

DEAN WANLESS ON RE-THINKING HOW HOME ENERGY CERTIFICATION HAPPENS

Transcript

Introduction and the Mission

Dean Wanless (00:00)

My name is Dean Wanless. I'm the service owner on the Energy Performance of Buildings Register at MHCLG. And the mission that we have is to improve the way that building physics is delivered to people who are trying to get building compliance.

Linda O'Halloran (00:18)

Can you tell us a little bit more about what the challenge that you're trying to fix for the people is, where it was stuck, and what you're doing to fix it?

The Challenge: Problems with the Historical Building Compliance Process

Dean Wanless (00:27)

Sure. So when you are building a new home, you need to go through a building compliance process, which is run by a local authority. Ultimately, it's who's in charge of planning. And so, as the building designer, you need to submit various documents to prove that your building is compliant. Now, this could be fire safety, it could just be structural integrity, and the bit that we're interested in is energy efficiency.

A new home needs to be built to a certain energy efficiency standard, and the building physics methodology is used to prove that the house is built to the relevant standard.

Historically, the process has been handled by third-party software developers who pick up a specification for a nationally recognised methodology, and take that tech specification and turn all of the complex maths that's in it into software so that the energy assessor can get the plans for a new building, enter all the relevant details about it — so, how big the rooms are, how high the ceiling is, the type of heating technology it

has, the kind of insulation it has — put all of that into the software, and then get a calculation to say whether or not it will be compliant against building regulations for energy efficiency.

They then generate a report called a BREL report that they send to the local authority and planning department, and it sits on file for that building as part of its compliance journey.

About every five or six years, the building physics methodology changes. And the reason that it changes is because what's deemed energy efficient enough effectively changes as new technology comes in.

So, for example, as we're transitioning from gas boilers to heat pumps in new-build homes, the building physics methodology needs to reflect that. So when there are these kinds of changes that come in, or regulatory changes to support energy efficiency, the building physics model needs to change.

This is an incredibly laborious process, which involves several different organisations all effectively doing the same work, which is to pick up that tech specification of the new building physics model and turn it into code, and then test it against about 200 different test scenarios, which between them test all of the different possible combinations of house, technology, fabric, size, and location. This is a torturous process that takes an incredibly long time, not just for government, but for private sector companies who are operating in the area as well.

It also introduces a lot of uncertainty because the house builders need to get their supply chains in place to allow for any new technology which is going to be required because of the new model.

There's also a hard legal deadline on this because building regulations are a legal regulatory thing, and so they come into force on a certain day. So all of the new software needs to be ready in advance of that day so that supply chains can be got into place, and the house builders can make sure that the houses that they're planning on building will be compliant.

The last time we did a big update, this all went quite badly wrong. On the day that the new legislation came in, we had software that only served about 70% of cases of homes that might be built.

And obviously, there was a reputational issue here for government. Even though we don't have too many levers over the third parties, ultimately it's our name which is on the policy and on the building regulation law. And so it's us who people come and shout at when it goes wrong.

So, having worked on this last update in 2022, I realised that there was a better way of delivering this. We had an additional challenge coming as well, because the old building physics methodology, which had been incrementally changed over the course of many years...

The regulation change was actually being scrapped completely and replaced with a whole new building physics model called HEM, the Home Energy Model, which is an incredibly complex piece of building physics methodology with far more calculations happening and far more complex data entry. And the idea of going through this process of writing a specification, releasing the specification, and then holding the hands of the software developers while they develop their solutions wasn't something that we felt was really tenable.

The Solution: Introducing Energy Calculation as a Service (ECaaS)

So instead, we devised the idea of ECaaS, which is Energy Calculation as a Service. So rather than doing that old process, instead, the building physics model itself was written in code in Python.

Python was chosen because it's generally quite human-readable. You can pick it up; you don't need to be a software developer to understand Python. And when it's well annotated as well, it meant that someone could go up and understand easily what the intent of the code was. We took that code in Python and rewrote it into a different language called Rust.

Rust is much more performant when it comes to doing complex maths. And the reason that we chose Rust was because the Python implementation of the home energy model took a very long time to run — about 90 seconds to two minutes to run a single calculation — which would effectively break the industry. The industry relies on very quick calculations happening, and that's what they've been used to.

So we took the Rust implementation, ported that into Rust, and then we could run calculations in a couple of seconds. In support of that, we've also built an infrastructure that goes around it so that the energy assessment schemes who write the software for the building compliance only need to build a front end.

And then they interact with our engine via the APIs that we've built for them to use. So that an energy assessor enters lots of data about the building from the plans, presses the big green gov.uk button, and then they send the data off to the ECaaS service, and they get the calculated response back that they can use for compliance. That's the nutshell version of what we do.

Linda O'Halloran (07:09)

It's a really interesting scenario because I think part of perhaps what gave you so much runway to deliver a systemic intervention was the fact that how it went wrong last time, and how painful and expensive it was, was really well evidenced. I think this is the kind of beautiful example of doing digital policy alongside national policy changes that we'd benefit from so much more of, and often the problem in the case of locally administered services is that it's really hard to make the case. If you want to tell us a little bit more about how that all kicked off...

Socialising the Intervention and Gaining Buy-in

Dean Wanless (07:46)

After the 2022 update in the regulations, where we needed to update the software, it became clear that the current delivery method was untenable. It had pulled in people from policy and had brought in people from digital; it had brought in people from operational backgrounds, from two different government departments trying to wrangle several private sector organisations to try and do the same one thing. And it wasn't successful. It was very expensive in time for government, and it was a burdensome project management.

So when we came up with the idea for ECaaS, we actually had quite an easy time of socialising it within that community of people who'd been hands-on with the most recent delivery because it was so clearly broken and it was so obvious that there was a good fix for it.

We had the benefit of being a mature digital team within a policy division, so that we were trusted. I think we were seen as sort of safe pairs of hands and credible so that people would actually listen to the solutions that we were bringing forward. So we managed to win the internal case quite easily, for the ECaaS delivery being something that we should take forward.

Where we met slightly more resistance was when we got through the next layer of SCS, where they are possibly a bit more risk-averse, and they did see this kind of novel software development — because this is a very novel software development for government. It's not like a transactional service, like a form or "get my certificate" or "prove who I am." This is a big, chunky building physics engine; it's not something that government typically does. And so this was seen as a real risk when we got to the higher levels of clearance that we needed to get through. Particularly when we got to DG level, where we were asked to come back time and again with lots of different evidence for this being a good thing to do.

And ultimately, we could keep falling back on the evidence that we had from the last

delivery of something that was late to be delivered, had errors in it, and had people writing letters to our minister because they were upset. So we could constantly lean back into the fact that it's not a risk to do the ECaaS delivery; it's a risk to *not* do the ECaaS delivery. And ultimately, that was what won through the day, but it was a long process to do that. We had to prove our case time and again to lots of different people of varying seniority, even in different government departments.

We also were very careful to make sure that we brought external stakeholders on the journey with us. We've had transparency completely at the heart of this development. The house builders, the big companies like Barratt Homes and Persimmon, for example, have an incredible amount of interest in this because this legislation and the building physics which underpins it shapes the way that they're going to be building houses for the foreseeable future.

And with how the delivery had gone before, we felt it was a really good idea for us to get out ahead of any issue that we have and do regular showcases of the work that we were doing from day one. So even when this only really existed on paper, we were talking to the industry about it as something that we were going to do.

And when we actually moved into the delivery phase of building, we did and continue to do monthly show and tell events where they can see not just the technical work that we're doing, but all of the user-centred work that we do that underpins it as well.

I think that that's made us really credible in the eyes of the industry as well, that we aren't trying to hide anything. We aren't trying to pull the wool over anyone's eyes. We appreciate that this is a big systemic change that we're asking them to make, and so we're bringing them on the journey by being as transparent as possible.

Linda O'Halloran (12:07)

I love that. And now that you've demonstrated the benefit of doing this complicated product work upfront, how are you managing perhaps fears of long-term ownership or a long-term change of role? Or do you find that senior government stakeholders are increasingly bought into this new long-term role?

Dean Wanless (12:31)

That's interesting. Ultimately, I guess, what we found was as soon as they had agreed to it, they kind of went hands-off. So we're left to normal governance structures now.

Long-Term Vision, Market Diversification, and Open Code

Linda O'Halloran (12:41)

What is the long term, and do you have a vision for what happens next, just to orientate us?

Dean Wanless (12:48)

The short-term goal that we have is aligned to the legislation that we're supporting, which is the Future Homes Standard. That gets laid in the next few months, and we need to be ready, certainly with the infrastructure that we've built. We've also, alongside the infrastructure and the engine, built a front end which interacts with it as well.

The reason that we've done this again sort of just goes back to dealing with the perceived risk that there was. So if the third-party software suppliers aren't able to produce software to our schedule, the building suppliers won't be able to achieve building compliance because there won't be software for them to use. So we've also built software which will allow building designers to get compliance.

The other reason that we've done this is part of the broader ambition of the service, and really where we see the industry going in the longer term with regards to new-build homes, certainly, is that we've built all of our code to be completely open. The reason for us doing this is that there's a real barrier to people entering the market for new-build energy assessment.

As I've described, it's incredibly difficult to build a building physics engine and the software which allows you to interact with it as an energy assessor. And so through our UCD process, we discovered that lots of the companies who are around this area, for example, do software so that you can energy assess existing buildings. They wouldn't enter the new build market because of this complexity and the expense of building the software and the engines which you need to manage that.

So we felt there was an opportunity for us to help diversify the market as well, which is de-risking things for government, because if there's only a couple of suppliers of building compliance, then obviously if anything happens to them, new homes can't get built because they can't prove compliance.

So this is another risk that we can do away with. And the way that we've dealt with this risk is by opening all of the code that we've written. So the code for the building physics engine, the code for the infrastructure that surrounds it and allows it to be hosted on the cloud and accessed, and the front-end software is all open in our repositories. And we

encourage people to go and pick that up and build their own solutions.

So what we have been saying to potential entrants to the market is: "You let us worry about the engine. We'll host that. We'll give you API access to it, and you just need to build a front end. And by the way, that front end, you can just take our code and do that as well."

There's still a load of other stuff that they need to do that we can't help them with to become an official organisation who can do this, but we take care of the really expensive bit for them.

Since we've started this project, we've had two new organisations coming in to build this software so that you can do compliance for new buildings, which is great. So that diversifies the industry for us and decreases the amount of risk that's involved, which is brilliant.

But there's also all of this other activity that goes on around building compliance, which is... It's not for compliance, and it's not for building official artefacts like energy performance certificates. It's sort of consultancy around the "what if": what if we built this estate with the following technology?

We don't want to support that with ECaaS because we're really interested in building compliance and energy performance certificates. And obviously, there's a burden of running these things, a cost burden. And that's the bit of cost that we're willing to take. But if you want to go and do all of this consultancy, by all means, grab our code, spin up an engine, spin up the infrastructure so you can make your own ECaaS in your own cloud environment, and do whatever consultancy work you like using that.

So we're really sort of encouraging the industry to be innovative as well. And again, in throwing open the code that we've written, that's just something else that we see takes away the risk from government of this not being delivered. Just by diversifying the offering of what could be built to support new homes.

Linda O'Halloran (17:19)

What does your long-term benefits case sound like?

Framing the Long-Term Benefits Case through Risk

Dean Wanless (17:27)

I'm going to end up talking about risk again, aren't I?

So I think with any digital development that you take on, you've got very tangible benefits like the asset that you're building and the obvious benefit that you get from it as a policy

team. That might be, for example, that you get to understand more about how people are impacted by the policy that you're building. It may be that you get to build up data that helps you with your analysis and helps you make better policy in the future.

I think that those are really tangible and obvious benefits to doing digital. I think the less tangible part of it, but I think just as important, is how it helps you understand risk. I think that the civil service has got a very straightforward way of looking at risk through the lens of "this is the risk and this is the mitigation." It doesn't really account for the risk of not doing something. And I think that with the ECaaS delivery in particular, we had a really strong case to make of: "If we don't do this thing, if we don't do this difficult, relatively niche thing, then we're throwing ourselves on the mercy of third-party software developers and the system that we know doesn't really work to make this software."

And what's knowable, I think, often seems less risky. Despite the fact that we have had lots of problems with this delivery method, we have managed to deliver; therefore, "this delivery method is okay" — it doesn't really stack up when you take that apart, and you look at the problems that you've had and how they all coalesce into something that just doesn't really work anymore.

Whereas having a really good idea of what your problem statement is, you can really work into that: "If we don't do this difficult thing, then actually we'll be in a far worse situation than we would be otherwise." And I think if you can spin up a really credible narrative around that, where you're looking at the evidence that you've had from past deliveries and speaking to the sector — I mean, never forget to speak to people in all of this, not just your users, but your stakeholders too — I think that you can arrive in a really credible place with a narrative that you can really win hearts and minds with. Yes, it's going to be difficult, but actually the benefits that we get from this far outweigh any difficulty that we might have along the way.

The Difficulty of Cross-Government Working

Linda O'Halloran (20:10)

You might have already said this, but do you have anything else that was hardest about the process?

Dean Wanless (20:15)

Gosh.

Honestly, Linda, it's all really hard.

The really difficult thing in all of this has been the sort of cross-government working of it.

Because... DESNZ own the building physics engine, and we own all the policy that relates to it — because government's great like that, right?

Linda O'Halloran (20:40)

I mean, doing anything at this scale that hasn't been done before of its nature, means that nobody has a solution. It requires multidisciplinary collaboration. And so I think that always takes quite a bit of practice.

Dean Wanless (20:52)

It does.

Okay, so one of the particular challenges that we had was that different parts of this puzzle live in different government departments. So the policy sits within MHCLG; that's the bit that's in charge of housing and building regulation. But the actual building physics side of it, the people that own the engine and the development of the engine, sit in DESNZ, which is Energy Security and Net Zero. So they're building physics experts and work with a third party to actually write all of the Python code. So they between them write the building physics and then translate that into code, which we then pick up and port into Rust, which is the more performant code base that we're actually building our service around.

This has meant that we've got a lot of non-building physicists, but excellent software developers, picking up software that's been written in Python really as a source of truth rather than as something to actually run a product or service from. But it's been made by building physicists. So we've sort of had to really feel our way through the dark on how this relationship works and what the kind of feedback loops that we have are. And we've landed in quite a comfortable place.

So obviously, we have all of our daily team standups and things like that to make sure that we all know what everyone's working on within the ECaaS team itself. But we also have a weekly standup with not just the building physicists in the other government department, but also with our policy people and with their policy people to make sure that all of the different timelines that are at play here are going to match up and that we're all delivering what we need to be delivering at the right time. We all know what everyone's up to in any given week so that we can work out any dependencies as they show themselves.

It's not always been straightforward. Obviously, we're an agile multidisciplinary team working in MHCLG on a software delivery. They have very different ways of working in DESNZ, and they don't always match up in quite an ideal way. But through the constant communication and that openness that we've had with them — knowing what we have and having access to our repositories — we've been able to work through to get to the

right sort of place. But certainly, having an honest and open relationship with cross-government partners has been really critical to this delivery and will continue to be for its future as well.

Learning and Collaboration with Policy Colleagues

Linda O'Halloran (23:51)

It sounds exciting. How have you been successful in learning from policy colleagues as well, like in that two-way education? Because it's so hard to meet another deep specialist from a totally different universe at a place where you can both be at the forefront of your mission at the same time.

Dean Wanless (24:14)

Yeah, for sure. So our major policy partnership has been with MHCLG colleagues and working on the Future Homes Standard, which is the regulation that we're underpinning. I'm lucky enough to have a really great relationship with the head of that policy and with the deputy director as well.

They're able, as they're speaking with the industry — which they're doing all the time because obviously the home builders are really heavily impacted by the future homes standards; it changes what they're able to build, changes their supply chains, it changes an awful lot — they're able to really easily tap into what their concerns are, what they're worried about as an industry, and where they see barriers coming up. They can feed that into us so that we can think about these issues from a UCD (user-centred design) perspective. We can think about how, in the show and tells that we do for the industry, we can soothe any particular concerns that they have around delivery.

It doesn't mean that everything goes away completely. We've had some quite long conversations with the industry about certain niche points in which it doesn't really seem to matter what we say; those things sort of remain as concerns. But the fact that it's not just with us, but with our policy colleagues as well, means that they don't go away, they aren't forgotten about. We can always reignite conversations when we need to.

But also I think it's really interesting and kind of fun to work on a software delivery that is alongside policy in the way that this is because I think often when you're working on a digital service, you don't necessarily get to see that real physical outcome of what you've done, but this is linked to the 1.5 million new homes that we're meant to be trying to build in this parliament.

And so, good delivery of a digital product will have a really tangible impact on the intended policy outcome as well, which I think is probably going to happen a lot more in the future as policy and digital development live more cheek by jowl than they possibly

do at the moment. So that's been a really exciting part of this development as well.

Linda O'Halloran (26:45)

Could you tell us what your policy colleague might say about how collaborating with you has made it faster or more impactful for them to achieve their goals?

Dean Wanless (26:58)

I think that for our colleagues in policy, the benefit that they've had from having such a close working relationship with us on the ECaaS team has probably been access to information has just been a lot quicker than they might ordinarily expect. When we've done this in the past with that disaggregated delivery of requiring third parties to build their own software, it was very difficult to get information about how quickly they're proceeding, what particular problems they are having, and when can we expect delivery. Whereas we've got an open dialogue to have those conversations. And aside from sort of formal opportunities to have those chats, the fact that we're in the same Teams channel just means that we can have them on an informal basis as well. So I think there's a lot more transparency just about how our development is going.

Lessons Learned and Final Advice

Linda O'Halloran (27:55)

I should try to wrap it up here. Perhaps, if you could do it all over again, would you do anything differently?

Dean Wanless (28:02)

Hmm... If I were doing this again, or if I were doing a similar delivery again, I think that I would land a lot sooner on that risk piece of describing the benefits via the prism of the risk of not doing this. I think that was really when we managed to get traction, where there were people who we needed to buy into the delivery.

I mean, to talk about, ultimately, what we're doing is a mitigation, right? We have a risk-filled delivery thing that we know all about because it's not worked before. The mitigation is this scary, expensive thing that we're about to start doing. But it means that it will work. It means that we'll have something that will work in the future.

But also, not being afraid to take charge of the direction of those risk conversations, take them where I want to take them, rather than being taken to that straight place of: "If we do this and it goes wrong, this is terrible for government." Not doing anything is also terrible for government. So, yeah, I'd have been less worried about those things.

Linda O'Halloran (29:17)

Ultimately, you are a little bit bold, and you have to be to do something that hasn't been done before. Perhaps as public servants, we're extra careful to use our collective resources wisely, but you do have to be bold to...

Dean Wanless (29:21)

Yeah, absolutely. And I think that the thing with boldness as well is that I think it can be quite infectious. I think as a service owner, my main role is to advocate for what we do as a delivery team. And you've got to go forward. You've got to be arm-wavy about things. You've got to evangelise about the great things that you can do as a team.

And I think that's actually quite infectious. I think that you can actually get people quite excited about what might be possible, as long as you're realistic about it and couch it against a good narrative of learned experience. I think that there's a lot to be said for enthusiasm taking you quite a long way.

Linda O'Halloran (30:16)

I really relate to that and would add that even in the civil service-politician relationship, that is an important tool for the civil service. A busy politician won't necessarily know about the opportunities to bring policy and digital closer together, and a little bit of advocacy, upward management, and education can go a long way. That relationship needs to be nurtured as well to keep their sponsorship over time, because these systemic interventions aren't, as you say, cheap, and often they are not going to return an instant reward to the taxpayer. But if they're not done, they stay stuck in limbo forever and never achieve what should be possible in this day and age.

Is there any other final advice you would like to give to anyone who's embarking on a similar journey?

Dean Wanless (31:08)

Yeah, I just think the whole transparency piece has been so important to this delivery. And the main thing that I would advocate for is just: don't be afraid of the light.

I mean, you're probably doing great work, and exciting work, and work that deserves to be shouted about. So shout about it. Don't be afraid to speak to your stakeholders. Don't be afraid to speak to your users, because you'll learn loads from them. And also, you'll really make them confident in you and in what you're building. And I think that's really valuable.

Confidence in something doesn't start from when it exists, and is tangible, and they can use it. It starts a long time before that if you can bring them on the journey with you.