



Energy- saving projects in the National Theatre

5 EPC projects in total:

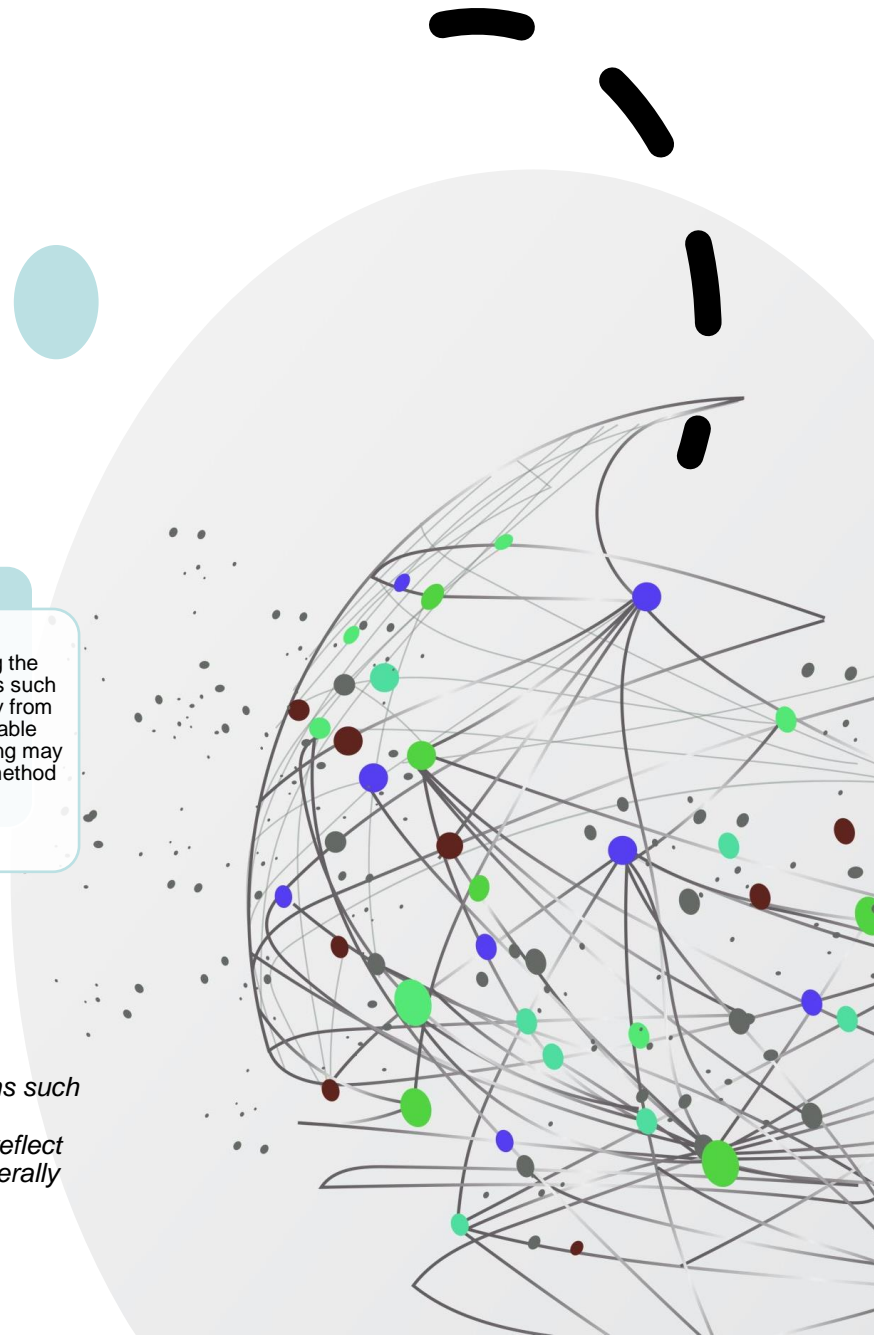
- **The National Theatre** 2008 - 2017
- **The State Opera** 2010 - 2019
- **The Estate Theatre** 2010 - 2021
- **St. Anna: Ballet** 2011 - 2022
- **Studios and Workshops** 2016 - 2027

EPC (Energy Performance Contracting) *)

EPC is a very effective tool for implementing cost-saving measures. The EPC method can be characterized as a guarantee of the expected reduction in energy consumption, which will be reflected in savings in operating costs used to repay the original investment. The EPC method was introduced in the Czech Republic in 1992..

The financing of a project using the "pure" form of the EPC method is such that the investment is repaid only from the cost savings over a reasonable period of time. Third party financing may be part of an EPC project. The method of financing can be chosen independently.

*) The EPC method has many different modifications using different names. Terms such as Contract Energy Management, Performance Contracting (PFC), Technology Performance Contracting, Contract Du Resultat or Third Party Financing do not reflect the different modifications of EPC, but are usually the same service, which is generally very similar to the service we call EPC.



EPC includes



proposal (energy analysis)



preparation (design of energy saving and cost reduction measures)



project financing



Implementation



training of equipment operators



Evaluation of measurements and monitoring of results



long-term monitoring of functionality and performance for the duration of the contractual relationship

Energy measures procedure



Project identification, purpose,
justification of need



Input analysis



Supplier selection / Offer



Detailed analysis



Contract



Project implementation



Guaranteed operation

Implemented measures:

reconstruction of the central boiler room

installation of a water-to-water heat pump

heat recovery from air-conditioned spaces

**use of waste heat from the stage technology
pressure station**

**modernization of the „Building Management
System“**

installation of frequency converters

implementation of photovoltaic power plants

installation of energy-saving light sources

aftercooling of condensing boiler return



**new
condensing gas
boilers 2x 1,44
MW**



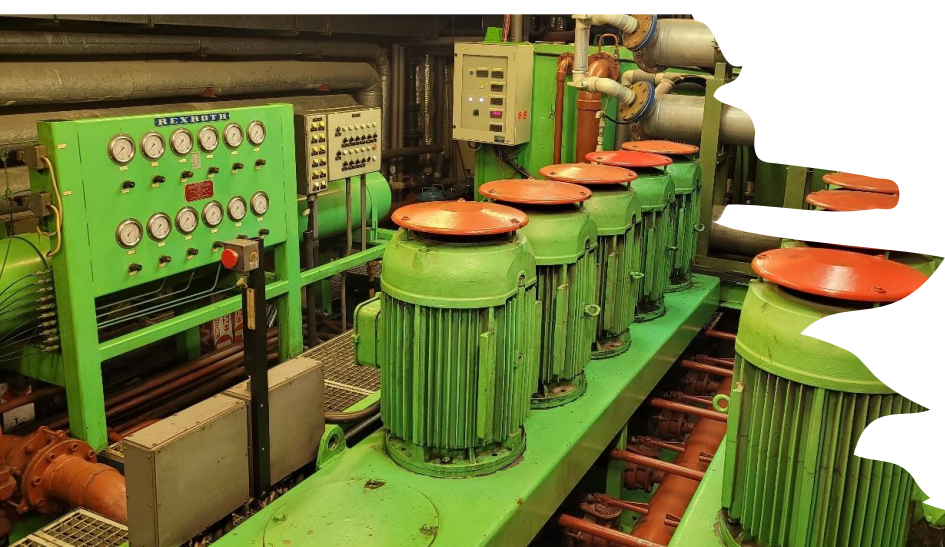
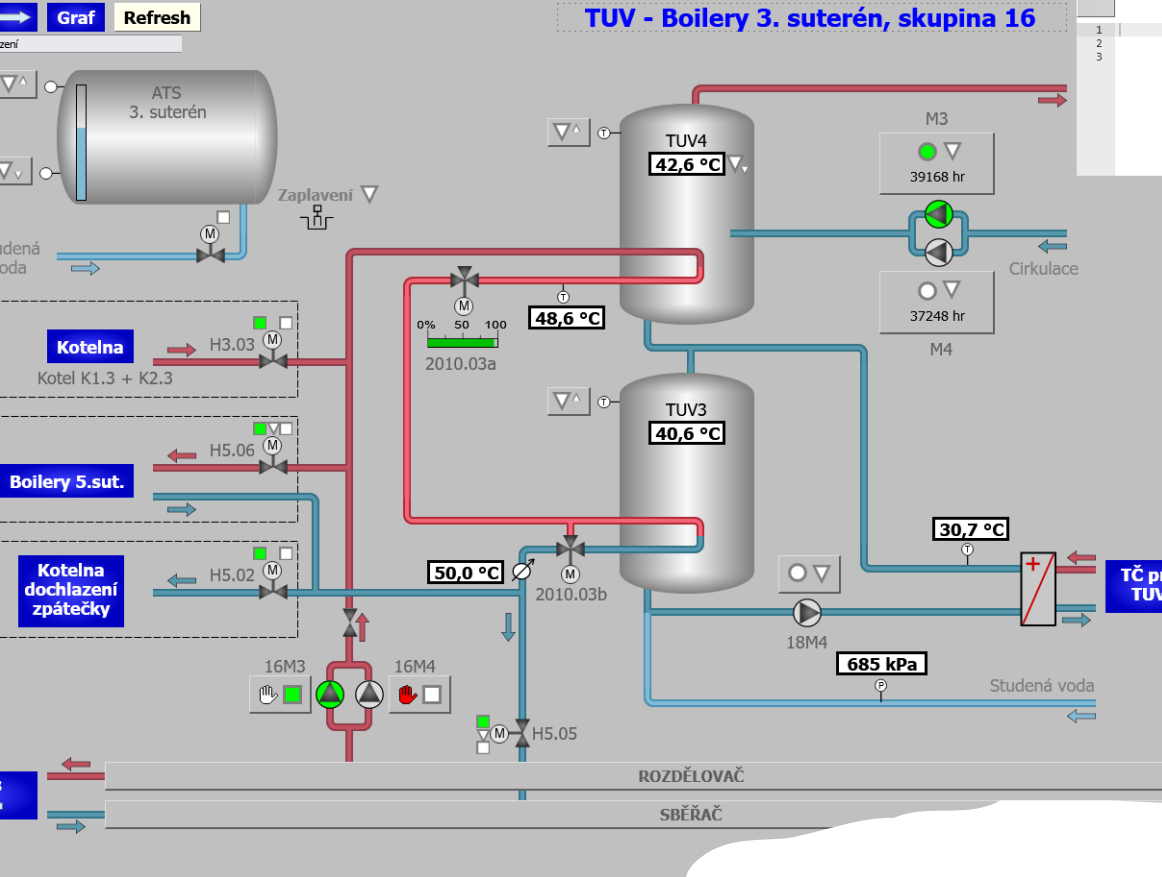
installation of a water-to-water heat pump



**Heat pump with
heating/cooling
capacity 1.41/1.03
MW**

possibility of
simultaneous heating
and cooling of the
building, during
cooling the heat
extracted from the
air-conditioned areas
(e.g. offices on the
south facade) is used
for heating of other
areas (it is not
necessary to return
the excess heat to the
Vltava River)

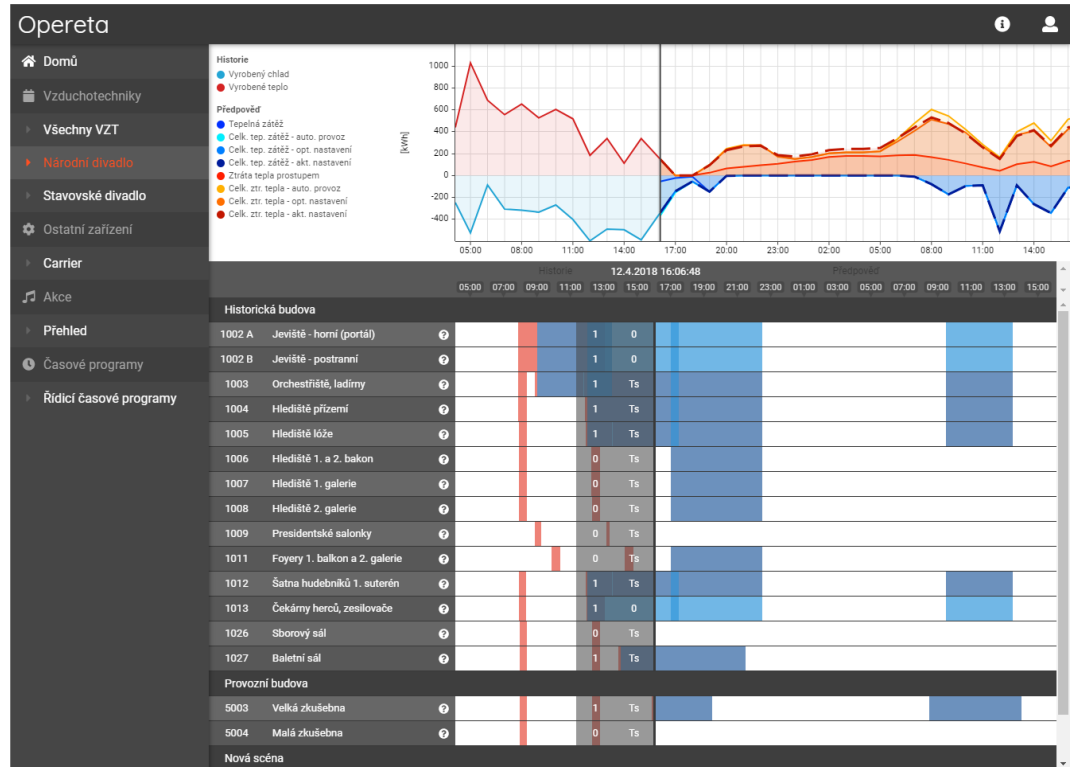




use of waste heat from stage technology

implemented by a heat pump with a heating capacity of 36 kW

modernization of the "Building Management System"



The „Opereta system“ collects data from the National Theatre's planning programme (Theasoft) and displays it clearly in a web application. Here it is possible to set the operation of specific air handling units depending on the types of activities taking place in the National Theatre.

installation of frequency converters for heating/cooling pumps and HVAC fans

infinitely variable control compared to the original inefficient on/off control, significant energy savings for the operation of the pump and ventilation, which have an input power of up to tens of kW



Photovoltaic power plant on the roof of the Operations Building and the New Stage

- annual electricity production 35 - 40 MWh/year
- less than 1% of annual electricity consumption ND
- foils with integrated PV panels in a 5,5 % gradient
- has a hydro insulation function
- grey foil, PV panels matt
- does not disturb views of the ND complex
- the roofs were also insulated at the same time

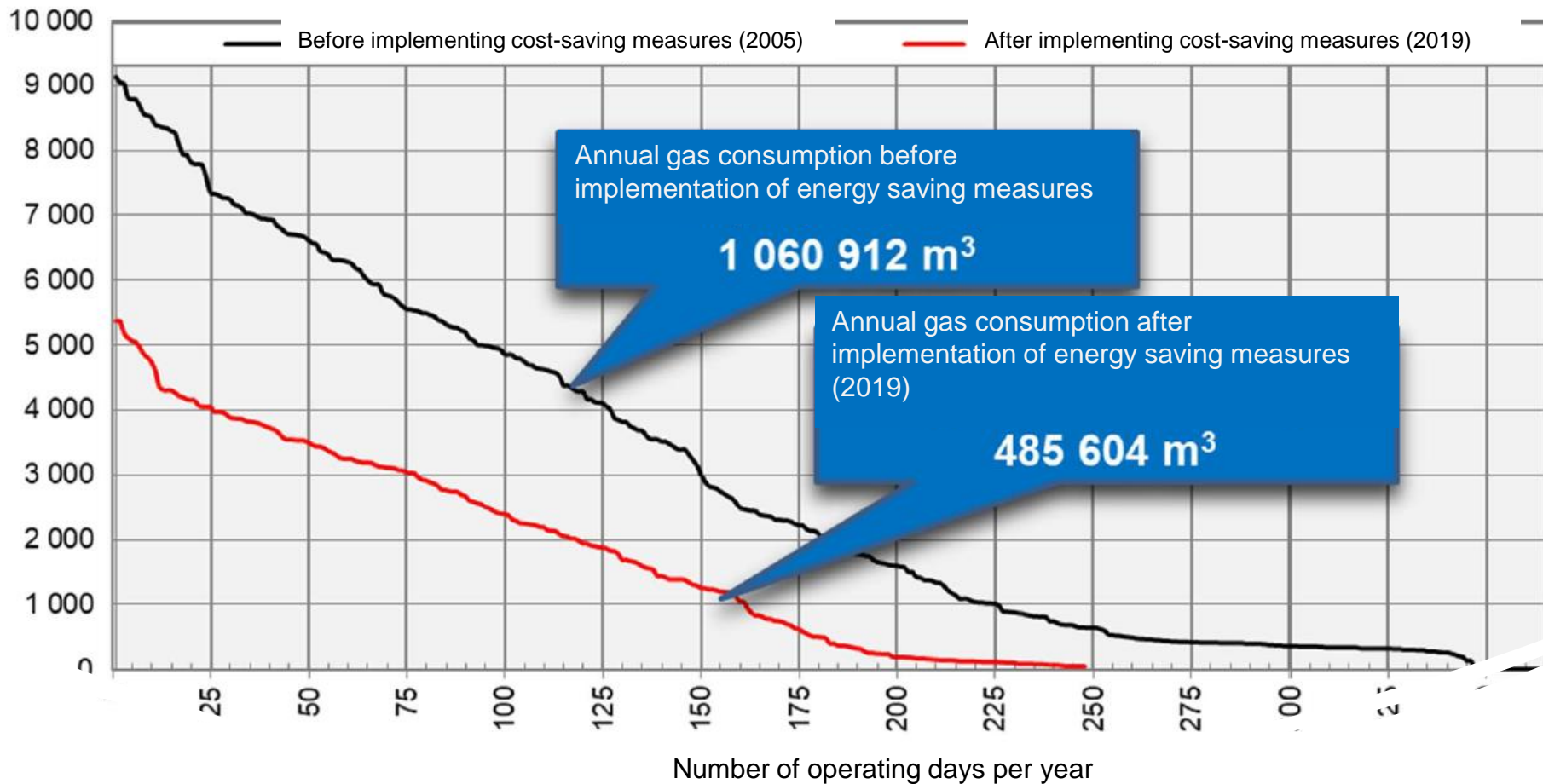




Photovoltaic power plant on the roof of the Operations Building and the New Stage

	Year of launch	Area of the PV plant [m2]	Power [kWp]
Operations building	2009	544	22
New Stage	2010	556	26
Total		1100	48

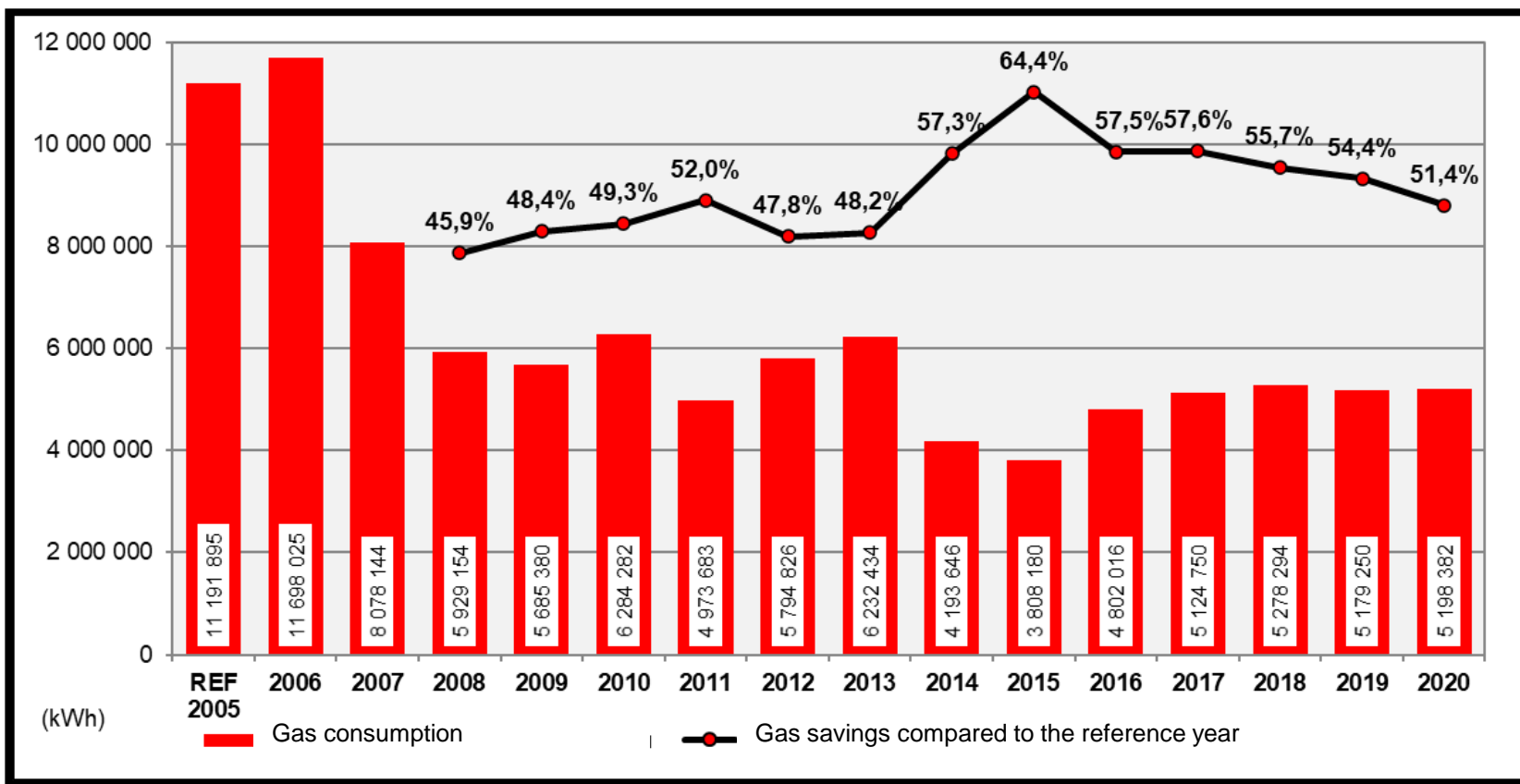
Daily gas consumption in m³



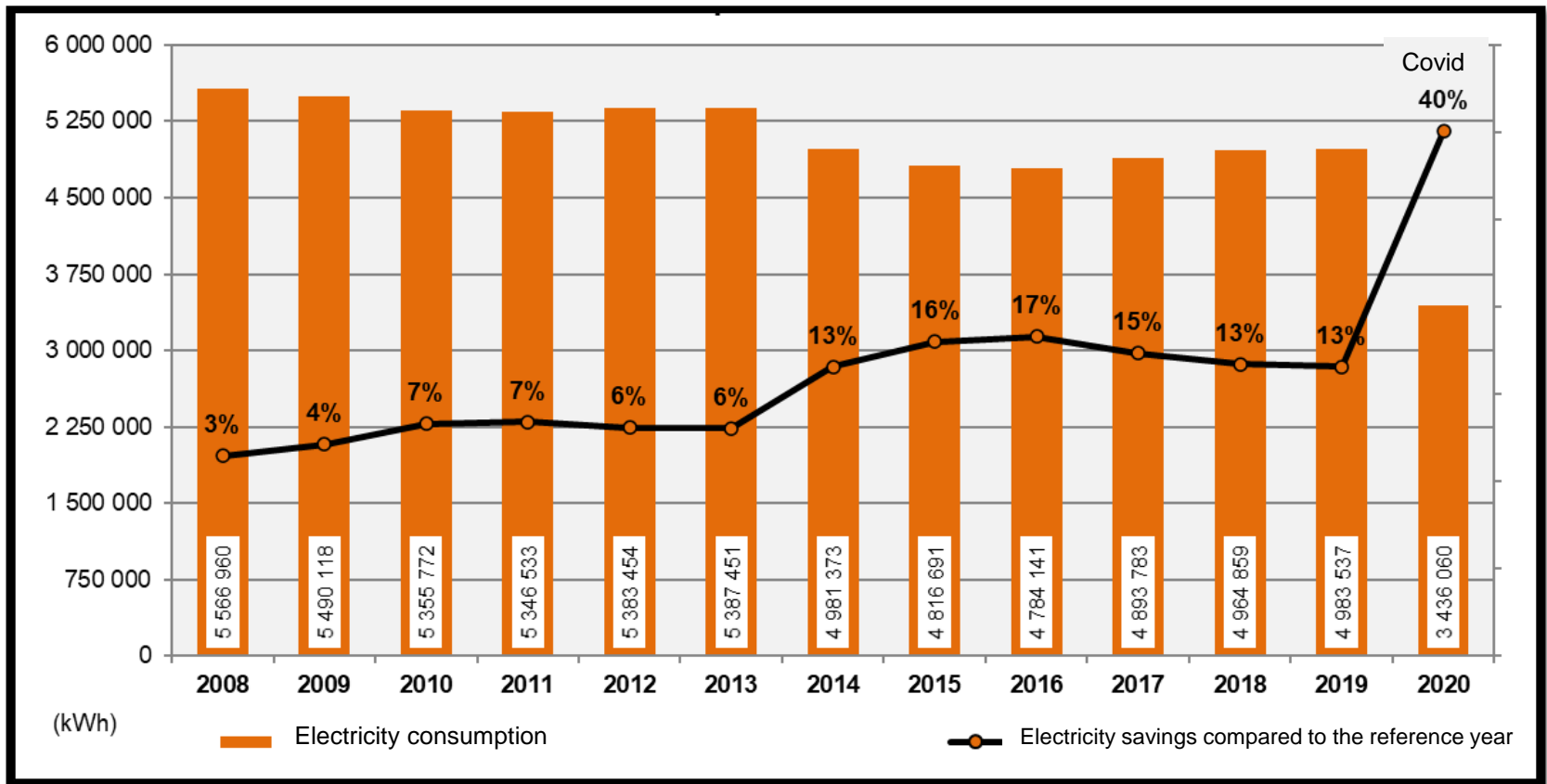
Reduction in gas consumption

- annual gas consumption before and after implementation of the measures
- Consumption in 2019 = 46% of consumption in the reference year 2005

Gas consumption (ncluding weather effects)



Electricity consumption



Evaluation of EPC projects in ND:

	cost	savings
The National Theatre	86,9	93,4
The State Opera	40,0	52,4
The Estates Theatre	45,0	50,6
St. Anna: Ballet Administration and Studios	9,6	13,1
Studios and Workshops	14,2	6,9 *

- * Projects are still running
- Figures in mill. CZK

**Planned
projects -
modernisation
of the ND
energy centre:**

- **using the National Program for the Environment within the National Recovery Plan (managed by SFŽP)**
- **3x water-to-water heat pump with a heating capacity of 4.5 MW**
- **Replacement of existing ČKD gas boilers**
- **modernisation of the Building Management System**
- **replacement of HVAC units and addition of heat recovery system**
- **installation of a photovoltaic power plant on the Operations building B**