

# Equipment and automation of solar power plants

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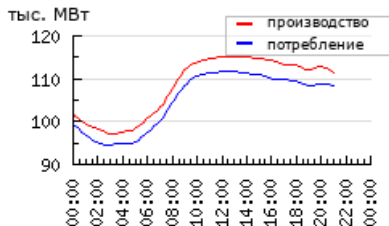
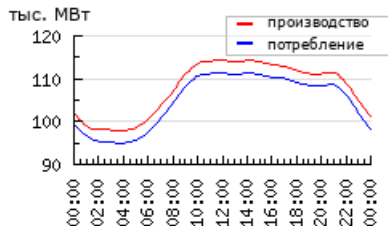
## living without fossil fuels

- wind
- solar
  - photovoltaics
  - thermal
  - biomass
- hydroelectric
- wave
- tide ∅
- geothermal

PV power engineering has become a meaningful sector of the world economy

- Annual commissioning of PVP capacities has reached 47GW is equivalent \$80bln.(2014) [1]  
fact 2019 is: 130GW – China , 64.2GW – US , 0.9GW – Russia [1, 2, 3, 4];
- By 2020 the value of the market will be estimated in terms of \$430-580 bln.

- Cost reduction: The improvement of technology;
- Accessibility: The Sun is an inexhaustible;
- Scalability: the size of a PVP depends on availability of a land plot [6] and a possibility of system balancing.
- Government support of solar market [5]



Plan and facts of generation and consuming (daytime, temperature, wind).

Balance of active and reactive power, overall system stability. Some time you have to switch off generation.

plans:

- Green Energy program 2015-2025 – 5 GW (70% – wind, the rest solar and small hydro- )
- Green Energy program 2025-2035 5.5 GW
- presumable after 2035 wind/solar generations will not need explicit Gov. support

implemetnation(financial tools):

companies that acquired rights to place Power Purchase Agreements (PPA) contracts and construct generating capacity in 10 regions of Russia.

concurrent acquiring of power.

In comparison:

1st Debates, The Clean Energy Superpower

2nd Debates, One question about energy policy

In total, under the Trump Administration, the US solar sector has lost almost 20,000 jobs. Meanwhile, according to the IRENE Renewable Energy and Jobs 2018 Report, China's solar industry has continued to expand by 13% over the previous year.

China, 2017 – 53 GW capacity installed  
China, 2018 – 35 GW capacity installed  
Russia, (mainly Hevel)  
Samara 75 mW (this summer),  
Crimea, 5 SES, 297mW Altai, 1 april,  
Ininskaya-10mW, Mayminskaya-5mW, (now 8 SES  
capacity 65Mw, at 2020 - 125mW) Tuva,  
Mongun-Taiginsky district 600kW



- [1] Byrd, S. et al. 2014, "Solar Power & Energy Storage", Morgan Stanley
- [2] How China's giant solar farms are transforming world energy  
[www.bbc.com/future/story/20180822-why-china-is-transforming-the-worlds-solar-energy](http://www.bbc.com/future/story/20180822-why-china-is-transforming-the-worlds-solar-energy)
- [3] U.S. Solar Industry Shaken by Trump's Trade War  
[www.chinausfocus.com/finance-economy/us-solar-industry-shaken-by-trumps-trade-war](http://www.chinausfocus.com/finance-economy/us-solar-industry-shaken-by-trumps-trade-war)
- [4] System Operator of the United Power System, Joint-stock Company [www.so-ups.ru/index.php?id=ees](http://www.so-ups.ru/index.php?id=ees)
- [5] [http://www.sol-en.ru/en/energy/wholesale\\_market](http://www.sol-en.ru/en/energy/wholesale_market)
- [6] [www.scmp.com/business/companies/article/2137539/chinas-solar-panel-industry-faces-year-reckoning-amid-global](http://www.scmp.com/business/companies/article/2137539/chinas-solar-panel-industry-faces-year-reckoning-amid-global)
- [7] <https://www.nyserda.ny.gov/About/Tracking-Progress/Clean-Energy-Powers-New-York>
- [8] Electric vehicle charging increased  
<https://www.nyserda.ny.gov/About/Tracking-Progress/Clean-Energy-Powers-New-York>
- [9] <https://www.climatecentral.org/news/china-solar-farm-satellite-21182>
- [10] <https://electricenergyonline.com>

