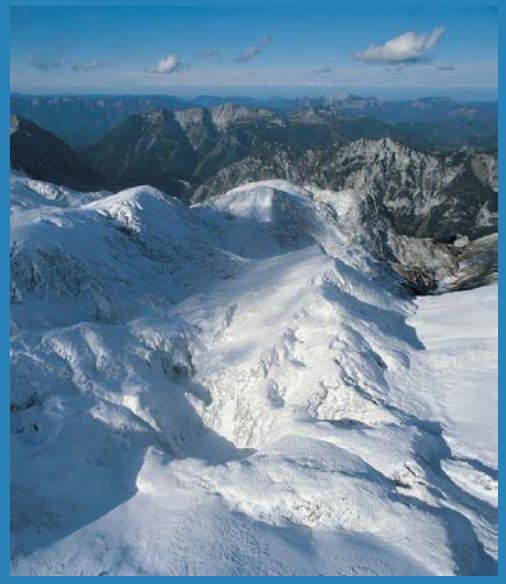
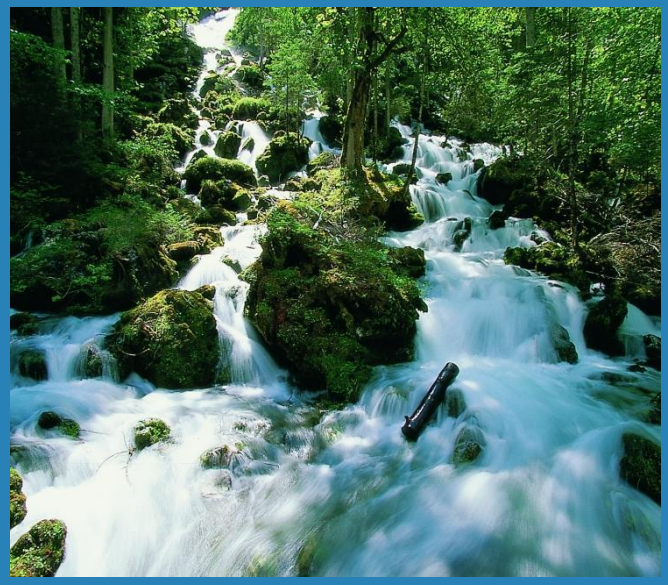




Renewable energy production - the case study of Vienna Water

From Source to Tap

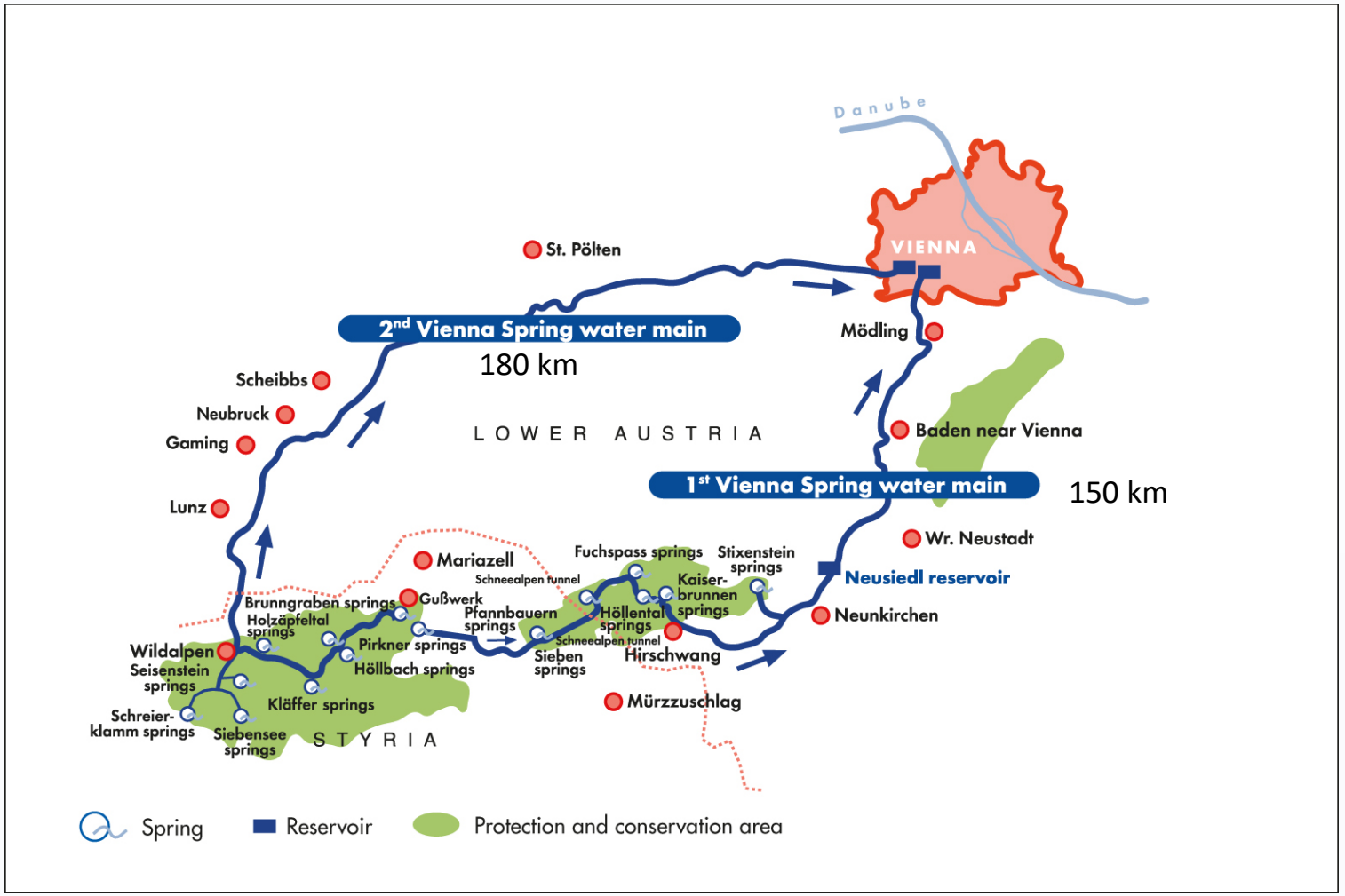
Heading towards renewable energy

Stadt Wien | Vienna Water

Wolfgang Gruber, staff unit management systems and representation of interests Vienna, 29th of June, 2022

Vienna water supply

Overview



Vienna water supply

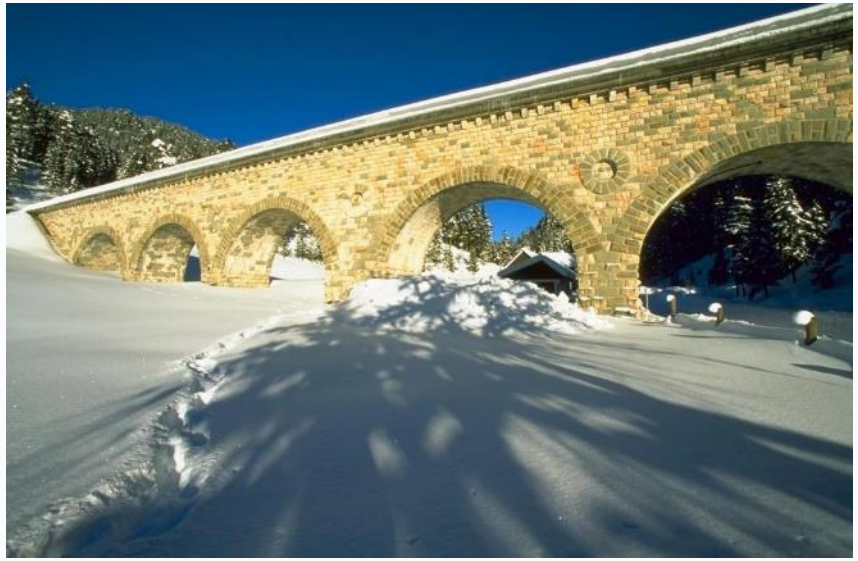
Characteristic values

- 1,9 M residents in Vienna
- water demand mean: 390 Tm³/d
  min. / max.: 300 / 520 Tm³/d
  143 mio. m³/a
- 99 catchments (springs and wells)
- Spring water: 95 %, groundwater: 5 %
- 130 aqueducts
- 31 water reservoirs (1,6 mio. m³)
- 26 pumping stations
- > 3.000 km pipe network
- losses: 7 %
- connections: 103.000
- fire hydrants: 12.500
- drinking fountains: 1.300
- 570 employees in 3 provinces
- tariff (including 10 % VAT)
  drinking water: 2,02 EUR/m³
  waste water: 2,22 EUR/m³
- 14+2 drinking water power plants
- 1+1 PV power plants

Vienna water supply

Mountain Spring Main

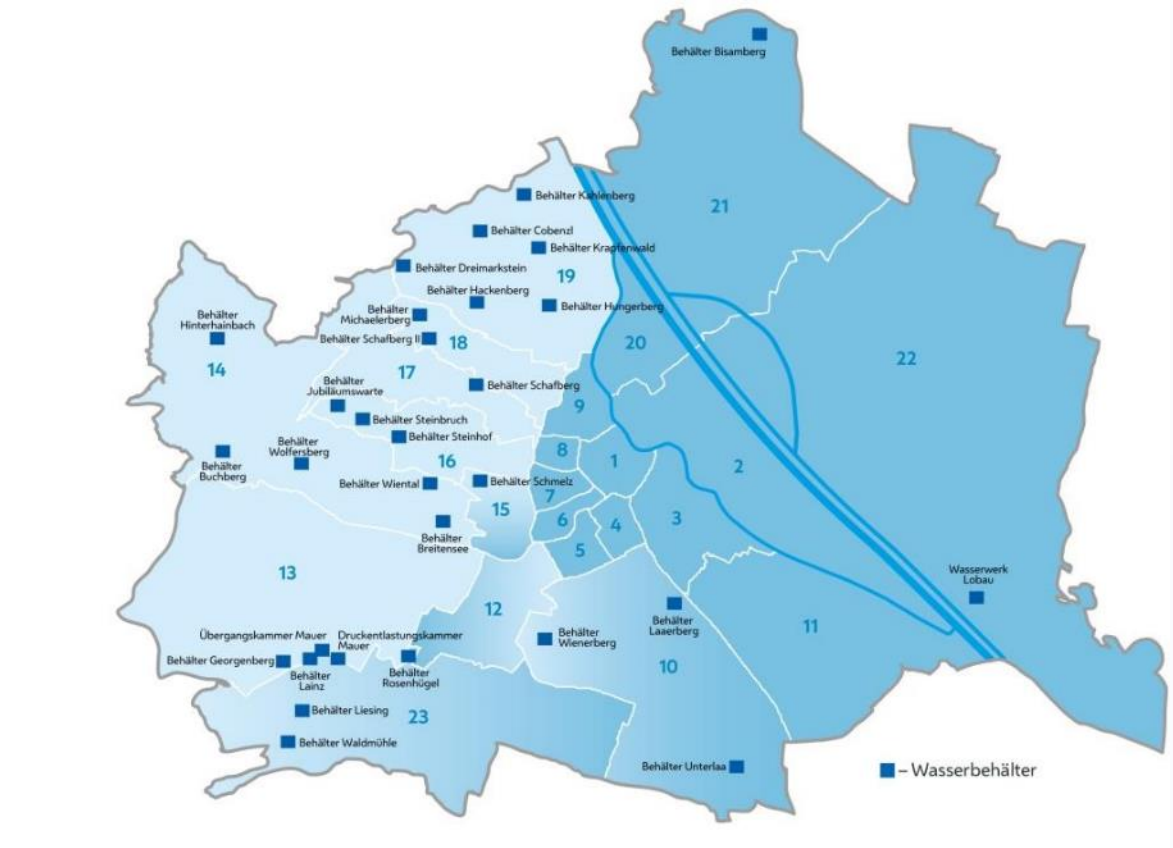
Gallery



Aqueduct

Vienna water supply

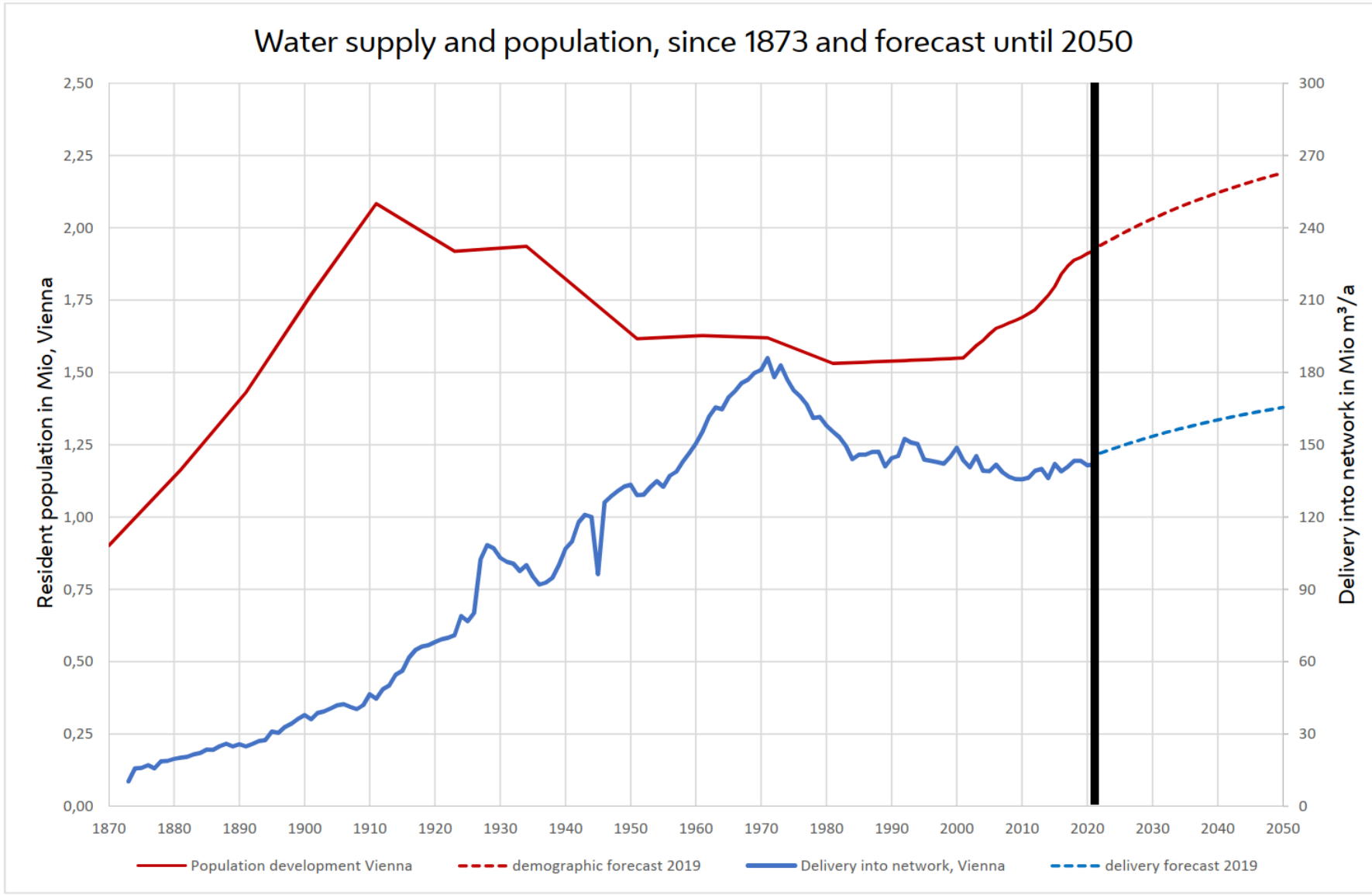
Water reservoirs



Water reservoir Rosenhügel
(*© Vienna Water, Novotny*)

Vienna water supply

Demand versus population



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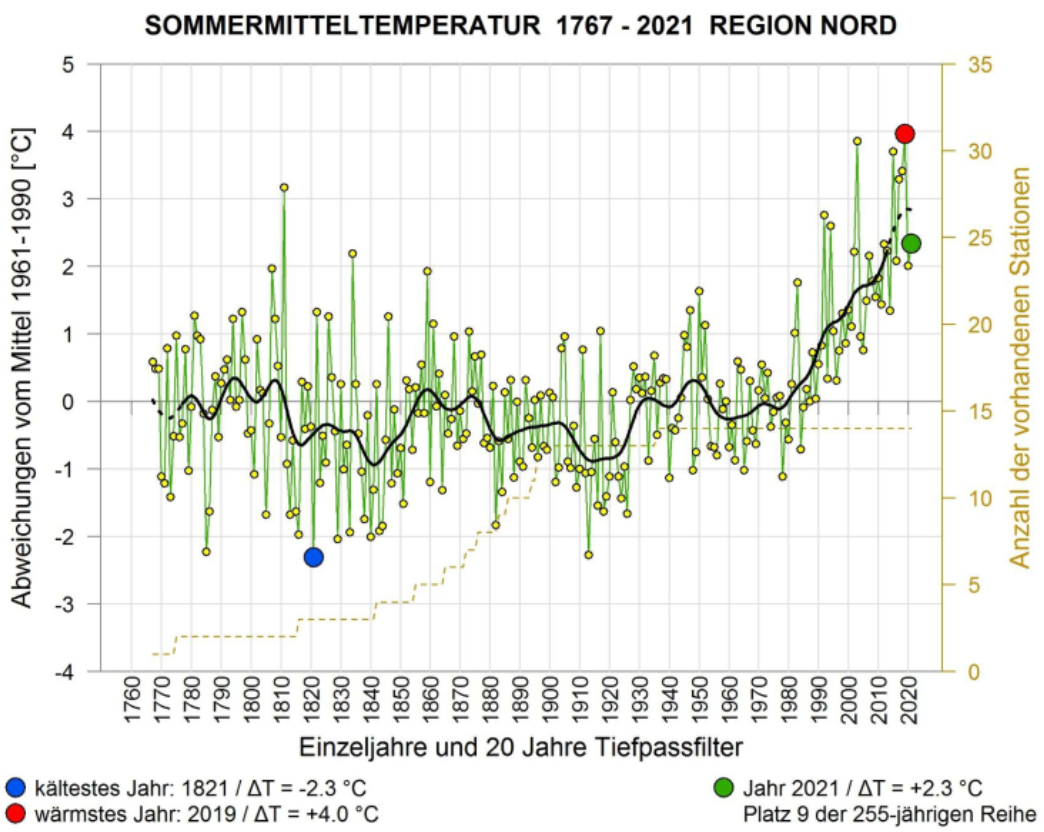
Vienna water supply

Situation today - challenges



(© *ZAMG*)

- climate crises
- surge of energy prices
- material delivery problems
- demographic development
- increasing land use conflicts
- increasing pollution (pesticides, metabolites, etc.)

Vienna water supply

Energy situation 2021

Energy consumption (annual):

Total: 24,3 GWh
being composed of

- electricity: 19,5 GWh (all facilities of Vienna Water)
- other energies, fossile: 4,5 GWh (fuel, natural gas, district heating)
- other energies, renewable: 0,3 GWh (wood)

Specific figures:

- 0,17 kWh/m³ delivered water
- 31 g CO_2/m³ delivered water

Pumping Station Laaerberg

hydroelectric power plants (drinking water power plants DWPP)

16 hydroelectric power plants driven by drinking water in the catchment area, along the main pipes and in the city of Vienna. Since 1912, power 50 kW to 5 MW. Total work capacity around 63 GWh/a.

DWPP Gaming I
(Vienna Energy 1926, 5 MW)

DWPP Mauer
(2003, 635 KW)

DWPP, Service chamber, Reservoir Schafberg
(2017, 100 KW)

Vienna water supply

Renewable Energy

- Pressure reduction without generation of energy
  - Clayton Pressure reducing valve
  - Globe valve (Ringkolbenventil)

- Pressure reduction with generation of energy
  - FRANCIS turbine (Ing. James B. Francis)
  - PELTON turbine (Ing. Lester Pelton)
  - Centrifugal pump (working as a turbine (PaT)

DWPP, Service chamber, Reservoir Wienerberg (2013, 65 KW)

Vienna water supply

Renewable Energy

Drinking water power plants

Stadt Wien | Wiener Wasser

wien.gv.at/wienwasser

Vienna water supply

Renewable Energy

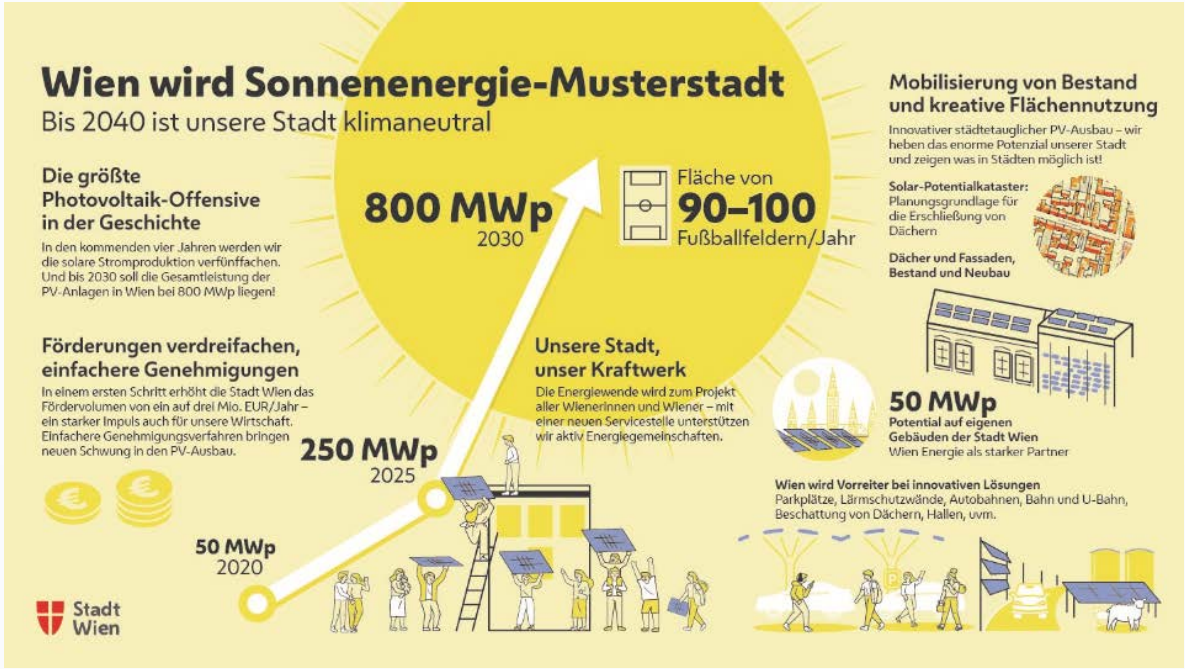
- **photovoltaic power plants**
  1 PV plant (6 kWp) on a building
  1 PV plant (2 MWp) on top of a water reservoir
  Total work capacity about 2 GWh/a
  Several plants in state of planning → PV Offensive

PV power plant, Reservoir Unterlaa, (Vienna Energy 2020, 2 MWp)
(*© Vienna Water, Fürther*)

PV-Offensive, City of Vienna

Photovoltaic power plants

- Starting from an already installed capacity of 50 MWp in the whole City of Vienna in the year 2020, the City Government plans to increase this amount to 250 MWp in 2025 and to 800 MWp in 2030.
- Only on municipal owner-occupied property it is planned to install a capacity of 50 MWp until 2025
- Vienna Water, as part of the municipal administration, has offered as a first step an area of 150.000 m² within the borders of Vienna to Vienna Energy to install photovoltaic plants, which represents a potential of 15 MWp.
  Outside of Vienna, a potential in the same extent is estimated.
- In order to take advantage of synergies, “Vienna Energy”, the municipal electricity company of Vienna, will install and maintain the plants to be erected on sites of Vienna Water.



(© *City of Vienna*)

Financing photovoltaic power plants

Vienna Energy is financing, building and maintaining the PV plants.

These plants are offered in the frame of so-called “citizens power plants”.

People can buy fictive shares of 300 Wp panels at a price of EUR 250,- each. In return they receive 5 years an annual voucher whose value depends on the production. 17,09 cent/produced kWh (guaranteed minimum EUR 51,27)

With an estimated annual production of 315 kWh this amounts to EUR 53,83 corresponding to an annual return of 2,51 percent.

So far, since 2012, 11.000 Persons have invested 39 MEUR in green electricity.

(© *PID/Felicitas Matern*)

Technological change in the mobility sector

2017 Vienna Water purchased the first electric company car. Today, 2022, 7 e-cars form part of the fleet, which comprises 153 vehicles (passenger cars, 4-wheel-cars, trucks, tractors).

Whenever a company car needs to be replaced, the availability of an electric version, that fulfils the necessary requirements, is checked on the market.

Small passenger e-car (2017)
(*© Vienna Water)*

Vienna water supply

Facade greening

Facade greening – Headquarter Vienna Water

- Natural air condition: plants regulate urban microclimate
- Plant pots & climbing plants cover about 990 sqm
- constructed in December 2015

Continuous scientific evaluation after 3 years of monitoring by TU Wien and University of Natural Resources and Life Sciences:

- High coverage through various climbing plants
- CO_2 saving: 480 kg = 1 car which drives 2.300 km
- Inside building temperature to 3 degrees less in summer

Facade greening at water reservoir Laaerberg was finished 2020

(*© Vienna Water, Zinner*)

Nowadays

(*© Vienna Water, Zinner*)

Future

(*© Vienna Water, Zinner*)

Stadt Wien | Vienna Water

Cheers!

Tchin-tchin!

Santé!

¡Salud!

Salute!

Prost!

(*© Vienna Water, Zinner*)