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JOURNAL

PROJECT

RE/SOURCED Renewable Energy SOlutions for URban communities based on Circular Economy policies and Dc backbones

Leiedal Intermunicipal Association, Belgium

TOPIC

Circular economy

EDIT 12 NOVEMBER 2024

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Journal 4 - RE/SOURCED

See on UIA website

Final Journal on the UIA RE/SOURCED Project

This Journal presents a review of RE/SOURCED challenges, achievements, deliverables and next steps. It is designed to provide municipalities and other urban development organisations who are contemplating the construction of a DC Smart Grid using Circular principles with insights into the challenges that were encountered and lessons learned. It provides specific recommendations

The core of the article is built around six areas of lessons Learned:

- RE/SOURCED – Energy transition
- RE/SOURCED – Resource efficiency
- RE/SOURCED – Energy system design
- RE/SOURCED – The heritage listed site
- RE/SOURCED – Educational infrastructure
- Project set-up and management

It concludes by summarising the project's legacy benefits.

1. Executive Summary

Renewable **E**nergy **SO**lutions for **UR**ban communities based on **C**ircular **E**conomy policies and **D**c backbones – RE/SOURCED - aimed to create a DC Smart Grid, that incorporated both electricity generation and storage technologies while using Circular Economy principles, at a former coal fired power station site (TRANSFO) in Zwevegem, Flanders (BE). It was led by Leiedal Intermunicipal Association and brought together academic, research, business and municipal organisations.

While focused on creating the Smart Grid, the implementation recognised the sensitive heritage nature of the site and its growing role as a public amenity destination. The Educational attributes were central to the project's overall delivery as was the creation of an Energy Community for businesses and residential premises located within the project's boundary. Private and social housing was included in the wider regeneration of the area.

The project was technically complex. However, the main challenges related to regulation. Electricity generation is a highly regulated activity, with safety and reliability at its core. Therefore Regulators and Distribution System Operators (DSOs) are cautious when innovating. RE/SOURCED would create a DC Smart Grid (to maximise efficiency gains with Renewable Energy) which was highly novel as public grids operate on AC. As local renewable energy generation grows, so too will the relevance and learning of DC systems created by this project. It is ahead of its time.

When the project was first conceived, Flanders had created a Regulatory Sandbox designed to allow novel approached to be tested which RE/SOURCED proposed to use. However, implementation of the Sandbox was slow and only a small number of projects were accepted. Given its novelty and the Sandbox limitations, RE/SOURCED progress effectively stalled for a period. It was impossible to build a consensus with the Energy Regulator, Energy Agency and the DSO on an acceptable path forward – each organisation proposed its own solution, but none of these were acceptable to the others. The project sought guidance through an Interpretative Question to DG Energy.

In parallel, the Flanders Government was adopting the two key EU Energy Directives that should have supported energy sharing and citizen engagement. However, when the adoption in the national law was finalised relatively late in the project's delivery, energy sharing between individuals was not supported in a way that would allow RE/SOURCED Energy Community to operate sustainably. Creating an asset that the community could manage was a core goal of the project and the way Flanders adopted the EU Directives meant that a bespoke Energy Community would not be operationally/commercially viable.

Thus, the project had to compromise on some of its initial aspirations. It encountered challenges that were both legislative and technical (as well as dealing with the effects of the global COVID-19 Pandemic) but managed to find suitable adaptations and solutions. It created a Renewable Energy Circular Smart Grid and developed deep learning of how to deliver a project of this kind. Key aspects of this learning is shared below.

2. Project's Progress

Progress since project end date

RE/SOURCED was put forward for an URBACT Innovative Transfer Network (ITN) call that would enable the learning to be transferred to five partner locations. Unfortunately, the application was unsuccessful but there may be future opportunities to transfer the project learning.

The project has been put forward for consideration to the EU Driving Urban Transitions programme which had a call September 2024. Leiedal made a submission under DUT's Positive Energy Districts topic.

Separately, Leiedal has submitted an application to the EUI Innovative Actions call (October 2024) under the "Energy Transition" topic. This is not for the Transfo site but relates to a new business park (Blauwpoort) near the city of Waregem at which the selected businesses will have a clear sustainability focus – it will build on the knowledge acquired through RE/SOURCED delivery.

Plan for long-term sustainability

The project will deliver its goal of creating a Circular DC Smart Grid at Transfo, an industrial heritage site. It has also appointed a Manager for the Smart Grid and the energy generation and storage assets. This Manager will oversee the operation and maintenance of the system and will ensure that it operates effectively.

Separately, the project has engaged the DSO (Fluvius) who will maintain the smart grid infrastructure for the next period. This will ensure that any teething issues (such as cable faults etc) which might be expected in a new system, can be addressed.

3.1 Lessons Learned - Energy Transition

Flux50 led the preparation of a Lessons Learned document entitled A Cobbled Road to an Electrifying Future (see project website link), the title humorously reflecting the significant challenges the partnership encountered. This section of the Journal is loosely framed around the findings in that document.

RE/SOURCED - Energy Transition

Energy is a highly regulated sector. Clear regulation is necessary given the central importance of energy to peoples' lives. Distribution System Operators (DSOs) manage the delivery of electricity through the networks. Their operations are also highly regulated to ensure security of supply and to protect citizens from injury.

Electricity networks are at capacity in many member states and this is affecting the delivery of energy transition. While governments may wish to encourage greater citizen involvement in household energy generation and sharing, the lack of grid capacity often prevents this from happening.

While there was relative clarity within the Directives on the role of citizens within the energy system, this dissipated as the legislation was adopted by member states over the past five years. The Flanders legislative context was constantly changing and only crystallised toward the end of the project.

RE/SOURCED encountered many blockages that were mostly regulatory but with some technological as well: the Flanders Regulatory Sandbox legislative instrument was not subsequently supported by Government; the Flemish Energy Decree effectively prevents energy sharing amongst citizens; the grid's DC's operation posed challenges for the DSO. Obtaining regulatory clearance took around three years and a lot of sustained pressure by the Project Partners. The biggest challenge was the inconsistency of acceptable solutions by the key energy stakeholders – the national Energy Agency, the Energy Regulator and the DSO all recommended approaches, but no single organisation's approach was acceptable to the others. This sapped project team energy and blocked RE/SOURCED progress – the design of the Smart Grid depended on the approval of its topology and it could not proceed until approval was granted.

Regulation also impacted the technologies that could be used. Elia, responsible for Belgium's high voltage network, updated its requirements regarding the minimum distance between physical infrastructure and its power-lines. This change, which was made towards the end of the project, meant that the proposed location of the wind turbine was no longer acceptable – it had to be located elsewhere in the district (with Transfo losing that energy source and its associated revenue).

An Energy Community was at the heart of RE/SOURCED. However, when the scope of the Flanders Energy Decree was understood, it became clear that energy sharing by private individuals, regardless of whether or not they were members of an Energy Community, would not be possible (this is unusual compared to other countries and does not align with the Energy Directives). This fundamentally reduced the financial sustainability of the Energy Community business model which, coupled with its relatively small membership numbers, meant a different approach had to be adopted.

Recommendations for others

If trying anything innovative, check how it might be delivered within your energy legislative structure. *There needs to be an agreed legal mechanism that provides a pathway for your implementation (the Regulatory Sandbox was the pathway in Flanders, but the Government only supported a small number of niche projects)*

Check how EU Energy Directives have been adopted into your member state's legislation *This "translation" from Directive to national legislation may not be what you expect!*

Creating Energy Communities is an excellent mechanisms to support citizen engagement*– but it is not the only one. It may be more appropriate to use an existing cooperative for this.*

3.2 Lessons Learned - Resource Efficiency

The project had circularity at the heart of its design. This is (very) unusual for renewable energy grid infrastructure.

Incorporating circular principles proved challenging. It was anticipated that used products could be utilised, but this was not always practical for various (good) reasons: functionality; durability; cost effectiveness; safety. Renewable energy generation technologies have advanced considerably over the past decade, so older products deliver notably lower output and their cost of removal, testing/refurbishment and recommissioning makes them commercially non-viable . The market simply does not exist for these devices because it is cheaper, safer and more energy efficient to procure new ones.

Equally, some of RE/SOURCED novel ideas (pumped storage using the former water tower) proved prohibitively costly to deliver. Substantial refurbishment costs would have to be incurred to recommission the water tower and its limited capacity meant it could only generate electricity for a short period. As with refurbished Solar PV panels, this element of the project was not implemented on viability grounds.

Resource efficiency has to be included as an integral part of the procurement process. But suppliers may not have the necessary technical data (e.g. performance and environmental data) available, especially where components are being reused. As noted above, the market is not (yet) requesting this information so suppliers struggled to provide it here.

RE/SOURCED aimed to reuse infrastructure materials, for example repurposing the steel superstructure from a building that was being demolished. Although it was thoroughly surveyed as part of the project application process, extracting the structure from the building led to it being irreparably damaged. It was also very expensive to remove and re-commission. Consequently a new steel superstructure was purchased – which was cheaper and which could be designed with future decommissioning/removal in mind.

There were notable legal constraints – covering procurement, product specification, smart-grid design and operation. These are covered by different EU Directives which were written in isolation – so those relating to energy efficiency (focusing on emissions and energy use) are not aligned with resource efficiency (minimising material waste).

That said, the procurement of second life batters, the principal storage medium for the system, proceeded broadly as planned.

Recommendations for others

Design-in circularity from the outset. Be prepared to lead the market in asking suppliers for data on the circular characteristics of their products as well as lobbying national policy makers to include circular data in future product type specification and legislation.

Adopt circular procurement principles. Aim to reduce the overall quantity of materials used in a product. Is purchasing a new product really necessary or could you share, rent or reuse (second life product) existing materials?

Reduce non-renewable primary resources and be clear on the share of recycled, bio-based and primary materials in products.

Make circularity part of the tendering criteria – ask for information on material use, sourcing policies, repairability, equipment flexibility, waste and take back schemes.

Be flexible in applying procurement rules to enable circular business models to be included and ranked appropriately.

Circular value retention - **aim to extend the useful life of products.** Ask for extended warranty periods. Ensure contractual agreements for maintenance and repair prioritise the use of products that can be easily repaired, maintained and upgraded.

Maximise the potential for future product or component reuse. Maximise future material recycling opportunities, for example, by avoiding toxic products or components and choosing biodegradable/compostable materials. Keep a record of the materials and construction processes used, so that when the market evolves, a new circular decommissioning process is developed.

Convert procurement challenges into local market opportunities. If you encounter a challenge when procuring second life components, consider whether there is an opportunity to facilitate local companies to start manufacturing/supplying them. This could cover product testing, validation, component replacement, and re-manufacturing through warranty service provisions (insurance).

3.3 Lessons Learned - Energy System Design

This is the project's main output and is relatively technical. Here we aim to keep the discussion accessible - if you'd like more technical detail, please refer to the project Blueprint (link) or Cobbled Road document (see 3.1 above).

The goal was to create a DC Smart Grid that would host, and link, three renewable energy generation technologies (Solar, Wind and CHP) and three energy storage technologies (Flywheel, small scale Pumped Storage and second life Batteries) while also providing a gateway to the public grid network.

This was a highly technical project and there were understandably a range of technical challenges encountered. These can be grouped under four key headings

- *Network design parameters* – this was an overarching challenge. The site is heritage listed, populated with a range of old buildings and its development had to comply with heritage standards. The Smart Grid had to be designed and constructed within these constraints.

- *Developing the operating parameters of the DC backbone* – projecting likely levels of energy demand proved difficult to predict as the site's restoration was evolving. New uses for derelict buildings evolved and were finalised relatively far through the project – uses define demand and demand informs hardware specifications (e.g. cable sizes).
- *Establishing the consumption profile at the start* – the consumption profile had to be agreed before any tenders were issued. The grid was being designed in parallel with the restoration process. Estimating the consumption profile required ongoing iteration and development – this had a knock-on impact on the specification
- *Meeting heritage–related constraints* – heritage planning and architectural requirements limited the scale of renewable energy systems located at roof level as the Solar PV panels had to be invisible from the ground.

Choosing DC Grid parameters was a particular issue as virtually all existing standards applied only to AC applications. Sourcing and selecting components for a DC grid proved a real challenge – standards do not yet exist for DC and this significantly curtailed the range of products available to use. Neither of the two standards (AREI regulation and the Dutch 9090 standard) offered sufficient information to allow the design and operation of a DC grid to be comprehensively specified. The team therefore had to rely heavily on three information sources:

- Technical reports from the International Electrotechnical Commission (IEC)
- Information provided by the Distribution System Operator (DSO) and
- Academic (technical) expertise through the project partner, University of Ghent.

Please refer to the project Blueprint for in-depth technical descriptions of the grid componentry, design and selection.

Two other grid parameters are relevant:

- *Setting the correct voltage level* – AC systems typically adopt the 3x400+N configuration to establish the optimum operative voltage for a network but there isn't a standard fixed voltage equivalent for DC systems. Voltage levels impacts on cabling – voltages that are too low leads to high currents (bigger cables) while those that are too high voltage requires equipment that is more highly specified (and costly). In the event, the project set the voltage at 700 V nominal
- *Cable, sizing and selection* – Setting the voltage at 700V allowed the cable specification to be agreed – standard 4 Core cable was used to align with the DSO public grid AC standards (cheaper to purchase, install and maintain).

Network, safety and circuit breakers – All electricity grids must have effective circuit protection that protects the well-being of equipment and people. It is a critical safety component. However, using DC introduces a unique challenge in that widely used AC circuit breakers are not suitable as they are designed to interrupt the flow of electricity when the current passes zero (50/60 times a second). With DC, this never happens and if you break a DC circuit, you get an electric arc - circuit breakers must have the capability of extinguishing this arc if fire risk and other damage is to be avoided. Solid state circuit breakers are being developed, but the project could not find a supplier in the market. The Smart Grid has been designed to accommodate these in future.

Residual Current Devices (RCDs) – these reduce the severity of injury caused by an electric shock. As the Smart Grid uses DC, a special kind of RCD had to be sourced – namely a B RCD.

Earthing and production of the DC grid – There are two established configurations for electricity circuit earthing: TN and TT. The TT configuration is predominant in AC distribution networks but is not well suited to DC as it can cause corrosion on metal components. The TN configuration was used at Transfo.

Retained capacity. The DC grid and the inverters can hold their charge after disconnection from the Grid which poses a potential safety risk. Standard AC switch connectors could not be used and instead the Grid incorporated a grounded switch disconnector.

RECOMMENDATIONS FOR OTHERS

Involve the DSO early. And certainly once you have a good idea of what your Grid design parameters will look like. The DSO will have well-established operating principles and methods. The more your design can fit with their approaches, the easier it will be to have your Grid adopted by the DSO and connected to the public system.

Use standard four core cable for DC circuitseven though two core may be possible. Again, this is to make it easier to interface with public grid networks operating on AC and which use four core systems. It's also likely to be less expensive given its widespread adoption and product availability.

Be creative and don't be afraid to combine old school technologies with state of art DC systems. At Transfo, they combined "old style" fuses and switch connectors which can be upgraded to more sophisticated circuit protection devices when these come to the market in future.

Involve local and regional authorities (early), especially where heritage assets are part of your project. Aim to get them on-board so that their input can be constructive and helpful.

3.4 Lessons Learned - Heritage Listing

The Transfo site received its heritage listing in 1999. Since then, the local municipality, intermunicipal association Leiedal, the Province of West Flanders and the Flemish Government have all worked together to deliver what has proved to a challenging but significant and innovative heritage project. Presently, Transfo features a microbrewery, offices, bar, residential housing (private and social), event spaces and leisure facilities such as a diving centre and outdoor sporting areas. Nearly half of the existing buildings have been repurposed with plans underway to allocate new uses to the remaining structures within the next 2 to 3 years. But it has not been easy and there have been a number of challenges.

Resource efficiency - Circular principles were applied to the built heritage conversion. It was a challenge to identify how to retain existing structures, materials and features while also creating an asset fit for contemporary and future uses and to do so within a circular framework. There was also a desire to retain the original emphasis of the site on industrial functionality.

The heritage buildings at Transfo were fragile even though they were of rugged appearance. They were built to different standards which meant that repurposing them to meet modern efficiency standards was a real challenge (some outer walls were single skin). It required careful planning and sensitive intervention. Sustainable materials like lime hemp were used to insulate walls whilst avoiding issues such as dampness and mould.

Balancing the demands of built heritage conversation, conservation and renewable energy. The Flemish Heritage Agency has clear and practical guidelines that aim to ensure responsible and consistent redevelopment of heritage assets. Implementing these guidelines correctly and effectively required extensive discussion around the choice of materials, selection of location for energy infrastructure and a preservation of significant heritage features. It required close collaboration by both project partners, heritage experts and subcontractors. This required significant management resources to be made available.

RECOMMENDATIONS FOR OTHERS

Utilise creative thinking and flexibility to tailor the system design to the specific characteristics of the site – be pragmatic when striking a balance between project aspirations, heritage preservation guidelines, practical constraints, and functional needs. Be prepared to remain flexible and responsive to unforeseen events and constraints which always arise when restoring built heritage assets and be open to adjusting the system layout accordingly.

Prepare for unexpected challenges and allow time for them to be addressed. Heritage sites frequently conceal surprises (subterranean structures, soil contamination, historic cabling, etc). Allow extra financial contingency to cover these unexpected issues and accept that addressing them may offer no additional functional benefit to the redeveloped site.

If you can succeed in a project like this, **approaches and solutions can be applied anywhere** – Don’t lose the learning gained on heritage sites as it can be usefully applied to non-heritage situations.

Storytelling can be really valuable when communicating the vision and gain buy-in from stakeholders and citizens. The re-created site at Transfo serves as a key attraction for drawing people to a previously derelict and blighted industrial site and provides a new asset that the community can (and does!) use.

3.5 Lessons Learned - Educational Infrastructure

The design and delivery of the educational infrastructure were notably innovative. The educational infrastructure comprises a mix of indoor and outdoor points of interest. The team used the expertise of the Project’s Advisory Board, especially Technopolis (Mechelen, Belgium) which is a recognised leader in STEM (Science, Technology, Engineering and Math) engagement, to guide the design and selection of exhibits to use. All exhibits had an electricity or energy focus. The points of interest comprised demonstration type assets to engage citizens in a fun way while also educating them on key energy related issues and topics. The exhibits were highly interactive and included an electric swing, energy floor, energy bike and a panel “challenge” where visitors manage a fictional national grid. There were a range of challenges.

Sequencing. The most significant challenge was around sequencing. Physical works relating to the Smart Grid and Solar PV arrays had to be repeatedly respecified and rescheduled in order to meet both technical and heritage requirements. This had an impact on the location of the educational assets and the timing in which they could be constructed. This proved difficult for the different contractors engaged to construct the educational assets.

Novelty. These were particularly novel installations and definitely not "off the shelf" products. They required the engagement of numerous contractors to construct the indoor assets, some of which had complex electronics.

Each element required an independent procurement procedure. Therefore, coordinating the collaboration across the different parties required extensive consultation, risk assessment, adaptation and a high degree of flexibility on all sides.

Legal and legislative issues. There were delays due to meeting the request and requirements of the heritage officials. This required extensive coordination and extra budget.

Several of the interpretative exhibits used real time energy data but the data had to be sourced from a range of providers, each with its own access controls and requirements. This would have required extensive software reprogramming of the exhibits which was not financially feasible. Separately, one of the exhibits depended on a commercial company for the reliable provision of real time energy data. Unfortunately, the company changed their business model which made access to these essential data a lot more expensive. This was a serious challenge that would have undermined the commercial viability of the exhibits' operation. It was resolved through negotiated consultation with the company.

Overall, the educational element required a lot of project management resource. For outdoor play equipment, there were legally binding safety and anti-vandalism requirements to be met, as well as the identification and use of sustainable materials for long-term use

The novel project characteristics meant that there were very few contractors who could tender for these opportunities and this limited how many the project could engage. This delayed progress.

RECOMMENDATIONS FOR OTHERS

Minimise interdependencies in construction scheduleswhere possible.

Be realistic about the level **ongoing financial commitment** required to keep the exhibits fresh. Repeat visitors will get bored quickly!

Heritage projects take more time And require more compromise on the location, prominence and visual design of exhibits

Be careful utilising commercially available information/data sourcesto support the functionality of your exhibit. Commercial operators can change the terms of their provision and this could render your exhibit inoperable (or of no value). When using commercially provided information sources, contractually agree future data provision and endeavour to identify more than one source.

3.6 Lessons Learned - Project Management

Composing the right partnership - Each partner selected for their expertise and potential contribution. Retrospectively they could have included Fluvius (DSO) and Vlaskracht (Energy Cooperative) as core partners as they proved to be central to the effective delivery of the project. The Lead Partner invested considerable effort when selecting partners to ensure that the necessary skills would be available to the project and that the partners would work well together as a group. This paid off in practice.

Systems Integration – RE/SOURCED was a technically challenging project to manage. There were complex technical aspects of the DC Smart Grid design to be designed. Separately, there were legislative constraints to be overcome – legislation in this area is complex given the risk to life of high voltage electricity systems.

It was also a complex system to build as it had multiple sub-systems that had to be integrated within the overall design for the system to work. The original proposal did not include a systems integrator role. Fortuitously, this was provided by one of the contractors (CE+T) engaged to deliver equipment. Systems integration is critical to successful implementation.

Once the system design started to be formalised, the project entered the procurement phase. However, this coincided with the height of the COVID-19 pandemic which significantly constrained the supply of people, components and systems. The successful delivery of the project was achieved through having a very strong, focused and tightly managed partnership, all of whom remain engaged throughout and delivered significant contributions along the way.

Being flexible while also retaining a focus on the project's original vision was vital. There were many occasions, especially when trying to find a compromise between the conflicting requirements of the DSO, Energy Regulator and Energy Agency, where taking an easier to deliver short-cut would have made the project management task more straightforward. But doing so would have lost key aspects of the original vision, in particular around circularity and those leading to greater community involvement.

The central RE/SOURCED idea was influenced by two EU Directives that promote the involvement of citizens in the Energy System. While these Directives are complementary, they are not always consistent. And, as with all EU legislation, it must be adopted by each Member State. This adoption process took place during the delivery of the project which meant that the legislative clarity required to finalise the Smart Grid's design was missing. This needed continuous reflection and refinement of specifications which significantly increased the lead-time before the final technical specification (and Blueprint) could be agreed.

It also meant that rapid decision-making approvals were required. The Lead Partner created a core team with delegated decision-making responsibility so that if one person was absent, another could take critical decisions to maintain project delivery momentum.

The ethos adopted to selecting the core partners at the outset was applied with good results to selecting contractors as well.

RECOMMENDATIONS FOR OTHERS

Identify stakeholders who will be key to the project's success**and engage them early**. Consider having them as part of the core project team

For the internal project team, **select people with the required mix of skills and interest**in the project.

Keep the internal project manage team smallso that decision-making can be agile. Distribute responsibilities across the team members

Don't be put off by legislative challenges. Strive to find work-arounds and aim to be creative. Most importantly, don't give up!

Appoint a Systems Integrator. This is a central role in Smart Grid development. Take time to select the person/company who will have the right attitude to work with you – being sufficiently flexible while at the same time ensuring the technical, compliance and legislative aspects of the project are met.

Limit the number of service providers and contractorsfor effective project management

Design-in circularity from the outset. If RE/SOURCED had not set clear circularity principles from the beginning, circularity may well have been lost during implementation due to the pressure to overcome technical and legislative challenges.

Public Procurement is often criticised for being inflexible and formal – making it harder to assess the qualitative attributes of tendering organisations. **Include tender questions that enable you to assess the contractor's understanding of the "nuances" of the project** – this proved very valuable for RE/SOURCED when choosing the best suppliers

UIA provides an expert dedicated to tracking and supporting their project's progress. Even without UIA support, there is value in **engaging an external third party**who can provide a different perspective, especially when progress appears to be "blocked".

Once established, **projects have to operate on a sustainable basis**(unless a funder agrees to provide on-going support). This is especially true where the Smart Grid assets are handed over to community to operate.

4 Conclusion

This was a genuinely pioneering and very innovative project.

Creating a DC Smart Grid is unconventional, but it makes sense within the context of local renewable energy generation and storage. Solar PV, which is the most common (and cheapest) form of domestic and small-scale renewable energy generation, produces its energy in DC form. Therefore, the benefit (principally saving DC-AC conversion losses) and need to create DC Smart Grids is likely to increase in future – RE/SOURCED was the first such application. The project is probably 5–10 years ahead of time. But it has produced a Blueprint that others can use to build their systems and it has a created a local energy asset that will benefit the community. Although not an original aim of the project, it has also engaged the DSO who will adopt the Smart Grid and use it to develop an understanding of how this type of infrastructure can work. They did not have this capability previously and have stated publicly how valuable it is for their future-proofing of the network going forward.

The main challenges were non-technical

The project experienced significant challenges on various levels

- Legislation was evolving at EU level which delayed the technical specification or required it to be modified
- Therefore, adoption of EU Legislation at Flanders level was still taking place during the project's implementation and resulted in a restrictive position being taken on "energy sharing" – this contributed to undermining the commercial viability of the proposed Energy Community's operating model
- The Lead Partner was given assurance that the Flanders "Regulatory Sandbox" would be a suitable legislative environment within which to test the project's operational model – this guidance proved misplaced
- Without the Regulatory Sandbox, the project required agreement from the DSO, Energy Agency and Regulator – each of these bodies proposed possible routes forward, but they did not agree with each other leading to progress stalling
- Transfo was a heritage site – heritage conditions had to be met which impacted on all aspects of the project's delivery, sometimes considerably
- Flanders-level rules governing the proximity of infrastructure to high voltage power lines changed during the course of the project. Consequently, while Elia (the national grid operator) approved the location of a wind-turbine at the start of the project, this approval was withdrawn when the guidelines required a greater distance between the Transfo wind turbine and the national grid

But there were also some technical challenges

There were lots of technical challenges as DC circuits do not behave the same as AC circuits. As very few high voltage DC systems exist, there is relatively little standard-approved equipment available to purchase. For example, circuit breakers are standard and comparatively cheap items on AC systems as are personal protection devices (RCBs). Similar components do not exist or have very limited supply for DC circuits - and AC componentry can't be used. So alternative solutions had to be found.

This suggests that you must be flexible and creative so as to find solutions to technical challenges.

COVID-19 pandemic interrupted procurement

Although not specific to RE/SOURCED, the COVID-19 pandemic impacted significantly on the delivery of the project. Partner meetings had to be held on-line and procurement was significantly disrupted. This was especially true for smaller and more novel items – market demand for contractors was so strong that they did not bother to respond to tender invitations. That is despite tenders being issued up to 5 times.

"Novelty" was also a challenge in public procurement.

Many suppliers simply could not meet the more novel technical requirements of the DC Smart Grid or the very innovative educational assets. So it proved difficult to get realistic tenders submitted. This may well be replicated in similar systems in the future.

This was an excellent partnership

The partners were carefully selected based on the potential contribution they each could make to the project's delivery. This took time – but it was time well spent given the challenges that were encountered. When challenges were encountered, partners proactively came forward with possible solutions and utilised their professional networks to raise the visibility of the project commercially and politically. This helped to expedite solutions.

5. The Project's Legacy

RE/SOURCED aimed to deliver something highly innovative within a heavily regulated sector during a period of significant legislative change and a global pandemic. What could possibly go wrong? Quite a lot as it turns out – but things "going wrong" is to be expected when trying a novel implementation for the first time. For RE/SOURCED, the important issue is that the partners managed to address the challenges and produce something unique and valuable. That is the key success criterion for an innovative project. They delivered the bulk of the project's aims albeit through a larger budget and over a longer timeframe – but critically, they delivered them!

The project created an operational DC Smart Grid that fulfilled circular principles and prepared a technical Blueprint that allows others to replicate – it shows how to do it and the key pitfalls to avoid.

There is now knowledge of how to marry contemporary community-level energy generation within a heritage regeneration site using circular principles.

The creation of the DC Smart Grid and the very active engagement and collaborative working with Fluvius, the DSO, has led to significant capacity building within the DSO. The DSO has agreed to "adopt" the network, will be responsible for its on-going maintenance and development and will use it to study the operating characteristics of a DC system. This is valuable to the DSO in the medium to long term.

In addition to the DSO, the University of Ghent will also retain access to the Smart Grid for its applied research purposes. This will provide a unique resource to the University that it can use to research and develop new renewable energy solutions. It also strengthens links between the University and the DSO (so stimulates on-going knowledge exchange).

The project facilitated collaboration and consensus-building between the DSO, Energy Regulator and Energy Agency in Flanders. These relationships can be built-upon going forward.

The project facilitated knowledge transfer from the research base (University of Ghent) and the commercial sector.

The project created an educational amenity that is attractive and valuable for the local community at a previously contaminated industrial site.

The project shows how to incorporate circularity within electricity infrastructure and highlighted the lack of market provision of recycled or reusable products.

Circular economy

See on UIA website