COST/BENEFIT ANALYSIS OF UTILITY MANAGEMENT SYSTEMS IMPLEMENTATION

AMEU CONVENTION 2016

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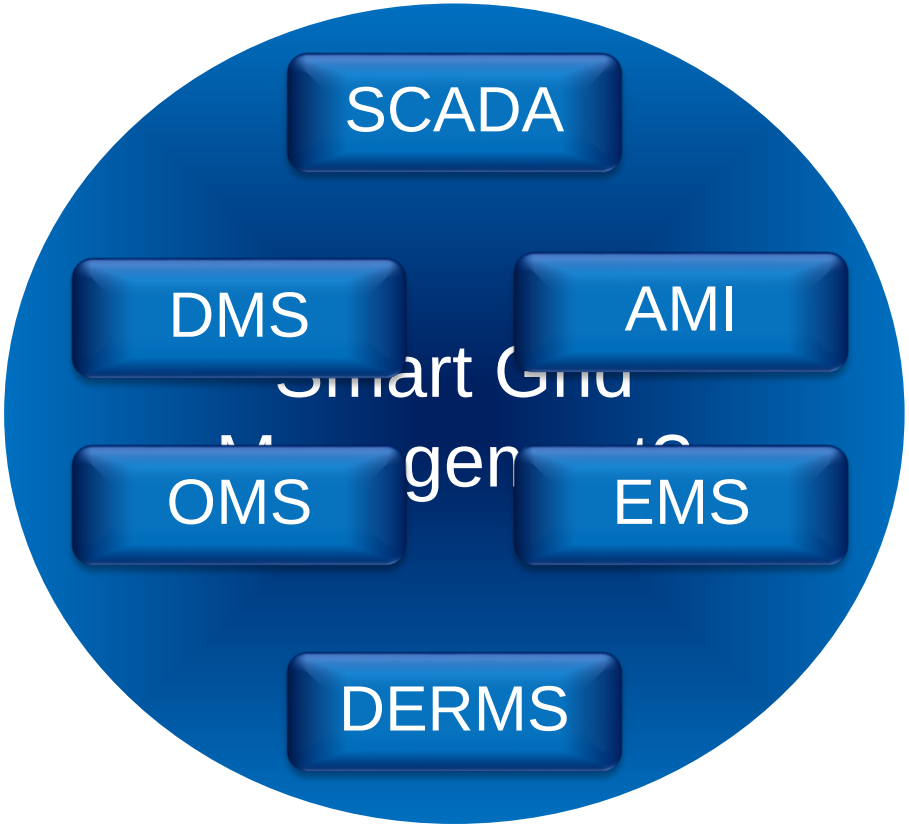
INTRODUCTION

Expansion of the technologies for the smart grid management

Integration of the separate systems into a unique management system:

- Optimal usage of energy resources
- Management of renewables
- Losses reduction
- Outage time reduction



UMS

AREAS OF RESEARCH

Potential solutions using UMS:

1. High expenses of normal operation:
   a) Repairs and maintenance
   b) Losses
   c) Penalties

Smart commanding

Optimal topology

Fast and efficient outage management

2. Expensive investments in network development — *Smart planning tools*
3. Poor supply quality and voltage profiles — *Operation optimisation*
4. Strict regulator rules — *Performance indices improvement*

COST ANALYSIS

COST ANALYSIS

Real costs of UMS implementation

1. Software licenses
2. Hardware
3. Labour services
4. Taxes

Considering two main variables:

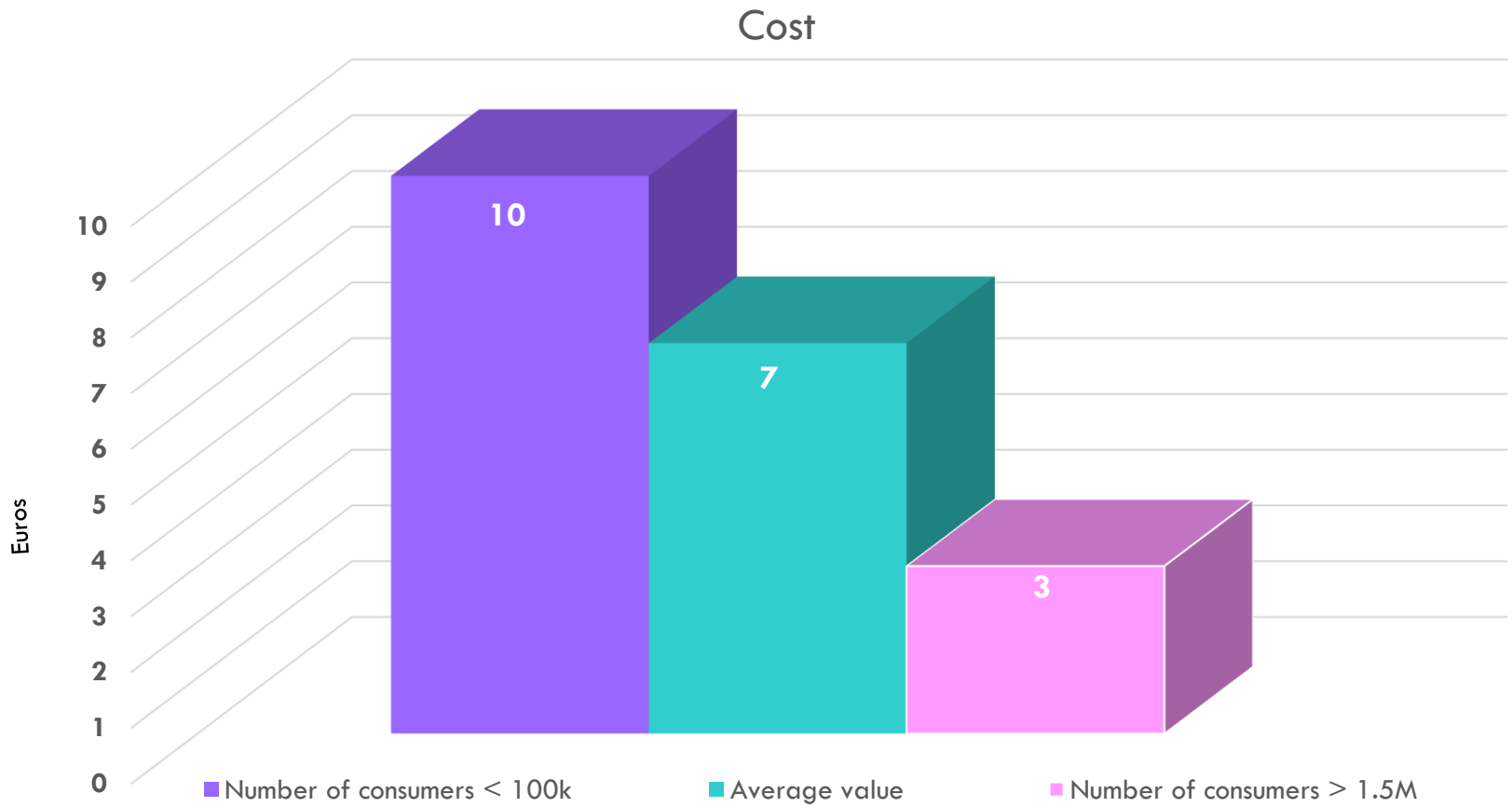
- Complexity of the solution (scope)
- Number of electrical consumers (meters)

Typical project duration 1-2 years

COST ANALYSIS

Analysis Results showed the range per meter to be: **3-10** €/meter

From this range, the average value was taken: **7** €/meter



COST ANALYSIS

All additional costs during 10 years of operation were considered:

- System maintenance
- Periodical system updates and upgrades

Total average cost: **2** €/meter/year

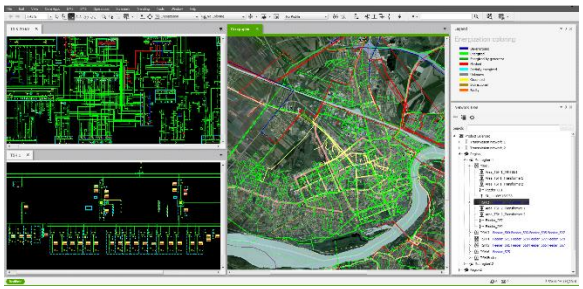
BENEFIT ANALYSIS

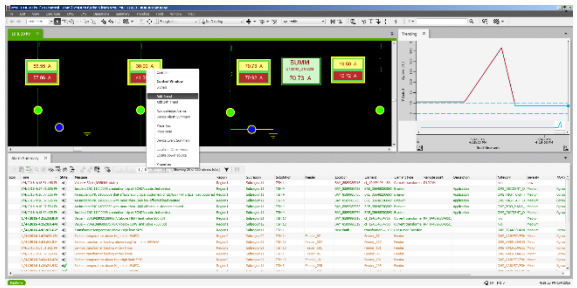
BENEFIT ANALYSIS

Using UMS software, particular benefits were analysed:

- Technical losses reduction – using optimisation functions
- Normal operation cost reduction – using outage management applications
- Voltage profiles improvement – using Volt/Var Optimisation
- Investment postponement – using smart planning tools

Results were compared with the real utilities experiences





TECHNICAL LOSSES REDUCTION

Optimisation functions:

- Network reconfiguration – optimal topology
- Volt – Var Optimisation – voltages and reactive power flow management

Final results presented in percentages of the total annual energy transferred through the system: **0,5%**

Experience of the utility in Italy (>30M consumers): technical losses reduction for 4% annually, 0.5% of the annual transferred energy

OPERATION COST REDUCTION

Outage time reduction means more delivered energy

UMS applications for outage management:

- FLISR (Fault Location, Element Isolation, Supply Restoration)
- OMS (Outage Management System)

+ UMS reduces the number of switching operations and prolongs the equipment lifecycle

Energy Savings due to outage time reduction:**1%.**

Experience of the utility in Texas (0.5M consumers): energy savings ~1% annually

VOLTAGE PROFILES IMPROVEMENT

Volt Var Optimisation with the following optimisation criteria:

- Demand reduction (reduction of the peak demand)
- Minimisation of the voltage deviations (voltage profiles improvement)
- Energy Efficiency

Energy savings due to demand peak reduction: **0.5%.**

The experience of the utility in North Carolina (1.5M consumers): Volt Var is operating in closed loop and reducing the demand peak for about 300MW (3%), resulting in savings of about 0.5% of the total annual transferred energy

INVESTMENT POSTPONEMENT

Investment postponement with UMS:

- Operation optimisation
- Smart planning of the network development

Experiences and possibilities with UMS tools were observed

Average annual savings of the annual transferred energy through the system: 1%

Experience of the utility in Serbia (200k consumers): savings in value of the 1% of the annual transferred energy

BENEFIT ANALYSIS

- Total benefits overview:

Benefit type	Method	Savings of the total annual transferred energy (%)	Annual savings per meter (Eur/consumer/year)
Energy losses reduction	Network Reconfiguration, Volt/Var Optimisation	0.5	1
Normal operation expenses reduction	OMS, FLISR	1	2
Voltage Profiles improvement	Volt Var Optimisation	0.5	1
Investment postponement	Optimisation functions Planning tools	1	2
	Total benefits	3 %	6 Eur/consumer/year

BENEFIT ANALYSIS

- Finally, the evaluated costs and benefits were compared :
- Costs: 2 Eur/consumer/year
- Benefits: 6 Eur/consumer/year
- Profitability: **3 times!**
- In order to increase the sensitivity of the analysis, total costs and benefits, over the project lifecycle were analysed considering the average depreciation rate:
- Total costs: 14.4 Eur/meter/10 years
- Total Benefits: 44 Eur/meter/10years
- Profitability: **3 times!**

BENEFIT ANALYSIS

Standard economic cost/benefit factors:

Economic profitability factors	Short explanation	Value
Profitability factor	describes the profitability of the project	3 times
Payback time	presents the time in which initial investment will return, and the project becomes profitable	3,3 years
Return on Investment (ROI)	describes the added value (benefit), which project will bring in the lifetime, over invested amount	2 times
Internal Rate of Return (IRR)	shows how much the investment is attractive comparing with the average rate of the capital	57.8 %

CONCLUSIONS

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The subject of analysis:

- Implementation costs
- Potential benefits

Costs and expected benefits were compared, the results point out that:

- High profitability rate: returned money is three times bigger than the investments
- Short period of the investment return: the entire investment is returned in the first third of the project lifecycle
- High income: income after returned investments are two times bigger than the investment

- **Results have shown that UMS is a very attractive investment, showing high profitability and low payback time!**

THANK YOU

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