



Comhairle Cathrach
Bhaile Átha Cliath
Dublin City Council



Energy Performance Contract Review

For Ballymun, Finglas and Markievicz
Sports and Fitness Centres





ENERGY PERFORMANCE CONTRACT REVIEW

Report prepared by Codema on behalf of Dublin City Council

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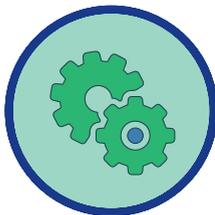
Executive Summary

Dublin City Council (DCC) awarded its first Energy Performance Contract (EPC) project to Noel Lawler Green Energy Solutions (ESCO) in July 2016, for the upgrade of three of its sports facilities - Ballymun, Finglas and Markievicz Sports and Fitness Centres. The following report is an analysis of the performance of the project for the first two years and a projection of total savings, based on this performance, for the full eight-year contract.

Key Findings



1. The Energy Performance Contract has operated as expected to date, **achieving cost savings of €318,281 and energy savings of 38%**

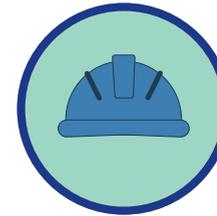


2. The actual operational costs, as recorded by invoices for utilities and maintenance, show that **the EPC has reduced overall costs by almost one third**

	2013	2014	2015		2017	2018
Energy Costs (Ex. Vat)	€495,155	€470,200	€457,388		€269,989	€275,424
Maintenance & Repair	€131,567	€103,946	€122,432		€32,126	€15,375
Service Payments	€0	€0	€0		€119,449	€119,520
TOTAL	€626,722	€574,146	€579,820		€404,884	€426,999



3. Based on the actual results for the first two years, the project is forecast to **save €1,682,503** that would otherwise have been spent on gas and electricity. When the extra costs for EPC service payments are taken into account, **DCC will save €1,532,604 over the contract term, while still having an asset that is fully maintained** and has had continued investment throughout the eight-year term.



4. A **contract manager is required** to assist the centre managers and provide continuity in the event of personnel changes in these facilities. This role would require two to three days per month and would ensure that all invoices are processed in line with the contract terms.



5. It is important that there is clarity in relation to the **Asset Register**, which is the record of new equipment installed as part of the contract as well as the existing equipment. All **equipment should be clearly labelled** so that it is as easy as possible for the centre manager to identify if it is new or existing.



6. The **Operations Manual**, as set out in the contract, must be kept up-to-date. It should specify **quarterly maintenance reports** for each centre and include a **forecast of any repair work** that the ESCo foresees in the coming quarter, for both new equipment (on the ESCo asset list, no extra cost to DCC) and existing equipment (on the DCC asset list, invoiced to DCC).



7. Based on the findings of this report, this **EPC project has been an overall success** and Codema would **recommend the EPC approach** for any other projects of a similar scale that are deemed suitable for this type of contract. All energy saving projects should include a performance guarantee that is measured and verified as this creates a cash flow within a project.



Dublin City Council (DCC) awarded its first Energy Performance Contract (EPC) project in July 2016

Introduction

Dublin City Council (DCC) awarded its first Energy Performance Contract (EPC) project to Noel Lawler Green Energy Solutions (ESCo) in July 2016, for the upgrade of three of its Dublin City Council Sports and Fitness facilities. The Council worked closely with Dublin's Energy Agency Codema to procure this contract, which will run for eight years and includes the maintenance of all equipment in each of the buildings. Works began in September 2016 and were completed within three months. The official contract start date was the 1st of December 2016. We are currently two years and ten months into the contract.

This report is an analysis of the performance of the contract to date. It focuses on all the payments that have been made to the ESCo to date, the measured energy and cost savings to date and a comparison of the operation and maintenance costs of the three centres before the EPC was implemented.



The Energy Performance Contract

The contract involved a combined capital investment of €670,230 between the three leisure centres and contracted annual energy savings of 38% or €164,569 per year in gas and electricity costs. DCC received a grant of €518,000 from the Department of Transport, Tourism and Sport, while the ESCo contributed the remaining capital investment of €152,230.

Under the contract terms, €33,000 of the €164,569 annual cost saving is guaranteed to Dublin City Council. This means that DCC always get the first €33,000 of energy cost savings each year, but in the event that the ESCo does not achieve the agreed level of savings in any year, then they must compensate DCC accordingly. All energy cost savings above €33,000 and up to a maximum of €156,340 (the shared savings threshold, as bid by the ESCo) are for the ESCo. The ESCo receives this in a series of monthly payments that are calculated based on the measured and verified energy savings.

This service payment compensates the ESCo for its contribution towards the capital cost of the project, the maintenance and repair of all equipment installed as part of the contract and the maintenance of all existing equipment (excluding repair). It also covers the cost of the ongoing energy monitoring and calibration of equipment, as well as the measurement and verification of project savings.

In the event that the ESCo achieves energy cost savings in excess of €156,340 in any year, then the additional costs savings are shared equally between DCC and the ESCo. Energy savings are measured and verified every six months. This is completed by the ESCo according to the International Performance Measurement and Verification Protocol (IPMVP), a recognised international standard. The report is then sent to DCC and is reviewed by Codema's Senior Executive Engineer, who is a Certified Measurement and Verification Professional (CMVP), to ensure compliance with the protocol and accuracy of results. To date, five reports have been completed and the sixth is being prepared.

Energy savings in general have been in excess of the 42% annual energy saving target, resulting in additional shared savings.

MAIN CONTRACT TERMS	
• Contract Duration	8 years
• Capital Investment	€670,230
• Potential Cost Savings (€/year)	€164,568
• Potential Annual Energy Savings (%)	38%
• Guaranteed Energy Savings by ESCo (%)	7%
• Guaranteed Cost Savings by ESCo (€)	€33,000
• Reduction of CO ₂ emissions (tCO ₂ /year)	639 tCO₂





Invoices Received to Date

Since the start of the contract, the ESCo has issued 43 invoices to DCC in relation to works and services carried out. These invoices fall into two categories: Service Payments and Repair Payments. Table 1 shows a summary of these payments for 2017 and 2018.

Service Payments

Service payments are the standard contract payments that compensate the ESCo for its contribution towards the capital cost of the project, the maintenance of equipment and the ongoing energy monitoring and calibration of equipment. It also includes the cost of measurement and verification of project savings. These service payments, according to the tendered figures, should be €123,340 (i.e. the shared savings threshold of €156,340 less the guaranteed savings amount €33,000). From Table 1 we can see that the actual service payment for 2018 was €119,520, which was slightly less than expected due to variations

between the predicted and actual gas and electricity savings achieved. As gas and electricity have different monetary values per unit of energy and as the actual savings are different from what was predicted, this has an impact on the final figure.

Monthly service payments are calculated according to the payment mechanism set out in the contract. At the end of each six-month period, the actual energy savings are calculated. If the savings for that period are greater than the sum of the previous, fixed-monthly payments, then a balance payment is made to the ESCo and the monthly payments for the next six months are increased accordingly. If the savings achieved are less than the sum of the previous monthly payments, then the ESCo must return the balance to DCC and the payments for the next six months are decreased accordingly. This motivates the ESCo to maintain a continuous level of performance, and encourages them to strive for even greater savings.

Table 1: Summary of Invoices

Year	Service Payment	Repair Payment
2017	€119,449	€38,803
2018	€119,520	€15,375

Repair Payments

As part of the EPC, the ESCo is responsible for the maintenance of all equipment that has a significant effect on the energy consumption of the building. In general, this includes lighting, Heating, Ventilation and Air Conditioning (HVAC) and all pumps and fans. It does not include the building fabric, pool equipment, pool water quality, cleaning, etc. Under the terms of the contract, the ESCo is responsible for the **maintenance and repair of all new equipment** installed as part of the EPC and the **maintenance of all existing equipment (excluding repair)**.

Repair payments are payments for repair works on existing equipment that was installed prior to the EPC and are not part of the contract. The asset register, which forms part of schedule 3 of the contract, sets out which equipment is new and which is existing. The responsibilities in terms of maintenance are set out in Clause 17 of the contract.

Over the two years, a total of €54,178 has been spent in the three centres on repair payments. These mainly include repair works to the Air

Handling Units, Building Management Systems and boiler systems. The majority of repair work has been carried out in Markievicz Sports and Fitness Centre. The main reason for this is because the building was closed and most of the equipment was not operational at the time the works associated with the EPC were being carried out. As a result, some of the necessary repair work only became apparent as the centre became operational and the pool was filled with water once again. It should also be noted that if DCC is not happy with any quote received for repair work from the ESCo, they are free under the terms of the contract to go to the open market for additional quotes and engage a separate contractor, if necessary, to carry out this repair work.

The average annual cost for maintenance and repair for these buildings before the EPC was carried out was just under €120,000 per year. The annual cost of routine maintenance for these buildings is €70,000, meaning that annual repair payments before the EPC project were €50,000 per year. From Table 1 we can see that repair payments for 2018 were just €15,375. This is another significant additional saving as a result of the EPC.



Performance of the Contract to Date

Measurement and Verification of Energy Savings

As mentioned in the introduction, the official contract start date is the 1st of December 2016. Since this date, four Measurement and Verification (M&V) reports have been submitted by the ESCo. The M&V report is the official measure of the energy performance or the energy savings achieved for a particular period of time. The initial report covered the first three months of the project (December 2016 - February 2017). Each subsequent report covers a period of six months, with the latest report detailing savings achieved up to February 2019.

Energy savings cannot be directly measured, because savings represent the absence of energy consumption. Instead, savings are determined by comparing measured consumption before and after the project, making suitable adjustments for changes in conditions, such as weather or occupancy. The comparison of before and after energy consumption is made on a consistent basis, using the following general M&V equation:

$$\text{Savings} = (\text{Baseline Period Energy} - \text{Reporting Period Energy}) \pm \text{Adjustments}$$

This is the main equation of the International Performance Measurement and Verification Protocol (IPMVP), the principal internationally-recognised standard for the measurement and verification of energy savings in Europe.

The energy baseline was calculated according to the IPMVP and is based on historical energy consumption. The main driving factor for each energy type was identified; for gas, this is external temperature, and for electricity this is generally occupancy or opening hours. By using these driving factors and historical consumption patterns, future energy consumption can be predicted. This can be seen by the line labelled “Energy Baseline” in Figures 1 and 2. This is the energy that the buildings would have consumed if the project had not been completed.

The line below this in Figures 1 and 2 labelled “Measured Energy” represents the actual energy consumed during the reporting period. This is the actual energy consumption as recorded by the electricity and gas meters. The energy savings are then calculated by subtracting this measured energy from the baseline energy consumption.

The results of the M&V for electricity and gas can be seen in Figures 1 and 2.

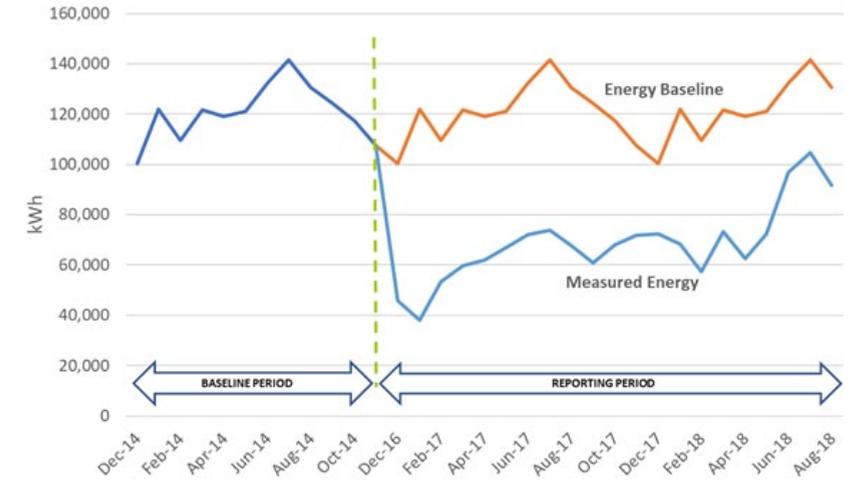


Figure 1: Electricity Consumption Before and After EPC

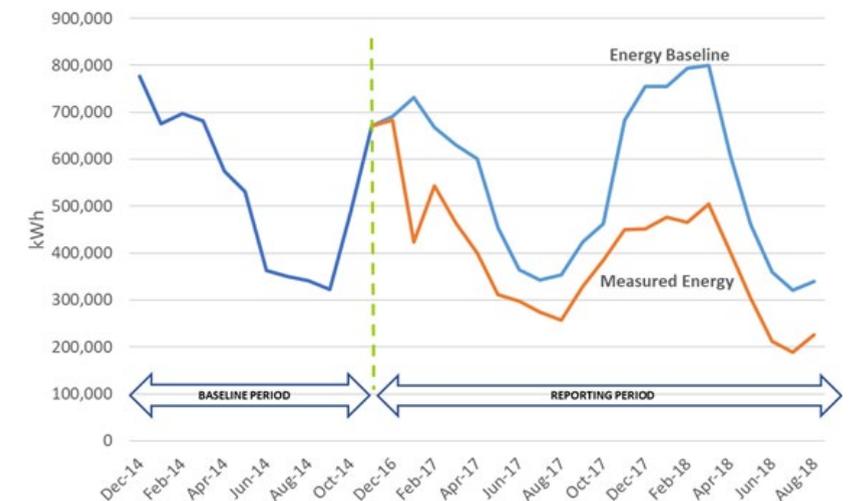


Figure 2: Gas Consumption Before and After EPC

A separate baseline is created for each energy utility. Both figures show the baseline energy period and the reporting period. In the baseline period, the energy consumption trend before the energy saving measures were implemented can be seen. The dashed green line represents the time when all the energy savings measures were completed, at the beginning of the reporting period on the 1st of December 2016.

From Figure 1, the immediate impact of the EPC on

electricity consumption across the three centres can be seen, with an immediate reduction in electricity from over 100,000 kWh to below 40,000 kWh. This trend continues until the summer of 2018, where a slight increase in energy consumption can be detected. This is mainly due to the unusually hot summer temperatures of that year.

In Figure 2, it can be seen that the reduction in gas consumption was not so dramatic. One of the reasons for this was an increase in gas consumption

due to the installation of a new CHP in Ballymun, which, in turn, contributed to the immediate reduction in electricity shown in Figure 1. However, in addition to this increase in gas, other predicted savings for Ballymun did not materialise as expected during Period 1. Figure 2 shows, however, that the ESCo addressed this issue and significant savings were subsequently achieved during the winter of 2017/2018.

However, the energy baseline may need to be adjusted to reflect changes that occur during the reporting period that are not accounted for by the driving factors. These are generally events that result in additional energy consumption that are outside the control of the ESCo and that did not occur during the baseline period. There have been a number of these since the start of the project; examples of these are listed in Table 2.



Table 2: Examples of Baseline Adjustments Since the Beginning of the Contract

Adjustment	Reason
UV systems in Ballymun and Finglas	The UV systems were repaired and put back into operation on the 29th of March 2017. These were not included in the scope of the contract.
UV system in Markievicz Sports and Fitness	New UV system in Markievicz Sports and Fitness
Finglas Regional Area Office electrical supply	Finglas Regional Area Office electrical supply was also added to the leisure centre electrical distribution, mainly to provide additional capacity on the CHP but also to avail of cheaper electricity for the Area Office and elimination of standing charges.

Actual Project Performance to Date

Four reconciliation or M&V reports have been submitted to date. These cover the reporting period as shown in Figures 1 and 2. The project has resulted in €414,458 of avoided energy spend to date. This is money that DCC would have spent on gas and electricity if the project had not been completed. Table 3 shows that while the potential energy savings were not fully realised during the initial and first reconciliation periods, the ESCo has achieved the full 38% potential savings for Periods 2 and 3.

Table 4 shows the actual costs for energy and maintenance before and after the project, ranging from 2013 to 2018. Energy costs include the cost of gas and electricity for the three centres.

Maintenance and Repair includes all the costs associated with routine maintenance visits and the repair of equipment as recorded by invoices received from contractors. For 2013 to 2015 this involved invoices from 10 separate contractors while 2017 and 2018 invoices are from the ESCo only. In 2017 and 2018 there is the introduction of the Service Payment which includes the routine maintenance checks along with the recovery of the capital cost and the ongoing energy monitoring and calibration of equipment.

The results show a significant reduction in operation costs of the building, just under one third of the cost in 2013. This is again illustrated in Figure 3 below.

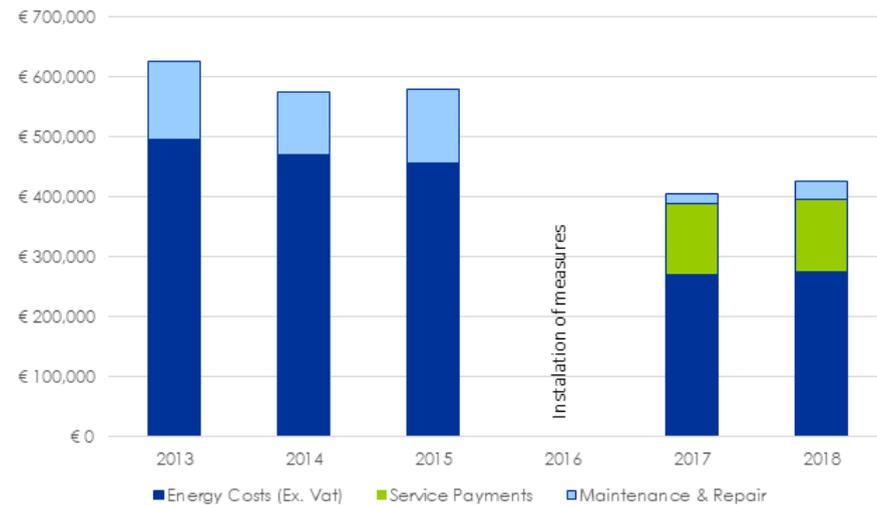


Figure 3: Actual Costs - Before and After Project

Table 3: Measurement and Verification Report History

Reconciliation period	Date	Avoided Energy Spend	% Savings
Initial Reconciliation Period	December 2016 - February 2017	€44,168	26%
Reconciliation Period 1	March 2017 - August 2017	€85,967	32%
Reconciliation Period 2	August 2017 - February 2018	€100,068	38%
Reconciliation Period 3	February 2018 - August 2018	€88,078	38%
Reconciliation Period 4	September 2018 - February 2019	€96,177	42%

Table 4: Actual Costs - Before and After Project

	2013	2014	2015	2016	2017	2018
Energy Costs (Ex. Vat)	€495,155	€470,200	€457,388	Project works	€269,989	€275,424
Maintenance & Repair	€131,567	€103,946	€122,432		€32,126	€15,375
Service Payments	€0	€0	€0		€119,449	€119,520
TOTAL	€626,722	€574,146	€579,820		€404,884	€426,999

Comparison Between EPC and Business-as-Usual

In order to get a full sense of the performance of the EPC, a comparison to a business-as-usual case has been made, where the baseline energy and maintenance costs persisted over the lifetime of the contract. For the business-as-usual case, energy costs were taken at the total baseline cost of €460,002 per year. This was then adjusted for a general rate of inflation across the eight years at 2% per year.

Maintenance costs are based on actual costs recorded for Ballymun and Finglas Sports and Fitness Centres during 2013, 2014 and 2015, as indicated in Table 5 below. Costs for Markievicz were estimated. The average maintenance figure combined over the three sites is calculated to be €119,315 per year.

For the EPC case, the energy costs, service

payments and repair payments are taken into account. Energy costs during the EPC are taken from the actual costs as recorded during the M&V periods to date. The service payments are based on the ESCo continuing to achieve the maximum energy savings of 38% or an annual value of €119,449. This figure is based on actual invoices to date. The repair payments are based on actual invoices received to date for repairs, as shown in Table 1, and a continuation of this spending level for the duration of the contract.

Table 6 shows that the cost of gas and electricity for the three centres over eight years would have cost €3,948,182. When the corresponding cost of maintenance is added, this amounts to a total of €4,972,260. This would have been the cost of just keeping the buildings operational over the

eight-year period and does not account for any investment in the buildings, other than routine and reactive maintenance.

Table 7 on the next page shows the same calculation, but this time in terms of the EPC. With the EPC, gas and electricity costs reduce to €2,265,679; a saving of €1,682,503 over the contract term. Service payments amount to €955,596; this compensates the ESCo for their contribution towards the capital cost of the project, the maintenance and repair of all equipment installed as part of the contract and the maintenance of all existing equipment (excluding repair). It also covers the cost of the ongoing energy monitoring and calibration of equipment, as well as the measurement and verification of project savings. Repair payments amount to a total of €218,382; this

is based on average repair costs incurred since the start of the EPC. When service and repair payments are compared to maintenance costs in the Business-as-Usual case, it shows that these costs have increased by € 149,899 or €17,737 per year but it is important to note that the additional services provided, as just outlined, compared to traditional routine and reactive maintenance.

Assuming the EPC continues to function as per the first two years, the project is forecast to save €1,682,503 that would otherwise have been spent on gas and electricity. When the extra costs for EPC service payments are taken into account, DCC will save € 1,532,604 over the contract term while still having an asset that is fully maintained and has had continued investment throughout the eight-year term.

Table 5: Maintenance Costs Before EPC Project

Sports & Fitness Centre	2013	2014	2015
Ballymun	€77,370	€61,359	€74,443
Finglas	€34,197	€22,587	€27,989
Markievicz ¹	€20,000	€20,000	€20,000
TOTAL	€131,567	€103,946	€122,432
AVERAGE	€119,315		

¹ Estimated annual maintenance costs

Table 6: Business-as-Usual (Forecast for the Contract Term)

	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Year 6 2022	Year 7 2023	Year 8 2024	Total
Energy Costs	€460,001	€469,201	€478,586	€488,158	€497,921	€507,879	€518,037	€528,398	€3,948,182
Maintenance	€119,315	€121,701	€124,135	€126,618	€129,151	€131,734	€134,368	€137,056	€1,024,078
TOTAL									€4,972,260

Table 7: Energy Performance Contract (Forecast Based on Performance of Years 1 & 2)

	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020	Year 5 2021	Year 6 2022	Year 7 2023	Year 8 2024	Total
Energy Costs	€269,989	€275,424	€272,707	€278,161	€283,724	€289,398	€295,186	€301,090	€2,265,679
Service Payments²	€119,449	€119,520	€119,449	€119,449	€119,449	€119,449	€119,449	€119,449	€955,596
Repair Payments	€32,126	€15,375	€27,089	€27,631	€28,183	€28,747	€29,322	€29,908	€218,382
TOTAL									€3,439,656
Avoided spend on energy utilities over the duration of the EPC									€1,682,503
Total savings as a result of EPC (including maintenance and repair)									€1,532,604

² Service payments are not subject to inflation as they are calculated according to fixed gas and electricity unit costs (€/kWh), as set out in the contract and measured energy savings (kWh)



Conclusions and Recommendations

The Energy Performance Contract has operated as expected to date, with the ESCo achieving the savings that they predicted at the beginning of the contract. However, there is a perception that EPC is more costly than Business-as-Usual. While it is true that service and maintenance costs have increased by €20,502 per year, this is far outweighed by the resulting energy cost savings. As we can see from Table 7, the project is projected to save €1,532,604 over the contract term.

One lesson learned from the project to date is the need for a contract manager, a person in DCC who is fully aware of the terms of the contract and someone who can assist the centre managers in fully understanding the responsibilities of the ESCo. This role would require two to three days per month and would be enormously beneficial to the continuity and successful operation of the contract. It also ensures continuity in the event that a new centre manager takes over who is unfamiliar with the contract.

There are a number of areas where the centre managers need support when dealing with the ESCo. The first is understanding what is within the scope of the contract and what is not. If a project is deemed to be additional, then the centre manager

is free to seek a quote from both the ESCo and other external contractors to ensure the lowest cost. This also applies to repair works for existing equipment that falls within the scope of maintenance for the ESCo. For these repair works, the centre manager is again free to seek a quote from both the ESCo and other external contractors to ensure the lowest cost.

Another area that needs more clarity is the Asset Register, or the record of new equipment installed as part of the contract as well as the existing equipment. It may not be immediately clear, even when on site, which equipment is to be repaired at the cost of the ESCo and which is at the cost of DCC. These equipment boundaries should be clearly defined and equipment clearly labelled.

The EPC contract is working well to date and DCC currently has a good relationship with the ESCo. Based on the findings of this report, this EPC project has been an overall success and Codema would recommend the EPC approach for any other projects of a similar scale that are deemed suitable for this type of contract. All energy saving projects should include a performance guarantee that is measured and verified as this creates a cash flow within a project.



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