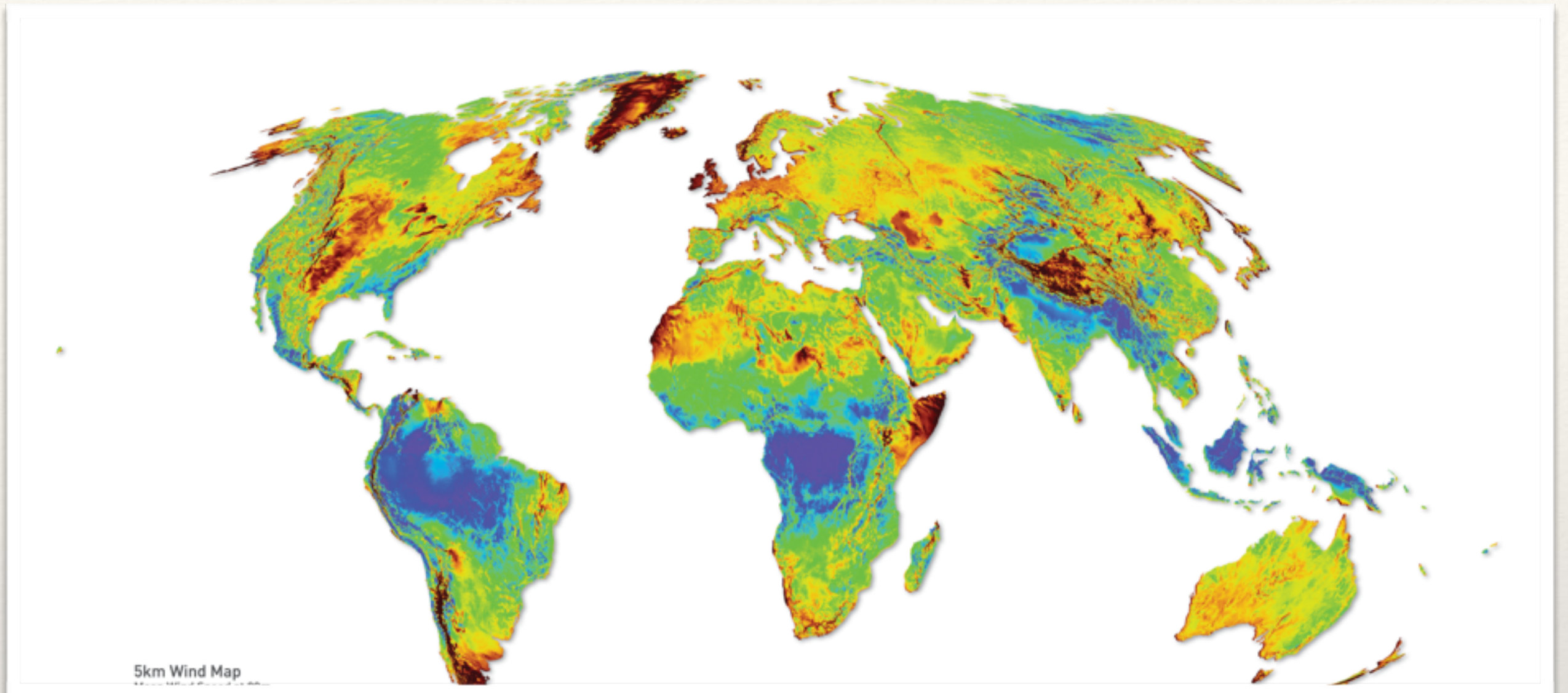




# Battery

- ❖ PB battery
  - ❖ cheap
  - ❖ acid
  - ❖ 200-500 cycles
- ❖ LiFePO<sub>4</sub>
  - ❖ expensive
  - ❖ green
  - ❖ >5000 cycles



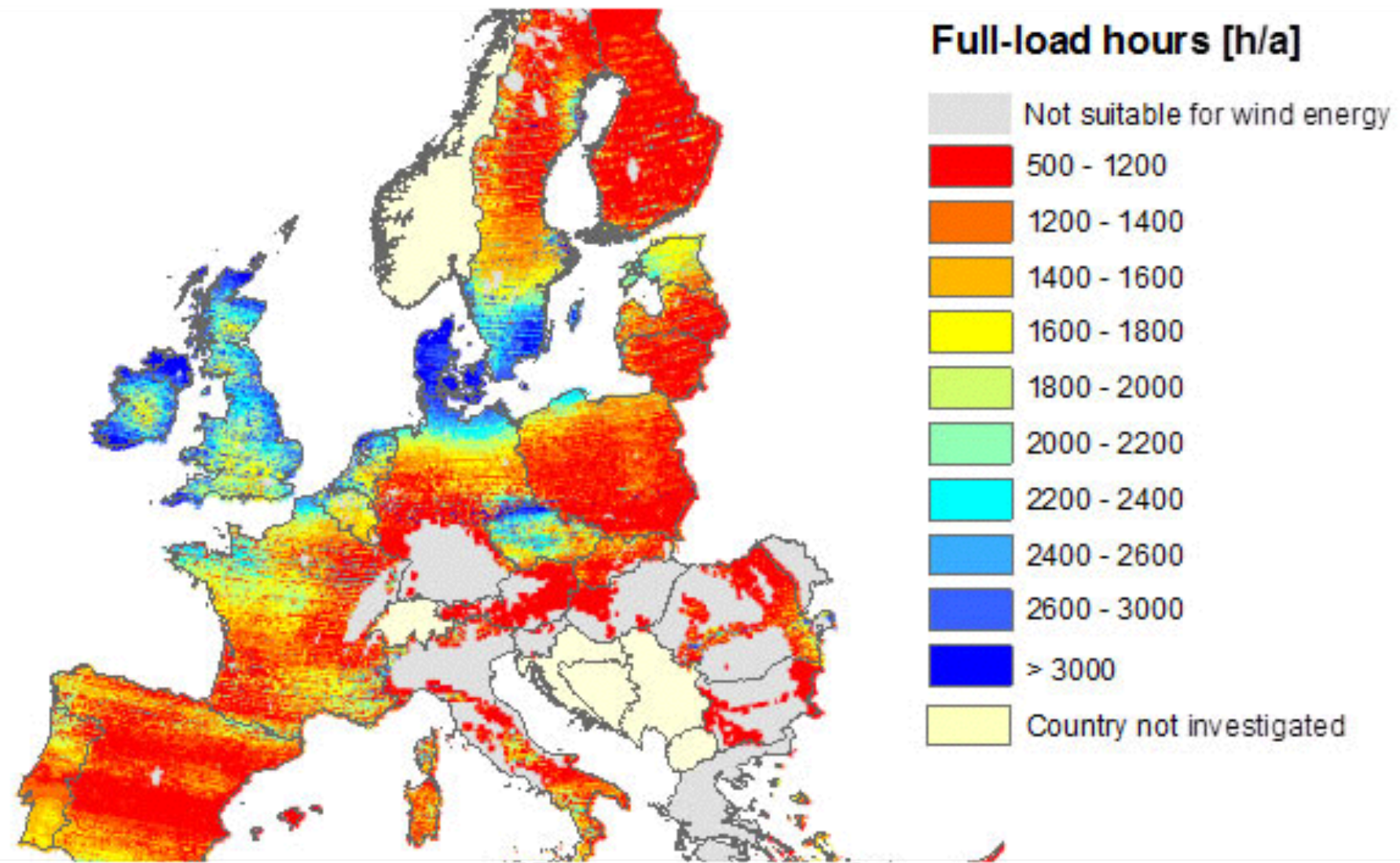


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Wind power

Alternative power





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# Wind power

Load hours





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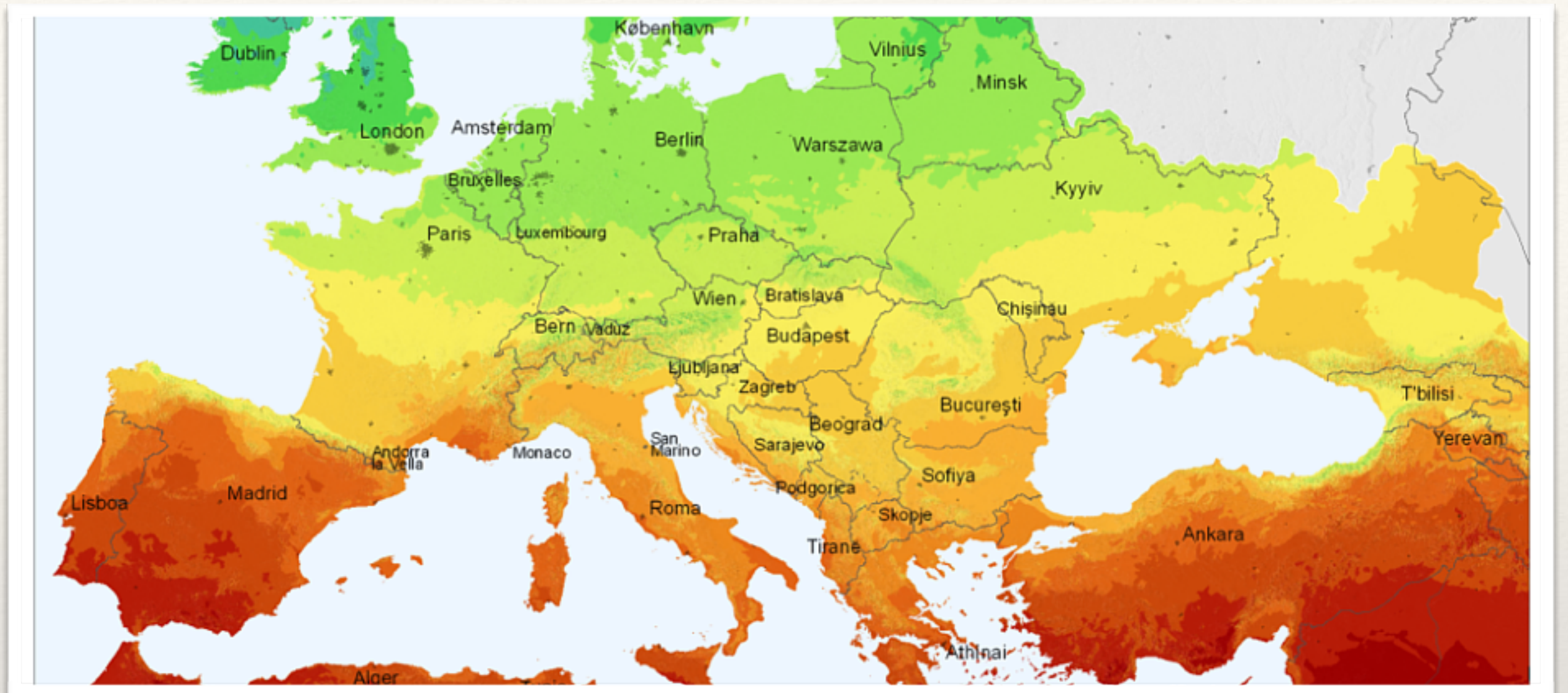
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Solar power

Alternative power

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# Solar power

Europe sun radiation





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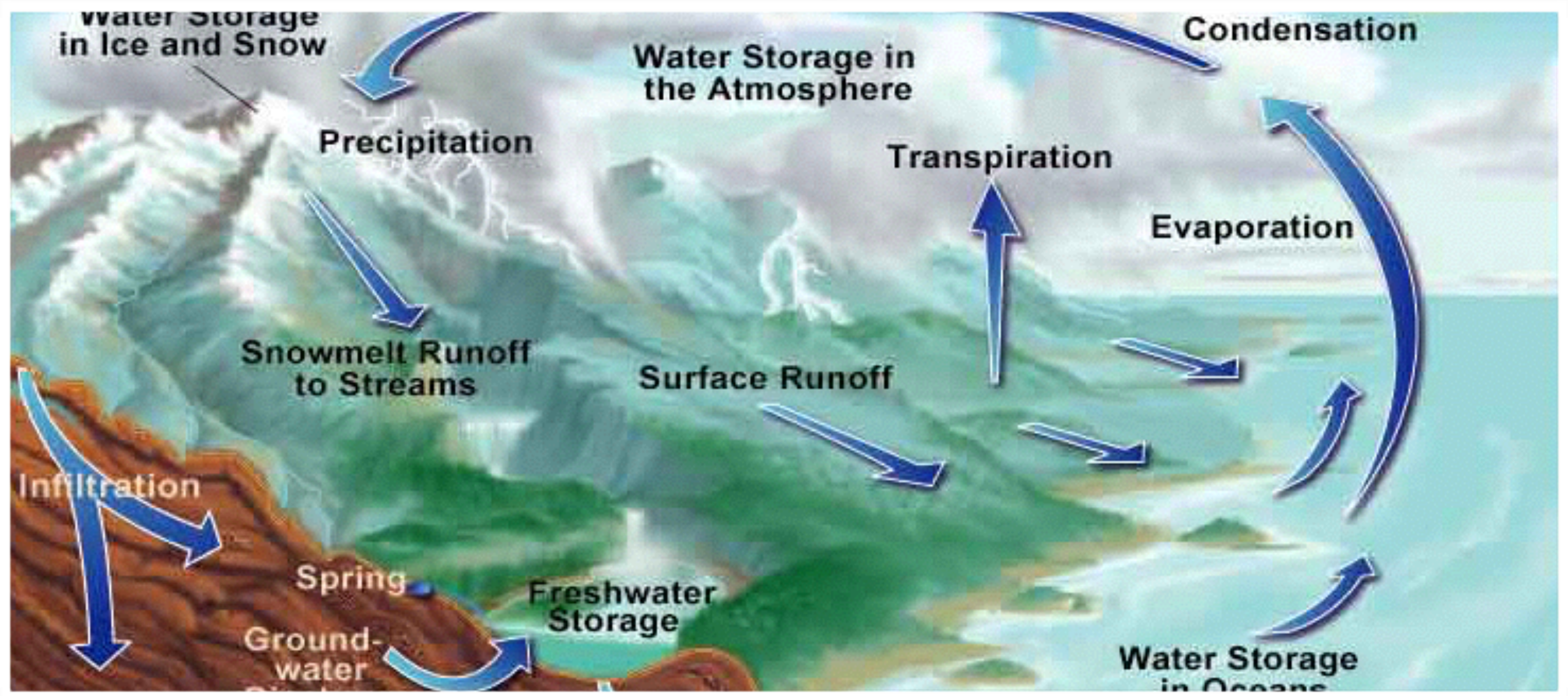
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Water power

Alternative power

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# Hydrology

Hydrology on installation site



# How Much water I have ?

cm	ltr / sec
3	0,2
5	0,8
6	1,2
7	1,8
8	2,6
9	3,4
10	4,5

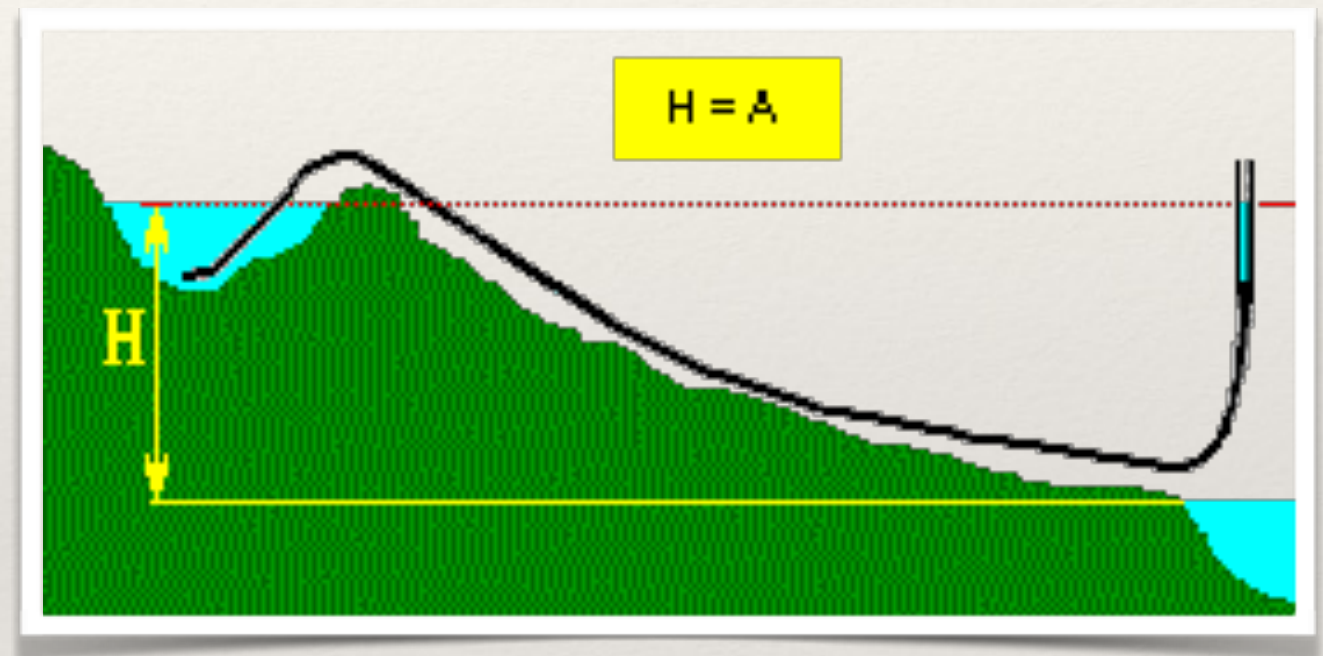




# Water energy

❖  $P(\text{watt}) = 0,0981 \times Q(\text{ltrsec}) \times H(\text{metres}) \times \text{Eff}(\%)$

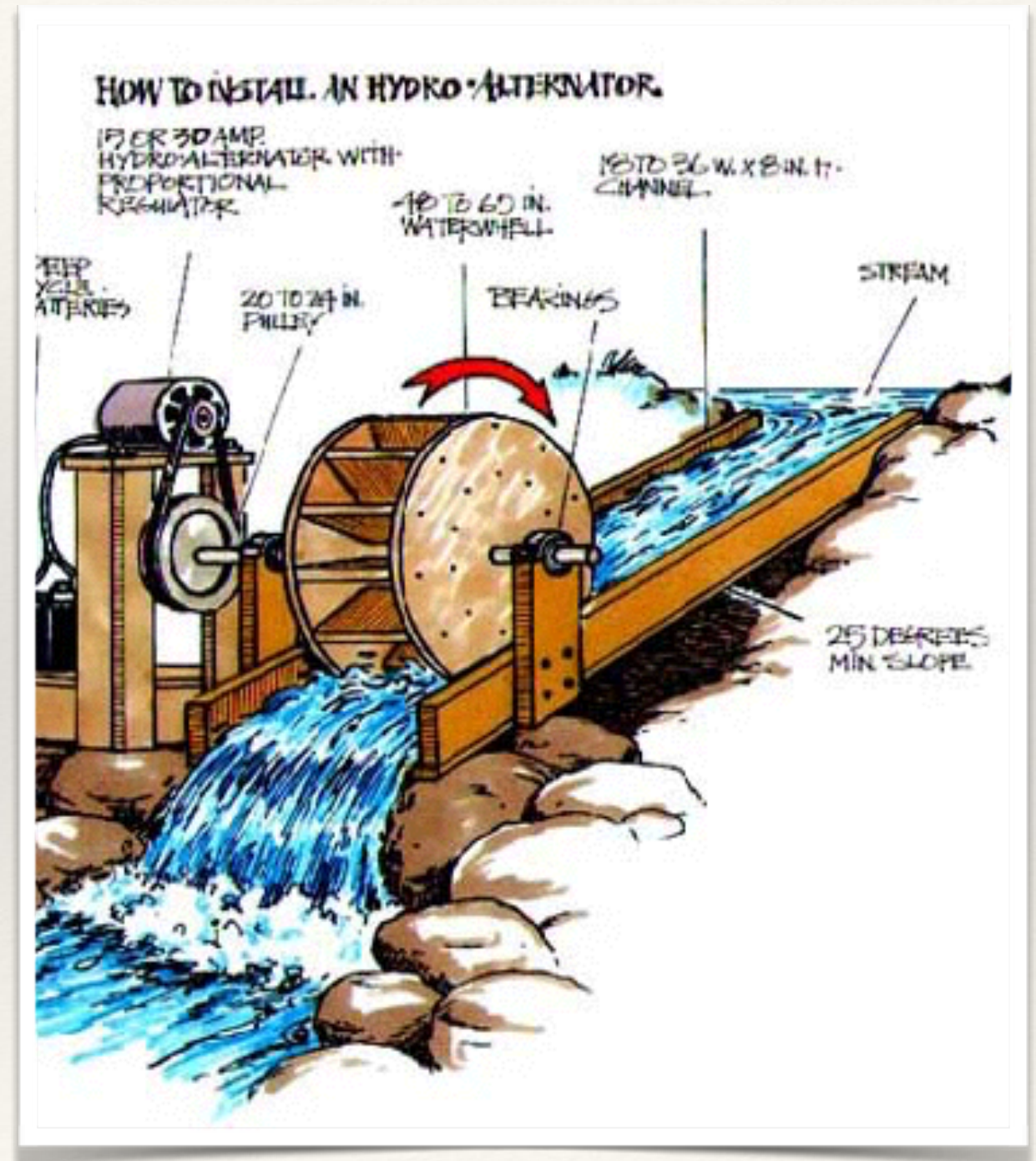
75% eff	2m	4m	10m
0,8 lt/s	12W	24W	59W
1,8 lt/s	26W	53W	132W
2,6 lt/s	38W	77W	191W
4,5 lt/s	66W	132W	331W





# water machines

- ❖ Water wheel
- ❖ Turbine
- ❖ other





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# Water wheel

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- Robust
- Difficult to steal
- non sensitive for dirty water





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# Turbine

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Kaplan

Banki

Pelton

Turgo

Tesla

...





# Wheel or turbine ?

Engine type	10 %	20 %	30 %	40 %	50 %	60 %	70 %	80 %	90 %	100 %
Water wheel	68	75	75	75	75	75	75	75	75	75
Kaplan Turbine	15	70	85	88	90	90	90	90	88	85
Francis turbine			15	58	72	78	82	82	82	80
Banki turbine		40	60	68	72	74	75	74	72	70



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# Real installation

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- ❖ Hydrology
  - ❖ 11m
  - ❖ 0,5 lt/ sec





# Where to take a water

❖ Cycling preparation









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# Pelton turbine

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Directly connected on PM Motor







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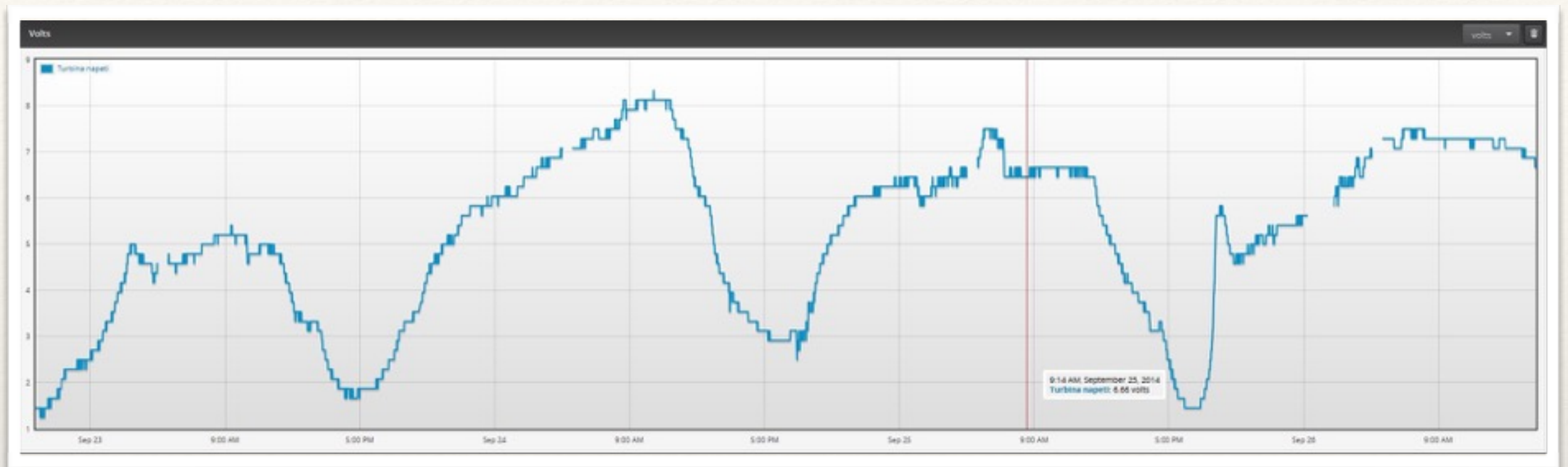
winter

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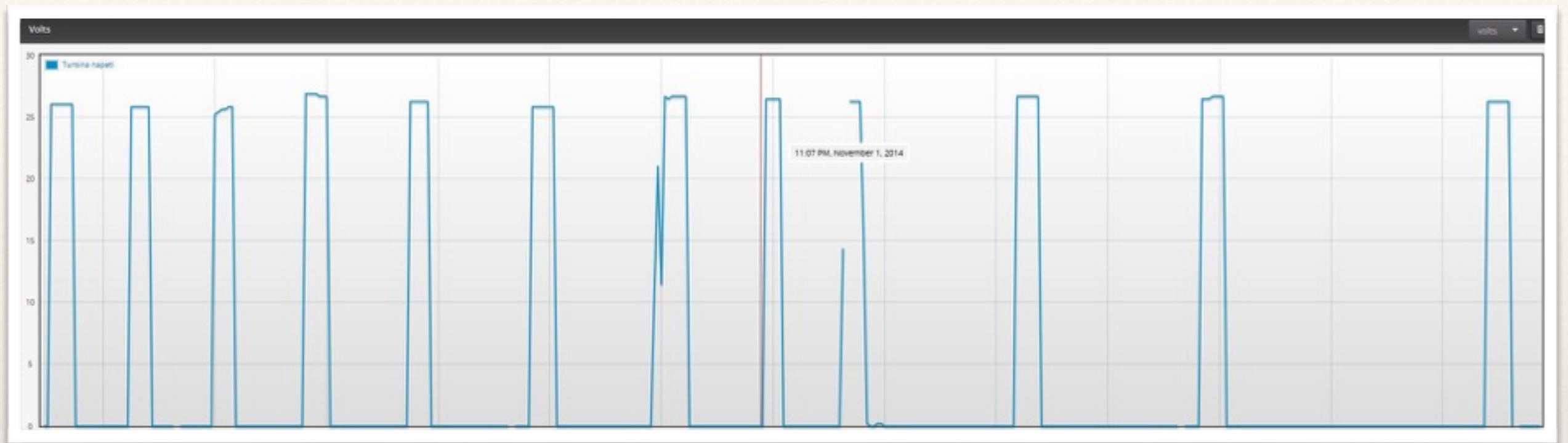


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Water - real numbers

voltage from generator



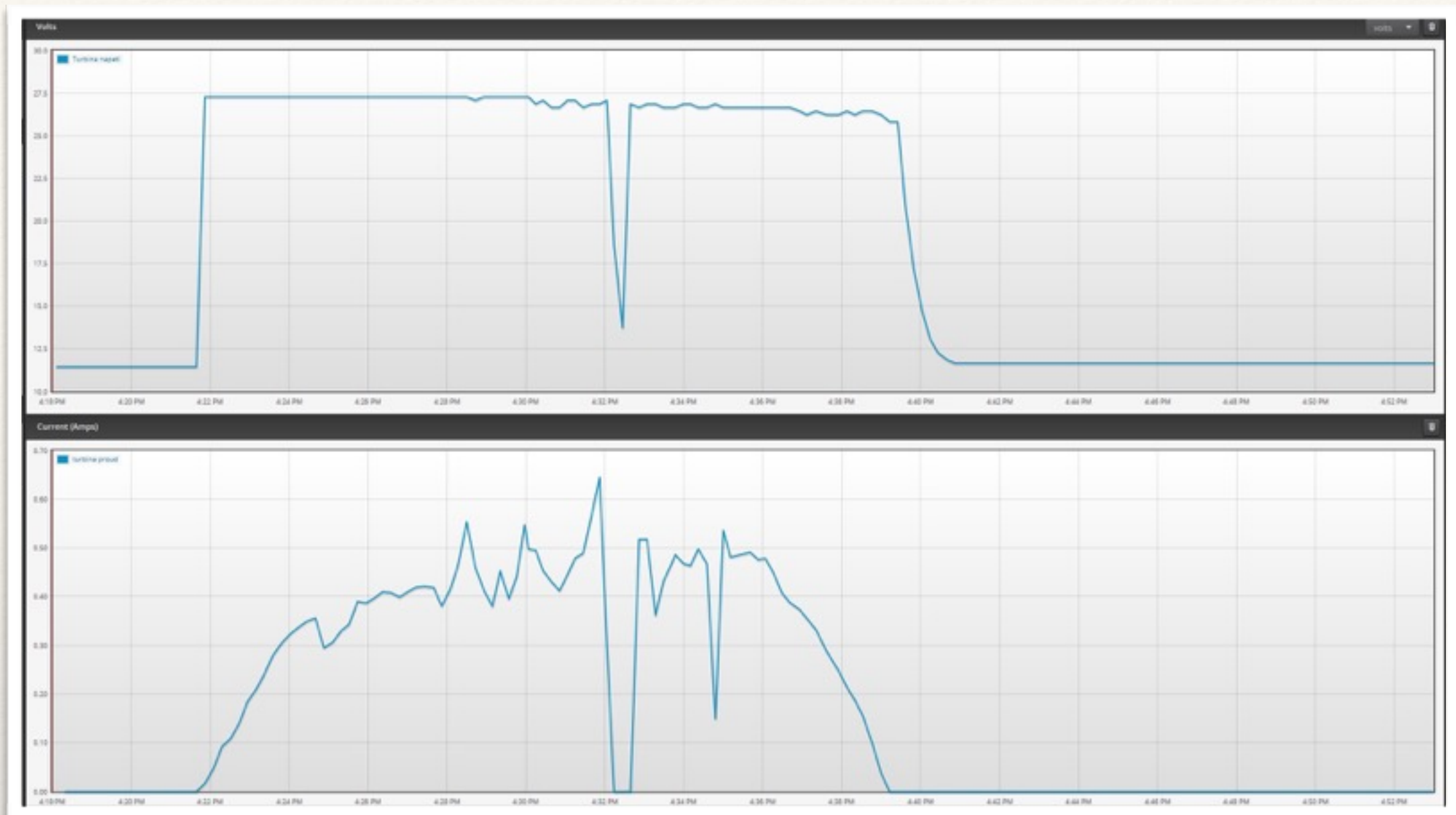


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Water - real numbers

voltage from generator  
Cycles





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# Water - real numbers

Typical raining

$$27V \times 0,5A = 13W$$



Thank you for attention

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