

# Climate change and Paks NPP

Climate crisis conference, Vienna

October 8., 2019. Eszter Matyas, CEU PhD



**ENERGIAKLUB**  
CLIMATE POLICY INSTITUTE  
APPLIED COMMUNICATIONS

# Outline

- Climate and nukes
- Danube basin characteristics
- Paks NPP I and Paks II
- Heating and climate
- Long term effects

“Stabilizing the climate is urgent, but nuclear power is slow”



# Don't nuke the climate

- ② WNISSR 2019: Stabilizing the climate needs solutions that are “granular, modular, mass-producible, fungible, quickly installable by diverse actors with little institutional preparation, and most importantly, propelled by the powerful feedback of increasing return learning by doing”
- ② energy efficiency + modern renewables  $\neq$  nukes
- ② Climate solution is urgent, nuclear is slow
- ② Latest trends: encouraging progress toward cheaper, faster options, more climate effective solutions



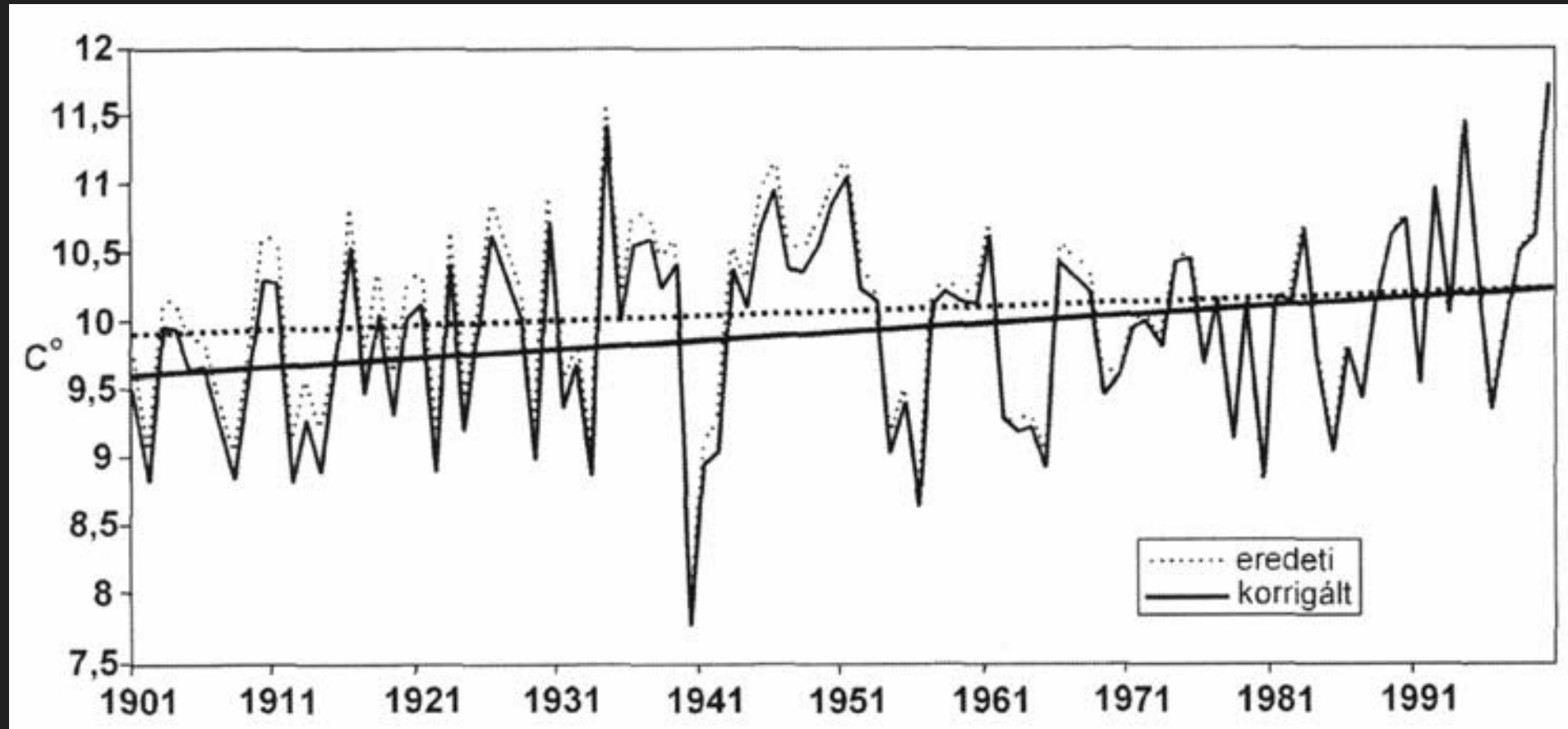
# Danube and the climate



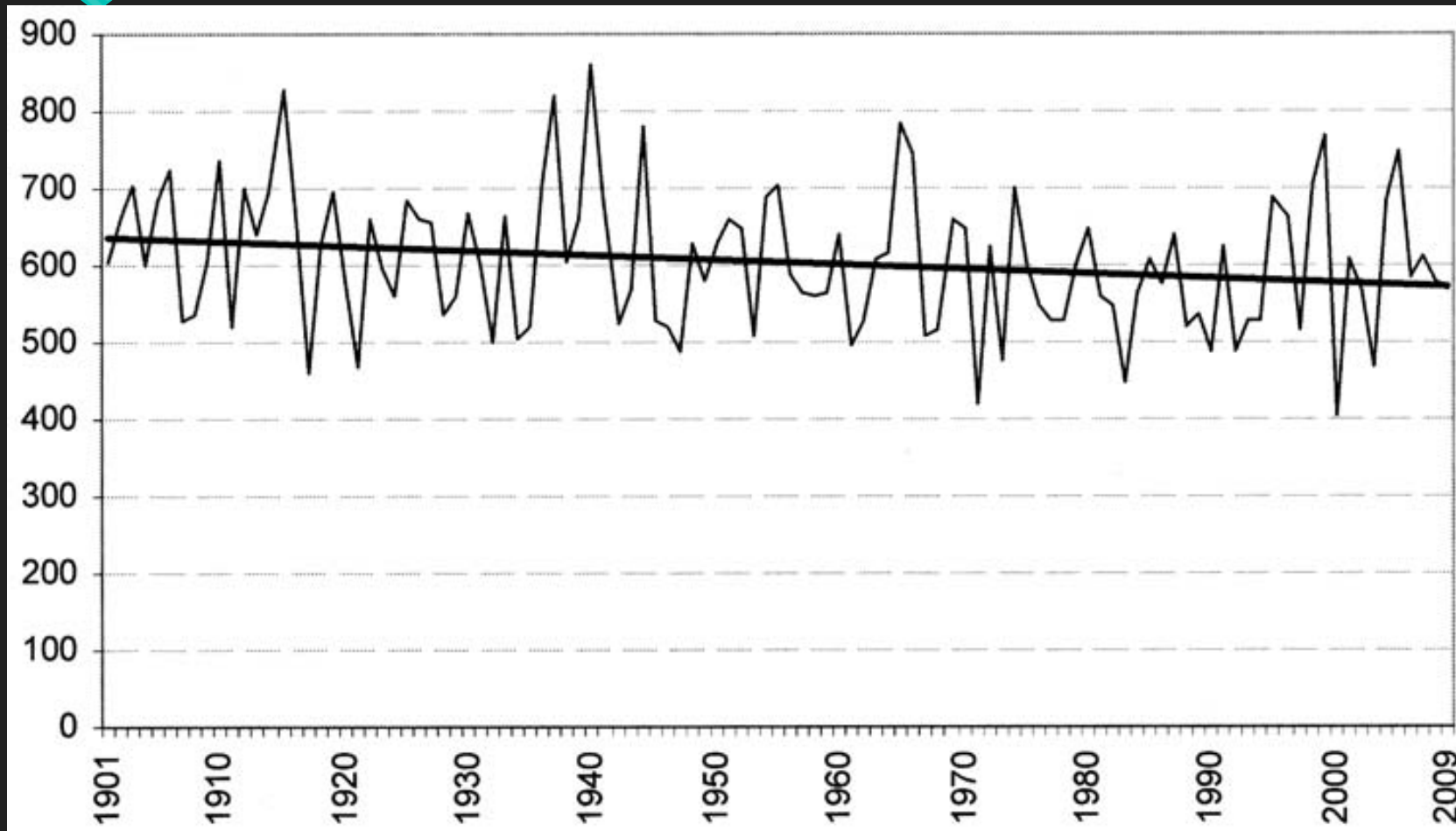
# Danube basin

- the world's most international river basin (19 countries, 11 EU country)
- 83 million people and hundreds of fish species
- major transportation route
- climate change is the dominant factor driving the change in water resources in the Danube River Basin
- summer months are projected to be 15% drier than during the period 1981-2010
- peak river flows are projected to be 10-20% greater than under current climate conditions
- Water scarcity is projected to be more severe and persistent

# Hungary's temperature and trend in the 20th century



# Average annual precipitation in Hungary from 1901-2009 (mm)





# Climate in Hungary



## Trends of last 30 years

- acceleration of warming (+0.77 Celsius)
- significant decrease in precipitation
- World Resource Institute: Hungary is the 16th most threatened country in the world in terms of expected drought frequency, which may not only deplete reservoirs but also reduce the water level and discharge of the Danube.

# Why these trends are problematic?

- When it comes to water scarcity caused by climate change, most attention is paid to drinking water and water used in agriculture
- the energy industry is a major beneficiary of the Earth's water resources
- In addition to hydropower, which is not significant in Hungary, there is a great need for water in the production of heating and fuel as well as in the cooling of thermal power plants and nuclear power plants
- “We also have to deal with more floods and droughts, higher water temperatures and fluctuations in river flows. They will also affect the cooling of thermal and nuclear power plants and the operation of hydroelectric power stations” (JRC-European Commission)

# EU context



- increasing the role of renewables is vital to the detriment of coal and nuclear power plants
- According to the EU energy system's decarbonisation strategy, water demand would be significantly reduced by 2050, but coal and nuclear power plants would still account for 50 percent of water use in the system.
- the continent's energy sector currently needs 74 billion cubic meters of fresh water, which will be reduced by 38 percent by 2050 by decarbonisation of the energy system
- Water scarcity (deficit) and water pollution cause billions of euros worth of damage to energy sectors such as coal mining and electricity generation every year.

# Hungary's low carbon climate strategy=nuclear energy





# Paks and Danube-heating the NPP

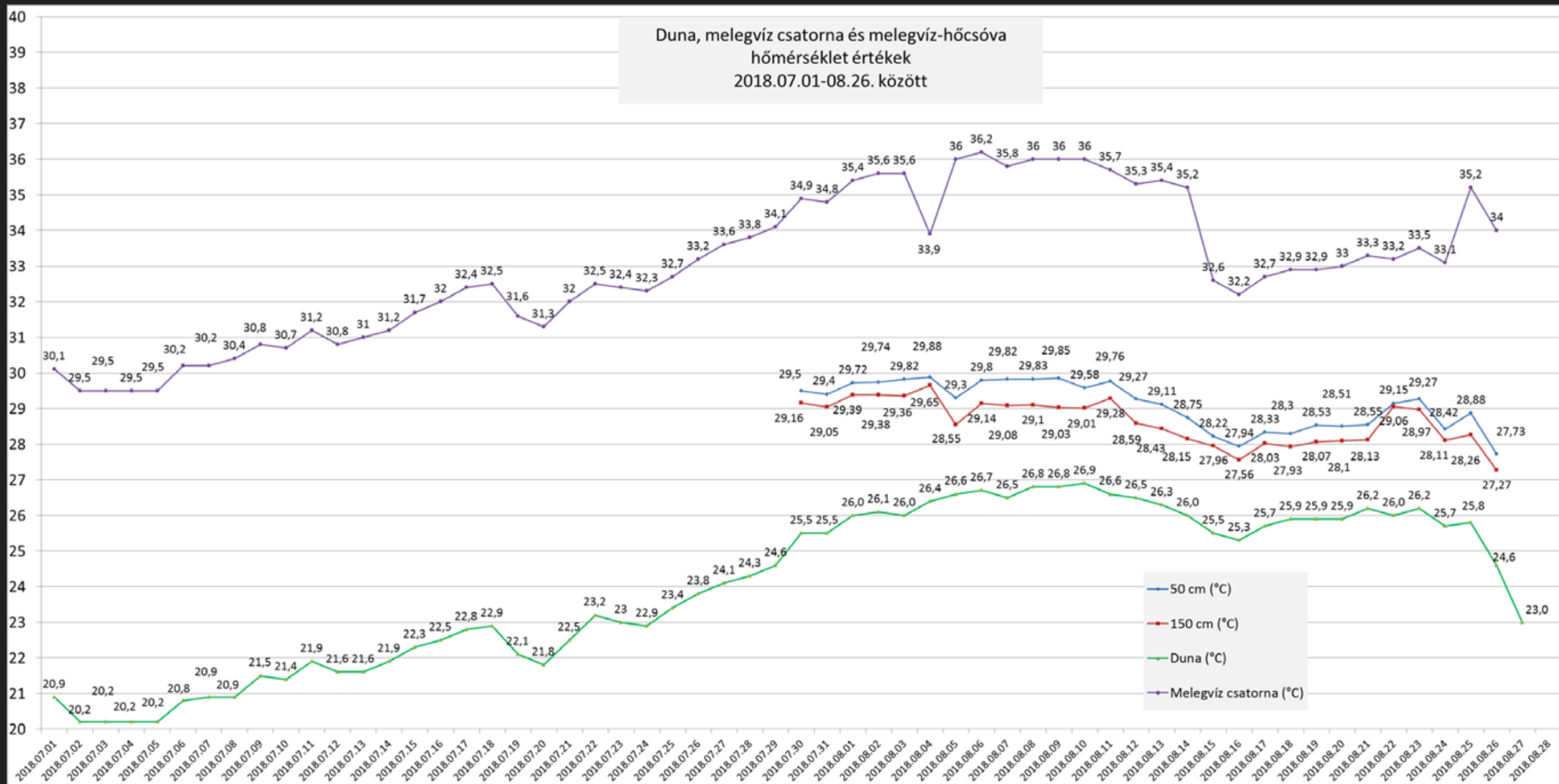
- PAKS I: 4 440 MW VVER 440/V 213 pressurized water reactors.
- The plant is fresh water cooled. The cooling water comes from the Danube. Due to the reactor safety conditions, three types of cooling water systems have been established
  - the cooling system of the condenser,
  - the technological cooling system, and
  - the emergency cooling system.
- PaksII 2 VVER 1200MW

# Paks and Danube

## Problems occurred-temperature

- Rule: water temperature of the Danube should not exceed 30 degrees Celsius 500 meters from the mouth of the cooling water channel
- Between July and August 2018, the water of the Danube was 25 for almost a month, often above 26 degrees, and in early August this year temperatures were rising to 26.2 degrees Celsius
- if the water temperature of the Danube exceeds the limit of 30 degrees Celsius in a 500 meter section of the mouth. In this case, the capacity to exceed the temperature limit - by 20 MW per degree 0.1 degrees Celsius

Duna, melegvíz csatorna és melegvíz-hőcsóva  
hőmérséklet értékek  
2018.07.01-08.26. között



# Paks and Danube

## Problems occurred-water level

- According to a previous statement of the power plant, 100 cubic meters of water are needed for the four reactor units per second, and the lowest Paks Danube discharge so far is 800 cubic meters.
- That is why one of the impact studies of the Teller-Levai project, which is preparing for the expansion of Paks, states that the combined operation of the current 2000 and the planned additional 2400 megawatts of reactor capacity can no longer be solved with the Danube water.
- The study suggested that cooling towers be built for cooling or that the Danube should be swamped with a cross barrier (the latter would create a difficult to handle situation by slowing down the flow and overheating the water).



# THANK YOU!



What should we  
include?

Please, let us know 🌴