

Jaromír Čihák

Mikrotik

Indonesia MUM 2016

Alternative power for Mikrotik

Youtube (Jaromir Cihak)

Already on YouTube
mikrotik water power
mikrotik water power Part 1

Who is Jaromir ?

Jaromír Čihák

SysDataCom founder

Mikrotik trainer

Network enthusiast

someone who know how to levitate

Mikrotik ->





Mikrotik 007 trainer certificate holder



Valens Riyadi

Low energy solution fanatic !

Flying enthusiastic

My aircraft usual passenger :D





Routedworld

Why alternative power ?

Rural relay tower installation

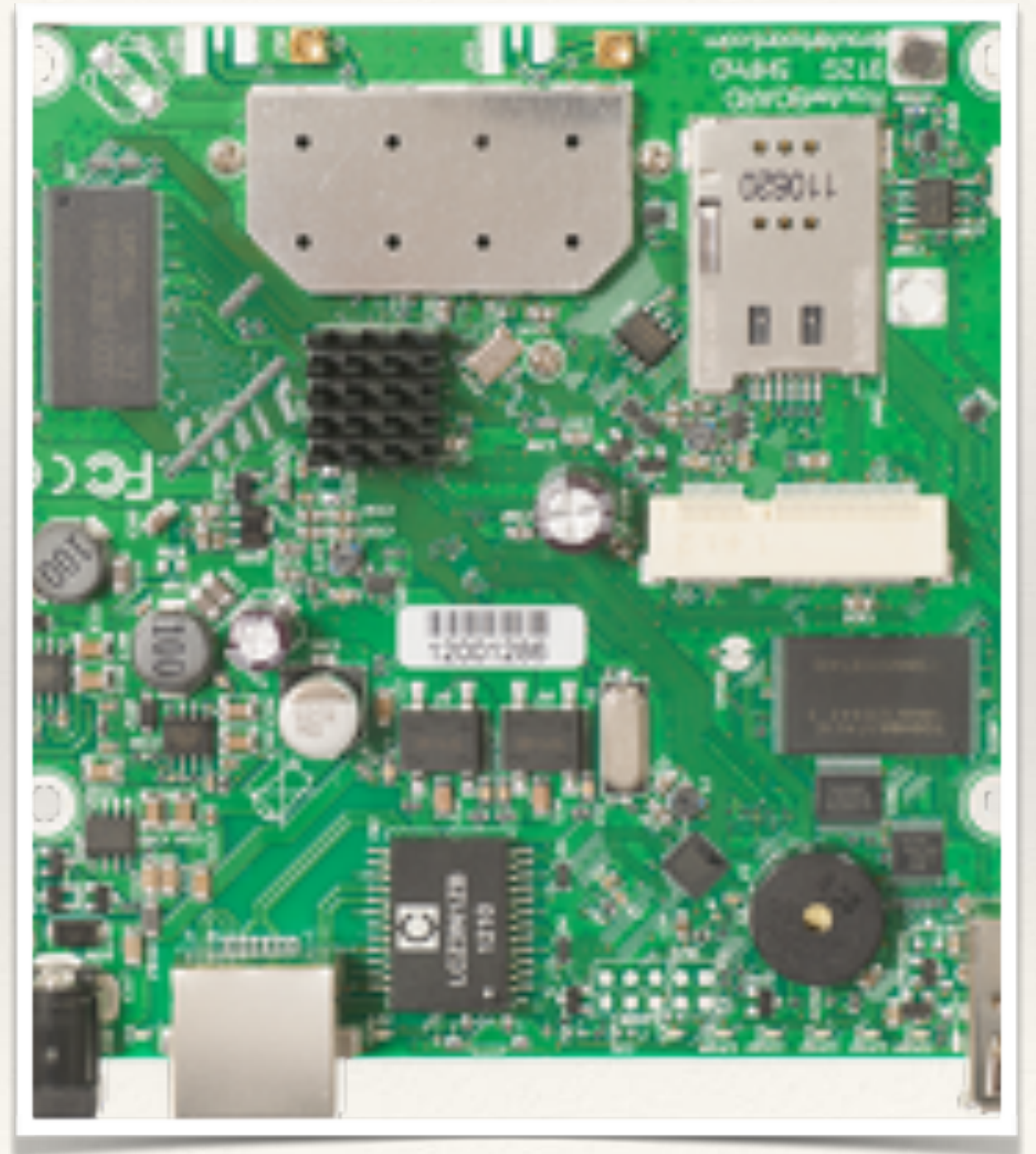
- ❖ Could be install
- ❖ Where is no
- ❖ POWER !
- ❖ or expensive...



Mikrotik consumption

RB 912 UAG-5HPnD

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



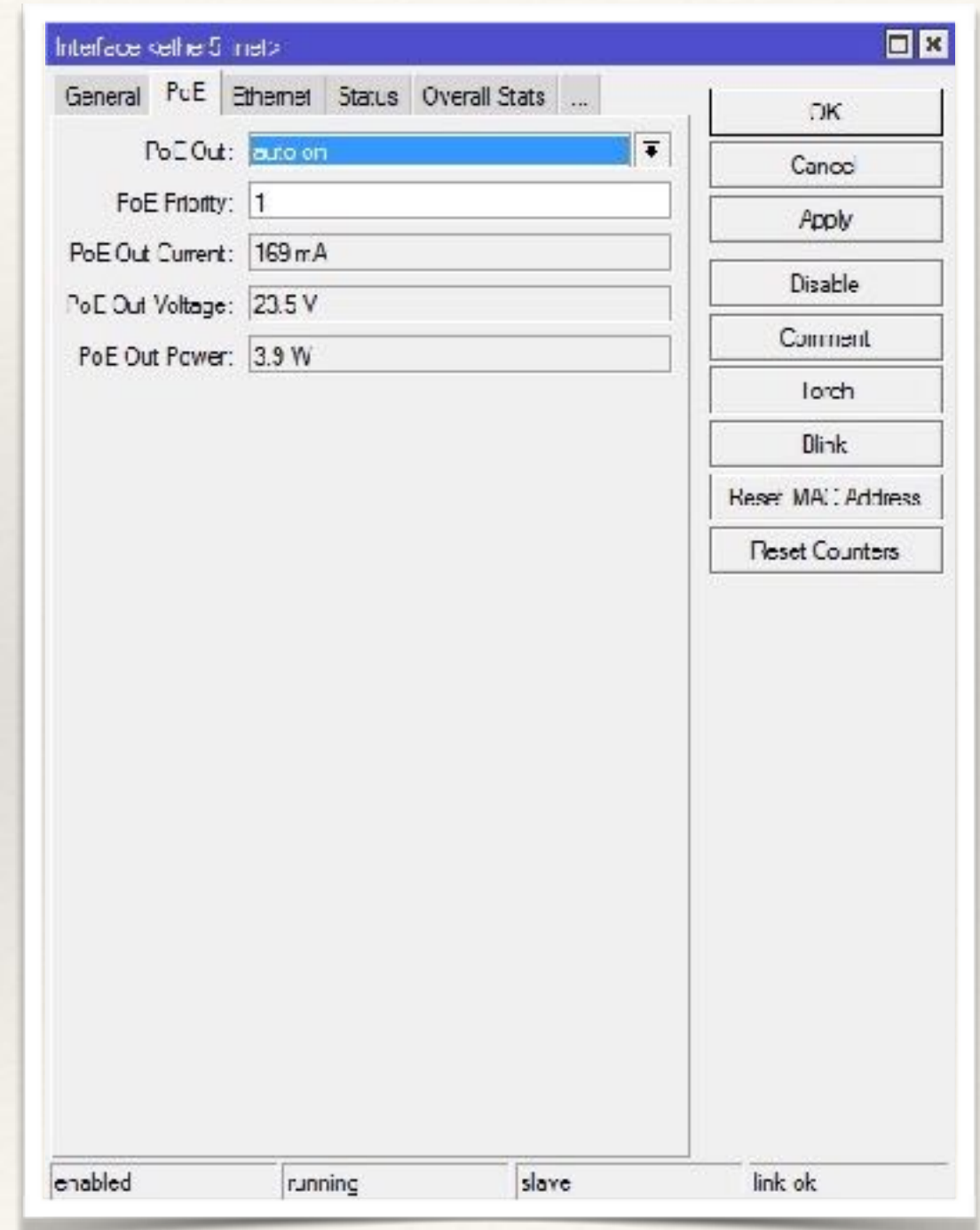
RB 750 UP

- ❖ 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



| 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

```
[admin@MikroTik] > interface ethernet poe monitor [find]
      name: ether2 ether3 ether4 ether5
poe-out-voltage: 23.2V  23.2V  23.2V
poe-out-current: 224mA  116mA  64mA
  poe-out-power: 5.1W   2.6W   1.4W
```

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PoE firmware

/interface ethernet poe settings
upgrade

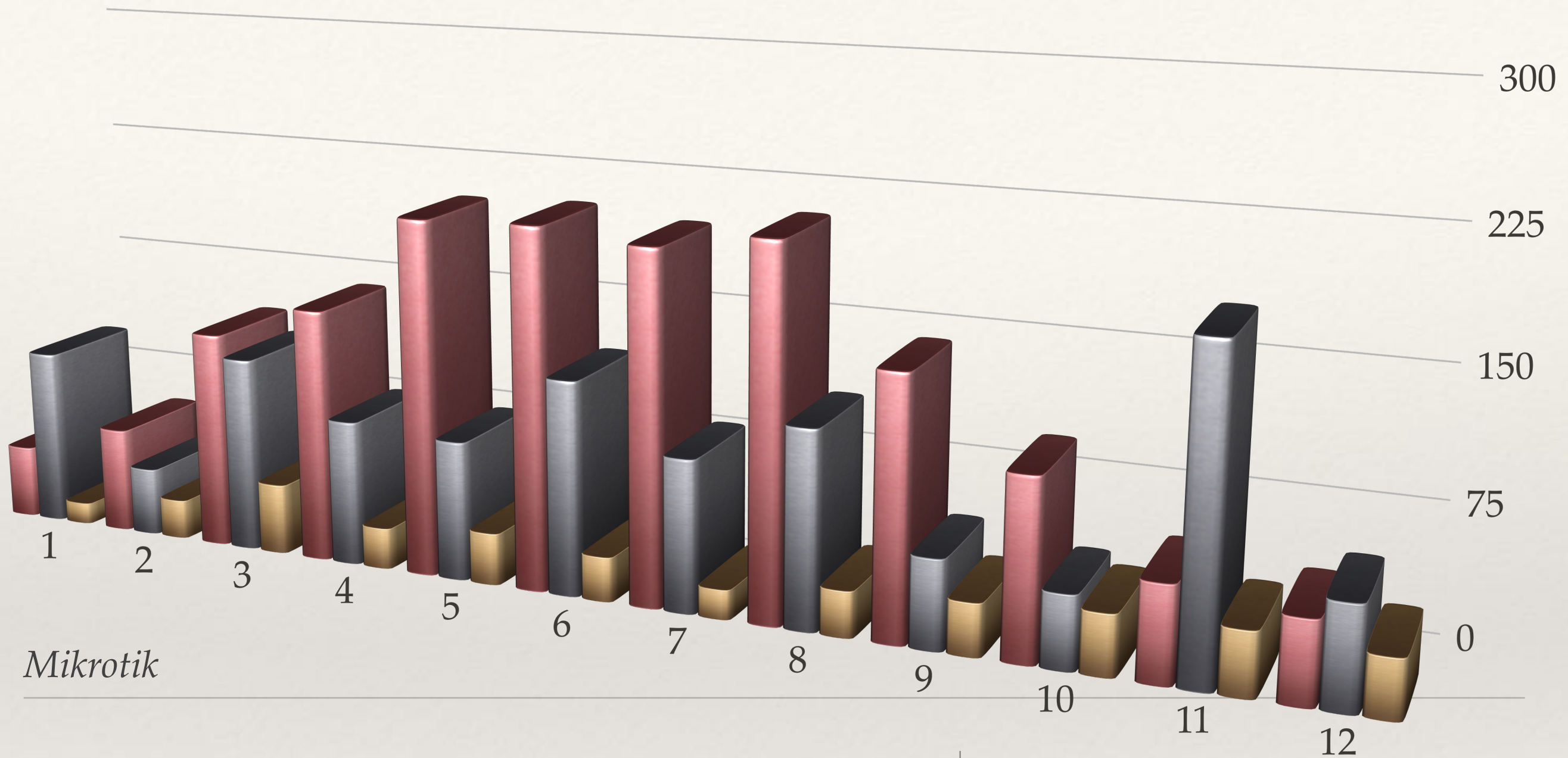
Known power alternative

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

Solar

Water

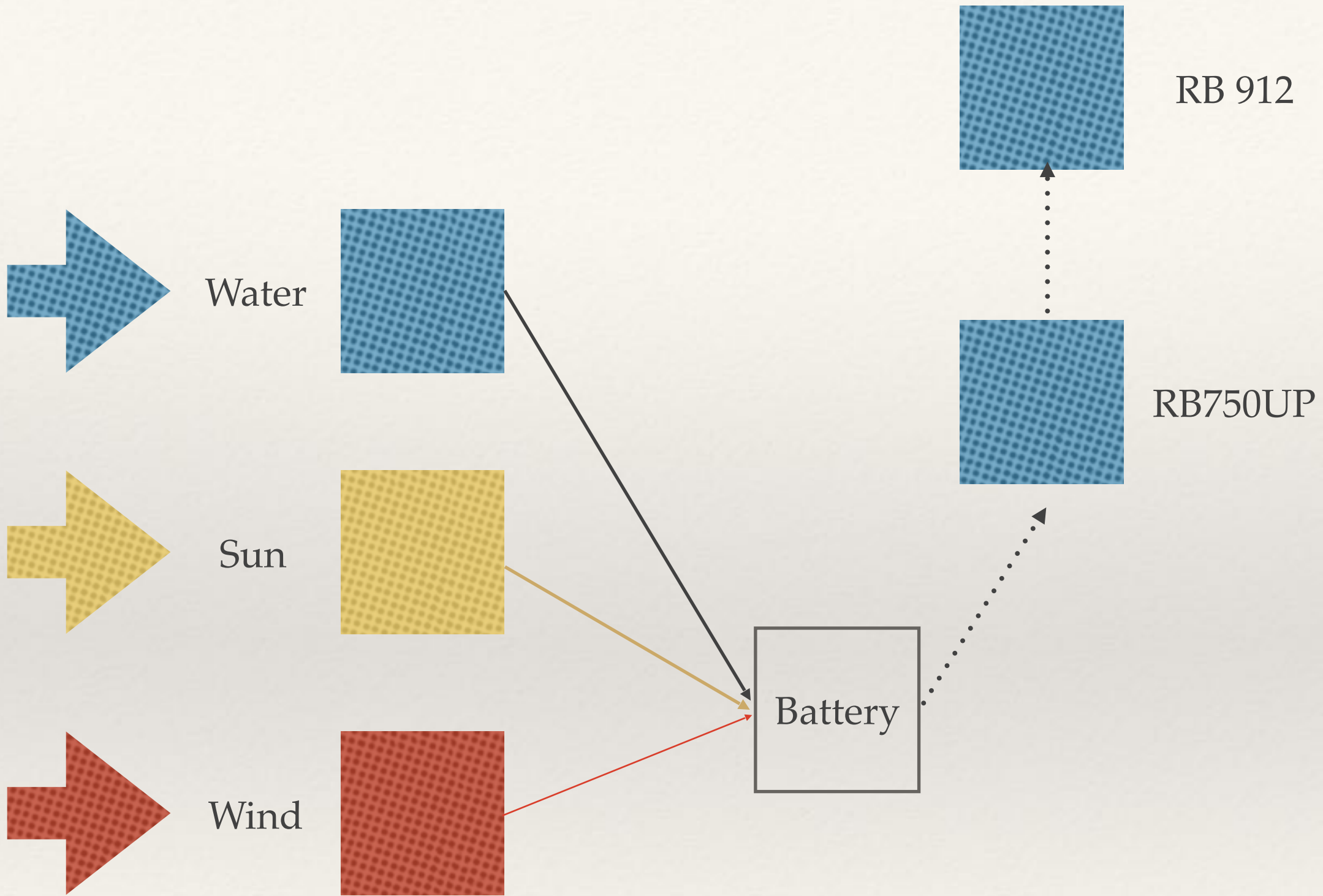
wind



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Solar - Water - Wind

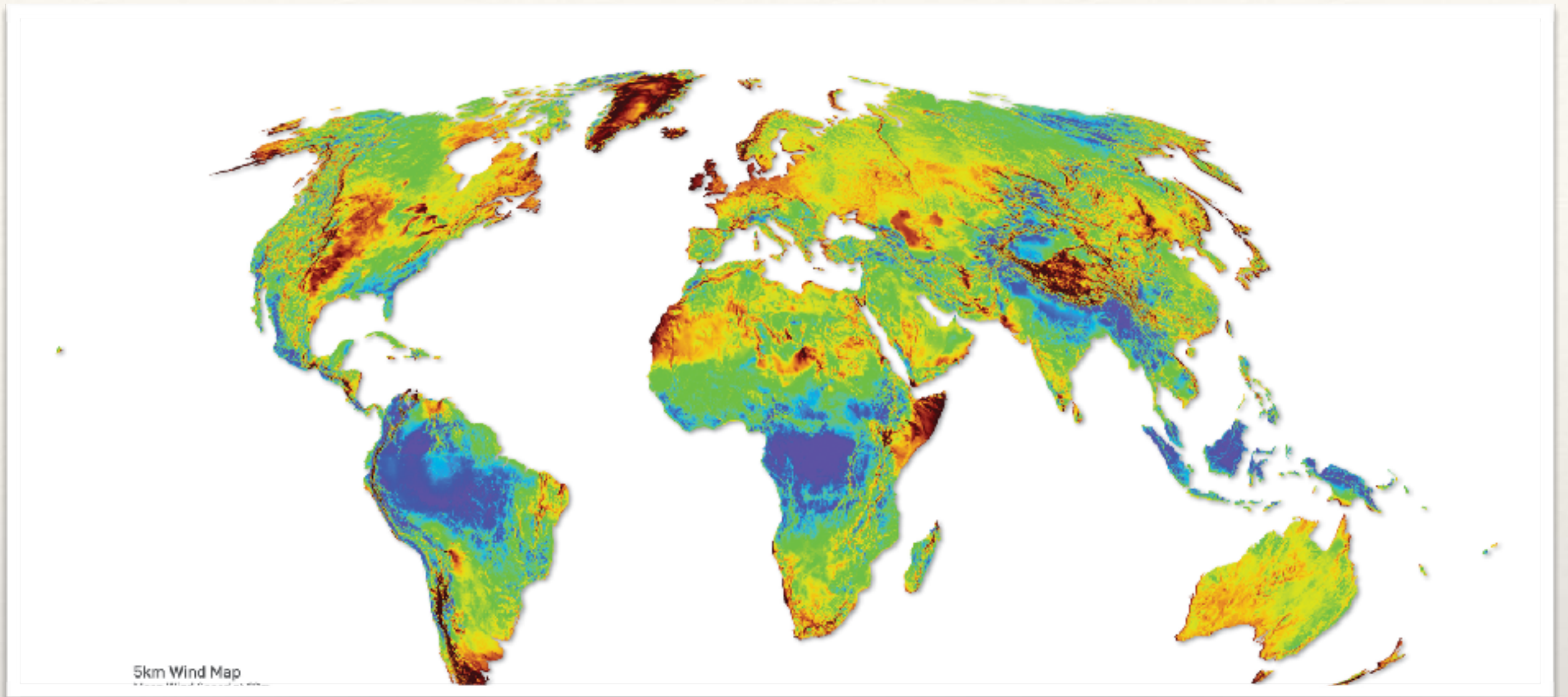
usable power through year



Battery

- ❖ PB battery
 - ❖ cheap
 - ❖ acid
 - ❖ 200-500 cycles
- ❖ LiFePO₄
 - ❖ expensive
 - ❖ green
 - ❖ >5000 cycles





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Wind power

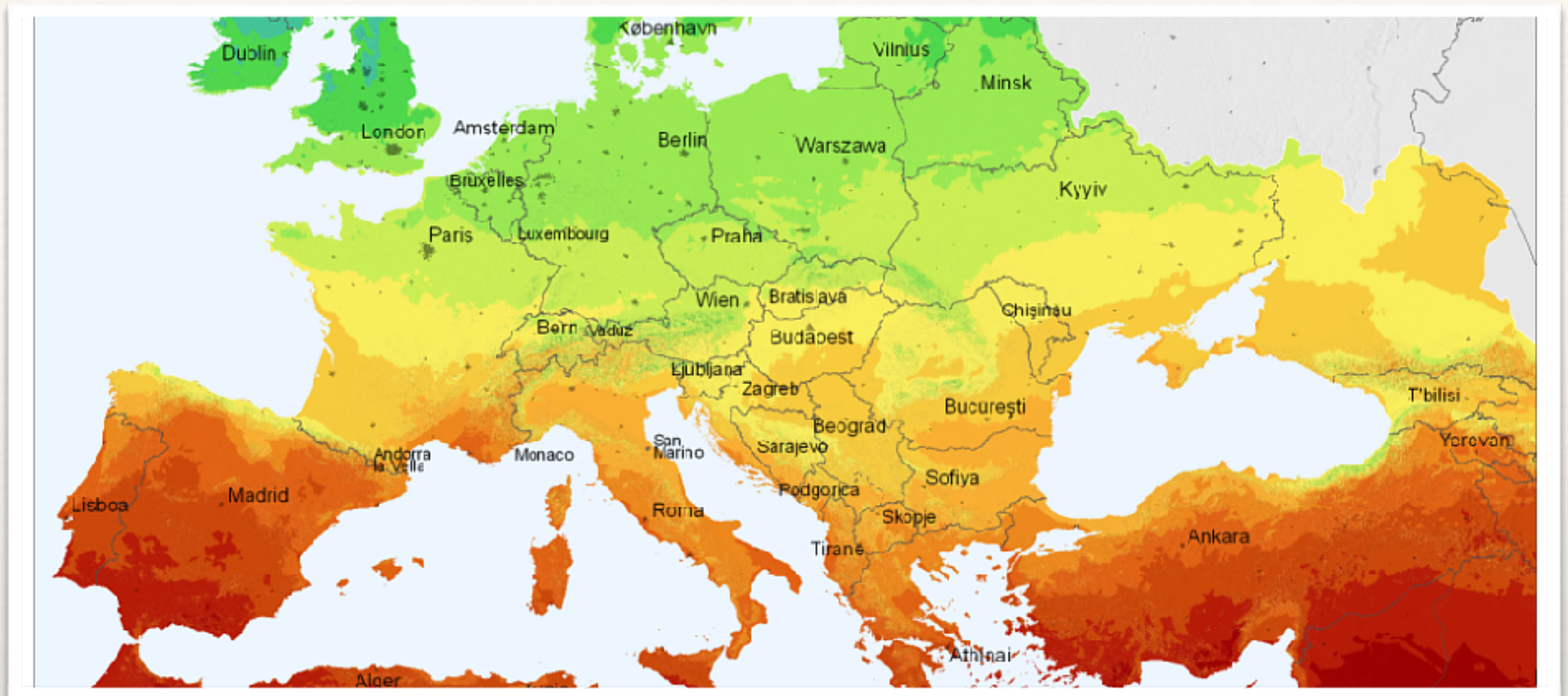
Alternative power



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Solar power

Alternative power



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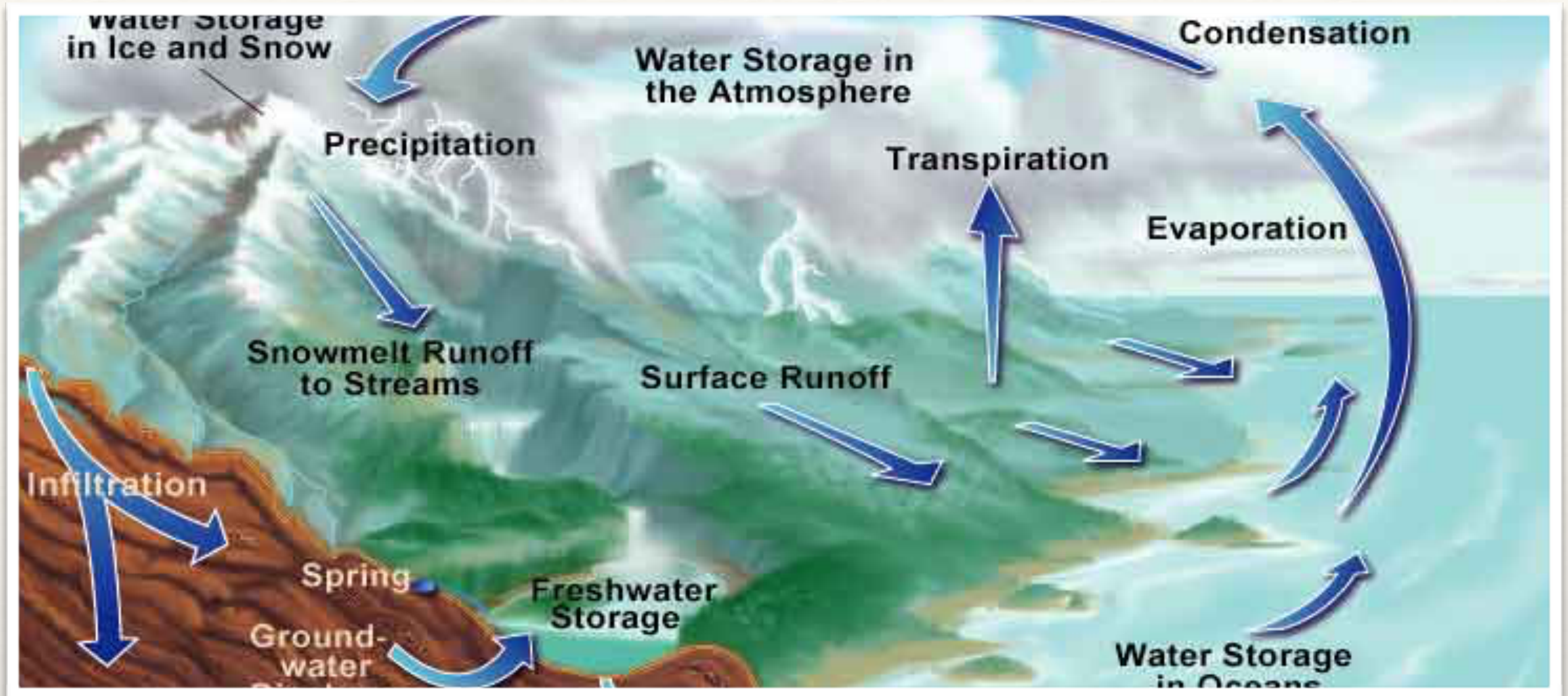
Solar power

Europe sun radiation



Water power

Alternative power



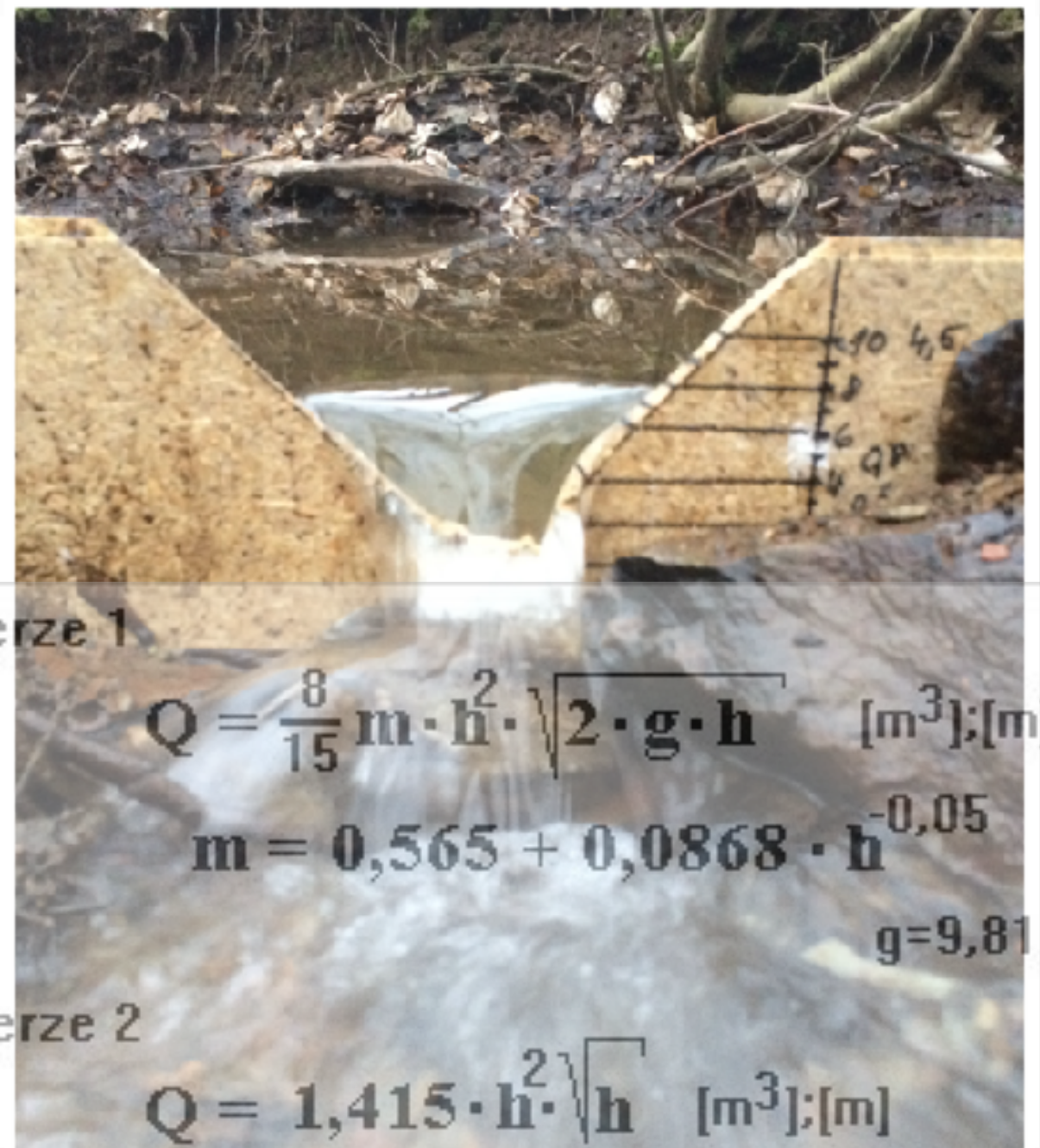
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Hydrology

Hydrology on installation site

How Much water I have ?

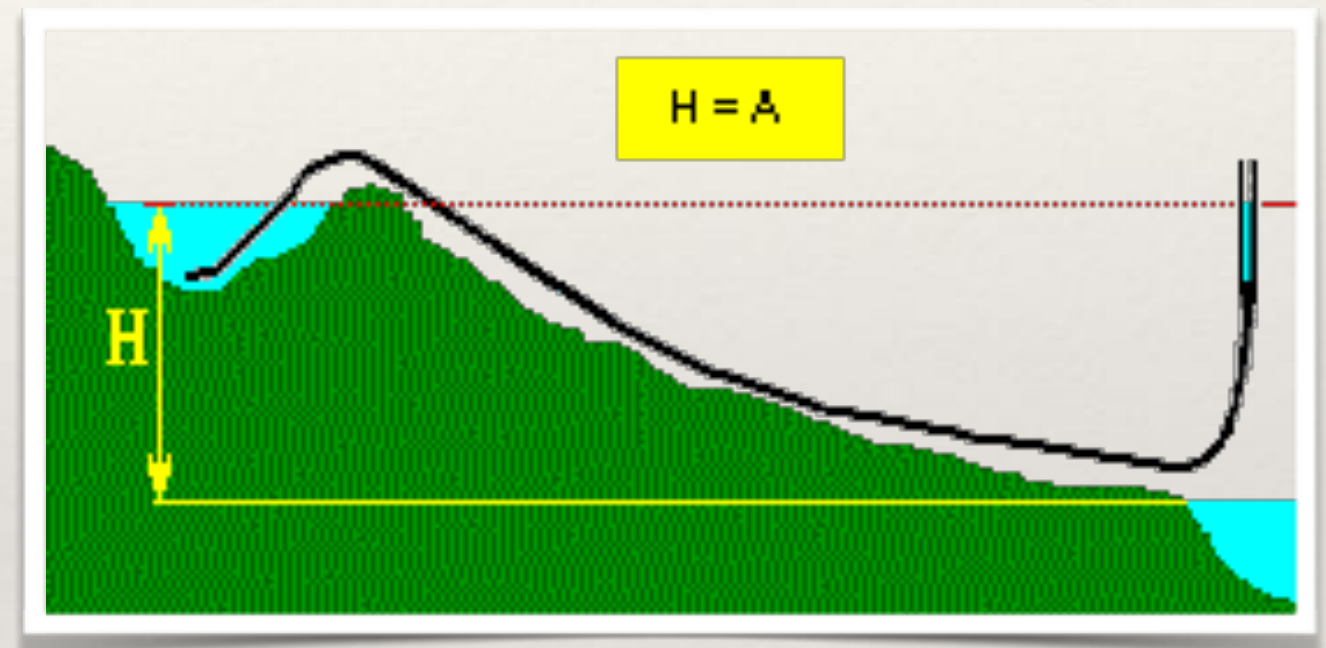
| cm | ltr/sec |
|----|---------|
| 3 | 0,2 |
| 5 | 0,8 |
| 6 | 1,2 |
| 7 | 1,8 |
| 8 | 2,6 |
| 9 | 3,4 |
| 10 | 4,5 |



Water energy

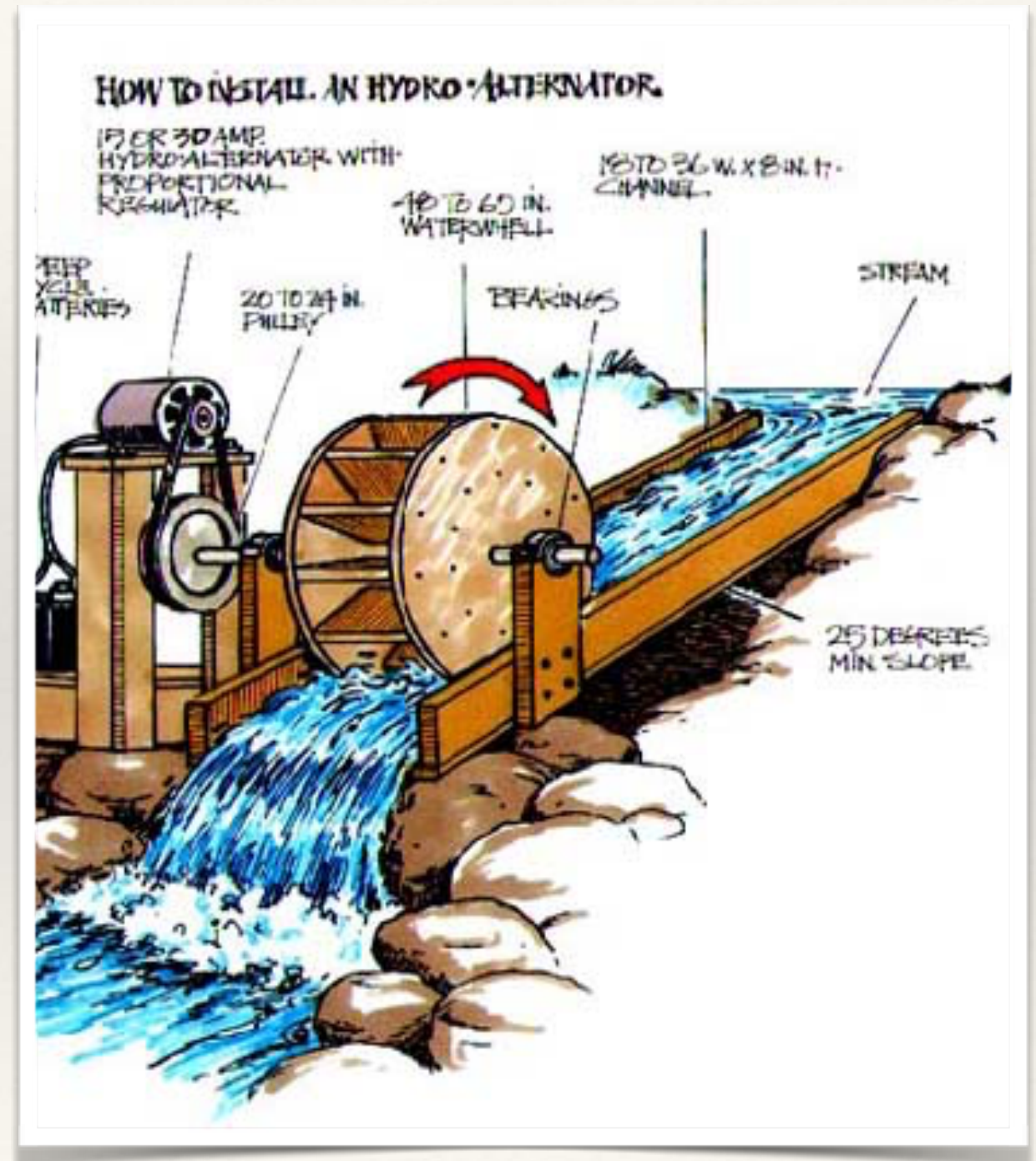
❖ $P(\text{watt}) = 0,0981 \times Q(\text{ltrsec}) \times H(\text{metres}) \times \text{Eff}(\%)$

| 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

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



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Turbine

Kaplan

Banki

Pelton

Turgo

Tesla

...





Pelton style turbine

Reversing water stream

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 |

Real installation

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



Where to take a water

- ❖ Cycling preparation





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Pelton turbine

Directly connected on PM Motor



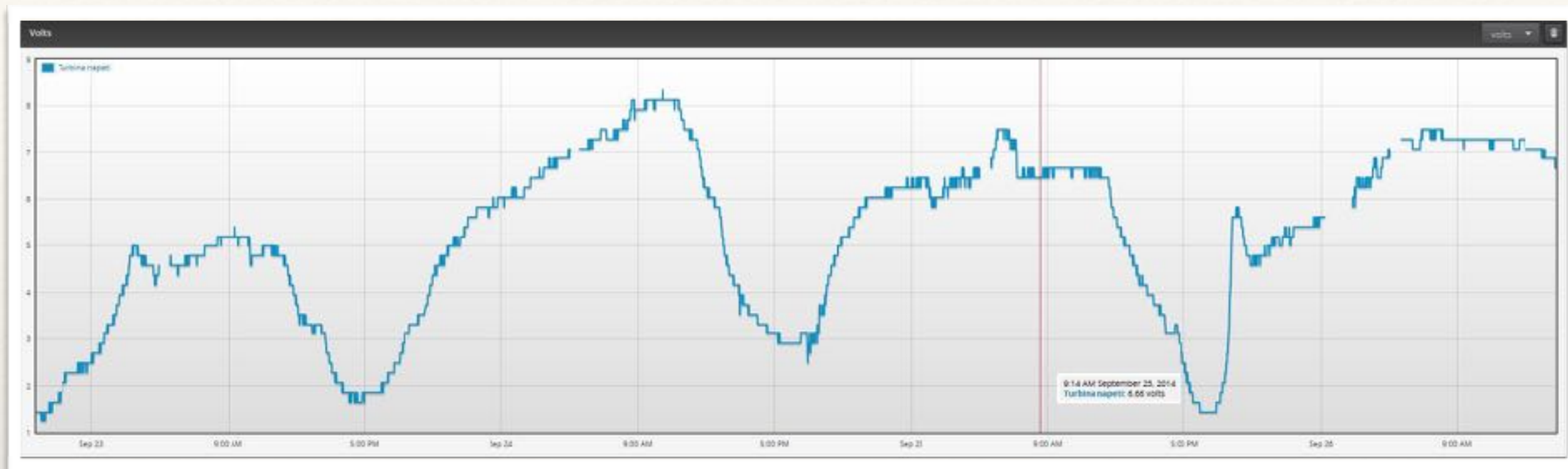


Energy



winter

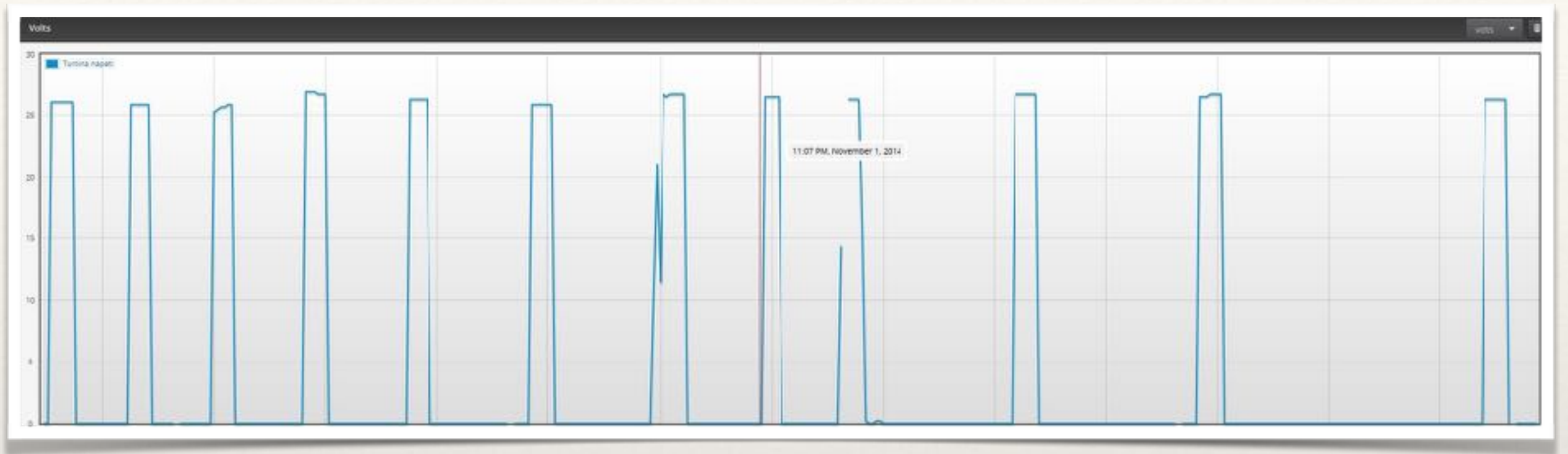




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Water - real numbers

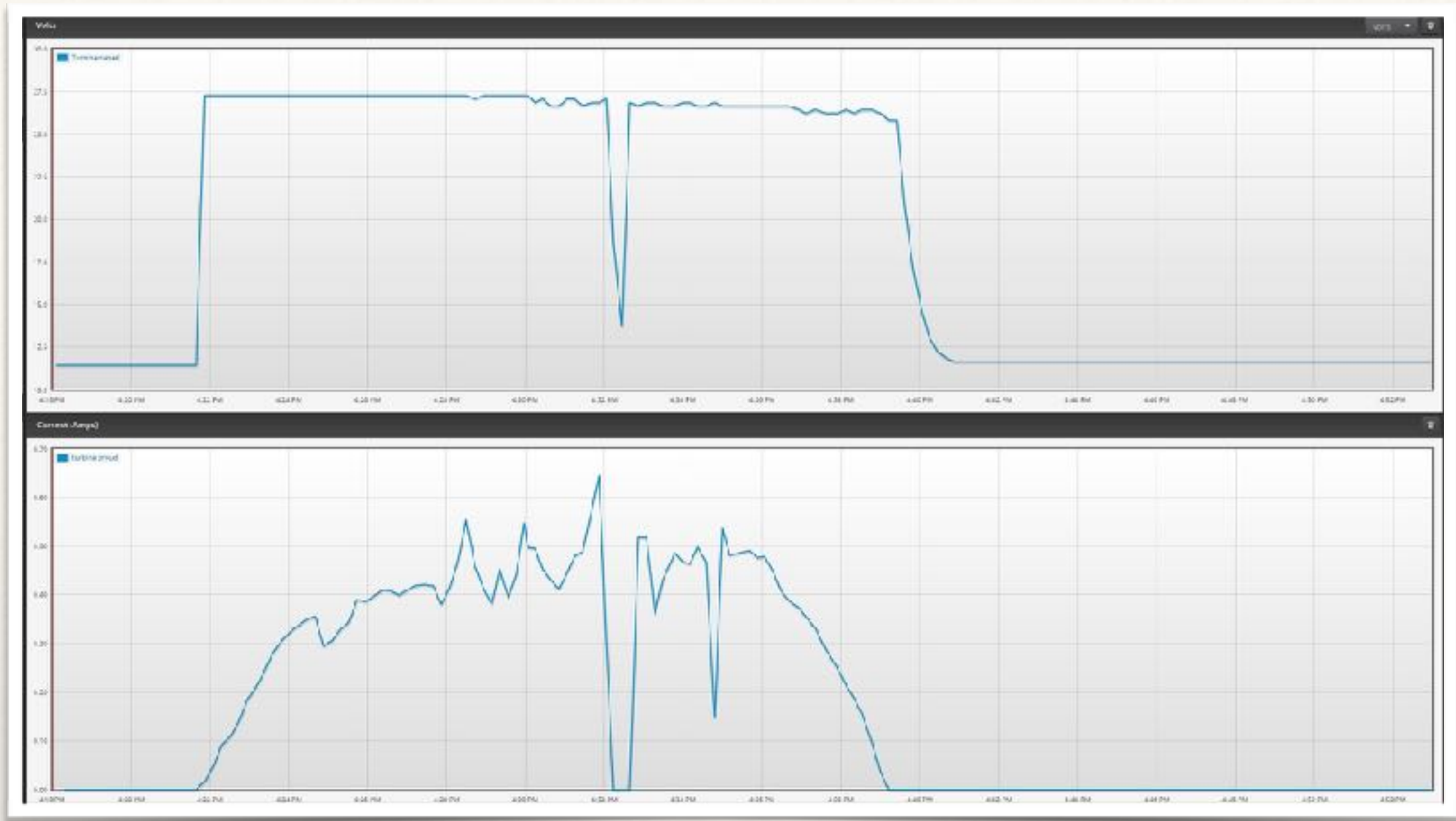
voltage from generator



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Water - real numbers

voltage from generator
Cycles



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Water - real numbers

Typical raining

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

*Another
Mikrotik
power installation*

Observe area





1,2 Km distance

First mast basement



Water source

How to collect water without leaves, and other dirties



Alpen style





Process just clean
water



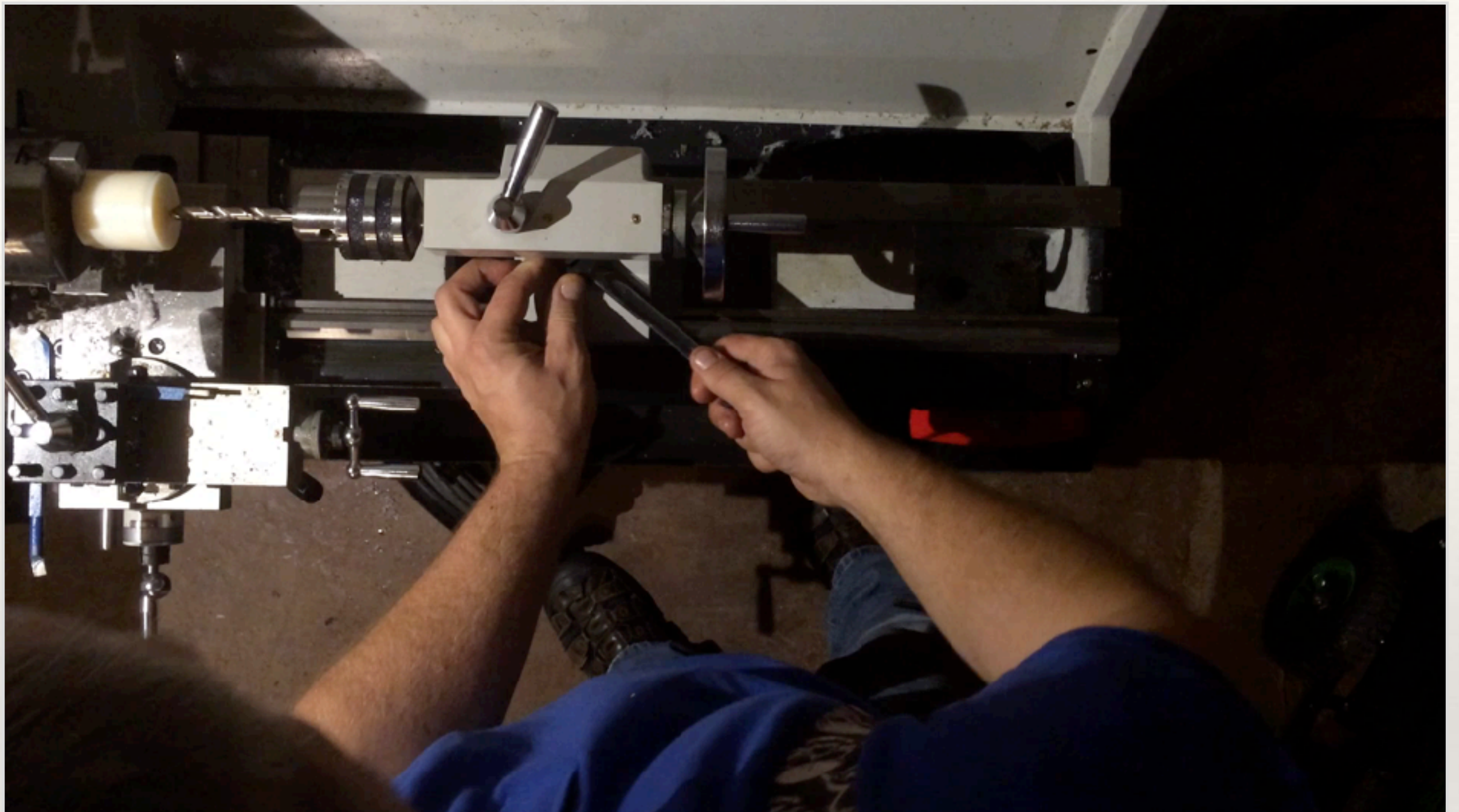
Place for generator

And turbine also

Powerfull Generator

- ❖ Permanent magnet
- ❖ Lo RPM generator
- ❖ No transmission





How to drill axe hole

You have to exact in the middle to have no radial forces. prefer to use lathe machine

And ... Done !



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Powered by water stream



Another place for Mikrotik power

Who is inspired enough to make his own water energy power supply for Mikrotik ?

Questions ?

- ❖ Any, any ? Any questions ...

Terima kasih

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