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Report on financing to stimulate the NOVICE dual energy services scheme

NOVICE

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Report on the financing to stimulate the NOVICE dual energy services scheme

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Description of the related task and the deliverable in the DoA	Existing financial schemes supporting the interventions of dual energy service will be identified, analysed and classified. The analysis of the existing financial schemes will be carried out at different levels according to the operators that offer those financial sources and to the financing typology. The financing hypothesis for the projects identified in WP5 will be analysed. The main requests made by funders for lending purpose will also be identified and some schemes will be given so as to structure a bankable model. Eventually, the possible ways to find out resources through incentive mechanisms e.g. tax reduction or specific incentives will be identified.				
Comments					

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LIST OF ABBREVIATIONS

BRP – Balancing Responsible Party
CAPEX – Capital Expenditure
CSR – Corporate Social Responsibility
DR – Demand Response
DSO – Distribution System Operator
DSR - Demand Side Response
EE – Energy Efficiency
EPC – Energy Performance Contracting
ESCO – Energy Service Company
FM – Facility Management
IRR – Internal Rate of Return
MOU – Memorandum of Understanding
M&V – Measurement & Verification
NPV – Net Present Value
OPEX – Operational Expenditure
O&M – Operation and Maintenance
PV - Photovoltaics
TSO – Transmission System Operator

EXECUTIVE SUMMARY

This report offers an analysis of the financial viability of the NOVICE model and its ability to access third party financing. The NOVICE concept or dual revenue stream model combines energy efficiency measures with demand response to better incentivize energy efficiency through the unification of these services.

Building on the previous bankability assessment of the NOVICE dual revenue stream energy performance contract (EPC) model in Deliverable 4.5, this report provides a high-level overview of investor criteria for energy efficiency investments to identify, analyse and categorize existing market-based financing schemes across Europe and then apply these criteria to the "pilot" site/simulated demonstration project. To evaluate how performance of the demonstration project would relate to investor criteria, seven configurations of energy efficiency and demand response measures for a large retail site were modelled using the eQuad platform (a tool that provides data to third parties such as an energy performance insurance provider and a provider of quality assurance and due diligence services). The investigated scenarios include energy efficiency alone, the addition of various demand response technologies such as grid services or battery storage, as well as the impact refrigeration for the site.

The review of existing financing schemes found that while the finance types of different investors varied greatly, from 10–100% equity to straight debt or other models, investing in standalone energy efficiency measures was rarely attractive enough to catalyse investment. By and large, investors opt to fund portfolios of projects with a size of at least 1 to 5 million euros. While investigating acceptance of flexibility revenue by investors, it became evident that these stakeholders are not entirely comfortable, either due to lacking acceptance or familiarity, with the co-mingling of demand response revenues and more traditional energy savings. Based on these findings, it is apparent that standardization is an increasingly important aspect of for financing success of the NOVICE model as it would ideally enable smaller projects to be pooled in one and the same investment, across different clients. Pooling is also necessary to reach a minimum size of flexible load that could eventually be offered to balancing reserves or other grid services.

The eQuad analysis of the different configurations highlighted that the introduction of demand response to the simulation site improved the financial metrics of the core business case. However, in the lens of an investor, a single site project will not hugely impact a sizeable portfolio. Therefore, replicability is attractive from both a revenue and risk perspective.

This research finds a notable opportunity for the NOVICE model to gain financing from existing schemes identified through the inclusion of demand response as an automatic part of a set package within a portfolio of similar or identical sites owned by a single entity, such as a hotel, restaurant or office chain. This type of portfolio would increase the attractiveness of the NOVICE concept for investment as well as overall bankability.

1 INTRODUCTION

1.1 NOVICE IN BRIEF

The NOVICE project aims to develop and demonstrate a new business model in building retrofit that would improve the business case for Energy Performance Contracts (EPCs). The dual revenue stream model combines energy efficiency measures with demand response in an effort to better monetize energy efficiency by consolidating services.

1.2 OBJECTIVES OF THE REPORT

The objective of this report is to identify, analyse and classify the existing financial schemes for the NOVICE dual revenue stream Energy Performance Contract. The report aims to provide insights on the financial viability of the NOVICE model and its ability to access third party financing.

1.3 BACKGROUND: BUILDING BLOCKS AND PREVIOUS ANALYSIS

1.3.1 Financial Viability and Bankability Considerations of the NOVICE EPC

EPC bankability was investigated in D4.5 *Bankability Assessment of the new EPC* through the consideration of different risk assessment criteria of various financial funds. Through interviews with investors representing specialized financial funds for energy efficiency and renewable generation technologies, the deliverable concluded that each financial fund is held to its own internal criteria and that the bankability of a NOVICE EPC was by and large reviewed on a per-project basis.

Against the original hypothesis of the NOVICE consortium, the addition of demand response measures to an energy efficiency project was not a certain method to increase the overall attractiveness of the project to investors. The initial hypothesis was a result of a higher IRR, lowered payback time and dual revenue stream; however, the reality was found to be that demand response remains an unknown programme type to most investors and in practice, adds an element of uncertainty.

Regardless of the added risk, if a project presents a significant savings opportunity and the demand response aspect can be justified by enhancing the overall value of the entire project (as well as the meeting the fund's general financial criteria), the project can be considered bankable.

A more robust understanding of the bankability of a given project would require a standardized risk-assessment and due diligence procedure for investors in European markets. The LAUNCH H2020 ongoing sister project of NOVICE offers a starting point to this with a Risk Assessment Protocol that maps the risk types commonly seen in energy efficiency project investments.

1.4 LIMITATIONS

The findings of this report are based on a desktop exercise and do not reflect a comprehensive pilot where financing was sought from a third party. Instead, results of the simulated pilot detailed in Section 4 were interpreted and evaluated against investment criteria of numerous financial funds, banks, and infrastructure funds to present analysis on the NOVICE model.

2 IDENTIFICATION OF EXISTING FINANCIAL SCHEMES

2.1 METHODOLOGY

A review of information in Joule's eQuad platform in addition to investors interviews and desktop research were used to generate the following investor criteria and identify existing financing schemes for energy efficiency projects. An internal review of EPC project negotiation with banks, private funds and infrastructure funds and supplemented by interviews with representatives of financial institutions within Europe, representing private equity funds, and public-private partnerships (PPPs). All investors interviewed offer financing solutions for EPC, though in reality these financing options take the form of standard bank loans.

"eQuad" is a software platform developed within the SEAF H2020 project (The Sustainable Energy Asset Framework), which ran from 2016-2018. While built by a consortium of partners with expertise in sustainable energy assets, electrical and environmental engineering, risk assessment, energy efficiency insurance, and software development, Joule Europe operates and is the data controller of eQuad. Today it is a web-based software-as-a-service platform that connects project developers and investors in relation to energy efficiency and renewable energy projects.

The platform has two main categories of users - project developers/contractors, who submit a project idea or proposal to the platform, and potential investors or financing entities. The platform works with, and provides data to, third parties such as an energy performance insurance provider and a provider of quality assurance and due diligence services. Once a contractor provides information about its projects to the platform, eQuad uses that information, where appropriate, to (i) evaluate a project and generate a project report; (ii) calculate project metrics; (iii) make introductions to investors; and (iv) send project information to investor(s), performance insurance provider, Quality Assurance Provider, and to other contractors engaged by the platform. Thus, ESCOs, engineering firms, and construction companies can access appropriate investment for their energy efficiency projects.

eQuad significantly lowers upfront due diligence costs for investors by standardizing prequalification processes. Funds or investors can grow their investment pipeline from a larger pool of already vetted, insured, and certified opportunities that meet their investment criteria.
eQuad helps easily manage every aspect of the project finance lifecycle with end-to-end project finance support in the form of:

- Financial analysis
- Due diligence
- Project certification
- Performance insurance
- Investor support
- Investment support
- Pipeline growth (for investors)

2.2 SUMMARY OF INVESTOR CRITERIA

Finance types of the different investors varied from 10–100% equity to straight debt and also included other models. Although the sampled investors were largely agreeable to EPCs of either guaranteed or shared savings, investing in standalone energy efficiency measures was considered rarely lucrative

enough, where the majority of investors opt to fund portfolios of projects with a size of at least 1 to 5 million euros. These investors further required that energy efficiency projects have a minimum size of 50-100k€ within larger portfolios.

To gain interest in smaller projects, pooling together assets/projects can make groups of energy efficiency measures attractive for investment. This is the case for most commercial or industrial energy efficiency projects that widely vary in cost but often fall in the range of 150k to 1 million €. However, to successfully aggregate projects, they must be comparable and follow the same format.

Based on this investigation, it is evident that for the NOVICE model and its proposed Dual Energy Service Scheme – standardization becomes increasingly important, as only with standardized terms and agreements as well as consistent risk assessment will the bundling and aggregation of project opportunities be viable. The goal would be to lower the bar to allow projects of 50k € to be pooled in one and the same investment, across different clients. Pooling of course is also necessary to reach a minimum size of flexible load that could eventually be offered to balancing reserves or other grid services.

Over the course of the NOVICE project, the level of understanding and acceptance of flexibility revenue from the investors' side has been specifically investigated. To put it simply, investors unfortunately do not fully understand or accept DR revenues to be comingled with the more traditional energy savings. This does not however entirely limit the NOVICE model as such – as the NOVICE business case could be enabled through the allocation of the right revenue streams to the correct party, and in that way flexibility definitely does represent a significant upside for the overall financial performance of a project. One example would be representing DR simply as an additional tranche of revenue, which would not directly be used for the payback of the third-party investment but would rather be directed towards the contractor and/or the end client.

A summary of the investor criteria outlined above is presented in Table 1 and categorized by general finance type. The overview represents market-based revenue schemes as subsidy schemes have been excluded due to the introduction of increased regulatory risk. A further discussion of common risks assessed by investors in determining project financing for energy efficiency is further outlined in Section 3.

Table 1: Summary of Investor Criteria for Energy Efficiency Projects

Finance Type	Geography	Technologies	Sector	Min IRR (%)	Min Project size (k€)	Min Portfolio size (m€)	Min PBT[1] (y)	Contract type
Debt	Belgium, Cyprus, Czech Republic, France, Germany, Greece, Ireland, Italy, Portugal, Spain, UK	Batteries BMS Cogeneration District Heating EE Upgrades Public Lighting PV: On ground PV: Rooftop PV: Upgrade existing plant RES: Behind-the-meter RES: Front-of-meter RES: Behind-the-meter Wind	Agriculture Commercial Industry Tertiary Residential Public Administration	1 - 6%	100 to 5000 k€	1 m€	3	Lease Loan EPC - Guaranteed EPC - Shared
Equity	Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden	Cogeneration EE Upgrades Public Lighting PV: Rooftop RES: Behind-the-meter BMS	Agriculture Commercial Industry Tertiary Residential Public Administration	7 - 8%	100 k€	0.1 – 1 m€	5	Operating lease Energy Service Contract PPA EPC Deemed savings

[1] PBT or "Payback Time" refers to the period of time in years from the initial investment to the point in time when the initial outlay has been paid back in full

3 IMPLICATIONS OF INVESTOR RISK

Evaluation of the NOVICE model in D4.5 has shown that the addition of DR components does not compel significant investor interest. This is due to the typically small revenue streams and uncertainty associated with the DR market or fluctuation on a yearly basis. These market characteristics stem in part from the fact that TSOs are not inclined to offer long term contracts and the technology used for DR, such as battery storage, can present a significant expense. Consequently, investor interest fundamentally sits in the merits of energy efficiency projects.

To better understand the implications of risk for an investor, an overview of risks assessed in standard energy efficiency projects are explored.

3.1 STANDARD ENERGY EFFICIENCY INVESTMENT RISKS

Chapter three contains a sample of risks gathered from the LAUNCH H2020 projects risk assessment protocol developed in deliverable 3.1. The following risk types serves as an illustrative selection of the types of risks that are assessed by financial institutions.

3.1.1 Regulatory Risk

Energy efficiency projects by and large contain a minimal degree of regulatory risk. As codes and standards for building and equipment are broadly in place and developing, efficiency projects typically bring buildings into compliance of regulation. Caution should be exercised around regulation that differs from jurisdiction to jurisdiction as well as around new technologies that have yet to be regulated. Assessment of the risk associated with reliance on government subsidies or feed-in tariffs for economic viability of projects are also significant. As some jurisdictions have experienced retroactive changes to feed-in tariffs for renewable energy projects, mitigation of these consequences is critical for reducing regulatory risk and ensuring project returns for all risk-bearing parties.

It is on the basis of increasing this risk type that subsidy schemes have been excluded from the scope of this report and the focus of investors is instead on market-based revenues.

3.1.2 Market Risk

Credit ratings offer an evaluation of a prospective debtor's ability to pay back debt. This rating is a metric for comparing fixed-income securities. Companies are assigned a rating based on their financial outlook, past and current situation. The same holds true for markets as a whole that can be assigned ratings. Consequently, companies or markets with good credit ratings will have a reasonable level of debt, a good track record of paying it back, as well as a healthy earnings potential. Credit agencies such as Standard and Poor's, Fitch Ratings, and Moody's, distinguish investment grade ratings from non-investment grade or speculative ratings. The most important threshold is the line between BBB- and BB+ (or Baa3 and Ba1), which distinguishes "investment grade" from "non-investment grade". Non-investment grade does not definitively mean that no investor will invest; however, many investment policy statements specifically prohibit investments below this threshold.

Table 2: Long-term Credit Rating Scales

S&P's / Fitch	Moody's	Rating description
AAA	Aaa	Prime
AA+	Aa1	High grade
AA	Aa2	
AA−	Aa3	
A+	A1	Upper medium grade
A	A2	
A−	A3	
BBB+	Baa1	Lower medium grade
BBB	Baa2	
BBB−	Baa3	
BB+	Ba1	Non-investment grade / speculative
BB	Ba2	
BB−	Ba3	
B+	B1	Highly speculative
B	B2	
B−	B3	
CCC+	Caa1	Substantial risks
CCC	Caa2	
CCC−	Caa3	
CC	Ca	Extremely speculative
C		Default imminent
RD / DDD	C	In default
SD / DD	/	
D	/	

3.1.3 Pipeline Risk

Investors who choose to invest in small projects often do so with the understanding that more projects of the same type will be developed and brought to them. The opportunity to work with the same counterparty, the replicability of projects and because the same client agreements, manufacturers and insurances are involved, the due diligence work and related costs are brought down significantly. The reliability of promoters to deliver on their prospected pipeline creates a specific risk and investors are forced to evaluate the certainty of the pipeline before committing to an investment. An ESCO sales pipeline naturally consists of projects at various stages of maturity, therefore details of contract status (i.e. if signed with implementer/client and agreement to proceed in a certain timeframe) are critical in understanding the level of risk.

3.1.4 Currency Risk

Currency risk typically signifies the risk of loss associated with fluctuating foreign exchange-rates. Exposure to foreign currency investment can present a significant risk for investors. In the context of project investments, it will be important to assess whether project cash flows will be generated in a different currency than the one in which the investment is made. Also, potentially diverging currencies for CAPEX and OPEX must be identified. One method to safeguard against this risk is hedging to mitigate the impacts of undesirable exchange rate changes.

3.2 Risk Reduction with Single Owner Multiple Sites or Portfolio Projects

Based on inputs from D6.2, it is apparent that Demand Response comprises a relatively small share of the financial benefit to all parties. From an investor's vantage point, this puts into question the viability of adding Demand Response for a single commercial site. If Demand Response is an automatic part of a set package within a portfolio of similar or identical sites (such as a hotel, restaurant, office chain) the incremental cost of including Demand Response that comes from added complexity and due diligence could in theory be justified. However, if each end customer is different and a range of technologies and capabilities are required, the Demand Response pre-qualification process, the customer, TSO and aggregator contracting requirements and the technical capabilities required for aggregating the loads to create viable bids – will quickly remove any financial benefit.

A more viable financing opportunity would be the integration of the Demand Response offering to an ESCO's service package when they have a contract with a single owner of multiple sites, such as a restaurant, hotel chain or office block, or in the case of single large industrial sites.

The key here is that complexity creates cost and lowers the motivation to engage, on the part of all parties. If the returns do not offset the costs of the complexity the offering will no longer be viable. Today in ALL EU Member States the complexity of making the customer sale, entering and pre-qualifying for market participation and the relatively unstable and low payments – mean that only large bids from single sites tend to be commercially viable. Unless an ESCO can bring an equivalent opportunity – either through a large single site or multiple similar sites, (preferably owned by a single party)– the model will not provide robust financial returns.

4 "PILOT" PROJECT SIMULATION

For the purposes of the pilot, it proved more difficult than anticipated to find a suitable site for NOVICE. A decision was eventually made for running a simulation for the pilot. This means that the site used for this demonstration has not had these measures implemented as of yet. All measures and savings, both in terms of kWh and euros, are estimates of what could feasibly be achieved at the demonstration site. These estimates are considered highly accurate since they are all based on actual savings of another nearly identical site.

The project is developed by Noel Lawler Green Energy Solutions (NLGES) and all the demonstration site information is taken from the report written by NLGES.

The analysis of this site is structured as a comparison between the financial metrics of both including and excluding demand response from the same demonstration site.

4.1 FINANCIAL METRICS DEFINITION

This report is heavily focused on certain financial metrics which are used by investors and financial funds to determine if a project is an attractive investment. These financial metrics are:

- Internal rate of return (IRR). The internal rate of return is used to estimate the profitability of a potential investment. It is essentially a discount rate which makes the net present value of cash flows equal to zero.
- Net Present Value (NPV). The difference between the present values of cash inflows and outflows over a certain period of time. NPV is used to analyse the potential profitability of an investment.
- Payback years. Refers to the amount of time it takes for a project to reach break-even.
- Investment multiplier. This metric express: [sum of future cashflows / CAPEX]

4.2 RETAIL SITE

This site simulation is based on the information provided in a report to JAE by NLGES. This report covers the site energy efficiency and off-site revenue opportunities and their importance in a retail context. The retail site is based in Ireland and has a total retail floor area of 4347 m^2

The purpose of the report provided by NLGES:

- outline for a case study site, the opportunities to create revenue and simultaneous carbon reduction opportunities through energy reduction
- integration of renewable energy and revenue through providing support to the electricity grid using a pilot site from an Irish retailer as a reference site

Space cooling is provided by chillers that are only used for short periods during summer months. This equipment is included in the HVAC sub-meter. The HVAC system includes 3 Air Handling Units, of which, 1 serves the textile area and 2 serve the grocery area. Heating of the space and of the domestic hot water (DHW) is achieved through natural gas fired boilers. A central Building Management System (BMS) controls the energy systems.

Of the total energy consumed 2,670 MWh /annum, 56% of the total consumption represents the electricity consumption, while 44% is the natural gas consumption or the thermal energy.

Since the site is a supermarket, the systems that consume the most electricity are lighting and refrigeration for cooling of food items in the fridge and freezer cabinets. The HVAC systems used for heating and cooling the occupied spaces consumes almost half as much as the refrigeration system.

The site opportunities were then analysed and a perspective on site carbon and energy reductions was given based on implementation of all available site opportunities.

4.2.1 Technical Details for Analysis

The following technical measures from the demonstration site were considered when the eQuad analysis was performed.

- Lighting
- HVAC
- Refrigeration
- Heat recovery
- Rooftop Photovoltaics
- Grid Services (Demand Response)

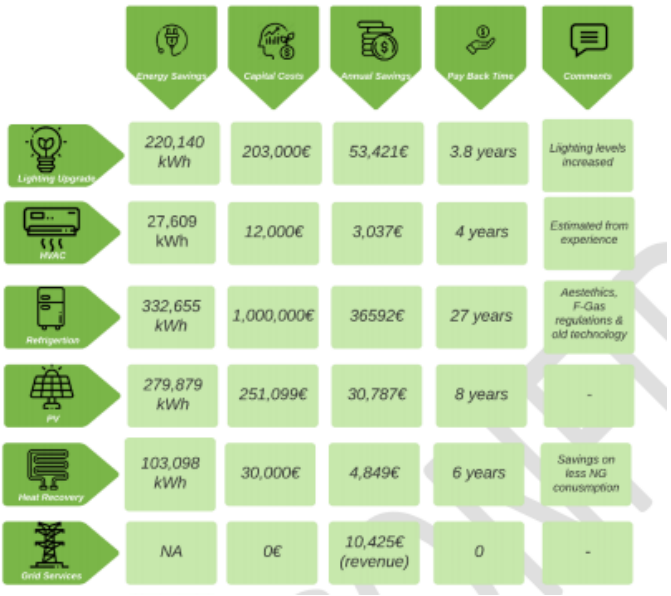

Figure 1: EE measures for eQuad analysis

These measures resulting in energy savings of a total 963,381 kWh, as can be seen in Figure 1.

Figure 1 shows all the measures from the NLGES site report and their respective estimated savings in kWh and euros.

4.2.2 Energy savings Financial Details

In Table 3 the financial metrics for the above-mentioned technical measures, *excluding demand response*, are displayed. The capital expenses, which is the required investment, amount to roughly €1.5 million and the annual savings from this investment would in year one amount to €127,149.

The operational expenses remain quite flat at €1,537 and as can be seen in Table 3, the only operational expense that has been included in this analysis is the O&M costs for the rooftop photovoltaics, as there were no other operational expenses included in the retail site report. However, the lighting project results in a reduction in O&M costs which are included in the Annual Savings figure for lighting. HVAC and refrigeration maintenance costs would be approximately the same before and after upgrades therefore there is neither an uplift nor a reduction in existing O&M costs. Considering the nature and size of the measures without any operational expenses in the report, the decision to

only include this expense was made since the expenses that have not been accounted for would (according to previous eQuad projects) not be of significant size to alter the outlook of the project.

However, it should be noted that as a result of the lack of operational expenses, the financial metrics are potentially slightly inflated and adding these would result in a more realistic portrait of the projects financial metrics.

Table 3: Financial numbers excluding demand response

Energy Efficiency Measure	Energy Savings (kWh)	Capital cost (€)	Annual Savings (€)	Operational Expenses (€)
Lighting	220,140	203,000	53,421	-
Refrigeration	332,655	1,000,000	36,592	-
HVAC	27,609	12,000	3,037	-
PV	279,879	251,099	29,250	1,537
Heat recovery	103,098	30,000	4,849	-
Total	**963,381**	**1,496,099**	**127,149**	**1,537**
Demand Response	-	-	-	-
Total	**963,381**	**1,496,099**	**127,149**	**1,537**

4.2.3 Demand Response

The second part of this analysis is investigating the same project, with demand response savings and costs added. In Table 4 the same numbers for energy efficiency measures are presented, with the savings of the demand response activities included.

Since there are no capital or operational expenses reported for demand response, the only changing variable here from the earlier metrics, are the annual savings which are increased by €13,000 to a total amount of €140,149 in year one.

Table 4: Financial numbers including DR

Energy Efficiency Measure	Energy Savings (kWh)	Capital cost (€)	Annual Savings (€)	Operational Expenses (€)
Lighting	220,140	203,000	53,421	-
Refrigeration	332,655	1,000,000	36,592	-

HVAC	27,609	12,000	3,037	-
PV	279,879	251,099	29,250	1,537
Heat recovery	103,098	30,000	4,849	-
Total	**963,381**	**1,496,099**	**127,149**	**1,537**
Demand Response	-	-	13,000	-
Total	**963,381**	**1,496,099**	**140,149**	**1,537**

4.3 eQUAD ANALYSIS

Developed within the SEAF project, eQuad helps European energy efficiency project managers (ESCOs, engineering firms, and construction companies) access appropriate project finance while lowering upfront due diligence costs for investors. eQuad performs third party financial analysis on projects, producing a standardised, easy-to-understand project pro forma, tailored to investor requirements.

In this report eQuad was used to analyse the financial data provided by NLGES, running the data through the platform as would be performed with the usual energy efficiency project and then comparing how the demand response added value could change the perception of the project to an investor. For this report, two different projects were created in the eQuad platform, one excluding and one including the demand response factors. Both projects were based on the numbers presented in previous chapters 4.2.2 and 4.2.3.

A key point to be noted regarding the following analysis is that the calculated cash flow differs from previous analysis in D6.2. The difference here is that the cash flow used in this deliverable is the average of the estimated cash flow over the duration of the project taking, inflation into account, rather than simply using the year one estimated cash flow. This results in a slightly higher cash flow and a somewhat improved payback period compared to that presented in D6.2.

4.3.1 Excluding Demand Response

Energy efficiency measures input for project excluding demand response:

- Lighting, LED
- Refrigeration, Domestic appliances
- HVAC, Air handling unit
- PV rooftop
- Heat recovery

The above measures consist of the following costs and savings seen previously in Table 3 which results in the following financial metrics, seen in Figure 2.

Financial Metrics	
IRR (%)	7.36
NPV (€)	339,473.60
Payback (years)	10.87
Investment Multiplier	2.04

Figure 2: Financial metrics excluding DR

4.3.2 Including Demand Response

Energy efficiency measures input for project including demand response:

- Lighting, LED
- Refrigeration, Domestic appliances
- HVAC, Air handling unit
- PV rooftop
- Heat recovery
- Grid services, demand response

The above measures consist of the costs and savings previously mentioned in Table 4 which results in the financial metrics seen in Figure 3.

Financial Metrics	
IRR (%)	8.56
NPV (€)	526,310.82
Payback (years)	9.95
Investment Multiplier	2.25

Figure 3: Financial metrics including DR

4.4 DUAL REVENUE STREAM MODEL

When analysing the numbers in the two example projects we are analysing what, if any, added value demand response brings to the financial metrics of the demonstration site and how this compares to the investor criteria in JAEs network. Between excluding and including demand response for this demonstration site, there is only one different factor in terms of costs and savings, which is the added demand response savings of €13,000 annually. The comparison between the two can be seen in Figure 4.

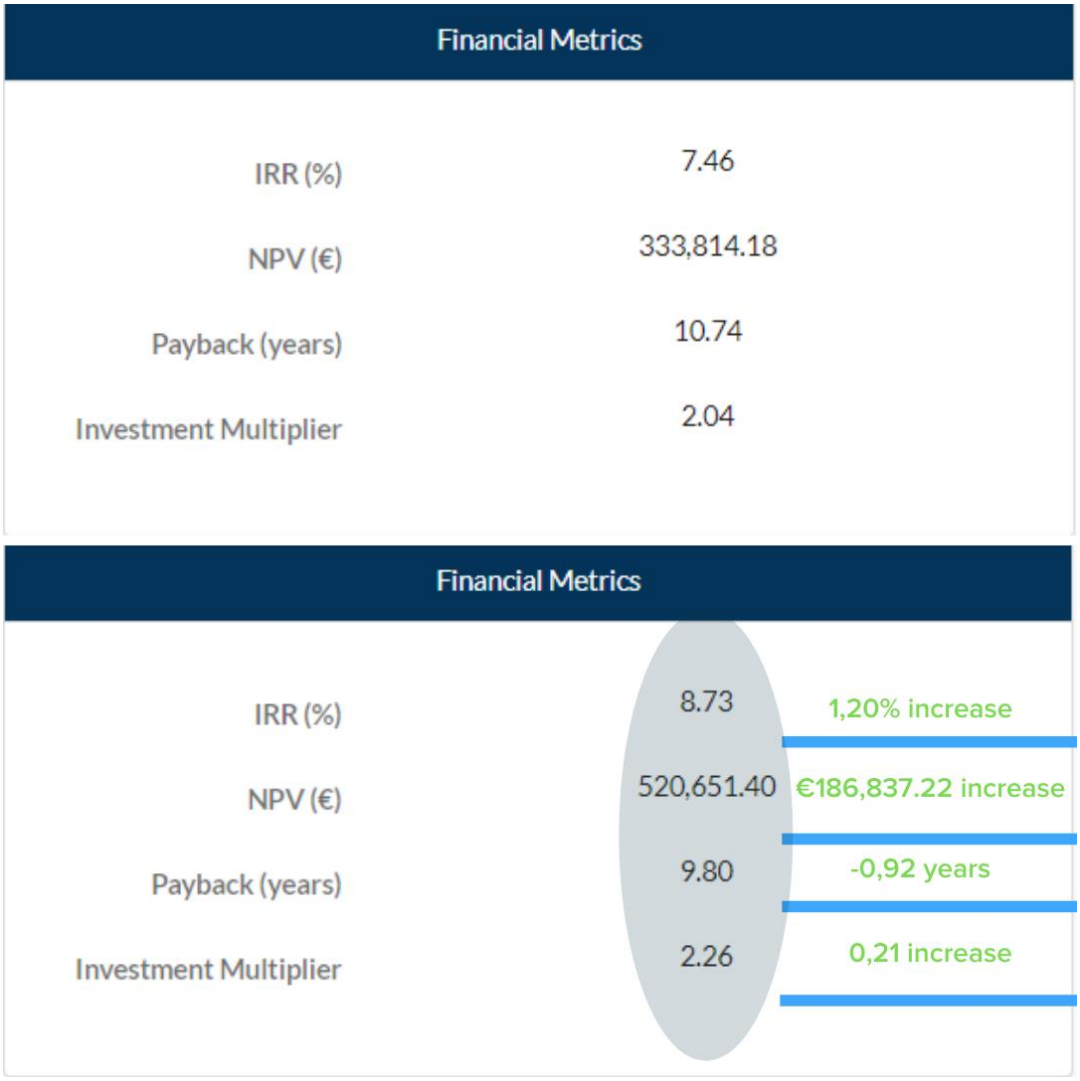

Figure 4: Comparison of financial metrics

Now, looking at the comparison of both these scenarios of the same demonstration site, including and excluding demand response, and comparing them with the average project housed in the eQuad platform, both projects are higher in payback years and lower in IRR % than the compared projects in the eQuad platform. This is not optimal since an investor would generally want the payback years to be as low as possible and the IRR % as high as possible. The NPV for both projects on the other hand is well within range of the compared eQuad projects.

Table 5: Comparison to average eQuad project

	Excluding DR	**Including DR**	**AVG eQuad**
IRR	7.46%	8.73%	10-15%
NPV	€ 333,814.18	€ 520,651.40	300k - 2m
Payback years	10.74	9.8	3-5 years

While the financial metrics of the demonstration are not necessarily within the regular range of eQuad projects, the influence of the additional savings as a result of demand response is clear. With demand

response improving all of the financial metrics, if only to a small extent, it is clear that it brings added value and might prove to be of even further value by pooling several properties together in the same project in order to create a portfolio of demand response savings.

- 1.27%, increase in IRR
- € 186,837.22 increase in NPV
- -0.94, decrease in payback years
- 0.22, increase in investment multiplier

Although the demonstration site, with the numbers provided, might not be the most attractive project for investment, it is a sound project and the addition of demand response in this case provides a real improvement to the financial metrics.

It is worth noting here, that one of the largest blocks of capital in this project is the refrigeration. With a capital cost of €1,000,000 and annual savings of €36,592. However, this measure has been considered only because the F-gas regulation demands a change in refrigerant used. Without this forced measure, the financial metrics of the project change quite substantially for the better as can be seen in Figure 5.

Financial Metrics	
IRR (%)	21.93
NPV (€)	1,221,965.45
Payback (years)	4.78
Investment Multiplier	6.46

Figure 6: Project including DR, excluding refrigeration

Similarly, can be seen in Figure 6 which portrays the same project, excluding the refrigeration, and in this instance, excluding demand response as well. The financial metrics of the project are substantially more attractive to an investor without the €1,000,000 capital cost which would cover replacement of fridge and freezer floor cabinets. Although this measure does result in significant energy savings, it is being considered mostly as a means of complying with new regulations on refrigerant gasses. Combining it with other energy efficiency projects softens the pain of making such large investments for seemingly small financial return for the retailer.

Financial Metrics	
IRR (%)	19.23
NPV (€)	1,003,039.38
Payback (years)	5.44
Investment Multiplier	5.63

Figure 5: Project excluding both DR & refrigeration

However, the most important aspect of this analysis is what added value the demand response brings. In this example excluding the refrigeration measure, it does make a difference to the results of the financial analysis, but again more so as a bonus than a deciding factor.

5 DEMONSTRATION SITE AND INVESTOR CRITERIA

The following phase of analysis consisted of comparing the results from the eQuad analysis and the concluded financial metrics, with the investment criteria provided by financial funds in the eQuad network.

Part of the eQuad platform is maintaining investor relations and understanding needs and wants related to investments. One of JAEs investor relationship management activities has been to collect the investors criteria revolving investment, enabling JAE to present the investor with projects which are known to be of interest to the investor.

According to the responses received from this network of investors, the following conclusion can be made of this demonstration site.

- 40 investors had matching criteria in terms of technology and sector.
- Geographical. Seven out of forty investors would be interested in investments in Ireland.
- Out of these seven, four were suitable in terms of IRR, NPV and payback criteria.

The relevant criteria of these identified four investors can be seen in Table 6.

Table 6: Investor criteria

Minimum IRR %	Minimum project size	Maximum payback time (years)
7%	€ 100,000.00	10
1.65%	€ 250,000.00	20
1%	€ 100,000.00	20
5%	€ 100,000.00	Not stated

The most notable fact in above table, is that the demonstration site project would have been of interest to these four investors before the demand response was added as well. For these investors, according to their criteria, the demand response serves the purpose of a bonus, rather than a deciding factor in investment decisions.

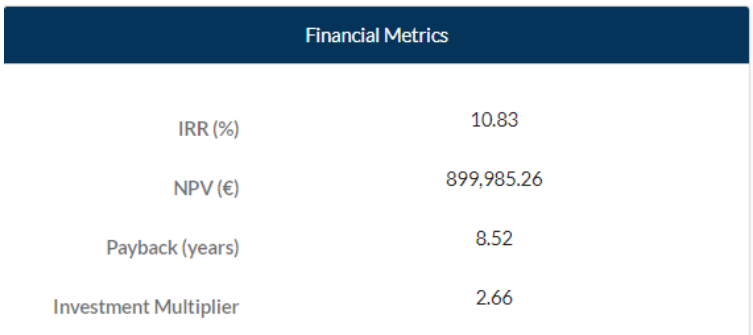

Figure 7: Three site demand response financial metrics

The real added value in these demand response savings lie in creating a portfolio of sites. The addition of two sites, excluding the energy efficiency measures, would increase the annual savings in demand response to €39,000 (assuming similar savings are achievable). This would substantially

increase the value of the project both in terms of IRR and NPV as can be seen in Figure 7.

Financial Metrics	
IRR (%)	13.77
NPV (€)	1,739,779.91
Payback (years)	7.44
Investment Multiplier	4.03

Figure 8: Five site demand response financial metrics

Similarly investigating the potential of an additional four sites, the financial metrics are immediately improved by another 2.94% IRR and NPV nearly doubled (additional €839,794).

A larger retailer such as the one presented in the NLGES report would likely operate several sites with similar infrastructure and possible energy improvements. This opens a door for replicating these projects with a customer where the relationship is already established, and the sale has already been made. All while creating a more desirable investment in the point of view of the investor.

6 BATTERY OPTION FOR DEMAND RESPONSE

A late addition to this analysis is the below input from D6.2 Report on Validation Results. Which describes how battery storage technologies can be implemented to further improve the financial metrics and value of demand response savings for the demonstration site.

To increase the revenues from demand response schemes, battery storage technologies can be used. As battery technology develops and costs substantially drop, this solution for energy storage becomes increasingly more attractive, in particular for a site with PV generation. Battery storage technologies can provide multiple and stackable revenue streams (from grid services, peak shifting, storing energy generated on site and tariff arbitrage). For the purpose of this report we are only evaluating the potential revenues from providing services to the grid, for which we can report more exact and non-variable values. A 150kW system would be large enough to back-up the whole site load.

Investing in a battery storage technology can increase the demand response revenues, as these would be added to the other flexibility revenues previously presented. The same aggregator has given the following quote for the 150kW battery storage system:

Service name	Response within	Response time	System Participating	Revenue for client (€)			
				2020/21	2021/22	2022/23	Total
FFR	2 s	10 s	Battery	7333	9226	9226	25785
POR	5 s	15 s	Battery	5058	5794	5794	16646
SOR	15 s	90 s	Battery	3060	3505	3505	10070
TOR1	90 s	5 m	Battery	2420	2772	2772	7964
TOR2	5 m	20 m	Battery	2076	2378	2378	6832
RRD	20 m	60 m	Battery	0	0	0	0
RM1	1 h	3 h	Battery	0	0	0	0
			Total	19947	23675	23675	67297
DSU	1 h	2 h	Battery	0	0	0	0
			Grand total	19947	23675	23675	67297

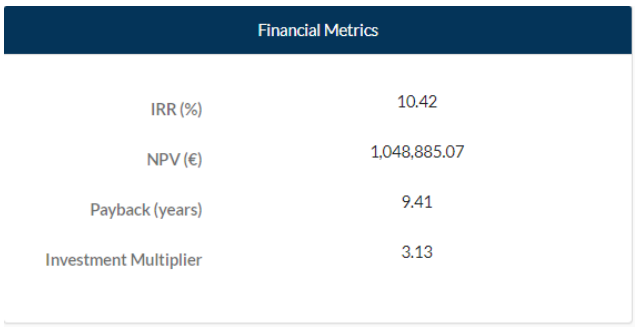

Figure 9: Battery included financial metrics

The battery has a capital cost of 81,000€ and an installation cost of 2,500€. For a battery of this size, the O&M cost is negligible compared to the capital cost (Brinsmead, Graham, Hayward, Ratnam, & Reedman, 2015). The yearly annual revenue from participating in all the demand response schemes with the HVAC system, the generator, and the battery amount to 32,000 €.

With this additional revenue from battery, the demonstration site financial metrics are improved further as can be seen in Figure 9.

Considering these alternative financial metrics with the battery option, we take another look at the investor criteria and how this battery-version of the project compares. For the same project excluding

the battery option, four out of the seven investors (mentioned in chapter 5) were compatible. With this added battery option, all seven of the investors were compatible.

The one factor remaining slightly negative according to some of the investors criteria being the payback years, however, it is still an apparent improvement from the version of the project without the battery option.

7 CONCLUSIONS

For this deliverable, seven different examples of the same demonstration site report were analysed in eQuad. These seven examples can be summarized as the following:

- Demonstration site excluding demand-response
- Demonstration site including demand-demand response
- Demonstration site including demand-response x 3
- Demonstration site including demand-response x 5
- Demonstration site including demand response and excluding refrigeration
- Demonstration site excluding both demand response and refrigeration
- Demonstration site Battery option

The quality of the financial metrics in all of these cases were adequate for investment and in most of the projects, quite similar to one another. The two projects which stand-out of these seven scenarios where the two excluding the refrigeration measure. These two scenarios showed significant improvements in all financial metrics, but to be noted, not as an effect of the demand response savings, rather because of the saved capital expenses of not implementing the refrigeration measure.

Reviewing these seven eQuad analysis, there are three elements which become apparent. Firstly, the NOVICE dual revenue stream business model clearly has added value for an investor since it evidently (according to the example in this report) improves the financial metrics of main importance when making investment decisions. Secondly, a one-site project does not necessarily majorly influence investment decisions. As could be seen in the eQuad analysis the difference between the two projects excluding and including demand response was not of major influence and did not change the demonstration site's position in the investment criteria. Thirdly, replicability is more attractive. Looking at this demonstration site, the driving influence for the investment decision will very much remain single-handedly the energy efficiency measures behind the project rather than the supporting demand response value. However, if you have obtained a customer operating multiple sites where the similar demand response solutions have a possibility of being implemented, you have an excellent opportunity to increase savings and the value of the project without heavily, or at all, increasing costs.

This is what would prove to be a deciding factor when making investment decisions regarding a project as the one presented above. Using replicable demand response savings portfolios to substantially increase the annual savings while maintaining low annual operational costs.

If Demand Response is an automatic part of a set package within a portfolio of similar or identical sites (such as a hotel, restaurant, office chain) the incremental cost of including Demand Response could in theory be justified. However, if each end customer is different and a range of technologies and capabilities are required, the Demand Response pre-qualification process, the customer, TSO and aggregator contracting requirements and the technical capabilities required for aggregating the loads to create viable bids – will quickly remove any financial benefit.

8 REFERENCES

NOVICE deliverable 6.2 - New Buildings Energy Renovation Business Models incorporating dual energy services

NOVICE deliverable 4.5 - Bankability Assessment of the new EPC

NLGES Supermarket case study report – "SITE ENERGY EFFICIENCY AND OFF-SITE REVENUE OPPORTUNITIES AND THEIR IMPORTANCE IN A RETAIL CONTEXT"

LAUNCH H2020 Deliverable 3.1 – Risk Assessment Protocol

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