

Open source approach towards integration of the meteorological records across Russia into a climate impact modeling workflow

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Motivation

Support of the long-term development plans with climate research is still quite limited

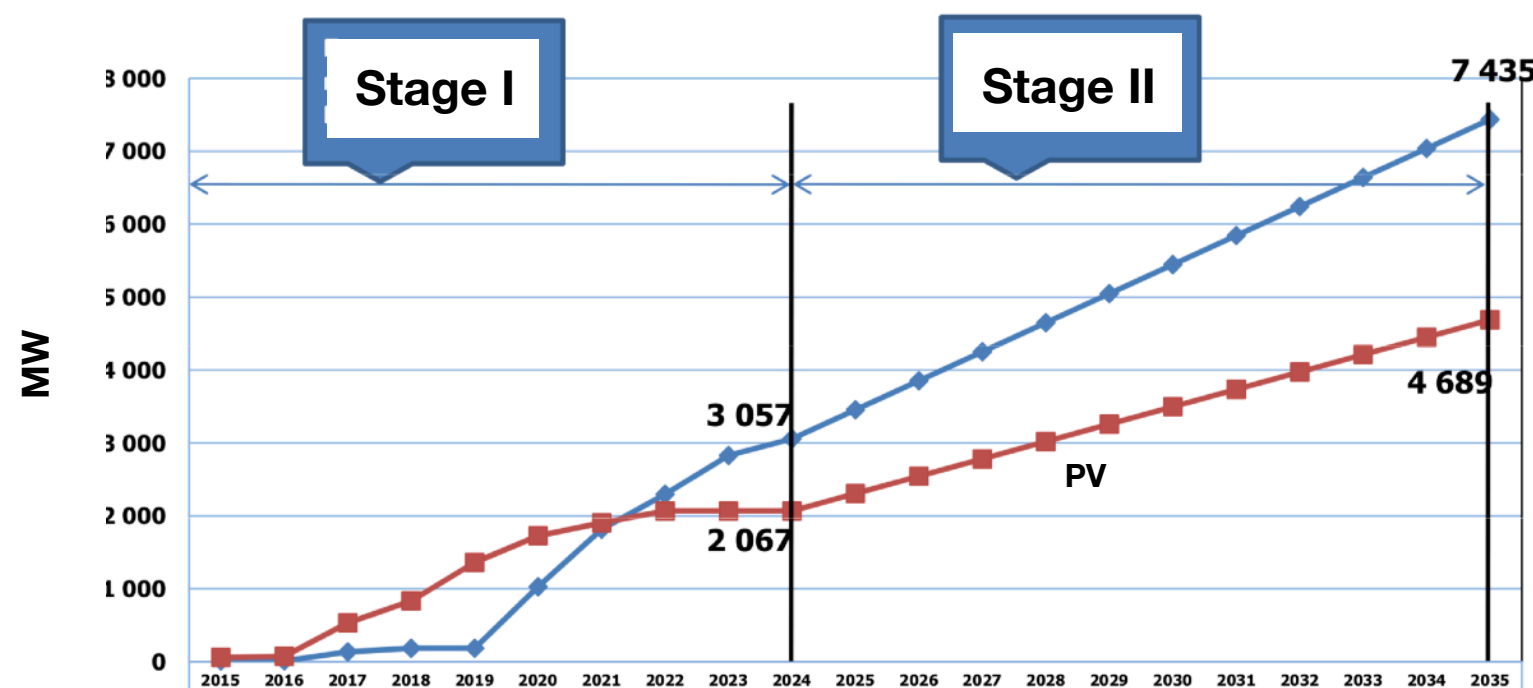


Figure 1. National plans on renewables development

Fields of study

- Space heating efficiency
- Reliability and risks of power supply
- Renewables integration into regional power systems and the national power market

Acknowledgements

We are deeply grateful to the *Roshydromet*, the *DKRZ CERA* and the *Copernicus C3S* teams for the granted access to the climate data. Thanks a lot to the *openmod*, *FOSDEM* and *R* communities for providing benchmarks of open source software development. Work was supported by the Russian Science Foundation (project 18-79-10255)

Climate simulation

- Need for uncertainty assessment when utilising climate archives
- Automation of observations records processing: *climaru* & *meteclean* packages

```
climaru::show_stations(st_ids = st_in_wind_commiss_area,
                      x_range = ru_lat, y_range = ru_long)
```



Figure 2. Example of the R-interface to processing the Roshydromet observation records

- Pragmatic approach towards the climate change scenarios

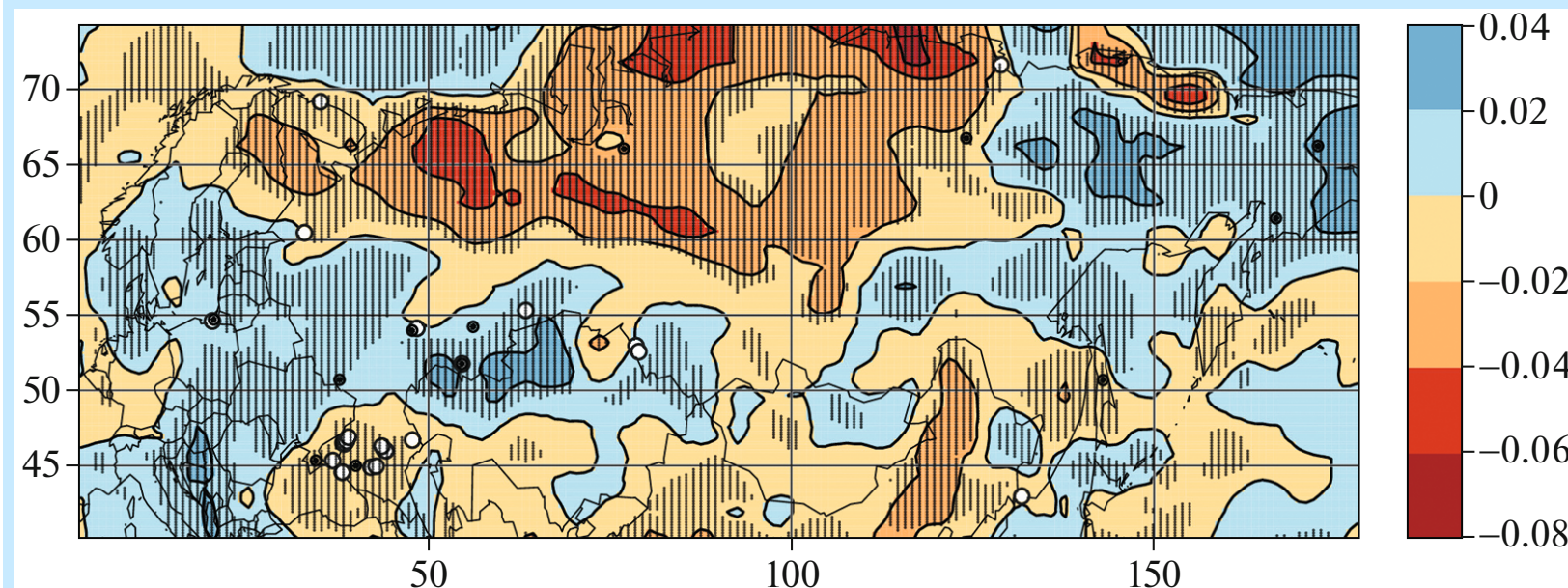


Figure 3. Projection of the relative change in the near-surface wind speed, %: 2050 vs 2010

Energy modelling

- Iterative process towards the climate-energy problem formulation
- Utilisation of analytical methods and theoretical tools

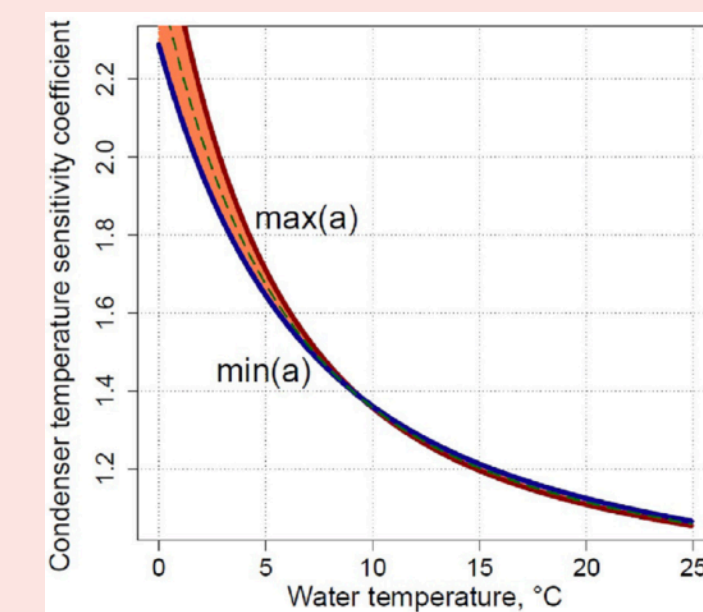


Figure 4. Sensitivity of the condensing power plants to the cooling water temperature

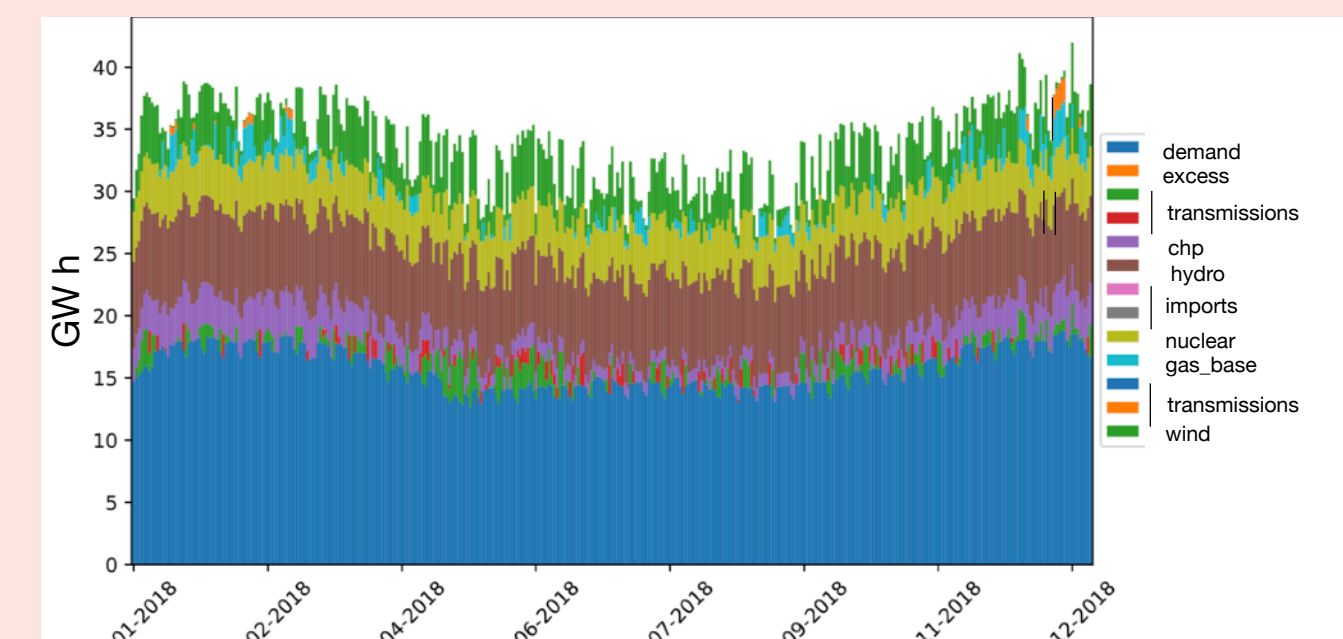


Figure 5. Operation of the Middle Volga power system with wind power included*

*The model was implemented with oemof Krien U., Schönfeldt P., Launer J., Hilpert S., Kaldemeyer C., Pleßmann G. oemof.solph—A model generator for linear and mixed-integer linear optimisation of energy systems / Software Impacts 6 (2020) 100028