# Serbien
# –
# Energieeffizienz im Bau

## Economic considerations related to EE Measures in Public Buildings in Serbia

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# Energy Efficiency in Serbia

## General Remarks

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# Energy Efficiency in Serbia

- Implementation of EU EE scheme
- adoption of secondary legislation on energy management done
- Priority in full transposition of EU Directive on EE
  - Legal Framework for energy performance contracting in place
  - ESCO projects at an early stage
- Large number of buildings with high energy consumption leads to good opportunities for reduction of energy consumption
- Low energy prices affect financial feasibility of investments in EE projects

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# Energy Efficiency Financing in Serbia

→ For 2020 EUR 4,25 Mio dedicated to EE projects by gvt. Budget mainly to support EE measures of local governments

Budget Fund for EE in Serbia:

- EUR 1,4 Mio approved annually by government
- One project-one municipality principle

→ Public Investment Management Office supports local governments related to reconstruction and improvement of public facilities

→ Plans to launch a private household EE Fund in 2021 for co-financing of EE projects

- Planned size of the Fund is EUR 21,6 Mio
- financed by EE fees paid by citizens

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# Energy Efficiency in Uzice


- City of Uzice has allocated funds for EE projects in private households mainly focused on purchase of eco friendly boilers and thermal insulation
- In 2020 200 projects with EUR 334.000,- subsidized
- EE Budget for 2021 is EUR 375.000,-

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# European EE Financing Mechanisms

## Interreg IPA Funds:

- Allignment with EU EE aquis
- Supports pilot & demo projects on innovative technologies and EE
- Serbia received > EUR 300 Mio between 2014-2020
- New Tool for the period 2021-2027 IPA III

## WeBSEFF-Western Balkans Sustainable Energy Financing Facility:

- EBRD Financing Facility providing credit lines to Partner banks in order to finance investments in EE
- Available for Municipalities, ESCOs, Municipal Service Providers up to EUR 2,5 Mio
- Technology cutting $CO^2$ emmisisons by >20%
- Retrofitting buildings making them >30% energy efficient

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# Economic Evaluation of 3 Public Buildings in Uzice

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# Business Considerations

General Remarks:

- Project Period: 20 years
- Estimated Price Increase for Energy: 2% p.a.
- Calculation Interest Rate: 1,5% p.a.

→ Considered $CO^2$ and business opportunity

Impact on Financial Feasibility:

- Very low energy, esp. electricity price
- Utilization of Buildings
- High Conversion Factor for electricity drives $CO^2$ savings potential

# Theater Building Results

→ 5 measures defined incl. PV in 2 different sizes

Basic Data:

| | Baseline | Insulation | HR | CHP | PV 56 | PV 82 |
|---|---|---|---|---|---|---|
| Investment | | 224.600 | 126.000 | 97.500 | 69.020 | 101.150 |
| Energy Cost/a | 16.606,59 | 13.836,84 | 14.958,71 | 14.235,24 | 12.437,08 | 10.913,99 |
| $CO^2$ changes t/a | | -9,9 | -5,9 | -48,9 | -54,6 | -74,9 |
| $CO^2$ changes % | | -8,35 | -4,98 | -41,27 | -46,08 | -62,95 |
| Payback Period years | | n/a | n/a | 51,4 | 18,2 | 19,7 |

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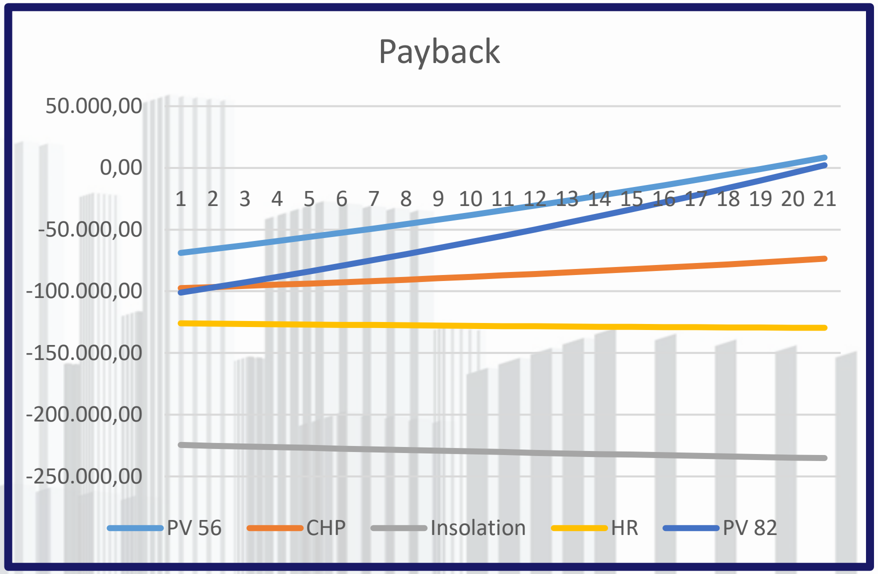
# Theater Building Results

## Financial Aspects

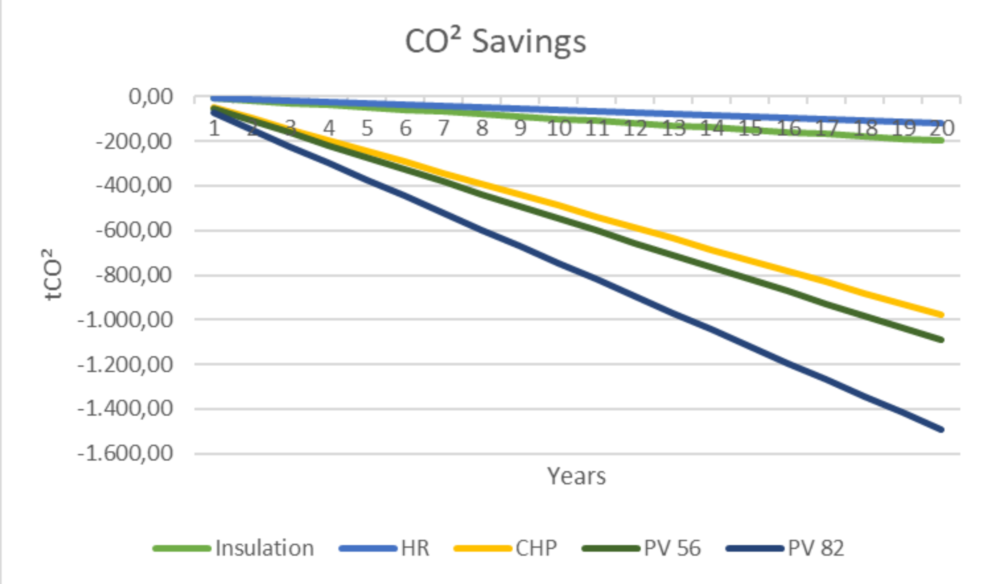
- Insolation, HR and CHP do not make economical sense
- PV as only possibility to reach positive financial results within the 20 years project period – PV electricity production during daytime does not correspond to hightest need in the evening for performances
- Insulation and HR require highest investment, but do not deliver positive financial results



# Theater Building Results

## $CO^2$ Aspects

- PV and CHP and deliver good $CO^2$ reduction opportunity
- Insulation and HR deliver low results only



# Theater Building Results

- Low utilization of the building has significant consequences for the sustainability of EE measures
- Both PV measures lead to positive financial results during the project period and show the largest $CO^2$ reductions
- Most of the produced electricity would be sent to the grid due to inbalance of production and electricity demand
- Other measures are financially not feasibile within the project period
- $CO^2$ reduction potential of insulation measures are relatively small although represent higher investments than PV

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# School Building Results

→ 6 measures defined incl. 2 different PV sizes

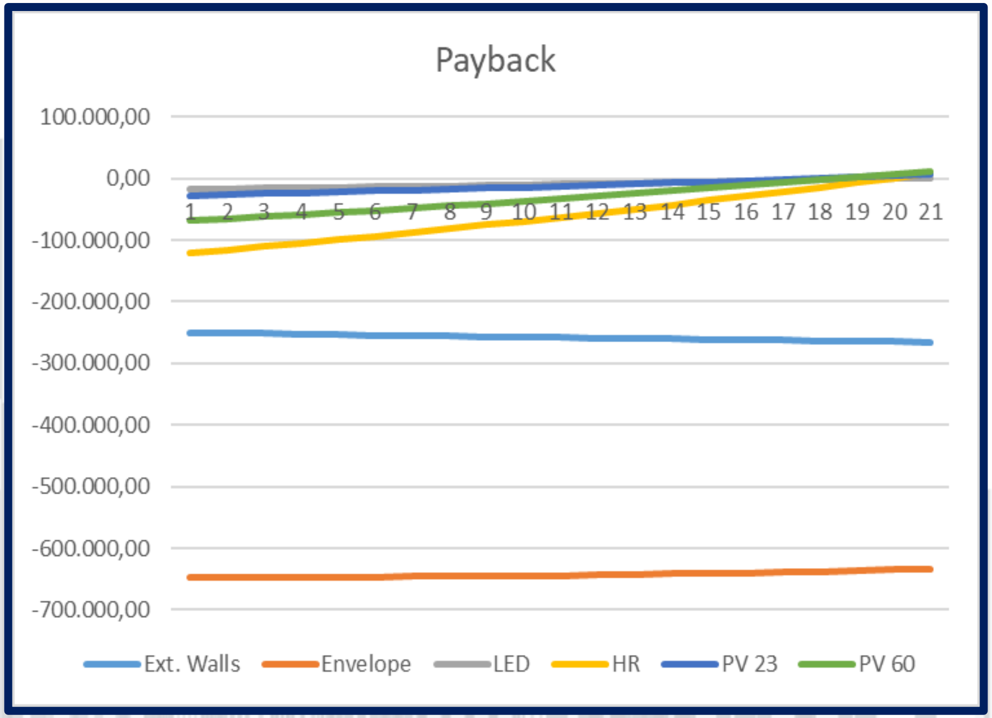
Basic Data:

| | Baseline | **Ext. Walls** | **Envelope** | **LED** | **HR** | **PV 23** | **PV 60** |
|---|---|---|---|---|---|---|---|
| Investment | | 250.000,00 | 647.622,40 | 17.315,00 | 121.205,00 | 27.540,00 | 69.020,00 |
| Energy Cost/a | 32.518,40 | 29.601,74 | 22.705,30 | 31.534,31 | 25.424,81 | 30.728,44 | 28.183,58 |
| $CO^2$ changes t/a | | -10,4 | -34,8 | -22,6 | -5 | -23,5 | -56,8 |
| $CO^2$ changes % | | -6,24 | -20,89 | -13,57 | -3,00 | -14,11 | -34,09 |
| Payback Period years | | n/a | 92,2 | 19,5 | 18,8 | 16,8 | 17,5 |

# School Building Results

## Financial Aspects

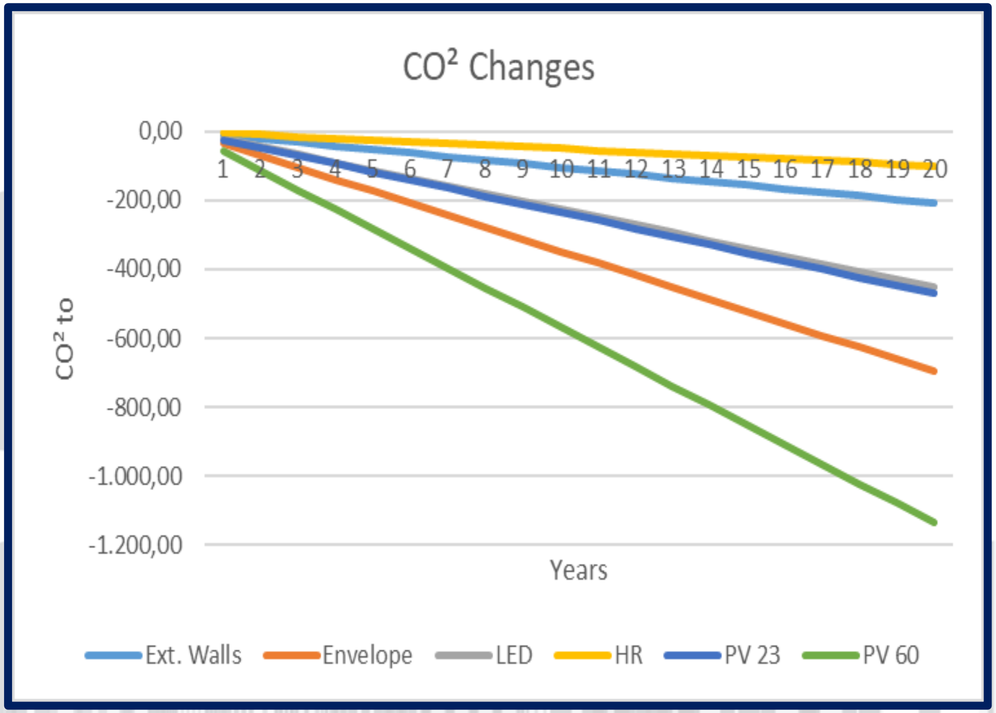
- Insulation of external Walls and the whole envelope requires significant investment and is not financially feasible
- HR and PV reach slight positive results within the 20 years period
- PV efficiency impacted by school close during summer time



# School Building Results

## $CO^2$ Aspects

- Hightest impact reached with PV or full envelope insulation
- LED reaches similar $CO^2$ reduction as the smaller PV installation with much smaller investment
- HR and Ext. Walls insulation lead to a minor $CO^2$ reduction only



# School Building Results

- → much higher heating energy than electrial energy needed due to functionality
- → Summer school beak limits PV opportunity for own consumption
- → Insulation Measures require significant investment compared to other options
- → Full envelope insulation delivers best $CO^2$ reduction opportunity, but without financial feasibility
- → LED represents the smallest investment and would reduce $CO^2$ significantly with a financial feasibility within the project period
- → Further reductions in $CO^2$ could be reached with a comination of measures, e.g. HR, LED and PV 23 and representing financial feasibility within the project period

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# Swimming Pool Results

→ 4 measures defined

Basic Data:

| | Baseline | HP mono | HP bivalent | PV | ST |
|---|---|---|---|---|---|
| Investment | | 150.000,00 | 48.000,00 | 111.690,00 | 60.000,00 |
| Energy Cost/a | 125.124,80 | 80.974,32 | 95.669,48 | 117.526,41 | 113.664,80 |
| $CO^2$ changes t/a | | 136,9 | 91,3 | -99,5 | -32,5 |
| $CO^2$ changes % | | 14,82 | 9,89 | -10,77 | -3,52 |
| Payback Period years | | 3,5 | 1,7 | 16 | 5,4 |

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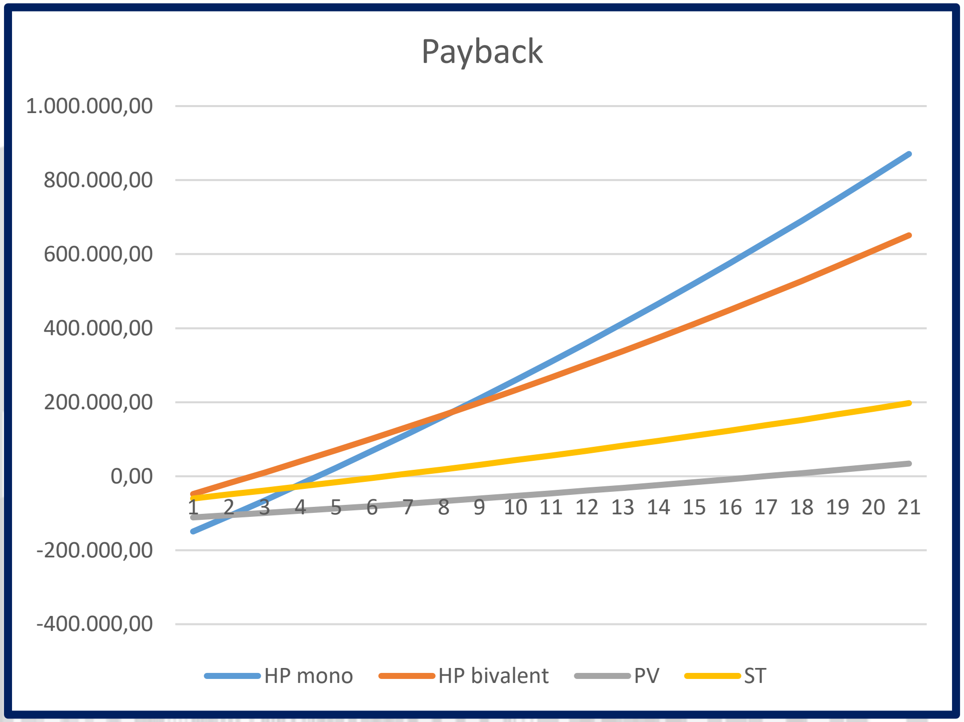
# Swimming Pool Results

## Financial Aspects

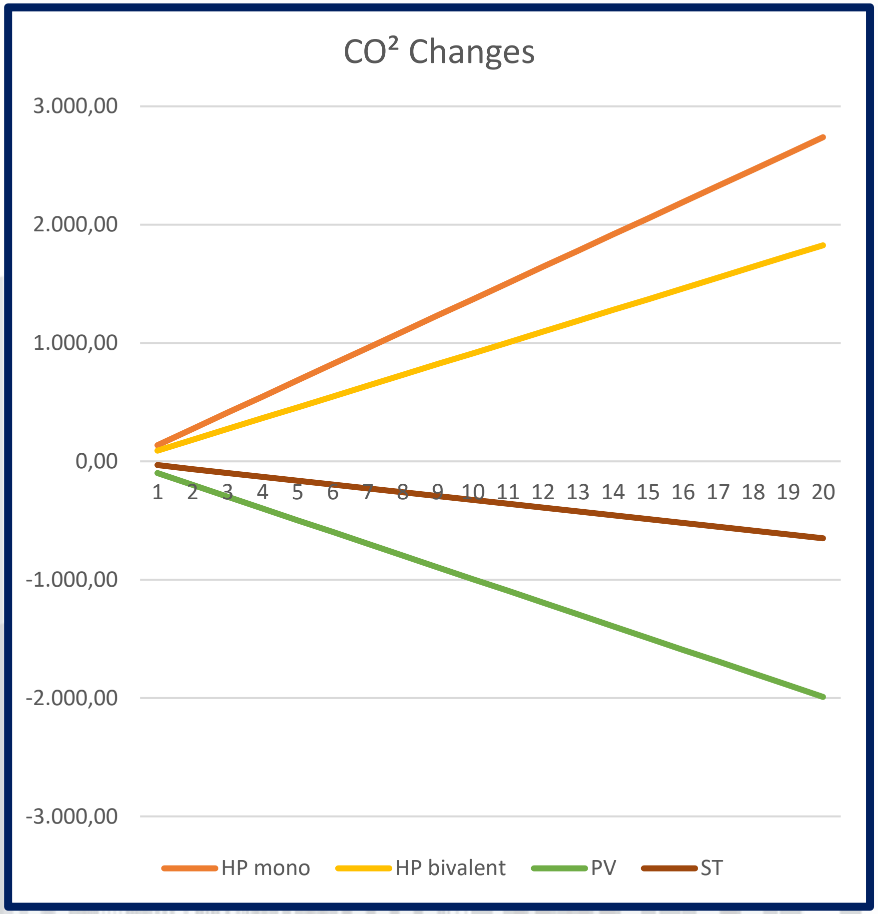
- All 4 measures reach financial feasibility within the 20 years period
- Both HPs show very good results with HP monovalent needing the largest investment and HP bivalent representing the shortest payback period of all investments



# Swimming Pool Results

## $CO^2$ Aspects

- Swimming pool requires large amount of heating
- $CO^2$ reduction potential relatively low due to electricity having a much higher conversion factor than heat from DH Uzice
- Both HP measures even increase $CO^2$ due to increased need of electricity
- PV show best results in $CO^2$ reduction, followed by ST



# Swimming Pool Results

- → EE measures show best financial results of all 3 buildings
- → $CO^2$ reduction opportunity limited due to high electricity conversion factor
- → HP bivalent could be combined with PV
  - HP leads to large cost reduction
  - PV offsets $CO^2$ increase

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# Thank You!

# Contact Information

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