

# SEDA

Scottish Ecological Design Association



# PATRICK HARVIE

# SECRET SANTA OR GHOST OF CHRISTMAS?

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Winter 2022

SEDA was formed in 1991. Our primary aim is to share knowledge, skills and experience of ecological design. SEDA is a network and links those seeking information and services with those providing them.

SEDA's membership comprises a large number of people involved, and with an interest in design, principally in Scotland. Members include academics, architects, artists, builders, planners, students, ecologists, landscape designers, materials suppliers, woodworkers, and many more whose work or interest involves design for a sustainable future.

SEDA is a charity and is run by a Board of Directors, who are elected at Annual General Meetings. The Board is advised by a voluntary Steering Group which meets 8 times a year for discussion and for planning the activities of the Association. All members are welcome to take part in these meetings. SEDA registered as a Company Limited by Guarantee in February 2011.

A SEDA membership is a great way to support ecological design in Scotland. As a member you will receive the SEDA Magazine for free, get discounted tickets to SEDA events, and have the opportunity to connect with a wide network of talented designers.

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## Editorial team

Nick Domminney, Viktoria Szilvas, Doug Tullie

With thanks to all our contributors, sponsors, and supporters.

What do you think of this SEDA magazine? Do you have any disagreements or something useful to add to the issues covered? Do you have an idea for an article? Drop us an email!

Cover image: Patrick Harvie - Secret Santa or Ghost of Christmas, Arc Architects Ltd.

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# NZC & SEDA's Top 20

**Nick Domminney**

The Winter edition of SEDA magazine was intended to have a number of articles around the subject of “Net Zero: what is it?”. We do indeed have a RIBA press release explaining how a definition of NZC will be adduced, and a Scandinavian built example of how Norway defines the category. We also have a totally different, poetic, thought experiment on the struggle to achieve NZC, by engineer, Susan Krumdiek. We are grateful to Steven Dijkstra Downie for collating the latter.

But our cover and key article is a follow-up on SEDA’s letter to the Scottish Government’s Minister for Zero Carbon Buildings, Active Travel and Tenants’ Rights, Patrick Harvie, directly following our representatives’ return from COP26. SEDA made 20 clear and achievable recommendations, within the purview of the minister. They are summarised in the article, but the whole letter was printed in the Winter 2021 SEDA magazine.

SEDA has also added our name to the recent Wellbeing Economy Alliance’s letter to the same minister, calling for and describing, an [“urgent transition to a Wellbeing Economy.”](#)

The energy crisis is never far from the headlines, so we are lucky to have an explanation of the complexities of energy pricing from micro-hydro developer, Adrian Loening. The SEDA section also includes some hints and tips about how to save house energy and a personal experience of self-build retrofit to cut bills. SEDA’s Green Drinks kicked off again,

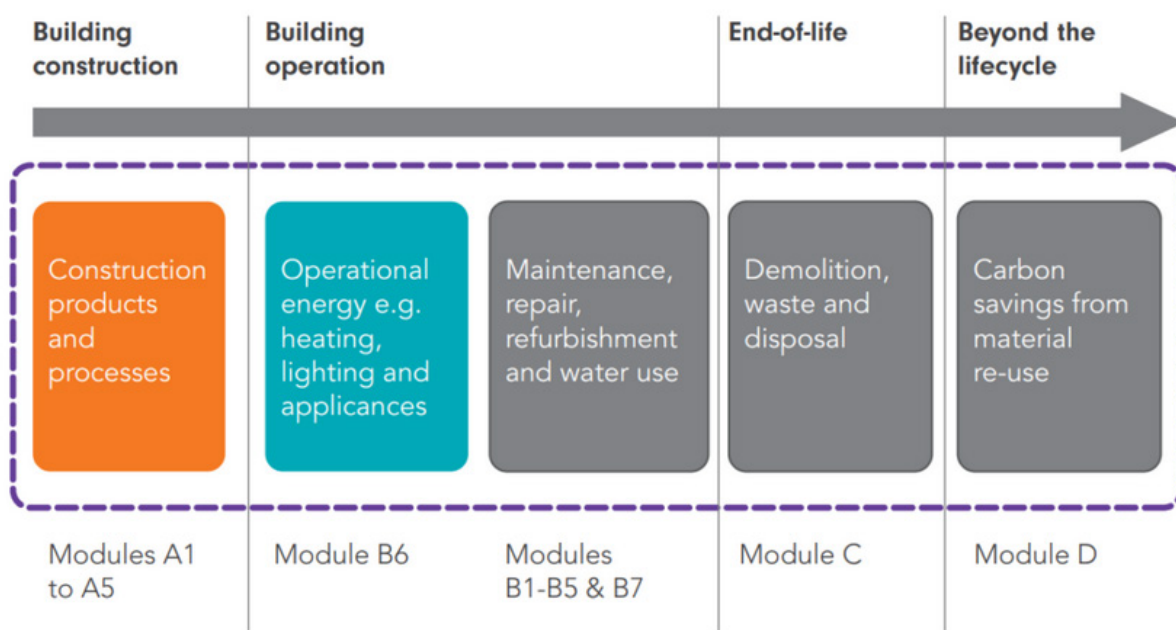
hosted by Jonathan Lynn, seeking ideas as to how he could retrofit his Category A Listed apartment to do the same. Plus we have reviews of two books about design for people with dementia.

SEDA Specification has Peter Wilson of the Mass Timber Academy following up his series of article, this time about CLT. SEDA Land is launching into game development. Colin and Glo, of SEDA Solar, build on their very successful series of seminars with 4 and 5 covering building integrated solar design and how China’s PV industry is expanding.




Then we have a new SEDA magazine sub-group, SEDA build. Our correspondent, Duncan Roberts, reports on the feedback from SEDA build’s Bridgened Bothy, which recently formally opened.

Finally, chairperson Catherine Cosgrove updates us on how SEDA is developing.

The magazine team is looking for helpers and contributors. If you have ideas for articles or subjects that should be covered, drop us an email. We welcome comments or questions, so please do not be shy. Also, remember that you receive this edition via a link to SEDA’s website but remember, you can order a lovely hard copy magazine via the SEDA [shop](#). ■



All Modules referred to are from EN15978 Sustainability of construction works – Assessment of environmental performance of buildings – Calculation method

-  Net Zero Carbon – Construction (1.1)
-  Net Zero Carbon – Operational Energy (1.2)
-  Net Zero Carbon – Whole Life (future development) (1.3)

# UK Net Zero Carbon Buildings Standard

RIBA press release Autumn 2022

## Coalition launches call for evidence

The coalition developing the UK's [Net Zero Carbon Buildings Standard](#) (NZCBS), has today launched a call for evidence.

The cross-industry team, of which the Royal Institute of British Architects (RIBA) is a member, is calling on practitioners from across the UK built environment industry to supply operational energy and embodied carbon performance data for their buildings. The evidence base will help to inform and guide the development of the standard - a single agreed definition and methodology for the industry to determine what constitutes a net zero carbon building.

Firstly, the NZCBS coalition is seeking operational energy data for buildings - specifically in-use consumption data from the best performing existing buildings, and modelled performance data for buildings in design or construction. This data will enable the NZCBS development team to understand what today's benchmark for energy performance is, and what current and future best practice might look like. As part of this, the NZCBS is also calling for experts to assist with energy modelling - more information on this can be found in the call for evidence guide.

Secondly, the NZCBS team is seeking embodied carbon data from both new construction and retrofit projects. This will enable the NZCBS development team to set out benchmarks for embodied

carbon emitted in the construction process of different building types across the UK.

Participants are invited to submit data via the [Built Environment Carbon Database](#) (BECD). The deadline for submitting data is 16 December 2022. The NZCBS call for evidence coincides with the launch of the beta version of the BECD this week.

Those with operational energy and embodied carbon performance data to share are encouraged to review the call for evidence guide, available on the [project website](#) with more detail on the process for supplying data.

For additional guidance on the relevance and suitability of data required, the team can be contacted on: [energydata@NZCbuildings.co.uk](mailto:energydata@NZCbuildings.co.uk) or [Embodieddata@NZCBuildings.co.uk](mailto:Embodieddata@NZCBuildings.co.uk), depending on the type of data in question.

Chair of the UK Net Zero Carbon Buildings Standard Governance Board, **David Partridge**, said:

*"If the real estate industry and built environment is to seriously address its impact on climate change, a universally adopted Net Zero Carbon Buildings Standard is essential. We are looking for built environment professionals to contribute data from a number of different asset types to develop a single, agreed methodology and for all stakeholders in the real estate industry who will be using the Standard to get involved to formulate it appropriately. Please contribute*

*to our call for evidence and join us in our update event to learn more about our plans and programme for developing and testing the Standard."*

Chair of the UK Net Zero Carbon Buildings Standard Technical Steering Group, **Clara Bagenal George**, said:

*"Not only will this project deliver much needed clarity on how to verify net zero carbon buildings in the UK. But it also brings together key organisations that have been working in this space, to create a robust, industry led Net Zero Carbon Buildings Standard, created through consensus and collaboration based on science." ■*



# K2: Zero Energy Building BEL, Bergen

**Marie Berge Holmen: Group Leader for Building Services Design, Sweco Norway**

This article gives an example of what Net-Zero can look like when applied to a new academic building. In this case, the 'K2 Building' at the Western Norway University of Applied Sciences in Bergen.

From the outside, it looks like a normal building. But inside its modest exterior the new building hides some very special features.

As we enter this new university building, we reach an atrium with an indoor garden. K2 was completed in 2020 and has been named the 'Garden of Eden' – where wood dominates all surfaces and bushes and trees have been placed in the building and will be allowed to reach up to the skylight, five stories above.

The Contractor, Kruse Smith, has constructed the building with Sweco Norway acting as the Engineering Consultants for energy, HVAC, and electrical engineering. The architects were [L2 Arkitekter](#). The project has extremely ambitious climate and energy aims. In order to meet these, Sweco, in collaboration with the Architect, Client, users, and contractors, has managed to find holistic solutions for all areas of the building. The best available solutions have been used, particularly when it comes to environmentally friendly materials selection and reduced energy consumption. The result is a zero-emission building that produces more energy than it consumes.

## K2 stats

The K2 Building has a reduced building materials embodied carbon by 40% and has an overall reduced carbon footprint of 30% compared to a traditional academic building. In order to reach these values, it has been essential to use low-embodied carbon concrete. The building has been rated as BREEAM Excellent and a qualified Zero Emission Building (ZEB-O+EQ).

ZEB-O+EQ stands for Zero Emission Building excluding user equipment and is defined by the Research Centre on Zero Emission Buildings Norway ([www.zeb.no](http://www.zeb.no)), as one of five levels of ZEB ambition, see Figure 1. This means that on-site renewable energy generation compensates for the energy consumption to operate the building, minus the energy consumption of user equipment, such as plug loads. A typical university building has a building regulations requirement of 125 kWh/m<sup>2</sup> per year, the K2 Building has a calculated energy consumption before the contribution from the solar PV array of only 38 kWh/m<sup>2</sup>. To achieve this, there has been a need to significantly limit energy consumption from the mechanical and electrical building services. Figure 2 shows the comparison in energy demands between typical university buildings and the K2 Building.

K2 has been constructed with a compact form, with high levels of insulation and airtightness. This has reduced winter heat loss. In order to reduce the building's cooling load, external solar shading has been installed on all facades exposed to the sun. Bergen is known for being the city where it always rains, so there is no shortage of water for adiabatic cooling of the ventilation system. This reduces the power demand for cooling considerably, by around 40%, depending on the desired supply air temperature and humidity of the outside air.

An important factor in reducing building energy demands is to minimise pressure loss and therefore energy consumption for fans and pumps. All HVAC components have therefore been sized with generous dimensions. Air handling units (AHU) are located in the basement and require large plant rooms in order to achieve low specific fan power (SFP) values. The AHUs are fitted with high-efficiency heat exchangers to recover waste heat.

In order to minimise ventilation rates and heating requirements, efficient lighting and room climate controls have been installed.

In the basement, domestic hot water is heated by a heat pump which uses CO<sub>2</sub> as a refrigerant. This allows high temperatures for the DHW to be reached and provided efficiently.

Images:  
 Below: ZEB ambition level definitions (Fufa et al, 2016, as published in ZEB Project report 30-2017, <https://tinyurl.com/2nbckuww>)  
 Bottom: Comparison in annual energy demand for the K2 Building and typical university buildings.

### Heat & coolth

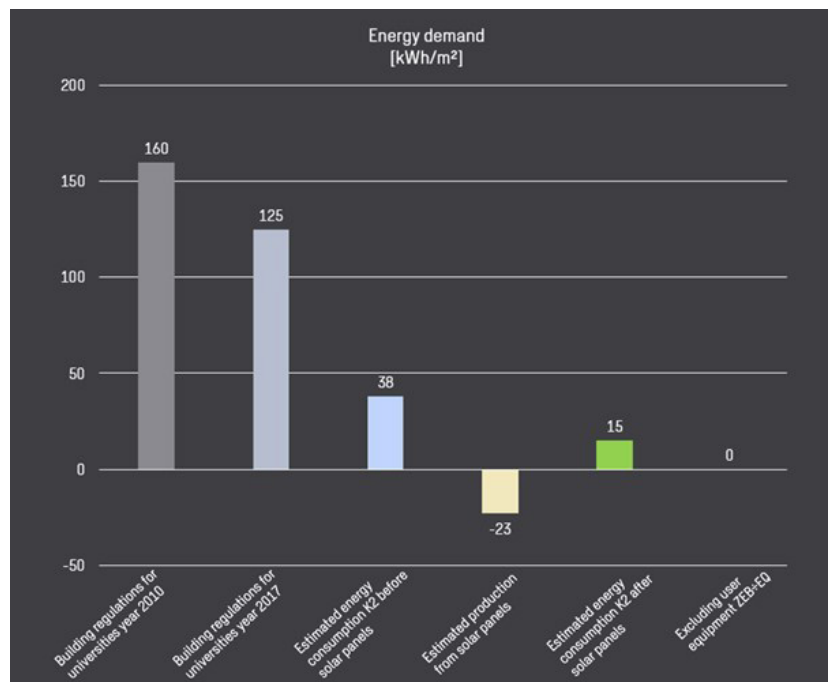
Heat for space heating, like many Scandinavian buildings, comes from elsewhere, from reversible heat pumps in an adjacent building. These are ground source heat pumps, and the borehole field has been expanded to service the K2 building by increasing the number of boreholes to 95, with each one reaching down 220 metres below ground.

A large underground cold storage facility has been added, which acts as a store for coolth. It is charged at night, then discharged during the day either through cooling coils in the AHUs or fan coil units mounted in the ceilings of the teaching rooms. The cold storage contains 12,000 cooling elements in four large tanks.

In order to produce enough renewable energy to compensate for the building's greenhouse gas emissions, the entire nearly 2,000 m<sup>2</sup> roof is covered with solar PV panels with a rated output of 340 kW<sub>p</sub>, see Figure 3. The Bergen weather can be grey and wet, but the PV panels are able generate sufficient power over the year.

The result is a zero-emission building that can produce more energy than it consumes.

K2 is a teaching building in a special class and in 2021 was nominated for the 'School Building of the Year' award. ■



**Zero Emission Buildings Definitions**

A zero emission building produces enough renewable energy to compensate for the building's greenhouse gas emissions over its life span. The Norwegian ZEB research center has defined different levels of zero emission buildings depending on how many phases of a building's lifespan that are counted in. The main ambition levels applied by the ZEB research center are described as follows:

**ZEB-O+EQ:** Emissions related to all energy use in operation "O" except energy use for equipment/appliances (EQ) shall be compensated with on-site renewable energy generation.

**ZEB-O:** Emissions related to all operational energy use "O" shall be compensated for with on-site renewable energy generation.

**ZEB-OM:** Emissions related to all operational energy use "O" and embodied emissions from materials "M" shall be compensated for with on-site renewable energy generation.

**ZEB-COM:** Emissions related to construction "C", all operational energy use "O" and embodied emissions from materials "M" shall be compensated for with on-site renewable energy generation.

**ZEB-COME:** Emissions related to construction "C", all operational energy use "O", embodied emissions from materials "M" and the end of life "E" shall be compensated for with on-site renewable energy generation.

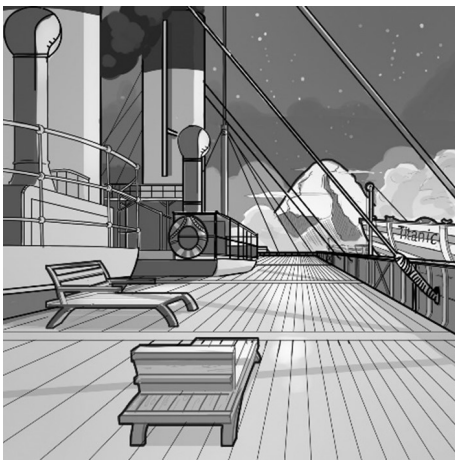


Images:  
Below: BEL Exterior, L2 Arkitekter.  
Bottom Left: BEL Atria, L2 Arkitekter.  
Bottom Right: BEL Section, L2 Arkitekter



# You know the answer, now what?

**Professor Susan Krumdieck, Chair in Energy Transition Engineering, Heriot-Watt University Islands Centre for Net Zero (ICNZ), Orkney**



Have you ever felt like you know the answer, but that delivering the sustainable solutions just seems impossible? What are the mechanisms for changing course?

Let's do a thought experiment involving a time machine, four SEDA members and a ship.

Your team includes Glenn, a practical guy from Glasgow, Ellen, a thinker from Edinburgh, and Paul, a passionate guy from Perth. You arrive in 1912 on the deck of the Titanic, on the second day of her maiden voyage to New York.

Good thing your team have perfect knowledge of the future pathway.

The ship is at full steam on a direct collision course with a massive ice flow. At 11:38 tonight the lookout, Frederic Fleet, will spot the iceberg and raise the alarm. The ship will take emergency action, turning hard and reversing engines, but with less than two minutes left to act, there is no hope of avoiding the disaster. The innovations and technology solutions built into the ship will not hold. The hull will be breached along the starboard side. The ship and more than 1,500 people will be gone in less than three hours.

You know catastrophe is coming, so what do you do?

*Yes, this is a thought experiment examining what we can do to slow down the technical enterprise and change course. This is a model for the complex human system of actors and roles in our industrial society. Yes, we are on a collision course with global warming and ocean acidification as the result of our successful, comfortable and titanic industrial technical enterprise.*

Glenn urges the team to grab a lifeboat and save yourselves. There are only enough lifeboats for one third of the passengers anyway. Ellen points out that taking that lifeboat might not save your team – you will be in the middle of the Atlantic and no one will know you are there. She also points out that this action will condemn at least 75 people to death.

*Yes, this is like wealthy Europeans buying up EVs, PVs, and batteries for their energy needs. Shouldn't resources be prioritised for long-term essential needs of many rather than short-term consumer comforts of a few?*

Titanic's wireless operators, Jack Phillips and Harold Bride, will receive no fewer than seven iceberg warnings throughout the day. The final message at 10:55pm will give the exact location of the iceberg that will sink the Titanic. Glenn suggests convincing the wireless operators to be more urgent in delivering the information to the navigators. Don't let them get distracted by all of the first-class passengers sending messages to their friends in New York and London. But Jack and Harold feel they are doing their job as required.

Image:  
Overleaf: Titanic, Susan Krumdieck

*Yes, this is like the climate scientists doing their job of observing the climate crisis and writing their papers giving the warnings.*

Ellen suggests convincing the navigator to plot a new course. But the chief navigator explains that the course is set by the business plan. The first-class passengers mustn't be late. It's all determined by the market.

*Yes, this is like the economists and business leaders believing the Market Forces will solve the climate crisis. Green Growth policies! Full steam ahead!*

*Paul wants to act, glue himself to the doors and occupy the bridge. He will demand the Captain, Edward J. Smith, take action to slow the ship and change course! Maybe throw soup on the White Star Line logo!*

Ellen points out that the Captain is at dinner with company chairman, J. Bruce Ismay, Titanic's designer, Thomas Andrews, and millionaire Isidor Straus, owner of Macy's Department Store. This is where the real power is. If we want to slow down, change course, and save the Titanic, then we need to get into the first-class dining room. We need to urge the designer to admit the ship really isn't unsinkable. We need to convince the chairman of the asset risk and that he has to change the business plan. We need to explain to the millionaire that the Atlantic is going to be cold. We need to call on the captain to take action! The problem is the stewards at the door of the first-class dining room refuse entry.

*Yes, we expect politicians, business leaders and wealthy elites to steer the technical enterprise away from disaster. They are the ones with the power to change the course of the technical enterprise... but it is time to get realistic and think of something else.*

Paul heads down to lower decks to agitate the economy class passengers. He plans to organise a protest demanding action. But it's past bed time. The folk are on the way to low-wage factory jobs in America. They are hoping for some sleep. Most don't believe there could be any problem with the ship. If there was a problem, the captain would take care of it. They are afraid to make trouble.

*Yes, the public are too tired to get involved in climate actions. They don't want to change anything.*

You know that the ship can't be saved because it is under full steam heading straight into an iceberg. Ellen understands thermodynamics, and she suggests a radically bold move. Your team will go all the way to the lowest deck of the ship. There are no guards on the door. You just have to convince the fifty men shovelling coal into the ship's engines that the ship is speeding toward danger. Explain about the warnings from other ships. Explain that the navigator knows the ship is on a collision course. Ask do they really think a ship is unsinkable? And finally explain that the captain is busy in the dining room with the 1% and there is no way that things will change in time. How can your team help them take the only action that

will save the ship? How can you convince them to take responsibility for the lives of the passengers and crew, to save the ship from disaster, and just slow down the rate of production of energy? They need help to find the courage to slow down the energy supply and change the business plan. What if the Captain gets mad, what if some passengers complain?

*Yes, this is like ecological designers working with engineers to just slow down the technical enterprise and help business and citizens adapt. Energy transition requires downshift of the high fossil fuel burn rate and remodel of business plans. Professional duty of care sometimes requires courage.*

SEDA members, please join with the Global Association for Transition Engineering, and let's change the future.

*Professor Krumdieck's book, Transition Engineering, Building a Sustainable Future (CRC Press, 2020), starts with the thought experiment of how to save the Titanic and continues on to set out the approach, methods and tools for this corrective trans discipline. The Global Association for Transition Engineering is a registered professional organisation providing courage to deliver the duty of care for energy transition.*

[www.transitionengineering.org/book](http://www.transitionengineering.org/book)

# Patrick Harvie: Secret Santa or Ghost of Christmas?

**Tom Morton: ARC Architects**

## What do we want from our leaders? A moot question this year.

At COP27, we saw humanity continue its struggle to deal with our existential challenge in an equitable and effective way. Was there much improvement since COP26, where many were excluded from the debate, never mind the decisions? The powerful thinking they must limit engagement and inclusion in order to achieve 'sensible' decisions and 'effective' delivery.

All the more disappointing then, that the political leader, who most directly relates to SEDA, Scotland's Minister for Zero Carbon Buildings Patrick Harvie, is deaf to the voice of Scotland's sector representative body for designers of a zero carbon built environment. Nearly a year ago, SEDA's 10 official observers at COP26 wrote to Minister Harvie, reaching out with 20 specific points of mutual engagement. While not an exhaustive list of what needs to be done to avert a climate catastrophe, as the letter says, the recommendations, "bring together the insight we gained and shares our consensus of the key specific actions that are within the power of the Scottish Government to deliver in the coming two parliaments." We received no response. Ten months later we wrote again, and again no reply.

Sadly, this is not the first time. When we asked all parties to answer SEDA members' questions for the 2021 elections, we got replies from Labour, Liberals and the SNP, but not from the Green Party.

After yet more pressure from SEDA, the minister's office replied on 30th November promising a "comprehensive response" and thanking us for our patience. What does this say about the Scottish Government's commitment, or even competence, to deliver "zero carbon" by 2045? At long last, however, and just as we went to press, the minister's office responded with a two page summary of what the Scottish Government has done or intends to do regarding heat in buildings and a nod to reducing embodied CO2. While this does not address SEDA's 20 recommendations, the minister has at least offered "to be invited to, and attend events about heat decarbonisation," Watch out for Patrick at a SEDA event in 2023!

## Just Transition

Scotland needs an effective partnership between government and civil society if we are to achieve a Just Transition away from our county's culture of environmental destruction. Because the problem is culture, much more than carbon. And the 'Building' in Patrick's Ministerial title is really about building as a process, much more than a product. We need to build a broad consensus for a new, progressive culture of construction.

Governments have traditionally seen the construction sector as a lever for economic growth. It should surely also be a lever for equality, for health, biodiversity and the circular economy. Public procurement, as a tool to deliver social and environmental progress, rather than economic growth.

But that requires huge change from a sector whose inertia holds it back, stuck in patterns of self-harming behaviour that creates 40% of our solid waste, as well as 40% of our carbon emission, where painters die before their time because of the products they use, where modern apprentices are 97.3% male and where men are three times more likely to die by suicide if they work in construction. These are individual symptoms of a deep cultural malaise that needs leadership in positions of power to relegate to history.

## Carrots & sticks

Patrick's ministerial leadership pack contains the sticks of Building Standards and Planning controls, with the carrots of huge public procurement funding. Organisations like SEDA can help make the sticks better targeted and the carrots more nourishing. But his bag must also hold hearts and minds. Lack of stakeholder inclusion in the construction sector is one of its deep-rooted weaknesses, an addictive bad habit that holds back progress. Hearts and minds deliver culture change in a way no stick or carrot can, but the agenda for a shared future has to be set from the top while fed from the ground.

It's interesting to compare the discourse between government and civil society between our various crises. With the pandemic, every day Scotland's Chief Scientific Officer and First Minister were on the TV and radio communicating with the public, with the Cost of Living Crisis there have been emergency financial measures and bills quickly passed to

restrict rent rises. But with the climate & biodiversity crisis, when the Climate Change Committee has for years said there needs to be urgent action in Construction, we have never seen Scotland's Chief Architect on our screens, and half my office has never even heard of Patrick Harvie, didn't know we had a Minister for Zero Carbon Buildings. Crisis, what crisis?

### Wellbeing

As we Scottish ecological designers navigate this landscape of culture change, we seek out fellow travellers for mutual support and to achieve more. We do that individually by joining SEDA and other organisations, including political parties. SEDA does it by working with other organisations, like we do through the brilliant SEDA Land, and recently through participating in the Scottish Wellbeing Alliance of 115 charities, economists, businesses, trade unions and academics who sent a joint open letter to Scotland's First Minister calling for an "urgent transition to a Wellbeing Economy."

As the recent climate marches show, we have many fellow travellers. Why not come and meet some at SEDA events—Show & Tells, Green Drinks, and SEDA Assemblies (see Catherine's Thoughts). You can tell me what's wrong in my analysis and how we can better engage with government. The door is open. Everyone's welcome. Merry Christmas and let's work together for a happy new year. ■



## AN OPEN LETTER FROM THE SCOTTISH ECOLOGICAL DESIGN ASSOCIATION TO PATRICK HARVIE, SCOTTISH GOVERNMENT MINISTER FOR ZERO CARBON BUILDINGS

20 Recommendations to deliver COP26 from 10 Sector experts who were there. SEDA recommends that the Scottish Government (SG) implement the following.

### Energy Efficiency

1. Begin in 2022 a programme to insulate buildings along the lines of the Scottish Government strategy plan Developing Net Zero Technical Solutions for Scotland's Future Mass Retrofit Housing Programme, August 2021
2. Urgently update Energy Performance Certificates to best practice. This is currently widely recognised as a failing system
3. Establish a cross-sector Housing Retrofit Technical Task Force to optimise mass retrofit programme delivery, ensuring efficiency and effectiveness, with proper professional and statutory oversight to ensure quality control of outcomes from Government and private investment
4. Ensure that the commitment to 'zero direct emissions' is definitely introduced in 2024, and that compliance be assured by independent testing of actual performance, prior to issue of Building Standards Completion Certificates.
5. Create a requirement of all applications for Planning Consent for new construction projects to provide a Zero Emissions Plan.

### Embodied Carbon (Scope 3 Emissions)

6. Introduce measurement of embodied carbon into Building Standards for all buildings
7. Create a national methodology for the benchmarking of re-used and re-cycled materials on site
8. Introduce a requirement for Design for Disassembly as part of Buildings Standards approval
9. Introduce progressively increasing financial penalties for construction waste to landfill, with effective enforcement
10. Lobby the UK Government to progressively reduce VAT on refurbishment to remove the financial incentives to replace buildings
11. Take steps to reduce unwarranted demolition and dereliction, specifically, introduce an assumption against demolition and for re-use in the Planning process
12. Commit to implementing the UK Green Building Council Whole Life Carbon Roadmap
13. Convene a 'Clean Construction Taskforce' to advise the Scottish Government on decarbonising the construction sector, bringing together all stakeholders and sector expertise
14. Increase funding for the Construction Scotland Innovation Centre and enhance its operational focus and outcome delivery, with a remit to foster development of new bio-composite materials designed to enable zero carbon construction and increase carbon captured in buildings
15. Develop a specific sector strategy to reduce Scotland's consumption of carbon and steel

### Public sector procurement

16. Require all public bodies to annually report their carbon emissions
17. Make the Net Zero Public Sector Building Standard, which is currently optional, a mandatory requirement by 2024
18. Follow France's example and legally require public sector buildings to be made from minimum 50% biomaterials
19. Commit to the 110,000 new homes planned for Scotland by 2030 to be 'near zero' embodied carbon as well as zero carbon in use
20. Create a diverse cross-sector Advisory Panel to advise it on efficient and effective delivery strategies to decarbonise the built environment, similar to Denmark's National Strategy for Sustainable Construction

Yours sincerely

Catherine Cosgrove (Chair), Tom Morton RIAS, RIBA, EBUKI, David Seel MA Hons, MSc Ran Boydell B.Sci.Arch, Dip.Arch, Natasha Houchin ARB, RIAS, RIBA, Gordon Duffy Dip ID, MA, RIBA, FRIAS, David Somervell BArch, Kyle Henderson, Eamon McGarrigle, Emma Donnelly ProfDip BSc, Gloria Lo MA, MArch RIBA RIAS ACAN Lillian Johnstone BSc BArch RIBA FRIAS APM IMaPS Dr Richard Atkins RIBA, FRIAS, FRSA, Matt Bridgestock RIAS RTPI, Prof. S. Halliday FWES FRIAS FRIBA.

# Wellbeing Economy Alliance: letter to the Scottish Government

<https://www.weallscotland.org/post/letter-to-fm>

SEDA is proud to add its name to the long and incredibly august list of 115 charities, economists, businesses, trade unions and academics to send an open letter to Scotland’s First Minister calling for an “[urgent transition to a Wellbeing Economy](#).”

The letter was sent ahead of the Wealth of Nations 2.0 Conference, urging Nicola Sturgeon to transform Scotland’s National Performance Framework into a Wellbeing Framework and strengthen its power and reach; use devolved tax powers to share wealth more evenly, invest in social security, universal basic services, public sector wages and environmental improvements; and to reshape the business support landscape to prioritise the kind of enterprises that enhance our collective wellbeing.

The Scottish Government’s National Strategy for Economic Transformation contains the aspiration to become a “Wellbeing Economy”, but a narrow focus on GDP growth grounds the strategy in “the same logic that has delivered decades of poverty, inequality and environmental degradation.” In a supporting statement we have set out our collective vision of a Wellbeing Economy, which we define as one that “delivers good lives for all people and protects the health of our planet.” ■



# The complexities of electricity pricing

**Adrian Loening: Director, Mór Hydro Ltd.**

The fundamental problem for electricity grids is continuity of supply. As I write this article, on a cold November day, with little wind and the sun setting, the UK is demanding 40.84GW of power of which more than half is coming from gas power.

We expect the power to be on at all times and we expect the quality (voltage and frequency) of that power to reach unbelievable levels of consistency. At the same time we would like our power to come from the cleanest source possible at the lowest price available. But of course demand and supply of electricity does not always match. So how do we go about fulfilling the expectation of energy supply?

## National Grid

Quality of electricity supply is an obligation placed on electricity network operators and necessarily relies on the networks of high voltage cabling, the transmission grid. The transmission system is controlled by National Grid who closely watch demand and frequency of the system and can call of generating resources to provide, or stop providing, power at very short notice in order to keep the grid stable. Exactly which generators are used to do this depends on the speed of response required. Some generators (mostly gas and pumped hydro) are kept spinning but not generating and the momentum in those machines can provide almost instantaneous support for grid frequency. As frequency starts to fall other rapid generators can be brought

on line and this is usually, in order of speed of response, pumped hydro, gas, import across interconnectors and large scale wind (if available). All of this has a cost, payment for maintaining 'spinning reserve' or payments for constraining output when generation exceeds demand, and purchasing fossil fuels to fill the gaps. What cannot be quickly changed are the base load technologies primarily nuclear. And, as exemplified by the weather today, we remain highly reliant on gas generated electricity.

## Tariffs

Since 1990 the UK government has had a number of schemes to support the development of nuclear and renewable energy generation.

- Non Fossil Fuel obligation
- Renewables Obligation
- Feed in Tariff

All of these schemes provided for a more guaranteed revenue stream for both large and small renewable energy projects. Each scheme was funded by a levy on energy bills, which currently totals around 13% of the pre-VAT charge per kilowatt hour (kWh).

All generators will contract to sell their power to an electricity supplier and, depending where they are located in the country, will contribute to the cost of operating the local distribution network

and the national transmission network. The smaller renewable energy schemes, under 5MW and built over the last twelve years, will receive a fixed income under the Feed in Tariff as well as any income they obtain from selling power under a power purchase contract.

Suppliers of electricity then have to match the power that they sell to the power that they buy from generators, both in terms of quantity and time of supply. Any shortfall in matching that energy supply will be made up by National Grid primarily by buying power from gas generating stations. Those costs are charged to the energy suppliers through a balancing mechanism, worked out some months after the time of supply.

The result is that suppliers costs of buying energy are currently tied closely to the price of gas. Energy suppliers that sell wholly renewable energy generally do so by receiving Renewable Energy Guarantees of Origin (REGOs), which may be generated at a time different to the time of energy supply. But over any accounting period, if they can obtain sufficient REGOs to cover their total supply, then they can effectively use the grid as a bank and claim theirs as 100% green energy supply.

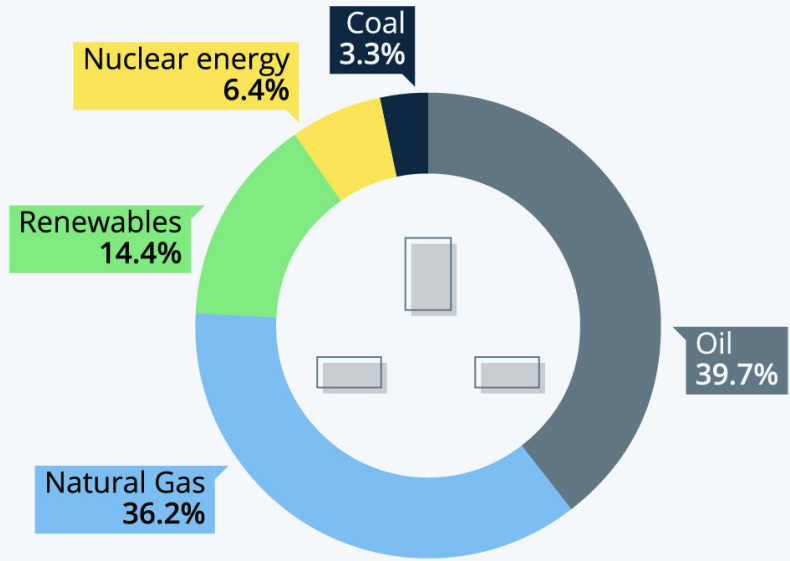
## Prices

Now, of course, in recent months the international price of gas has risen extremely sharply, largely resulting from the conflict in Ukraine, although gas prices were rising before that. So the cost of the



# The UK's Energy Mix

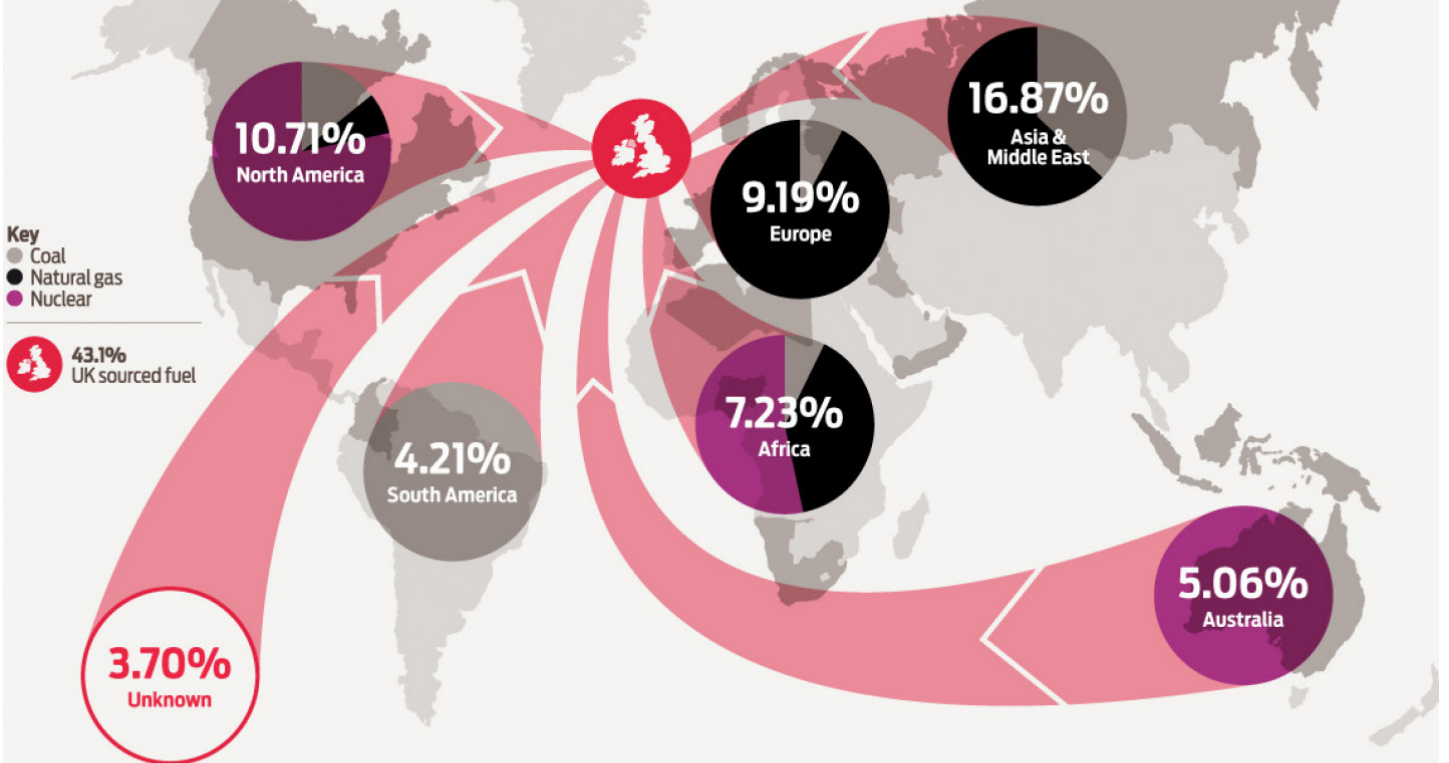
Primary energy consumption of the UK in 2019, by fuel type



Primary energy comprises commercially traded fuels, including modern renewables used to generate electricity.  
Source: BP



## Where the fuel to produce electricity in the UK comes from



It has not been possible to calculate the country of origin for 3.7% of the fuel used to generate electricity in the UK due to lack of available fuel tracking data.  
Data analysis by Good Energy using available UK Government and EU data for 2010. UK fuel exports excluded. For full details of the method adopted visit [goodenergy.co.uk](http://goodenergy.co.uk).



Images:

Previous, top: UK Energy Mix, Statista

Previous, bottom: Where the fuel to produce electricity in the UK comes from, Good Energy

Below: Control Room, National Grid

grid balancing mechanism has resulted in dramatic increases in electricity prices. Many UK electricity suppliers, who had agreed fixed tariff with their customers and not agreed sufficient forward energy purchase contracts, got into trouble. Gambling on energy future energy prices, they were unable to pay for the energy they supplied when prices rose substantially.

So what can be done about it? The UK government has come up with four schemes, each of which has some merit but none of which forms a long term solution;

1. Simply pay domestic consumers a sum of money to help with their energy bills. Not a long term solution at all, but undoubtedly will help consumers in the short term, but does nothing to reform the market

2. Remove the renewable energy levy on domestic bills and bring that into general funding from taxation. That is

also a temporary scheme and, as with the consumer bill support scheme, increases government borrowing or the requirement to raise general taxation

3. The Energy Prices Act allows the government to claw back some of the additional revenue that renewable energy generators end up receiving as a result of the high market value of power

4. An Energy Profits Levy, in the form of a “windfall” 45% tax, will be raised from large nuclear and renewable generators on profits made where their wholesale prices exceeds £75/MWh. With legislation still to be brought forward the exact details are unclear, but this levy is expected to run until at least 2028 and is projected to raise £14.2b over the six year period.

So is this the solution to the current energy price crises? In part, and in the short term, it might help, but the real

solution is to de-couple the international price of gas from the UK energy market. The only way to achieve this is to reduce the consumption of gas for electricity generation to zero. And the way to do that is to encourage huge scale investment in renewable energy (not nuclear for many reasons, but certainly because it is too slow to develop) along with massive energy conservation projects. Adding additional taxes to renewable energy production is counterproductive. Those windfall profits currently being made should be ploughed back into renewable energy investments, both large and small scale, through a system which rewards the risk taken by investors and communities without giving the future opportunity for excessive profits. ■



# What crisis?

**Catherine Cosgrove: SEDA Chairperson; associate Austen Smith Lord architects; BSc (Hons) BArch RIBA RIAS**

The energy crisis is never far from the headlines, so here are a few articles about how to reduce energy use. SEDA Chairperson, Catherine Cosgrove, drew up some basic measures with which many SEDA readers will already be familiar. These are just a start, of course, and we will include more in forthcoming editions.

We also have a personal, hands-on account of retrofitting her ground floor tenement flat to improve her comfort and cut down bills.

Cut out draughts and reduce your heating bills

All buildings change a lot over time. If there is any movement between solid building elements, hairline cracks can appear. The cracks can allow warm air from within a building to escape and cold air from outside to leak in. This uncontrolled air movement can add up to 10% onto the cost of your heating bills. If you know where to look for the most common places for those cracks to form they can be repaired fairly easily. Here are five places to look for and stop up draughts:

## Windows

There are a lot of different junctions around windows where draughts can occur. The first place to look is at the junction between the window and walls, on both the inside and outside. The seal at this junction can shrink over time. Make sure that it runs

continuously and repair it where necessary. Window sills can also move slightly and cause hairline cracks all around them which might need re-pointing. Another junction to check is between the opening sections of the window. These can be more expensive to fix and you may need a joiner's help. If you have wooden shutters that have been painted shut, think about getting them working again. Recent tests on how to cut down heat loss through tenement windows showed that closing shutters could cut heat loss by 50%.

## Doors

Doors and windows have a lot of similar problems. With doors the biggest problems is the gap between the door and the frame. A draught strip around the frame could help, especially at the bottom edge of the door. In front doors, letterbox openings can also be a source of draughts. Adding an inner flap to the letterbox can help reduce the air leakage.

## Skirting boards

Ground floor timber joist constructions in older buildings tend to have no insulation below the floors. There should be some sort of ventilation path present below this type of floor which helps to remove any condensation that might be present below the floor but that doesn't mean that you shouldn't try to cut down uncontrolled draughts. If you ever have any reason to lift the floorboards then that's the time to add in insulation. Any ventilation below floor joists will find a way through the junction where the floorboards meet the wall. Consider sealing the gap between the bottom of the

skirting boards and the floor with some mastic.

## Ceiling junctions

Where ceilings meet external walls can also be vulnerable to draughts, especially those at eaves level. I like to use an extra timber batten behind this wall to ceiling junction when designing new buildings to block any ventilation path but a similar solution in existing buildings would be to tape up the junction or seal it with mastic.

## Incoming services

Services entering and leaving a building can be changed many times over a building's life. It's quite common for workmen to drill a hole into an external wall or floor to feed in the new services and these holes are often not fully sealed up when the work is complete. Check where your services enter into the building and also where drainpipes, overflow pipes, boiler flues and extract fans leave the building. Fill up any holes with expanding foam or with a special collar or the site of pipe or flue.

## Take control of your heating system

Energy prices are still rising and it costs more every year to heat our properties, but there are some simple steps that everyone can take that might help to cut those bills right away. Heating systems come in many varieties and you have to learn how they work to get the best from yours. Here are five ways to taking control and make savings on your heating bills:

Images:

Below, left: Boiler servicing, Shutterstock

Below, right: Hot water tank jacket, Stevenson Plumbing

Bottom, left: Loft Insulation, Shutterstock

Bottom, right: Radiator TRV, Shutterstock



### Find out how your boiler works

If you don't have an instruction manual, try searching online. Most boiler suppliers will provide electronic copies of your manual and sometimes they have a quick start guide available as well. Some boilers' controls will allow you to have summer and winter settings, but some of the newer ones will let you set several different programmes, which you can use for weekdays and weekends settings or some that can be used in spring and autumn. A lot of people had problems over this winter, because they didn't know that their gas boiler had a condensate drain. This is a pipe that runs from the boiler out through an external wall and is used to drain condensation that occurs through the boiler combustion process. Freezing temperatures in winter caused the condensation to freeze at the outside end of the pipe, blocking it and forcing the remaining condensation back up to the boiler. It would have been a simple matter to check and clear this type of pipe, if people had known about it.

### Get your boiler serviced every year

This seems like an obvious thing to say, but a faulty valve or control panel is often the root cause of wasted energy and is more likely to be found quickly if you have a regular maintenance check. And if you couldn't find a boiler manual ask the engineer to show you, how to change the settings. Make sure you ask as many questions as you need, so that you feel comfortable in making changes regularly.

### Turn down the temperature of your hot water

Try turning the temperature of the hot water down by a few degrees. This will save you money without much noticeable difference from the water coming out from your taps.

### Turn down room and radiator thermostats

Does your property have any room thermostats? Try turning these down by a degree every few weeks from now until your next energy bill comes in and see if it makes a difference. A lot of radiators have thermostatic control valves as well. You can use these to locally control the radiator temperature. If there's a room that you aren't using very often, then turn the radiator temperature down.

### Bleed your radiators

Do you have radiators with hot water in them? Sometimes air can get into the system and cause cold spots. You can get a radiator key from your local DIY store that fits onto the valve at the side of the radiator. Turn it a little and any trapped air will come hissing out, but be careful, you don't want the water to come out as well. If you find that you have to bleed air from your radiators regularly, then there might be a leak somewhere in your heating system, so get into the habit of checking them every few months. ■

# My Retrofit Journey

**Lisa Ann Pasquale: architect [sixcylinder.wordpress.com](https://sixcylinder.wordpress.com)**

**Lisa Ann Pasquale is an architect whose focus is on building performance sustainability through low-energy designs. Throughout lockdown, she retrofitted her own tenement flat. She shares what she learned along the way.**

How is it possible to combat both the climate crisis and energy price hikes from home? By changing things at home. One way of doing this is a retrofit. By modifying the existing traditional structure, both energy bills and usage can be dramatically slashed. But what is it like to retrofit your own flat... by yourself?

**How did you go about beginning such a huge endeavour as retrofitting your whole flat by yourself?**

I trained as an architect and a bench joiner, so I've always been quite hands-on in terms of building things. I intentionally chose a flat that needed work which was within my capabilities. I still needed tradespeople for electrics and boiler replacement, but the insulation and joinery was mostly done by me. I was frequently advising my clients on 'the correct way of doing things', but there were always pragmatic and financial barriers. I figured, I needed to not only take my own advice, but also have the hands-on experience of attempting this myself and experiencing the frustration. By actually being in the thick of it, I could see if I could find better ways of doing things, so I could advise my clients better.

**What was the high point of your retrofit?**

My bathroom was freezing, due to a very poorly fitted bathroom installed before I bought the flat. For five years, I couldn't get a hot bath. The water would cool before the tub filled and the room was so cold, my teeth would chatter. So, once I'd finished the insulation, draught-proofing, and installed a new bath in that room, the first time I got in a genuinely steamy-warm bath, I was so excited I nearly cried. I have a bad back, so being able to soak it in a hot bath is bliss. Read more: [The Retrofit Revolution](#)

**What was the low point of your retrofit?**

I had to do a lot of stripping out of previous work to do what I wanted and that genuinely got very tedious. I found that there was always twice as much that I needed to strip out than I had anticipated.

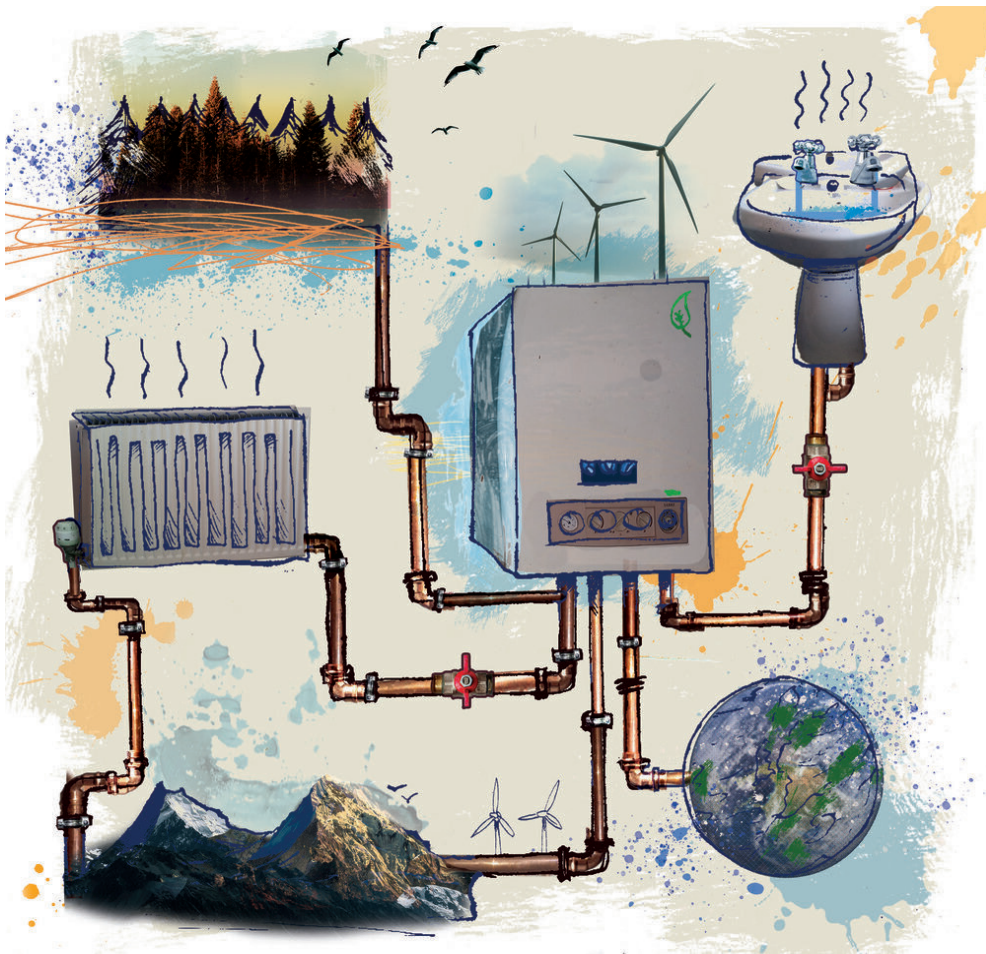
**What one piece of practical advice would you give to someone who wants to retrofit their flat?**

I would say that you really need to engage a professional who understands the nuances of both energy efficiency and, if it's a pre-1919 building, the nature of how vapour permeability works in them. Even as a high-level professional in this area, I had to either educate some tradesmen about why I was asking for certain things, or press them quite hard to do it the way I wanted.

For example, nearly every plumber tried to sell me a boiler that was considerably larger than I needed. Whilst combi boilers are inevitably oversized in small flats, it was still a bit of a fight to get one which was reasonably sized. Most consumers wouldn't know any better and would just accept the gas engineer's recommendation. The first engineer suggested a boiler which was literally 11x larger than what I needed for heating. What he was suggesting would have almost completely negated the point of upgrading my heating system.

**What one piece of emotional advice would you give to someone who wants to retrofit their flat?**

Start small and do one room at a time. For example, if you're a ground floor flat like mine, maybe just start with draught-proofing the floor in one room. Feel what a difference it makes, get a sense of how much time and cost is required, and then move onto the next. It's very easy to bite off more than you can chew with these sorts of projects, especially if you're living in it whilst the works are underway. This can start to feel overwhelming and spoil the experience of living in a nice, relaxing home. Also, take plenty of breaks during big works. When I got the flat rewired, I ended up sleeping on a friend's couch to just get a few nights' break from the mess. When I was doing my bathroom, I spent a couple of nights at a hotel for a warm shower. There's no need to make construction works a suffer-fest! ■



*Lisa's interview is a personal account of her retrofit experience, but she also has a great detailed presentation of the process which we hope she will show us at a Green Drinks event. Watch out!*

*Interview by Emily Benita; Illustration by Alistair Quietsch; originally published in Greater Govanhill community magazine.*

# SEDA Green Drinks: Realistic Retrofit at Park Terrace, Glasgow

**Jonathan Lynn: Year 3 architecture student, Strathclyde University**

On Thursday 27th October, a SEDA Green drinks event held in Glasgow, focused on retrofitting. The evening commenced with a visit to a flat on Park Terrace; a segment of Charles Wilson's Victorian masterpiece overlooking Kelvingrove Park. We then continued informal discussions at a local pub.

Wonderful ideas were generated by the group concerning the best ways to retrofit the flat and other tenement buildings. We debated what one could do theoretically versus the constraints of reality (listed building consents and affordability). Engaging debates focused on heating solutions (making gas boilers efficient, renewables), mechanical ventilation, wall, floor and ceiling insulation, air tightness measures and solutions for improving the thermal efficiency of single glazed sash windows.

It was clear from the enthusiasm and interest that retrofitting townhouses and tenements is a hot topic that deserves careful attention and debate with multidisciplinary input. We need to find solutions to preserve the architectural significance of buildings whilst making them energy efficient and affordable for the future. It was a great night, one which we hope to repeat once the retrofitting project on Park Terrace gets underway. ■



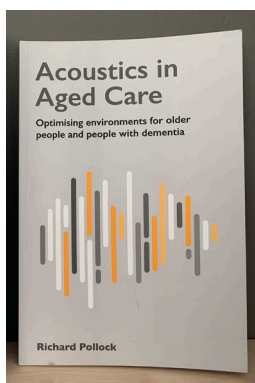


# Double book review

Sam Foster: architect

**A Breath of Fresh Air: The importance of air quality in aged care design** by Annie Pollock and **Acoustics in Aged Care: Optimising environments for older people and people with dementia** by Richard Pollock (both 2021, Hammond Care, 96pp and 43pp respectively)

“At least you’re using pencil to write on those,” remarked my wife, as I set about defacing with scribbly notes these two new books from husband and wife Annie and Richard Pollock, both of which claim to focus on the design of buildings for older people and those with dementia.



**A Breath of Fresh Air**

I say ‘claim’ without any intentional malice, purely because Annie’s book, for example, makes clear that, as well as older people and people with dementia, those vulnerable to poor air quality include pregnant women, children and adults with long-term health conditions.

It sets into context the twin issues of outdoor air pollution and indoor air pollution, noting the alarming range of individual pollutants we are commonly exposed to and highlighting that indoor air is up to ten times more polluted than outdoor air. Common pollutant sources include building materials and finishes, fires and stoves, furniture and furnishings, and personal products such as fragrances and so-called ‘air-purifiers’.

Invaluable nuggets of information are peppered throughout the book, such as ‘*Relatives and carers may attribute some of the symptoms caused by poor air quality (such as drowsiness, confusion or agitation) to the result of a person’s dementia.*’ Another points an inquisitive finger at the extent of asphalt in urban areas, noting that pollution emissions from this material rise with temperature. It is worrying that most of our new buildings, whether homes, schools, hospitals, care homes etc, seem to be designed with vehicle access at their heart.

Annie’s book looks at all aspects of design for aged care, from site selection and building layout, to mechanical services and landscaping – such is the range of factors that have a direct impact on the health and wellbeing of older people and people with dementia.

**Acoustics in Aged Care**

Focusing specifically on acoustics in aged care, Richard’s book gives a valuable overview of what sound is, how human hearing ‘works’ and how it can be affected as we age and develop neurological conditions, such as dementia.

Most of us will be familiar with the slightly uncomfortable feeling of being in, for example, a noisy, clattery café where it’s difficult to focus on the conversation at hand, or the sound of a heavy metal gate banging against its post in the wind. Now imagine that causing such discomfort that it feels like you’re being attacked, or that you feel disorientated or confused. Such is the power of sound in our built environments.

Like Annie’s, this book also offers guidance and recommendations for site and building layouts and interior design. However, it also includes the value of eliminating unnecessary stimuli, such as avoiding noisy alarms in favour of vibrating or visual alarms, and the importance of staff awareness, such as the value of quiet mealtimes and kitchen tasks.

Both books are highly referenced and include case studies, real-life examples from around the world, and clear guidance. Despite being targeted at design for aged care, it’s clear that they have much wider application to the general design of healthy, sustainable buildings. They are, as such, recommended to all. ■

# Cross Laminated Timber (CLT)

**Peter Wilson, architect and founding Director of the Mass Timber Academy Ltd. [www.masstimberacademy.com](http://www.masstimberacademy.com)**

Cross Laminated Timber (CLT) has emerged as the current poster boy of the mass timber world, considered by many to be the salvation of a global construction industry that remains largely in denial of its reputation as the most carbon intensive and wasteful user of non-recyclable materials and building components. So what does CLT bring to the table to impact positively on this state of affairs?

CLT is not, as some still imagine, a new and magical material: indeed a US patent exists from 1926, but its commercial gestation really kicked off in the 1980s in Switzerland in a search for ways to deliver higher value uses from domestic forest overproduction and timber regarded there as low-grade. By the early '90s, German manufacturer Merk was producing glued cross laminated timber panels on a vacuum press - the precursor to the highly efficient, automated hydraulic presses used in most CLT factories today. Modern CLT manufacturing is an expensive process, however, with production facilities currently costing between €15-50m, one reason why the UK timber processing and construction sectors - notorious for their reluctance to invest for the long-term - have still to engage fully with this 21st century technology. This is likely to change with the takeover of the UK's largest sawmilling group, BSW, by Binderholz, the Austrian company that is currently the world's producer of CLT.

## Making music

The first use of CLT in the UK appeared in 1998-9 in the roof of Shrewsbury Music School, yet there is still little or no formal education for architects, engineers and other construction professionals in the range and uses of mass timber elements. This deficiency has led to mistakes being made in design and construction - especially in the area of moisture control. Fire is also thrown up by competitor sectors as a reason not to use engineered timber, despite the fact that this form of modern timber technology has experienced very few fires and the combustion effect on CLT panels and other mass timber products can be calculated accurately (the char layer) to achieve required fire performance values.

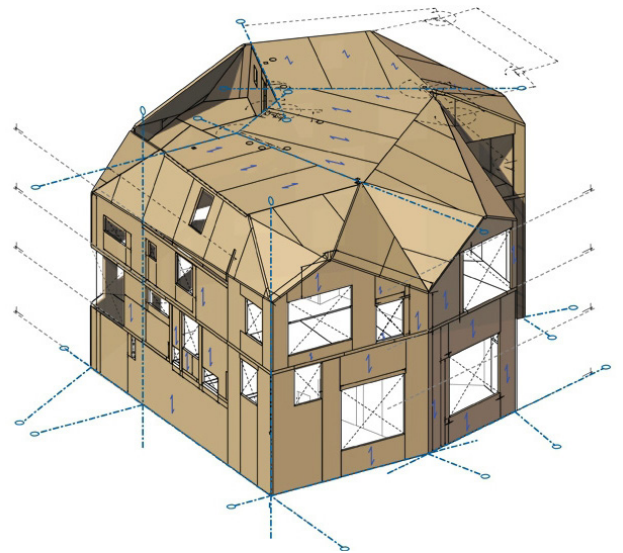
CLT in fact has multiple positive attributes compared to traditional structural systems, the combination of which has led to its use in building types never previously associated with wood construction - the increasingly numerous tall commercial and residential timber structures appearing across Australia, North America and Scandinavia being obvious examples. And, despite the regressive building regulation changes that came into force in England and Wales after the Grenfell Tower fire, the former building type is still possible - especially in London - since the height and wall build-up restrictions introduced apply only to residential structures.

## No brainer

So should SEDA members consider the use of CLT, despite any reservations they may have about products containing adhesives? The percentage volume of glue in a CLT panel is minuscule and is arguably far outweighed by the environmental advantages the product offers. And, as when CLT is manufactured in Scotland from homegrown species, its carbon credentials and other benefits make it a no-brainer. ■

*The Academy offers a six-session online Continuing Professional Education (CPE) course covering everything you need to know about CLT.*

Images:  
Below, left: Cons Living, Tom Raymont  
Below, right: CLT BIM Model, Tom Raymont  
Bottom, left: Barratts Grove Interior, Tim Soar  
Bottom, right: North Woods Construction House, Bernard Planterose



# SEDA Land goes interactive

## Gail Halvorsen: architect

Soon, SEDA Land will have a much-improved, more visually-engaging and more content-rich website. Patrick and Linda Flockhart very kindly gave a donation to fund the new site, the development of which has been overseen by two of our young volunteers – Rosanna Harvey-Crawford and Eleanor Fraser. We believe the new website will become the first port-of-call for anyone looking at rural land related issues, dramatically raising SEDA Land's awareness. There will be resource pages on subjects such as the rural economy and biodiversity which, in true SEDA Land fashion, will combine information with artwork, poems, blogs and videos.

Our double-bill event, *Imagining Bioproducts and Reimagining Food*, held in June has been picked up by *The Herald* on Sunday's writer-at-large Neil Mackay who featured it in his 'Big Read' on 11th December- if you missed this great piece it is available on [SEDA Land's website](#).

### Land Use video game

We have also been awarded a grant by The Pebble Trust to develop a digital game with Abertay University-the best university in Europe for video games education. The interactive game will demonstrate the effect decisions about land-use have on the climate and the complex interrelationship between land use, food systems and climate change. Dr Pietro Ianetta, head of ecological food systems at the James Hutton Institute (JHI) and Mads Fischer-Møller of the WWF are co-developing a

mind map displaying various scenarios resulting from different decisions being made about land use. For example - what would happen if one crop rather than another is planted and farmed in one way rather than another. And what about catastrophic events, such as a blockade or volcanic eruption?

The game will be set in a Highland town, loosely based on Huntly, Aberdeenshire. The grant includes funding for running a workshop in Huntly with the game developers and scientists. This will run as a pilot for further demonstrations to be rolled out across Scotland. The Abertay students are already conceptualising from games such as *Dorfromantik*, *Neon White* and *Frostpunk*. With names like that what's not to like! Many thanks to The Pebble Trust.

### SEDA Land Conversations

Watch out for several SEDA Land Conversations planned for early 2023 covering topics such as social capital in rural Scotland, sustainable place making and another bioproducts event, this time aimed at policymakers.

Rosanna Harvey-Crawford is also organising a two-day youth forum for May 2023. This is a much needed gathering for the overlooked group of 20 somethings, who have left further education and are embarking on a land-related career. Planned for Beltane (the Gaelic May Day festival), it will include a range of speakers as well as more informal social gatherings.

And lastly, good news about one of the entries to SEDA Land's poetry competition, which took place at our Conversation 'Imagining Bioproducts' held at The Gordon Schools, Huntly. It has been adopted by the Huntly Foodbank Centre as part of their promotional material. ■

Images:  
Grampian Graziers, Nikki Yoxall



# SEDA Solar Seminars 4 & 5: building integrated and intelligent solar design & solar PV manufacturing and China's journey

**Colin Porteous & Glo Lo**

The first of two autumn 2022 SEDA Solar seminars in October 2022- Building integrated and intelligent solar design-explores the issues of the title via two experimental solar buildings –an institutional one in Lisbon and houses plus training centre near Bristol.

## Solar XXI - INETI Headquarters

Prof. Helder Gonçalves, Head of INETI (National Institute of Engineering and Industrial Technology, Portugal) and President of the Portuguese Solar Energy Society, introduced Solar XXI crediting its main architect, Pedro Cabrito, and INETI engineering colleague, Carlos Rodrigues. Solar XXI, is a climate-sensitive, rational rectilinear block of offices with a long south-facing, 2-storey façade above a basement floor, fronting a triangular wedge of laboratories. Remarkably, it provides comfortable summer conditions without any air-conditioning. Moreover, its entire net annual electrical demand is met renewably – by building-integrated photovoltaic (PV) panels, spaced alternatively along the façade with its windows (95m<sup>2</sup> multi-crystalline); arrays as shading canopies over parking in front of the offices (initial 6kW amorphous, followed by 12kW CIS modules, 2010); and a small building-integrated wind turbine.

Shading of double-glazed office windows is also a crucial part of the design, with individually adjustable external louvre-blinds. This cooling strategy, critically augmented by the system of

natural ventilation. Unglazed parts of the building envelope are insulated to levels appropriate to Lisbon's climate – e.g. roof U-value 0.26W.m<sup>2</sup>K, thermal bridges 0.53W.m<sup>2</sup>K. Fresh, passively-cooled air at 21-22°C enters offices at the rear via a labyrinth of 32 underground pipes (soil 12-14°C) led into the basement and ducted up to a low fitment in each office. Helder indicated that this intake cooled the room in terms of its passive gain by 2-3°C, with air intake-rate adjustable manually via sliding panels, and augmented if necessary by an electric fan. Manually adjustable flaps above and below each PV panel also enables further convective fine-tuning of air to/from the outside. In cooler weather this picks up waste heat from behind the PV; also louvres in fanlights above office doors provide a ventilated link to/from the northern access corridor.

Regarding demand for heat, as opposed to electricity, Helder referred to active solar-thermal collection from an evacuated-tube rooftop array; its thermal store in the basement. Although annual electricity generation on site now reaches some 150% of demand, he emphasized that overall, Solar XXI is a 'near net zero energy' building, as additional winter demand for heat is met by gas.

Questioned about insulation type, Helder confirmed that polystyrene had been used, for example PV, air-gap, polystyrene, mass wall, and that cork might have been a better option. And questioned about the suitability of vertical PV for maximising solar collection,

he commented on the architectural practicality, and closer optimisation during winter with its heat-recovery, thermo-syphon option, simultaneously improving PV efficiency by lowering its surface temperature.

## Helios House - Solarsense

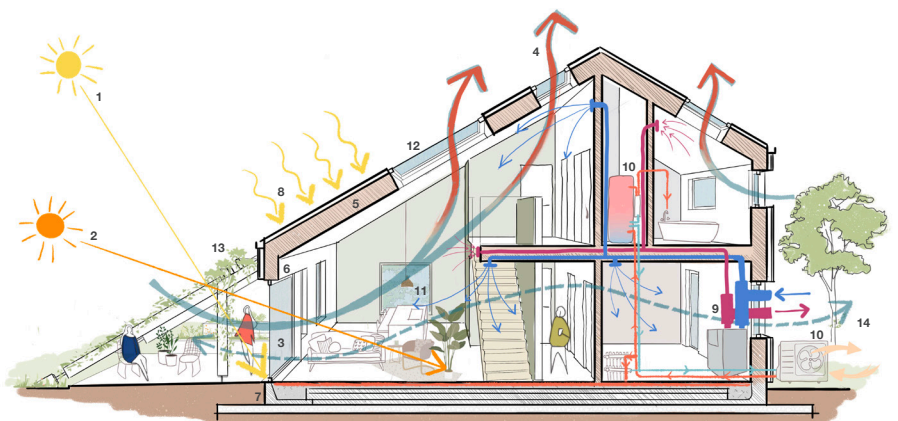
Chris Askew, principal of Askew Cavanna Architects, Stokes Croft, Bristol, introduced his experimental Heios House in the development of Solarsense as a training centre for sustainable technologies, a test-bed for new materials and technologies, and workspace for related/likeminded businesses. Setting the scene, Chris introduced historical landmarks –1939 MIT Solar House and 1948 Dover Sun House in Massachusetts; 1967 Trombe House, Odeillo, France; 1970s Earthship House, New Mexico (Mike Reynolds); 1977 Saskatchewan Conservation House (Hendrik Grolle et al); 1981 Ideal Home Solar House, UK (Dominic Michaelis Assoc.); 1991 Darmstadt-Kranichstein PassivHaus (Bott, Ridder, Westermeyer); 1997 BRE Millennium House (Damian Bree et al).

Chris showed birds-eye drawings of the Heios House site with existing buildings and the northeast part redeveloped with his domestic-scaled 2015 prototype; its asymmetrical section enabling a large pitched, integrated south-facing PV roof – 12.85kWp GB Sol (U-value 0.13W/m<sup>2</sup>K). Planning constraints and respect for adjoining owners noted, he elaborated on its 2015 rapid-build timber construction

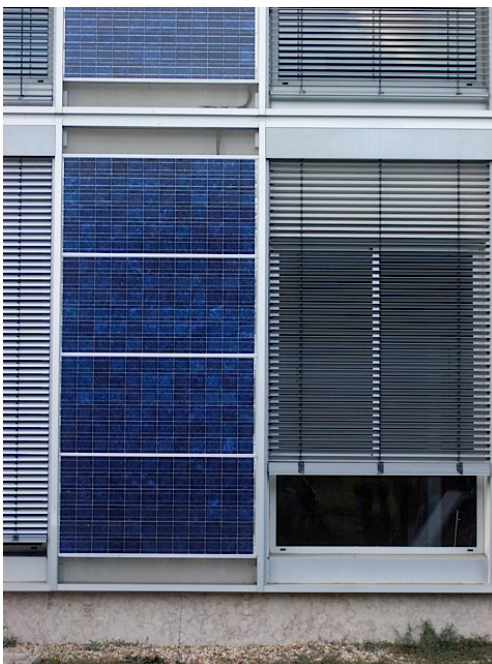
Images:  
 Below: Drone view of Helios building with two 'Field houses' and PV field., Askew Cavanna Architects  
 Bottom: ACA Backwell Eco Homes - Section, Askew Cavanna Architects

to Passivhaus levels of insulation and airtightness. Sections of translucent PV are incorporated within rooflights to enhance daylight, and the net annual power generated funded a Kensa ground-source heat pump running under-floor heating and hot water via a heat battery store by SunAmp. Mechanical ventilation with heat recovery (MVHR) is Paul Novus 450, and the building is fitted with Loxon smart home controls.

Chris then showed two subsequent 'Field' houses adjacent to the centre, with slightly amended design and construction – triple glazing, opening roof-lights, external blinds and planted pergola to vertical south-facing windows; also a reduced area of roof-integrated PV (plus solar arrays in adjacent field), and air-source - not ground-source- heat pumps. He remarked that the client of the first completed house was contented. Q&A revealed that the reduced area of PV on the two houses had reflected cost-consciousness on part of the clients, and self-build another factor in one case in terms of timber framing – albeit with lower thermal mass (debated during Q&A) compared with Helder's Solar XXI.



Images:  
 Below: South PV Facade plus Parking Canopy, INETI  
 Bottom: South Facade Detail, INETI



### Seminar 5, November 2022

The October event having pursued architectural integration, with PV foregrounded, the November one was principally focussed on PV production, including China's role globally.

### An Introduction to Solar PV Manufacturing

Dr PuiWah Wong, Research Associate at the University of Edinburgh, commenced with a global overview of 'modern renewables' compared with other renewables and fossil fuels – 2009 (8.7%) up to 2019 (11.7%) and 2020 (12.6%); PV a small fraction within these. For electricity generation, the overall renewable share rose from 20.4% in 2011 to 28.3% in 2021, and installed global generating capacity of PV rose exponentially in the last 10 years up to 942GW- now exceeding wind. This rising more uniformly up to 845GW from a position in 2011 that was 3.4 times that of PV. During 1990 to 2020, Asia significantly took the lead for PV-module production from 2010 onwards, with 92% of global production, and China over 60% of that.

PuiWah summarised the solar PV-module value chain from metal silicon, poly-silicon, ingot, wafer, cell, module to system (completed arrays). She then described the different components of a system: connectors, circuit-breakers, 'string' boxes and inverters; then the manufacturing processes from raw material through purifying iterations (to



10-Nine Poly-Si = 99.99999999% purity) to ingots; followed by cutting into thin poly- and mono-crystalline silicon wafers, through a semi-conductor process, to composite PV cells (Mono-CS and Poly-CS), and finally to assembly and framing of PV panels.

The specific Malaysian 2021 value chain ending in wafer, cell and module. (The last two with similar respective capacities of 11,930MW and 11,580MW) far outstrips Europe at 650MW and 6,750MW. Regardless of the dramatic shift eastwards in terms of global PV production, PuiWah showed data from the Fraunhofer Institute that broadly indicated a straight-line trend in reducing energy payback time (EPBT): “Each time the cumulative production doubled, the EPBT went down by 12.8% for the last 24 years.” There were natural geographical variations for rooftop PV due to solar irradiation and grid-efficiency e.g. 1.16 years for Europe 2020 (EU-27), Italy lower at 0.97 compared with a range of 1.05-1.28 in China. Laboratory efficiencies of varying PV cell types also varied – the best shown on a Fraunhofer chart for mono-crystalline silicon (79cm<sup>2</sup>) of 26.7%.

### The rise of China as the world's biggest PV manufacturer and market

Frank Haugwitz, based in Beijing since 2002 and supported by Germany and EU, is 2009 Cofounder and Director of Policy and Markets of the Asia Photovoltaic Industry Association (APVIA, 2009, based in Singapore) and 2012 Founder

and Director of Asia Europe Clean Energy (Solar) Advisory Co. Ltd. (AECEA, 2012). Frank ran us through China's ‘milestones’ based on successive 5-Year Plans, up to the 14th 2021-2025; noting that China had achieved 100% electrification by 2015. Clearly showing how policy and regulatory framework can influence the industry and uptake, the 2005-15 Brightness Program, a National Renewable Energy (RE) Law in effect during the 11th 5-Year Plan, an Experimental Period with national tenders for large PV projects, and an RE Development Fund established in 2009; followed by a country wide Feed-in Tariff (FiT) in 2011, although the latter has outstanding payments possibly lasting until 2040, has boosted the solar industry including research and technical development, with approx. 35 R&D sites and 100 PV industrial parks.

Frank recognised China's solar PV programme as softening China's image as a major industrial global greenhouse gas contributor during the lengthy transition to ‘Net Zero’ by 2050. Asked whether the Chinese were really committed in this regard, Frank responded unequivocally “Yes, they are”. He talked at some length about the expansion upstream (capacity) and downstream (installed) in recent years (e.g. a target of 105GW to be installed from 2016-2020); and provided breakdowns for the 2022 upstream industry for wafers (285GW), cells (2,248GW) and modules (302GW), respectively representing increases since 2021 of 86%, 57% and 30%.

He emphasised that China's progress on PV over the last three years was breaking all records, and that for EU countries to reassert a viable PV manufacturing industry, they would need to up their game, particularly in relation to manufacture of wafers, and open to new applications such as floating PV. Although China also had constraints such as land for food or for electricity generation, China was up for both innovation and scaling up, and Frank predicted that solar would overtake wind power by 2050! Questioned as to whether perovskite solar PV might be in the commercial ‘frame’, he replied “sooner than we might think” with cell efficiency as high as 30% - i.e. some 5% more than polycrystalline. ■

# From SEDAbuild to the Bridgend Bothy build - the de-brief is underway

**SEDAbuild de-brief group: Arleen Sinclair, Duncan Roberts, Emma Donnelly, Gloria Lo, Hannah Buss**

On Saturday 8th October 2022 the [Bridgend Bothy](#) was officially opened - there were speeches and music, food & dancing and the celebrations continued until the early hours of Sunday morning. Enquiries were made to book the venue for future events and the leader of the Very Inclusive Play Club was very much looking forward to being able to use the building and outside play area for their regular activities.

What became the Bridgend Bothy project, in Edinburgh's Craigmillar, was initiated back in 2015 with SEDAbuild, itself a development of the successful Love Milton scheme in Glasgow. SEDAbuild was intended as a means by which sustainable building techniques could be passed on via a series of courses, whilst working with local communities to delivery much-needed facilities.

## Lessons sessions

At the opening event, a group of the SEDA members involved in the project got together and, in association with people linked to the delivery of the Bothy from Bridgend, began the process of assembling the history of the project. Given the lengthy time period since its inception & the sheer number of people involved it was decided to engage a neutral facilitator to help us unpick the story.

A series of sessions are planned, through which the development of the SEDAbuild project can be catalogued & the implementation of its ambitions

through the Bridgend Bothy can be assessed.

It is hoped that the lessons learned will enable future projects to go forward and that other communities, who would benefit from the kind of facilities now offered at Bridgend, can see a viable way of achieving their aims.

Ultimately, it is hoped that a SEDA Guide to delivering such projects can be produced.

Funding for the facilitation & writing up of the Bridgend Bothy history and the production of a SEDA Guide need to be secured and possible sources are being investigated. If readers of this article know of any means of obtaining suitable funds then please let us know via the magazine.

## Bothy story

Similarly, if anyone who has had an involvement with the project, either at the SEDAbuild stage or on site at Bridgend, but who has not yet been contacted by the group please write to us via the magazine as your contribution, no matter how transient, needs to be part of the bigger story.

The people of Bridgend are very proud of their Bothy, it has been an amazing achievement delivered by well over 100 volunteers under the able supervision of Simon Hackin. A wide range of skills have been acquired and a very tangible sense of camaraderie engendered. The finished building is a testament to the dedication & commitment of all involved.

This process now needs to be celebrated and the SEDAbuild de-brief is part of that. Look out for future updates!

## Build films

Also a short film of the build can be found [here](#), and via the website. ■

Images:  
Below, Left: Bothy Team, SEDAbuild Team  
Below, Right: Exterior View, SEDAbuild Team  
Bottom: Grand Opening, Emma Donnelly





# Thoughts from the Chair...

**Catherine Cosgrove, SEDA Chairperson**

As I write this article, COP 27 has just started in Egypt and many of the news reports are covering the same subjects that we heard this time last year in Glasgow. In fact, it's hard to tell if we have made any progress at all in this last year. Of course the extensive summer heatwave in the UK and around the world, the floods in Pakistan and the countless stories of crops being destroyed, make it even more obvious than ever that we are living through the early effects of climate change. Although the political messages coming out of COP 27 haven't changed, there is more public backing for taking action.

So what action is SEDA taking? We have started forming the focus groups on the themes that we discussed at our annual conference. We've joined more than 50 organisations, academics, co-ops and social enterprises in signing up to the Wellbeing Economic Alliance Scotland's statement on redesigning our economy in service of people and planet. A copy of this statement and an accompanying letter will have reached the First Minister by the time you read this magazine. Hopefully, it will have more impact than our post-COP 26 letter to Patrick Harvie. We are actively promoting the work of other environmentally focused groups and are letting you know of events that you might find interesting. All this work is helping us build a network of collaborators that can help us make change happen.

A few weeks ago I was asked to speak at the BE-ST Fest conference in Blantyre. The acronym, for those of you not in construction, stands for Built Environment-Smarter Transformation. Most of the speakers focused upon the latest technologies and building methods, but I went in another direction, suggesting that re-use could solve many of our current construction problems. Given how many people came up to talk to me afterwards it seems this topic went down well with the audience. What I took away from the event was that the conversations we have in SEDA circles are ones that we should be having in the wider world. If every SEDA member started a climate change conversation with their families, friends, employers and work colleagues who knows where that could lead?

We also held our first Green Drinks event for several years in Glasgow recently. Thanks to Jonathan for arranging this and for leading the discussion on how he could retrofit his flat. It was lovely meeting many of you for the first time and the conversations that followed in pub session afterwards could have continued for many more hours. Hopefully we can pick these up again at events like the annual Show and Tell event in Edinburgh on the 9th December, Green Drinks, SEDA Assemblies and the engagement groups which resulted, or even writing for the magazine. I look forward to seeing and hearing from you!