POSYCO
Power System Cognification

Kritische ökonomische Parameter der Netzdigitalisierung in der Niederspannung

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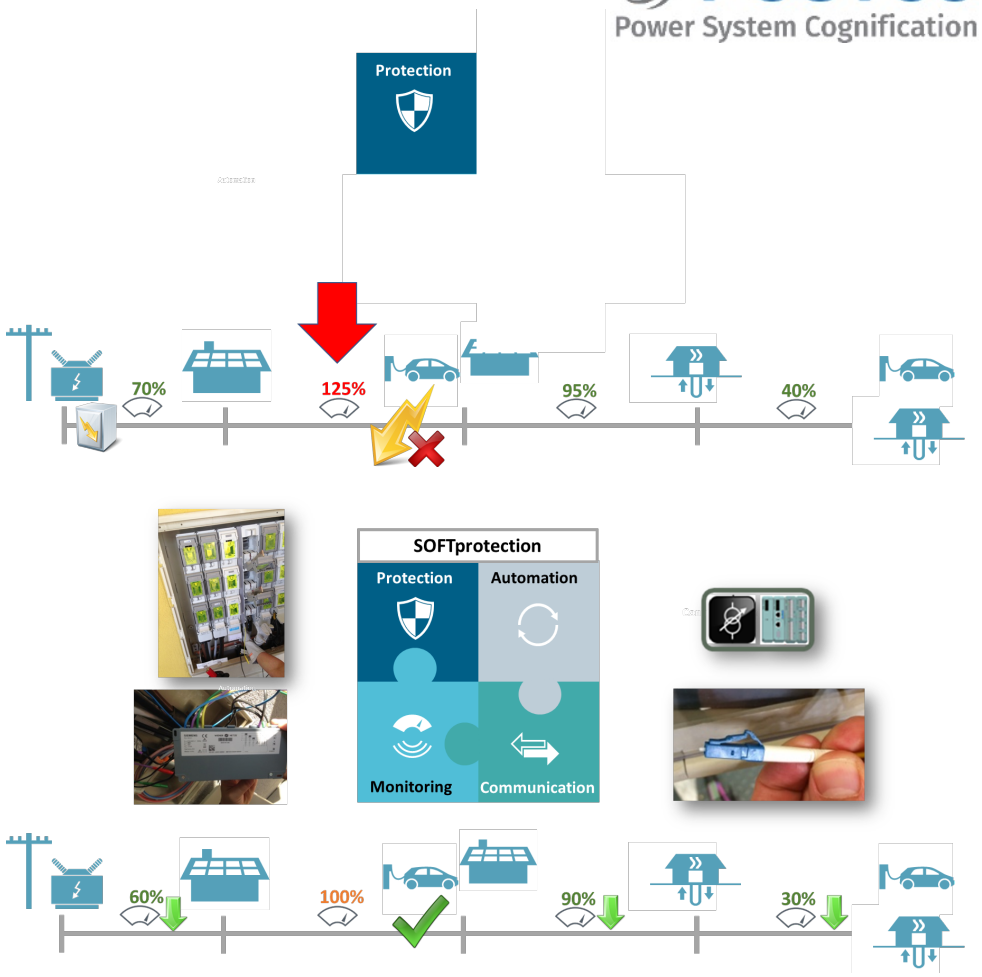
MOOSMOAR Energies OG

In a Nutshell

- Concept for a **'SOFTprotection'** as add-on for protection and control in low and medium voltage grids - widely autonomous support system
- Solutions for how a distribution system operator (DSO) can **implement an advanced smart grid protection and control functionality** in his technical and organisational framework
- **An ICT (Information and Communication Technology) system** for automated operation
- **Integration into working processes** including the human-to-machine interaction

Physical Dimension **ICT Dimension** **Process Dimension**



Use Cases

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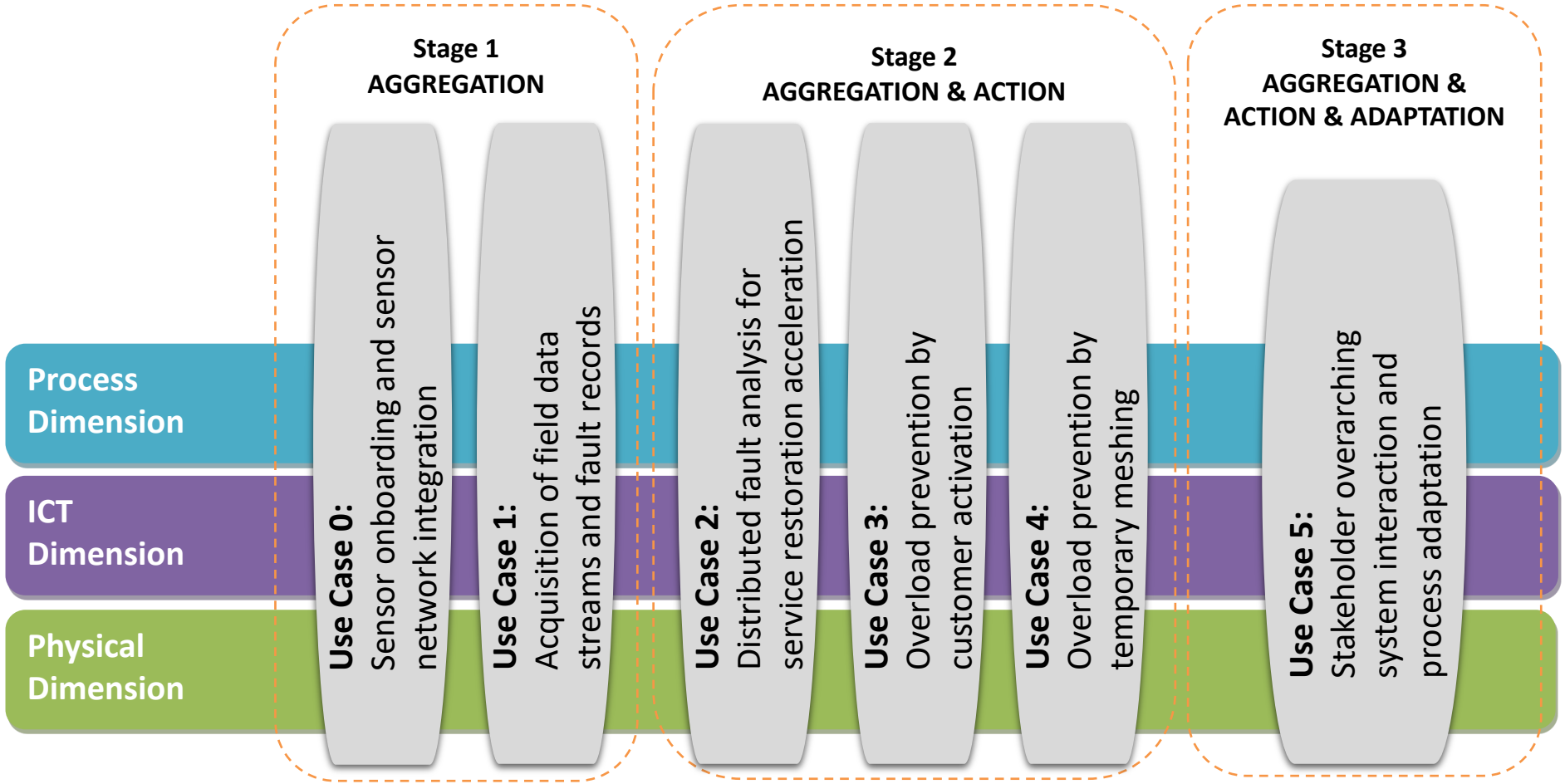
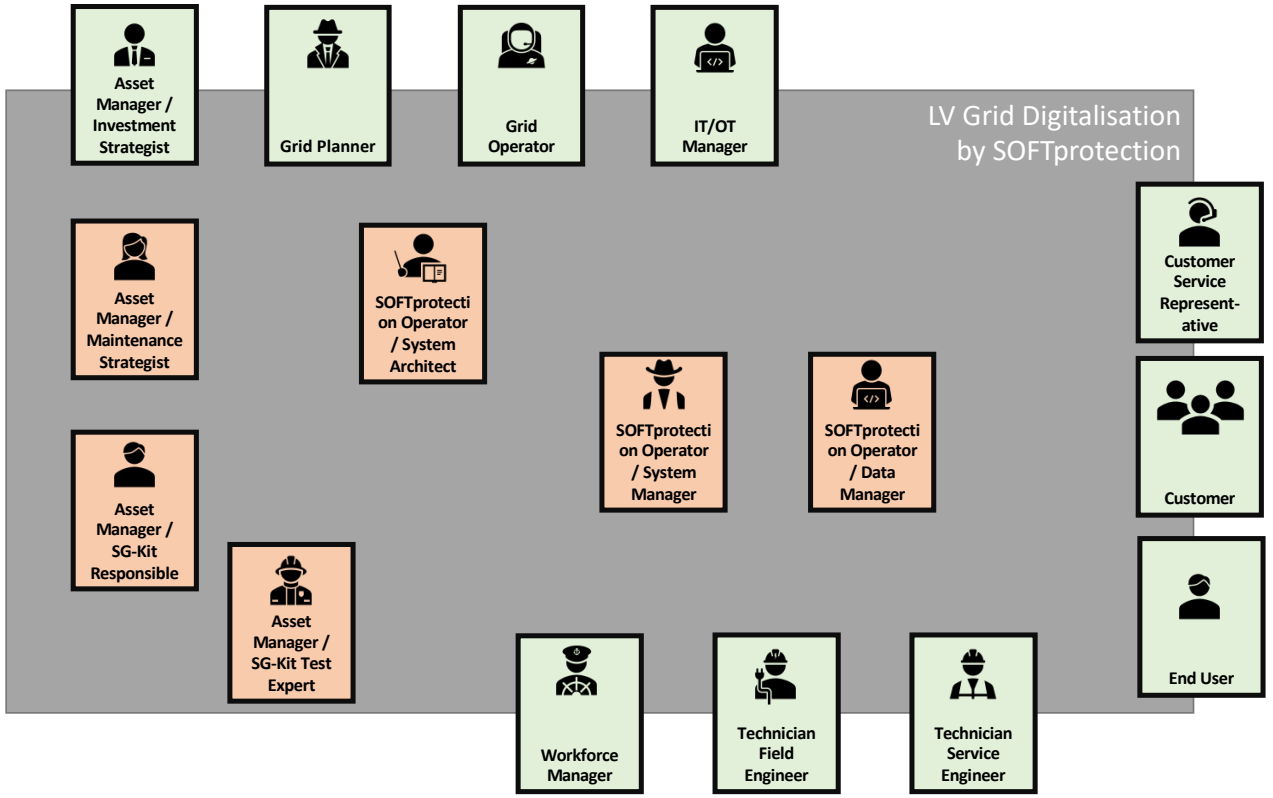
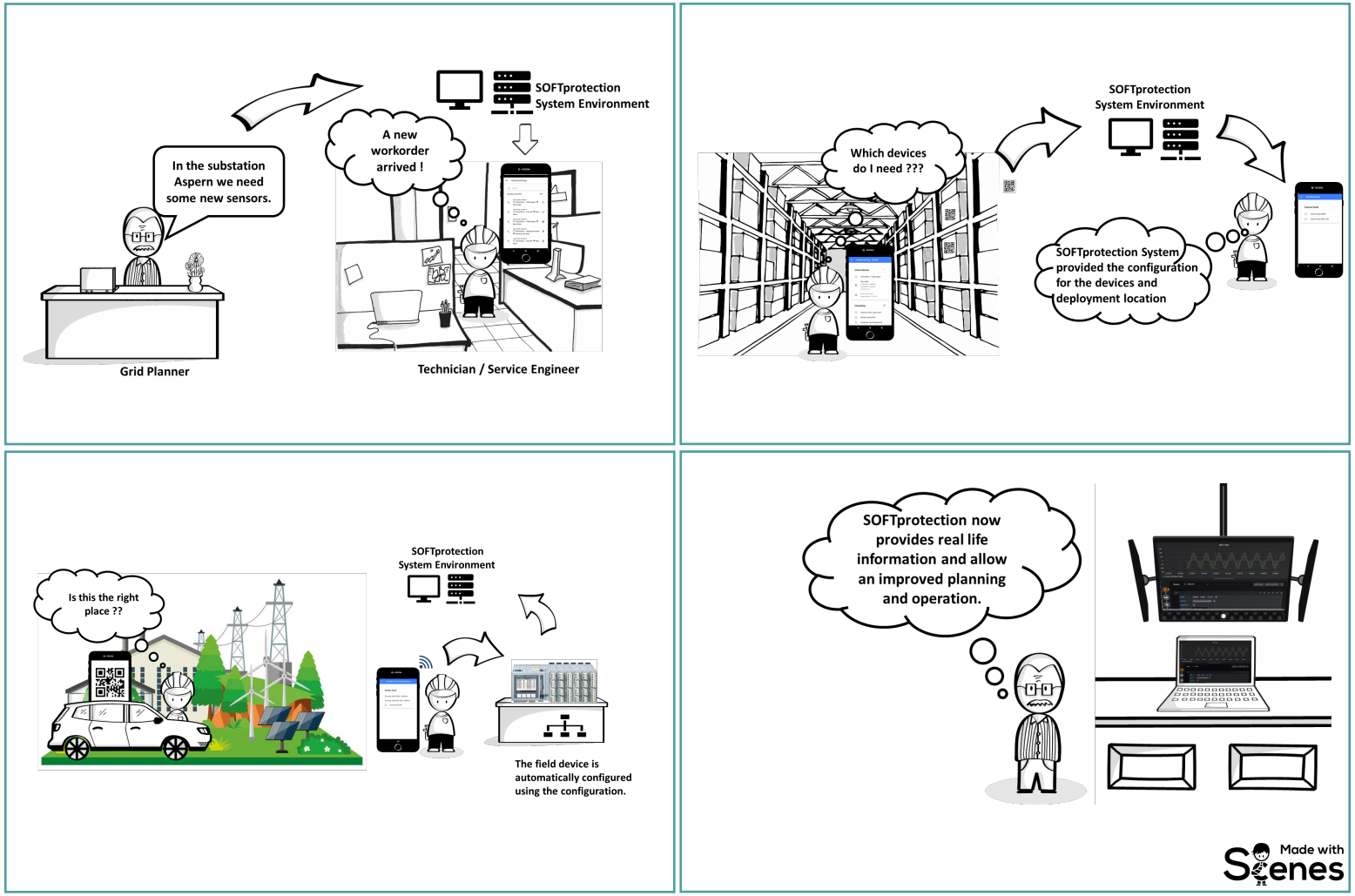


New Roles

- In several online and bilateral meetings, existing processes and interfaces were identified within DSO environments.
- For each Use Case of the PoSyCo project, corresponding roles (also new roles) and workflows (incl. new workflows) were identified.
- Roles and workflows are merged in special Show Cases, which will be analysed in depth (process optimisation and cost-benefit analysis) in the last project period.



New Workflows

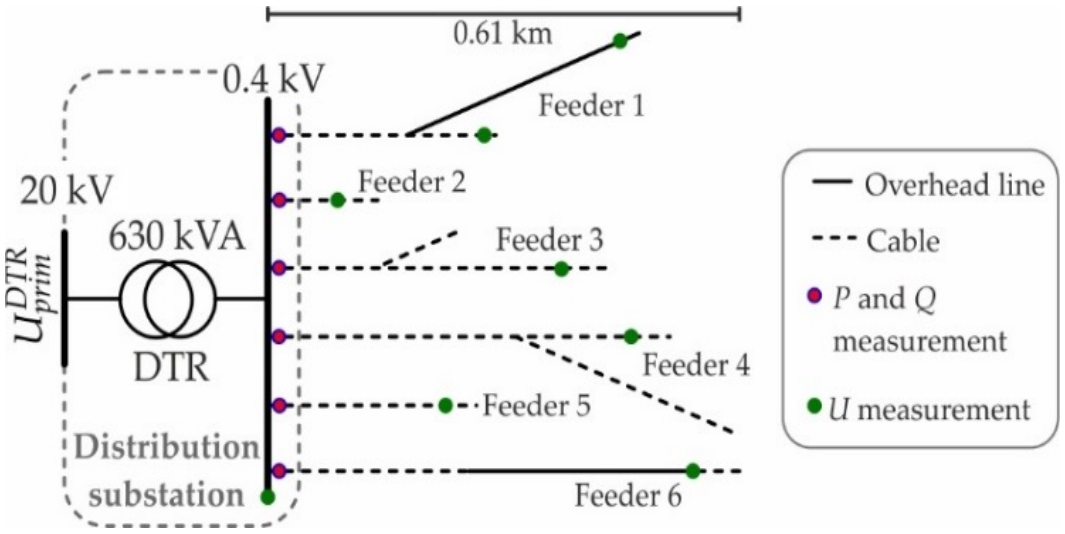


- Optimise the implementation of processes, interfaces and roles within DSO environments by using and extending BIFROST
- Corresponding user stories based on workflow descriptions
- Emulation of a wide range of possible scenarios with corresponding dependencies.
- Scenes represent workflow “sensor roll-out”

Work created with Scenes™ by SAP AppHaus (https://experience.sap.com/designservices/scenes)

Chosen Case Study: Cost parameter setting

Number of additional PoSyCo role full-time equivalents	5
Yearly staff cost per role in [€]	70000
Number of transformers of Wiener Netze	10841
Digitalisation rate	15%
Weighted Average Cost of Capital (WACC)	4,88%
Inflation rate	2%
Number of measurement points in test grid	14
Integration cost per measurement point in [€]	1150
Operation cost per measurement point in [€/yr]	50
PoSyCo controller hardware cost per transformer in [€]	3000
Cable laying cost (average) in [€/m]	450
Asset lifetime – cables in [yr]	40
Asset lifetime – IT equipment in [yr]	10

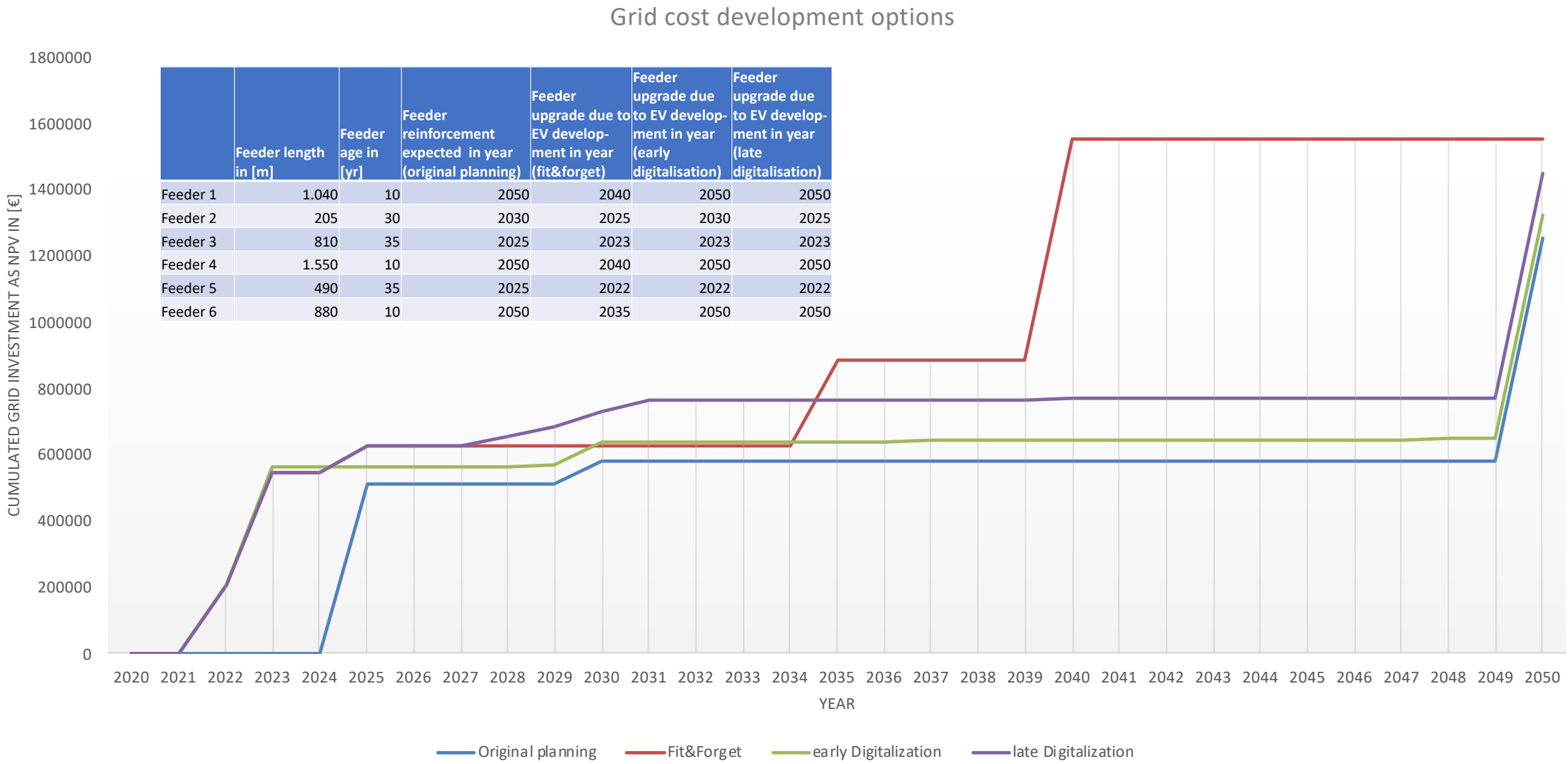


- Real urban grid with cable share of 81%
- 91 customers connected
- Scenario: 46 customers with PV (5 kWp), EVCS (11 kW) and EVs (40 kWh)
- Voltage measurement placed at the backmost distribution cabinet or pylon

Grid cost development options / strategies

	Feeder length in [m]	Feeder age in [yr]	Feeder reinforcement expected in year (original planning)	Feeder upgrade due to EV develop-ment in year (fit&forget)	Feeder upgrade due to EV develop-ment in year (early digitalisation)	Feeder upgrade due to EV develop-ment in year (late digitalisation)
Feeder 1	1.040	10	2050	2040	2050	2050
Feeder 2	205	30	2030	2025	2030	2025
Feeder 3	810	35	2025	2023	2023	2023
Feeder 4	1.550	10	2050	2040	2050	2050
Feeder 5	490	35	2025	2022	2022	2022
Feeder 6	880	10	2050	2035	2050	2050

Net Present Value (NPV) of cost development



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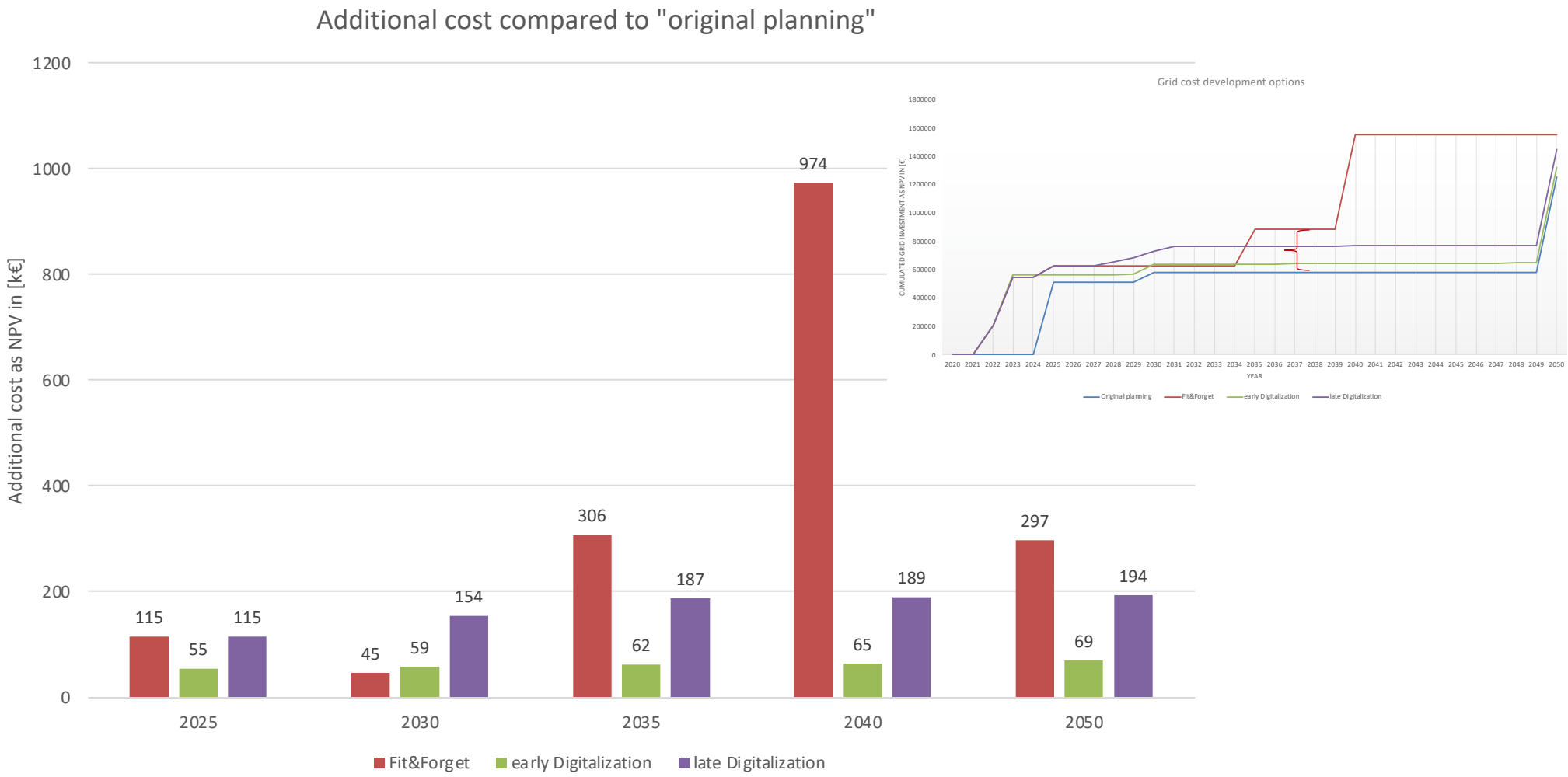
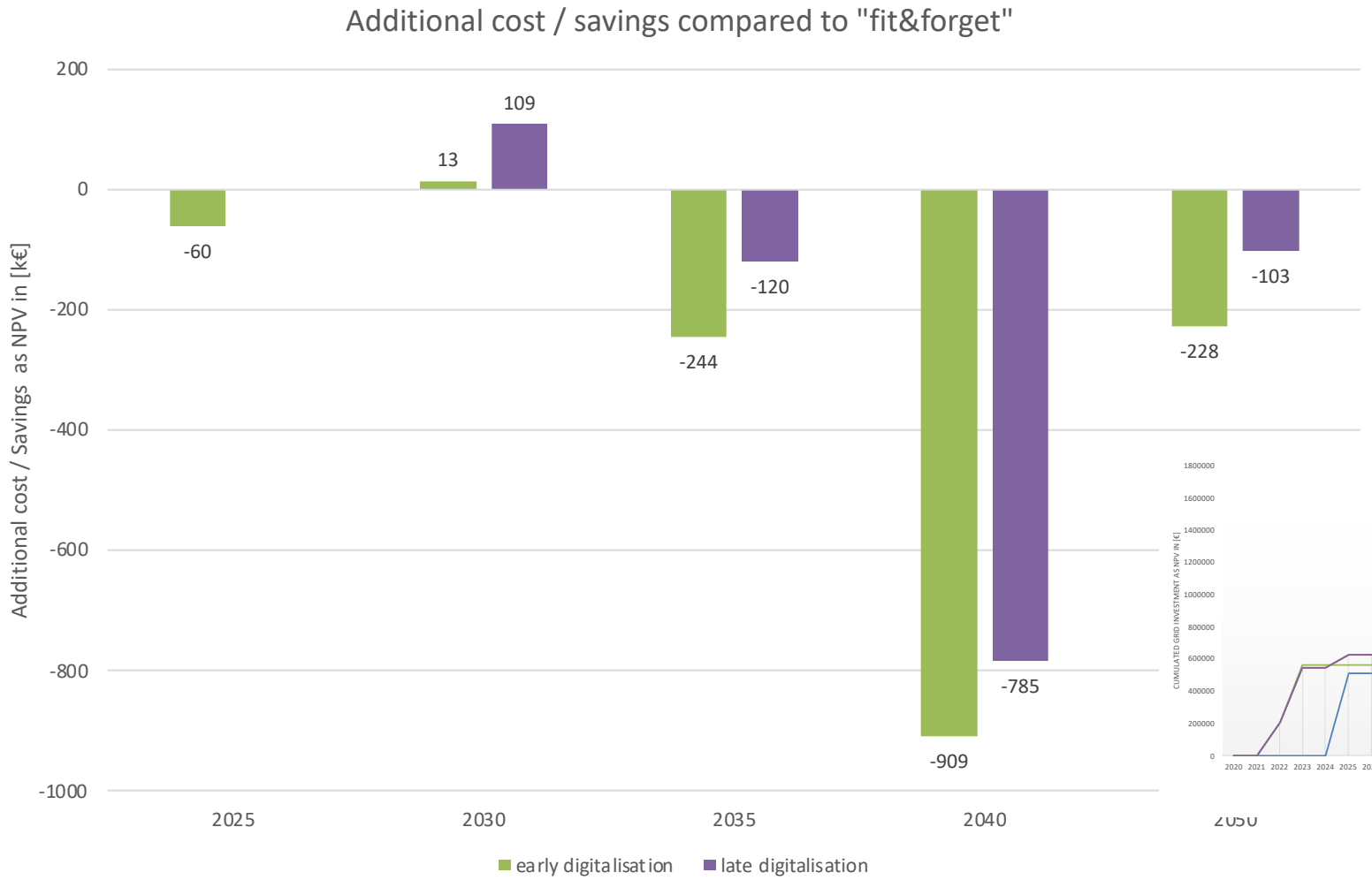
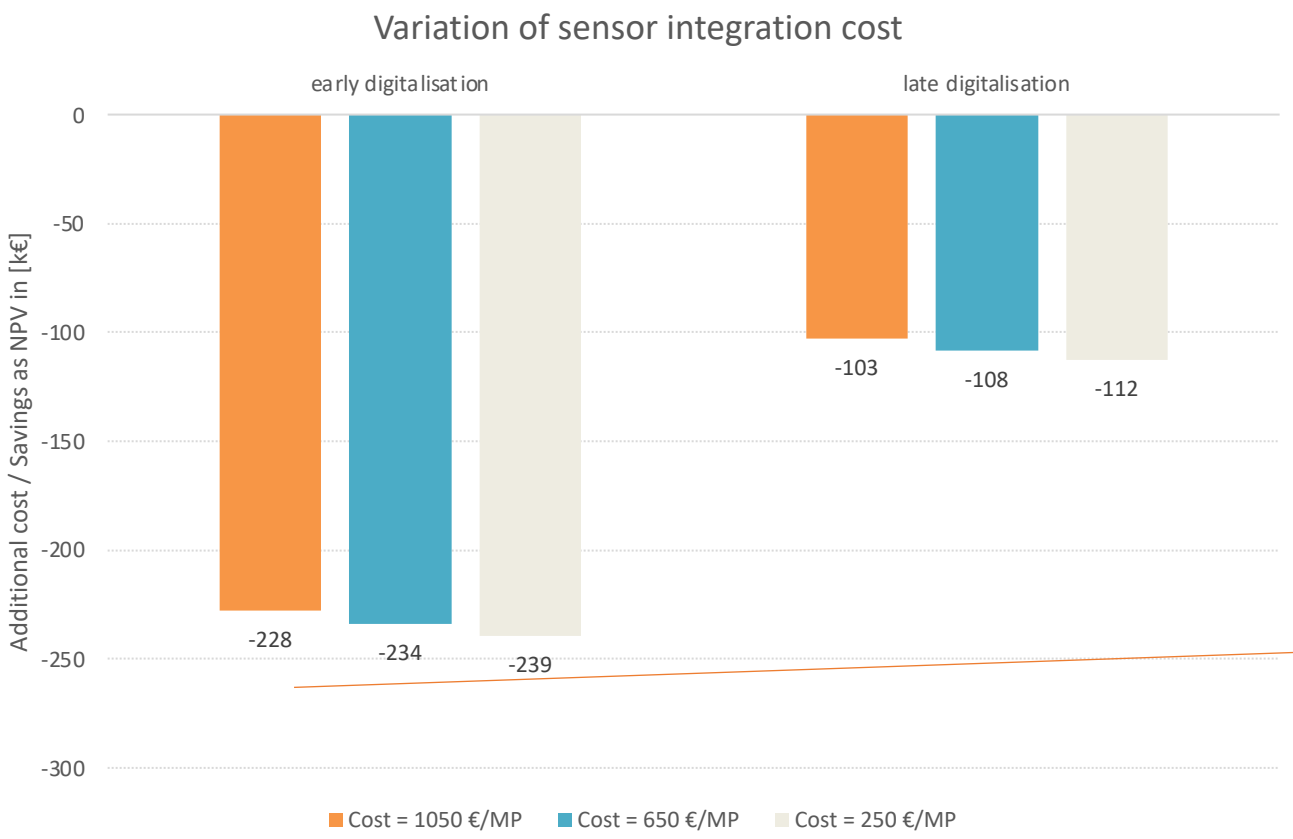
NPV of additional cost

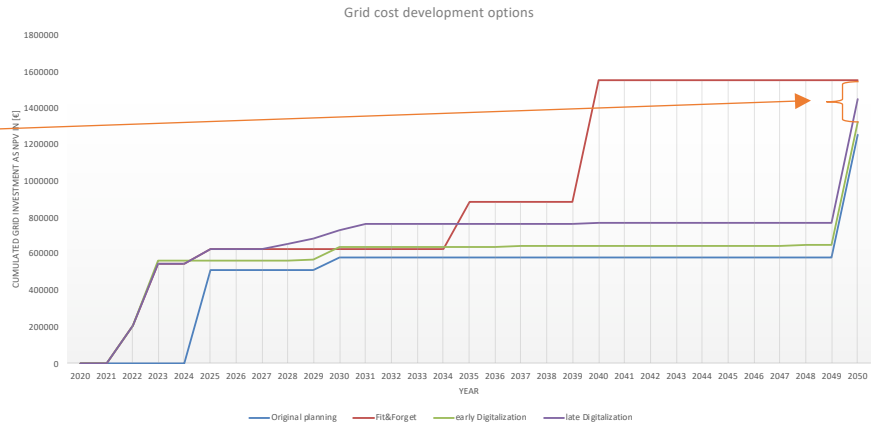


NPV of additional cost compared to “Fit&Forget”

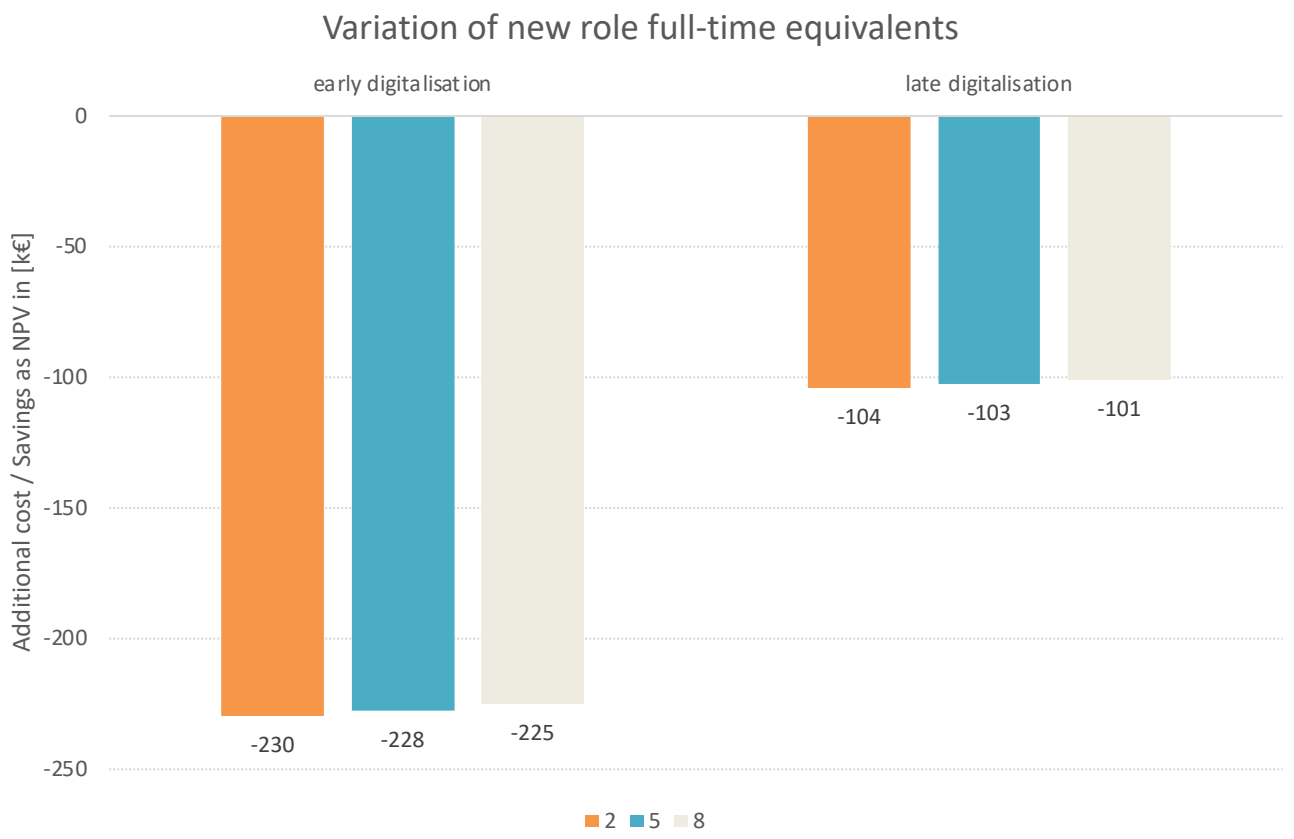


Variation of sensor integration cost (10h – 1h)

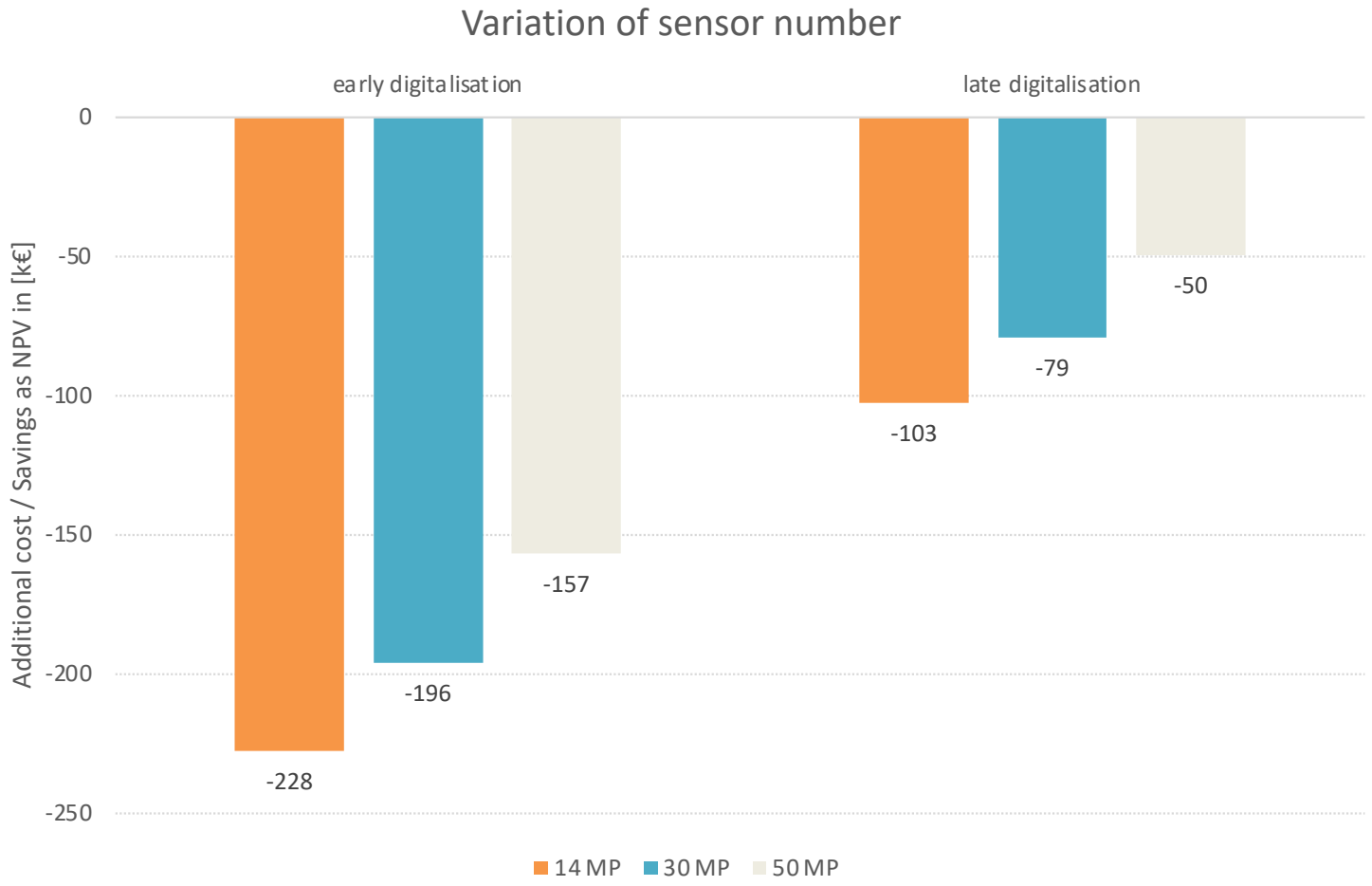




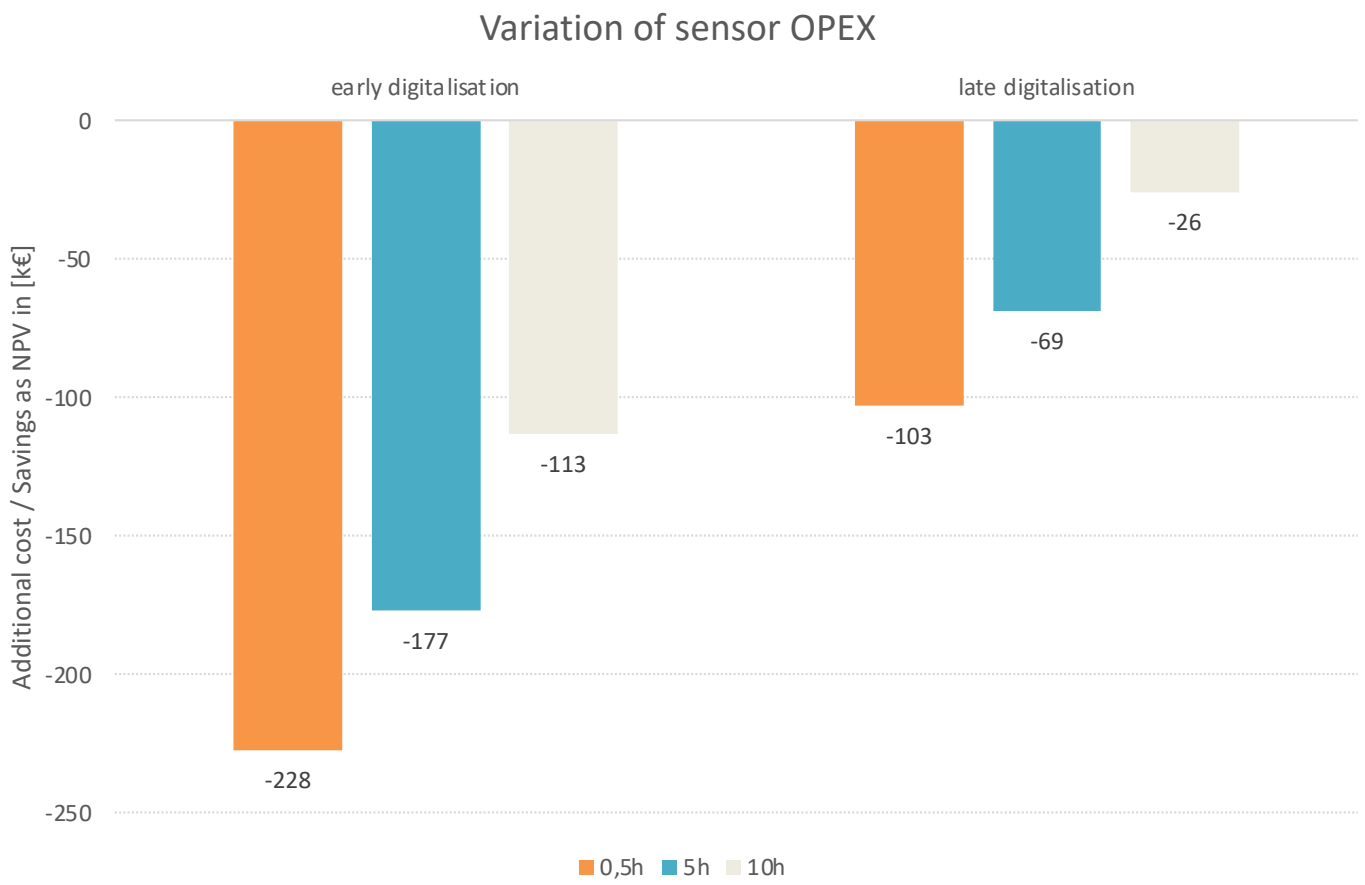
Variation of new role full-time equivalents (2 to 8)



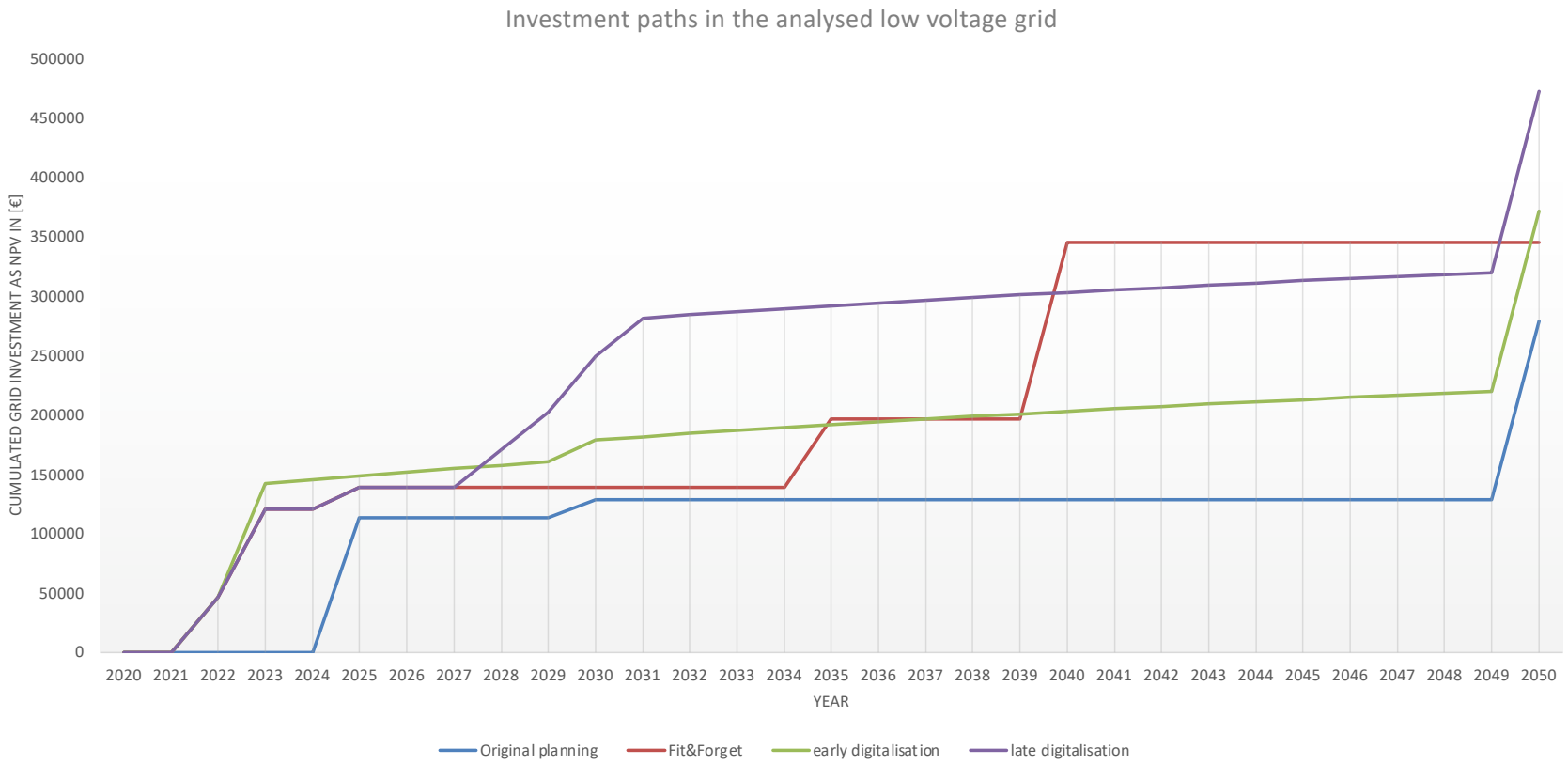
Variation of sensor numbers (14 MP – 50 MP)



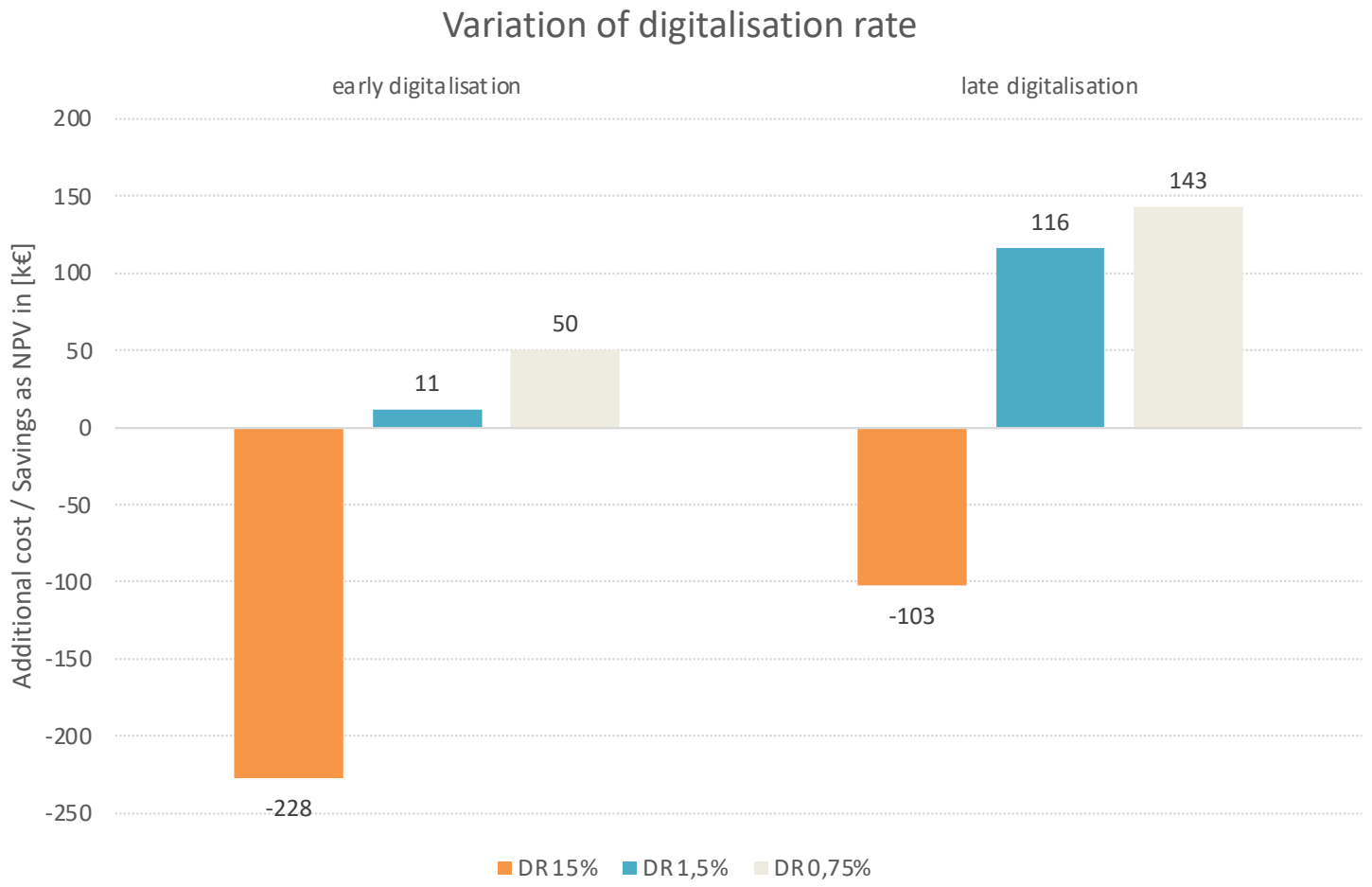
Variation OPEX of sensor (50 €/yr - 1000 €/yr): Cable price 450 €/m



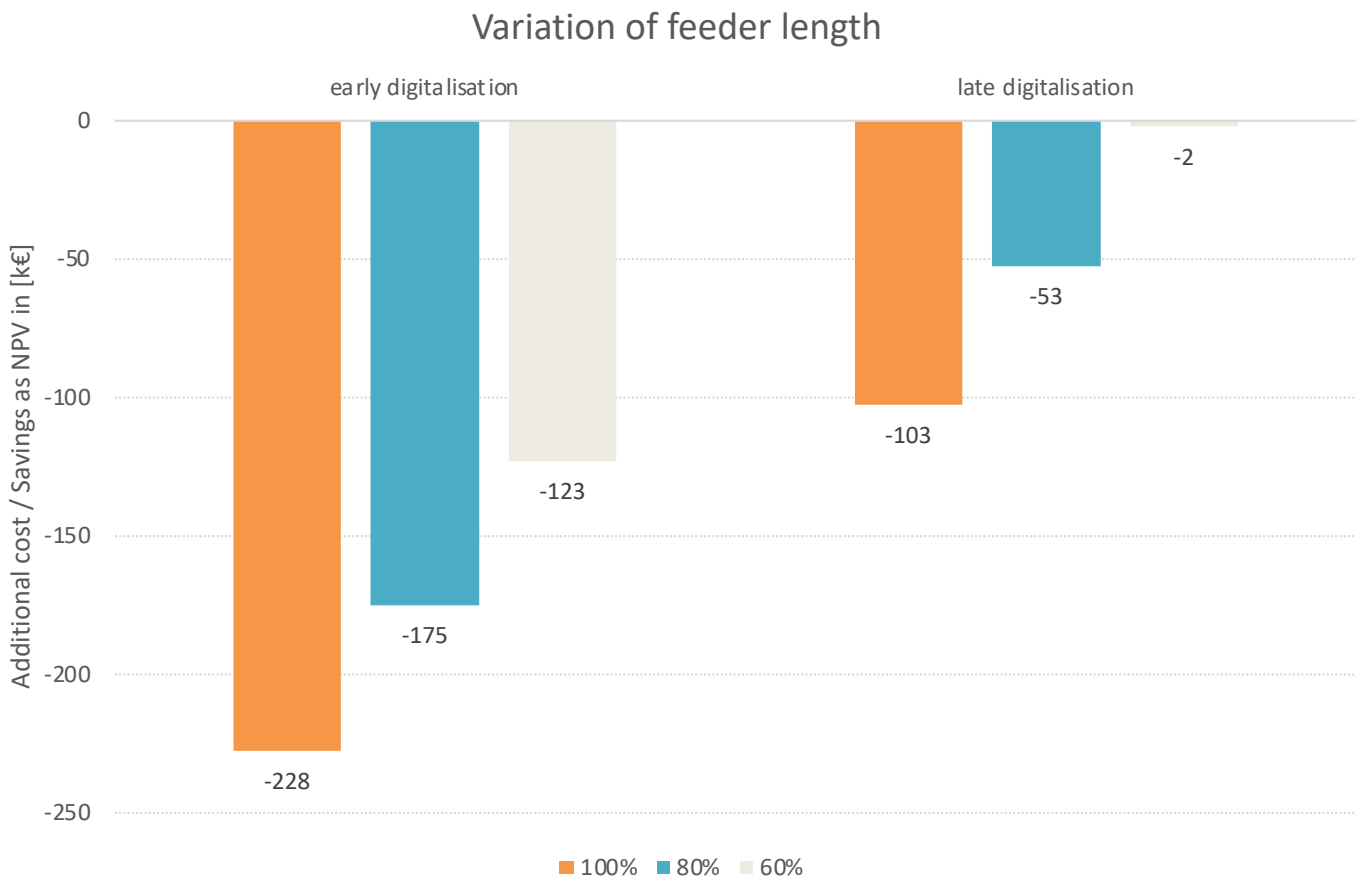
Variation of sensor OPEX (50 €/a - 1000 €/a): Cable price 100 €/m



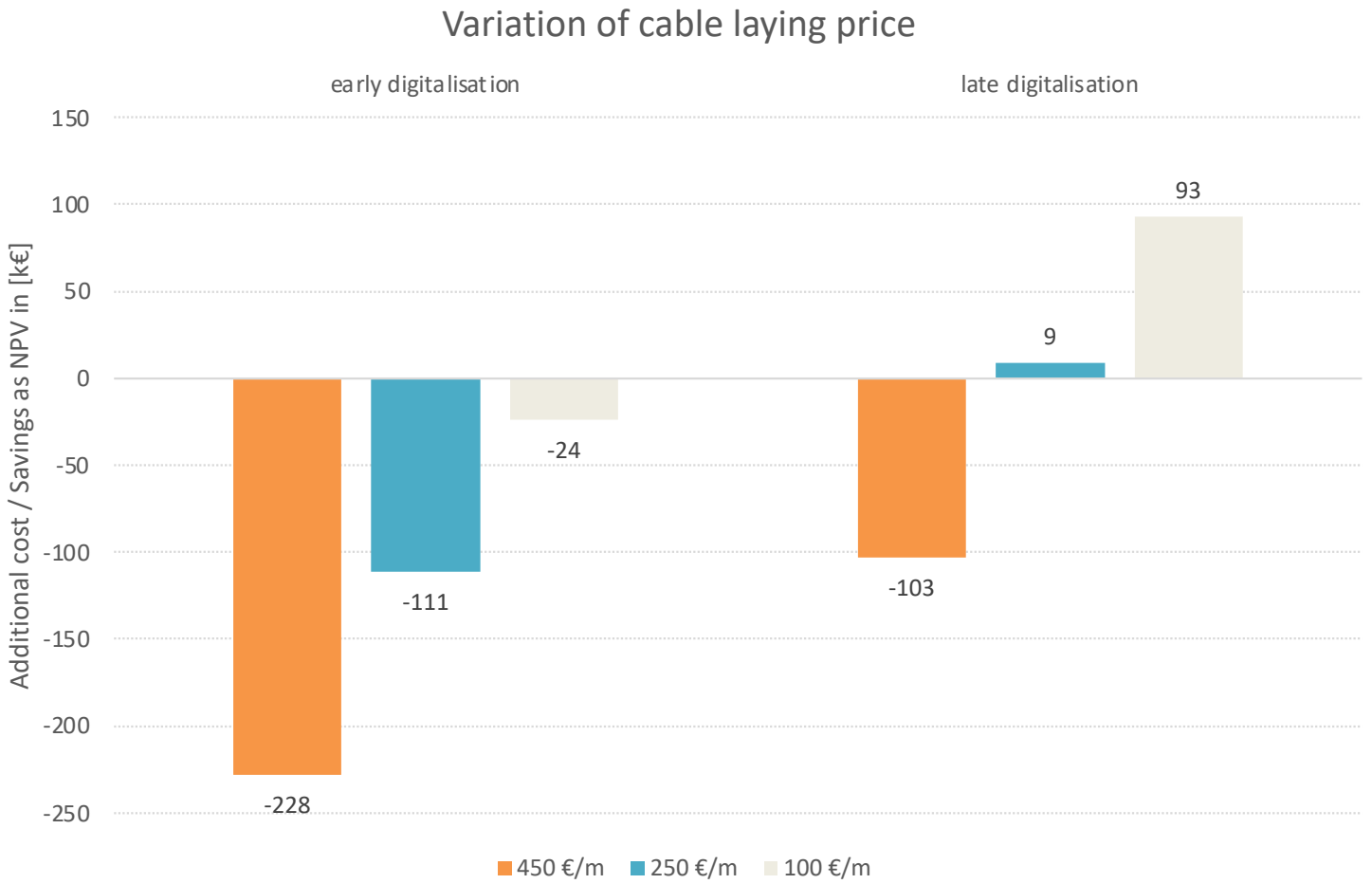
Variation of digitalisation rate
15% → 0,75%



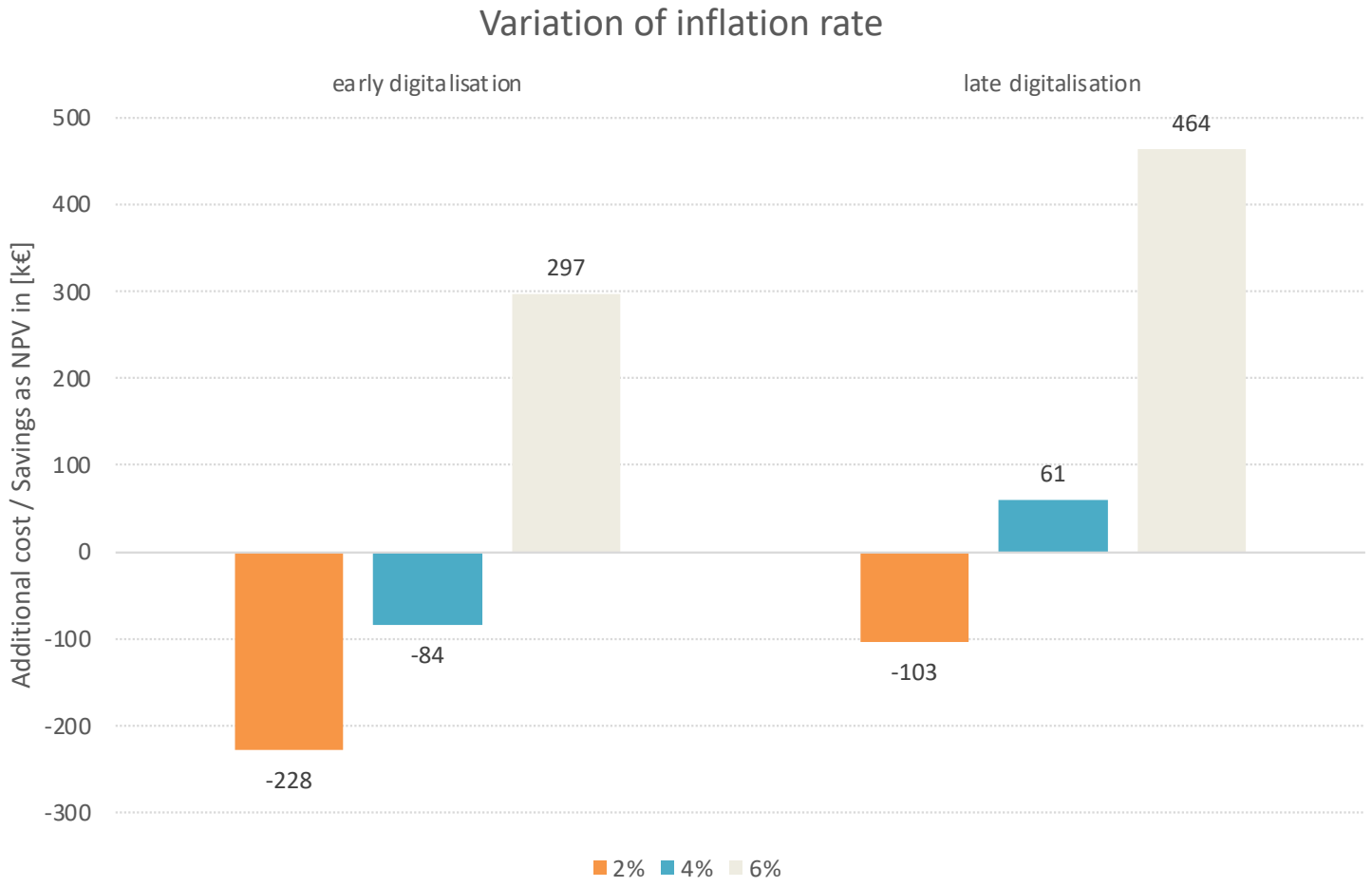
Variation of feeder lenght (100% - 60%)



Variation of cable price (450 €/m - 100 €/m)



Variation of inflation (2%/a - 6%/a)



Conclusion and outlook

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- Sensor integration cost impacts are low due to the long evaluation period
- At high digitalization rates impacts of role numbers are low
- Medium impacts can be seen for variation of sensor numbers, sensor OPEX and feeder length
- High impacts are given for variation of cable prices, digitalization rate as well as inflation

→ Identified critical parameters show that investment strategies towards network digitalization must be evaluated in depth before decisions are taken

Thus, a SWOT analysis from the perspective of DSOs is foreseen in the final stage of the PoSyCo project.

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Dieses Projekt wird aus Mitteln des Klima- und Energiefonds gefördert und im Rahmen des Energieforschungsprogramms 2017 durchgeführt

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