**Kevin Lockhart:** My name's Kevin Lockhart. I'm the research manager here at Efficiency Canada. And today I'll be presenting on the Net Zero Emissions Code.

And really it's part of the guide from municipalities on net zero emissions code. And in, in doing so cover off three areas related to Canada's first national Net zero emissions building code. First I'll pro provide some background on the guide and the why behind it, including why we chose to focus on municipalities. Next I'll briefly highlight some of the key issues and content in the guide. And finally, before moving on to our discussion, I'll highlight a couple of the ways how advocates can use a guide to influence the development of the net zero emissions code, which is continues to undergo its evolution.

So there's a little bit of background. In late 2021, the federal government committed to developing a net zero emissions building code by the end of 2024. This is a big shift in buildings policy as we've seen from the past. But it also means that we have just two years to, to prepare for what's quite a significant policy change.

As the net zero emissions code is being developed at the federal level and before it's adoption by provinces and territories, there's a range of issues that need to be resolved and termin terminology that needs to be defined. This includes a rethink of the fuels that we use to heat our buildings, but also the materials and components used to construct them.

It also includes considerations for how the net zero emissions code will integrate with other high performance codes, such as the net zero energy ready tier code. In part, this is why we developed the guide to help municipalities and others prepare for the net zero emissions building code and to use its development as a lever to accelerate climate action in their communities.

It's meant to provide background and context for municipalities and the information that they need to make informed transition to low carbon buildings. As well as create a discussion of how municipalities can take immediate steps to cut emissions in new construction as they await the implementation of the emissions code.

So in terms of the code's development, and this, you can find this image in the guide as well. The development of the net zero emissions code is a, is still in its very early stages. The policy and technical components are now being developed and will continue to be through 2023 and 2024.

As a starting point, work is underway to include an emissions objective to the code's other five objectives and to which net zero emissions code requirements will be linked. And some of the fundamental questions raised in the guide and elsewhere are being posed to different committees and working groups within that codes development system. As you can see, about halfway where March, 2023 and the Senate Committee on energy efficiency is now assigning working groups and task groups. While this work is underway, it bears repeating that there's an additional 18 month period under the Canada free trade agreement. This means that some measures, particularly those related to embodied carbon for which code requirements aren't expected until 2030, may not be advanced until late 2031 or 2032.

So as I mentioned, it's a significant policy exchange, and this is because in the past emissions from new construction have been addressed through a fairly narrow definition of energy efficiency. And this definition didn't account for things like the fuel used to heat our buildings, or the implication of material choices.

The 20 20 model codes now being adopted by the provinces and territories is a result. And it has the end goal of a net zero energy rating standard. However similar to the tiered code is the obesity energy sub code, and we can see that through that tiered codes.

Tiered energy codes alone, even at the highest tier, cannot guarantee reductions in a building's operational or em embodied emission. Now in part this comes down to fuel choices and it really highlights the fuel agnostic approach that the building code has taken in the past. It also reflects the lack of an objective within the model codes dealing with G H G emissions and that objective is now being added to the other five objectives, which includes safety, health, accessibility for persons with disabilities, fire instructional protection for buildings and environmental impact.

Now tiered energy code still will play an important role. They'll be expected to act as a compliment to the emissions code. And while it may not be perfectly suited to directly serve to cut both operational and embodied emissions from buildings, energy efficiency will continue to play an important role in the net zero emissions code.

As we've highlighted in the guide, energy efficiency can help reduce thermal demands, which in turn helps enable right size and low carbon heating equipment, and through energy efficiency, best practices, and in particular limiting air leakage in the building. Energy efficiency measures can also help reduce thermal energy losses and then limit the amount of high embodied emission materials needed to reach the upper tier levels of building performance in the net zero codes and other high performance building standards.

A good example of this is insulation. If we pull down that air leakage, we can re reduce high and embodied materials like insulation in the go wall assemblies.

Going a step further, reduced energy demands can also serve to avoid potential grid constraints and manage peak loads associated with increased electrification of our buildings. It can also be used to free electricity resources that can be used for further electrification, namely existing buildings and transportation. The emissions code is a change in how our codes tackle emissions in building operations and materials by limiting those emissions directly rather than continue to use energy as a proxy.

As mentioned, the focus is on municipalities, and so why would a net zero emissions code be relevant to municipalities? For a start, our homes, workplaces, and the places we gather in account for about 13% of Canada's GHG emissions. This rises to 18% when considering electricity used for cooling, lighting and appliance usage, and even higher when we consider the upstream impacts associated with the manufacturing of building materials or fossil fuel intensive construction processes, but as a proportion of local emissions, those in the municipality, the building sector can also often reach upwards of half of a municipality's overall emission.

All of this means that the building sector is at the center of MUN Municipal Climate Action. New buildings constructed today will last for half a century or more, and this means that municipalities can leverage the emissions code to lock in immediate and long-term emissions reductions and accelerate further reductions in other high emitting sectors of the economy as well, for example, transportation.

As municipalities look for ways to build the net zero economy, the net zero emissions code will play an important role in providing a standardized approach to regulating lower zero carbon buildings. The net zero emissions code can also help build off and support advanced actions in municipal provinces like British Columbia, where municipalities this year will be able to use a carbon pollution standard to regulate low requirements later in 2023 and zero carbon standards in 2025.

The net zero emissions code can also help support municipal efforts already underway in Toronto, Vancouver, and elsewhere.

So as the emissions code is developed, it's important to keep in mind what the limitations are to what is currently covered under our building code. And as we highlight in the guide, codes are only one tool needed for building decarbonization. Alongside the need to continue advancing things like provincial and federal energy efficiency standards for appliances and equipment, clean electricity generation, largely resulting from the federal government's commitment to achieve a net zero emissions electricity sector by 2035, but also by increasing the uptake of onsite renewables, and clean heat systems such as heat pumps and other low carbon alternatives.

An emissions code also brings new consider. And one of the ones that we highlight in the guide is the net component of what a net zero emissions building code would mean. So typically, net zero emissions refers to the balancing of the canceling ad of any emissions associated with the building's operations and materials, including equipment used in its construction.

The net component of net zero is achieved through offsets that provide an emissions reduction elsewhere. So this could include, for example, renewable energy sources or low carbon energy systems to offset remaining operational or embodied emissions, all of which is currently outside the building's building codes purview, which you can see on the right side of the image.

Offsets can also be used to act as a compliment to other actions, and so this would include things like materials that can store carbon and advance the circular. So clearly the low carbon materials that, that we will be using in the future must continue to be resilient against moisture and be durable.

But if by tracking and monitoring material emissions, new constructions it can unlock new opportunities to use buildings and construction materials as a, as an emission sink, as well as find high value applications for material reuse. So innovation in this area could allow builders to claim end of life savings off materials in pursuit of zero carbon building standards.

Now finally, offsets can be purchased also and a good example would be carbon credits or emissions offsets. However, as we've highlighted in the guide, given the new buildings can be designed to be near zero emissions from the out outset, if not today, then in the near future, net zero offsets would be particularly inappropriate for new construction.

So as part of the guide, we reviewed a number of different jurisdictions within Canada and beyond and also at different levels of government. And those jurisdictions that have already implemented a mandatory or a voluntary zero emissions building codes as well as different voluntary certifications have each been challenged by the questions laid out in the guide.

Also with things like how to define the scope of emissions and whether or not to include a prescriptive or perf performance path, and also the types of metrics best suited to a zero emissions building code. I now, there's a number of different flavors of these zero emissions building codes, but all of these questions will be on the table as Canada's net zero emissions code has developed over the next two years.

So in terms of em, embodied emissions one of the challenges in developing net zero emissions code is the embodied emissions And in the C V H CC'S timeline for the development of the net zero emissions code, it's proposed that no action will be taken in this area until 2030.

However, as building operations become more efficient embodied carbon or embodied emissions will be, will become an increasingly significant issue. These are the emissions generated from raw material extraction, manufacturer transportation, and the insulation of materials used in new construction.

These are supply chain emissions that come from things like concrete insulation and clouding or siding. And the emissions from these materials are released into the atmosphere long before the building is in service. This means they increasingly, as our buildings become more efficient, outweigh operational emissions, particularly in in provinces like BC, Manitoba Ontario, and Quebec that have relatively clean electricity grid already.

Embodied carbon is expected to account for approximately half the global building sector's emissions between now and 2050. And and so it's important that we act early to draw down these emissions particularly that given that there's a unique time value component of embodied carbon.

And what I mean by that is that since these emissions occur at the beginning of a building life cycle, The impact on near term emissions from the building becomes more, more significant. By addressing embodied emissions and new construction going forward, we can help the offsite emissions arising from additional floor space in the future as new between now and 50 new a significant amount of construction activity is expected to take place. And that new construction activity can be carbon intensive if if left to conventional practices.

Part of the challenge in addressing embodied emissions are the gaps found in existing approaches to lifecycle analysis or environmental product declarations. For LCAs, the question is around scope. How do we account for emissions and extraction and manufacturing of the materials? Not to mention the end of life stages of how a product is or material is recycled or repurposed, as well as the emissions generated in the construction process by construction equipment. In terms of VPDs while there's a range of VPDs available for number of products, there is an ongoing need for a broader uptake across the gamut of construction materials and assemblies.

Much of this work is already underway by both the private sector, but also through government projects and initiatives like nrc's low-carbon assets free life cycle assessment, L C A Squared and Construction 4.0, each of which are underway and will help support how we measure and track both operational and embodied emissions in the building sector.

In terms of the building the emissions code in the next few years, we'll need to find a way to simplify LCAs and make them more accessible and cost effective for smaller projects, as well as to incorporate LCAs and potentially EPDs into things like the permitting and the compliance enforcement process.

So in terms of how to use the guide, so the guide was intended to be used by both municipal staff and officials, as well as by advocates. In developing the guide which began back in September of 2022 and followed through until early in, in this year, we saw a number of areas either already in place or unfolding that can be used to advance this emissions code.

First up is the Natural Resources Canada Code Acceleration Fund. This fund was announced past this past January, and at the beginning of this week was extended until April 14th. The CF is meant to accelerate upper tier adoption or accelerate the implementation of other high performance building codes.

It's meant to promote higher rates of compliance with adopted codes or build capacity and support market preparedness for ambitious code adoption. And as one of the high performance building codes identified, the CF also applies to the net zero emissions code as well. This means that funding is potentially available for things like technical and feasibility studies, training, software development and permit permitting and compliance tools, all of which can help accelerate the implementation of the net zero emissions code and all of which will be needed in coming years to support the emissions code.

Up next we have the Canadian Board for harmonized construction code which now has a consultation underway and is looking for feedback from stakeholders on draft policy recommendations that will go into the emissions.

Consultation wave one began on in early February and ends this coming Monday, whereas wave two will run from April to June. It's important to note that public consultations will also on, on the proposed requirements for the emissions code will unfold over the next couple of years. And these are an opportunity comment on the technical aspects of the code.

The guide also shares ways to encourage local action, both by municipalities and others, mostly through things like developing and sharing case studies on low carbon construction practices, as well as implementation guides for choosing operational or embodied emission boundaries. And also how to use common tools to me measure emissions, for municipalities as a central player in code implementation.

Municipalities can help increase awareness and build the necessary knowledge infrastructure needed to reduce emissions in buildings. And they can do so largely through things like incentives which can encourage zero carbon heating and hot water systems, but also help reduce financial barriers to heat pumps or electrification in, in new construction.

Those are the voluntary measures, whereas some municipalities may have existing authorities to require low low emissions or all electric equipment. The Charter City of Vancouver is a good example of this, where they have used their existing powers to mandate specific targets and actions to achieve zero emissions buildings in all new buildings by 2030 largely through the zero emissions building plan.

But we also have other cities without the power, the Charter City powers of Vancouver, such as Montreal, which will use its by bylaw powers to mandate a zero emission standard for all new construction that begins in 2025. And the city of vi Victoria, which will require all new construction to produce no g emissions as of 2025.

Municipalities can also tackle low embodied carbon materials such as by using their existing powers as well. And so largely this is through the procurement process where the municipality can mandate low carbon requirements such as as is ongoing in Langford pcbc such as concrete. So using a a procure procurement process to mandate low embodied concrete to then shift the market from conventional products to low carbon alternatives.

So to wrap up as we developed the emissions curve it's important to look back at where codes have come. And so since their introduction in the Canadian market in the 1940s building codes have helped range the minimum performance of Canadian buildings. This is the first areas approach for safety, health, durability and accessibility. But also more recently, energy efficiency.

By applying the same approach to reducing G H G emissions in new construction we can take an important step towards the market transformation of the building sector. This is because building codes act as a high, highly effective market signal to industry manufacturers and consumers. They set and define long-term and durable net zero emission standards, and then help to deliver the certainty that market actors need to direct investments in low carbon technology processes and infrastructure.

And they do this while setting a market a market floor for standards of new construction that ensure each new building construction in Canada contributes to our net zero goals and long-term resilience. And finally, before we move on to our discussion I'd just like to take a moment to thank the low Carbon Cities Canada network for supporting this project, as well as helping provide insights and perspective on what Canadian municipalities need to know to prepare for the net Zero Emissions Building Code. Thank you.

**Emilie Grenier:** Thanks, Kevin. First up, are there any significant deficits in construction expertise to build the buildings we need to reduce emissions to zero and increase efficiency?

I am thinking solar shading, HVAC insulation, and triple glazed windows, et cetera.

**Kevin Lockhart:** I think that There is some steps towards looking at low embody materials and how we approach buildings and whether or not the practices that we've taken from energy efficiency should apply or if we can abandon those in, in favor of materials switching basically.

I think that we continue on that, that journey of Improving how we develop energy efficient buildings and take those same practices to constructing low emissions buildings. And as part of that, it's really looking at do we have capacity, the overall capacity of the market, energy advisors, trades, and an understanding in all of those as well as professions of How we approach our construction.

I also think there's a gap in capacity or availability of things like LCAs and EPDs and I pointed to a couple of government initiatives that do but I also think that there's ample room in the private sphere to develop tools that are already on the market further and really make them highly accessible easy for small builders to to apply to their project.

**Emilie Grenier:** Thanks Kevin. Jim is asking if the code will cover full W B L C. I'm not too sure what the acronym is but he specifies deconstruction slash reuse.

**Kevin Lockhart:** Whole building lifecycle assessment and I think that those are one of the questions I mentioned that are on the table for the codes, committees to work through.

I think that's probably the best approach to and where we will end up eventually. But again, there's a refinement or maturity needed in those processes to be able to Properly apply a a whole building assessment. And when I say that it's unnecessarily that those tools aren't prepared today to use in projects, but at scale, and so can they use across the country in a code which is aimed at all segments of the market.

Those are at the top already doing high performance buildings or those just starting out in their journey.

**Emilie Grenier:** Is the intent to prohibit the use of fossil fuel's natural gas, propane in buildings for space heating and water heating? If so, when would that be implemented?

**Kevin Lockhart:** I can't speak to that as it's not Within my powers.

But I think if we look at the net zero energy ready tiers as we reach the upper tiers, it certainly helps to to limit fossil fuels in the building. And if we extend that to the emissions code imagining that we'll reach zero operational emissions I think we come to difficult decisions about how we treat the fuels in our buildings.

And if we look at the as on one of the slides was the lessons from the BC step code. The really an UN electric building really approaches zero emissions quite quickly. Whereas fossil fuel building it's quite challenging, if not impossible.

So how do we reach zero emissions buildings in our buildings and and do with a number of different fuels?

**Emilie Grenier:** Thank you. What are some of the examples of current compliance tools and what is needed to improve compliance?

**Kevin Lockhart:** In terms of compliance tools for net zero emissions, the code is still under development. And I think those are areas that need to be developed.

But the work is also underway to to begin doing that and to begin accounting for emissions. And we can look at different projects in areas of the country and start to learn lessons from them. Overall I think it's important that we have some ambition in this iteration of the The 2025 net zero emissions code and look at at different ways that we can support compliance.

And so that being the development of tools but also as we highlighted in our recommendations rather than putting off measures for embodied carbon until 2030 why not approach something in a simplified measure only approach. So that we can start building awareness and start identifying what those challenges are in the compliance and en and enforcement processes.

**Emilie Grenier:** This might be a tough one to think of on the spot, but which municipalities would you look at for examples of incentives in play? And are there any examples of municipalities for bidding gas hookups for new subdivisions?

**Kevin Lockhart:** So for the last question, I think there's been attempts in BC but there's still working their way through the process and if that's a legitimate approach or a feasible approach.

And there is a list in the in the guide, a table outlining what those are or different municipalities and provinces as well. And but I would point to obviously we have the large municipalities like Toronto and Vancouver and Montreal that moving quite quickly.

But there's also really really strong measures and unique measures in Victoria and Langford, which I mentioned and they're really starting to move quickly in terms of how they're approaching operational emissions first and em embodied emissions next.

The incentives largely fall within what those municipalities already have. And so it could be things like floor space accommodations or. Tax benefits or speeded permits. And that's why I think it's really important to take the apparatus and the mechanism, the framework that we've used for to incorporate energy efficiency into our codes and replicate those with emissions as well.

**Emilie Grenier:** Thanks Kevin. Will passive house standards be encouraged along with other standards such as different levels of lead?

**Kevin Lockhart:** That would largely, I believe, be up to the to the municipalities. But again, I would just go back to my previous comment about the mechanisms that we've used in the past for energy efficiency.

We, we don't need to necessarily reinvent a wheel. We can use existing programs either through municipalities or utilities. Or in, in larger federal, provincial programs to then tackle how we move or how we reduce and incentivize emission reductions in buildings.

**Emilie Grenier:** David is asking if the Reno code is coming soon.

**Kevin Lockhart:** The alterations to existing building code is also expected for 2025 and underway. How it interplays with the emissions code will be interesting. And I would say that the emissions is expected to play a compliment to the tiered energy code.

I would expect the same with the alterations to existing buildings, but with the caveat of at some point, as item alteration to existing building code is developed, it builds off the n e CB and the National Energy Code for Building and the National Building Code and which currently don't have those emissions provisions in them.

And do we see that in 2025 in the ab or is that something that we see down the road in 2030? That's a good question.

**Emilie Grenier:** How would the emissions code work with the net zero energy ready code?

**Kevin Lockhart:** Again I think that's something to be decided. So it's still when I say early, I incredibly early within the development of the emissions code.

And so we saw late in 2022, we saw the outline of requirements and the outline of what the emissions code would look like being developed at by the federal government within organizations like Natural Resources Canada and national Research Center.

And those have moved to the sending committee on energy efficiency as well and and to its working groups and task groups and that's really where those those decisions will be worked out. I'd just to then make the link that the public consultation period closes Monday for the net zero emissions code.

As mentioned, that was wave one, and I think we've shared our recommendations. But there will also be public comment periods at which I'm advocates using resources like the Net Zero Emissions Guide, can add their feedback and their comments on how they see the net zero emissions code interacting with different codes both the net zero energy ready and the alterations to existing buildings.

**Emilie Grenier:** Thanks Kevin. So Andrew is stating that the weather files that are used for N B C 2020 and NECB 2020 are obsolete weather files.

Is Efficiency Canada looking at weather in the whole context of the net zero code recommendations.

**Kevin Lockhart:** That wasn't included under in those recommendations in particular, those tho those recommendations respond directly to questions posed by the Canadian Board for harmonized risk, the C B H C the and so it answers those questions directly. Whereas the climate files i, I think it's fair to say that's a recognized recognized challenger issue and it is being worked through code development within the code development system. Those files are being updated and and in an effort to more closely reflect our changing climate and the conditions that we build our buildings in going down the future to 2050.

**Emilie Grenier:** Great. Warren has posed kind of a comment, but I'm thinking we may be able to switch it to a question about products and suppliers. Has there been any movement to disclosing the carbon or CO2 embedded into these products? So for example, concrete.

**Kevin Lockhart:** And concrete's actually a good example of the work being done to identify the emissions within the product and to provide a robust c p D.

And and Concrete being one of the highest submitting materials in the most buildings. That's a good first step. And alongside things like the procurement in Langford and that procurement process is al also going through the the federal Greening government initiative as well.

And also mandating lower A lower carbon content, concrete all those things help shift the market. But we do need EPDs and robust CPDs that really walk back through the entire process manufacturing process. And and then we also have to decide what the limits of those are.

Is it source as a Either the reuse, recycling or disposal of those materials. And and so I guess to answer the question, there are a number of different initiatives underway both in private and public sector. And we really need to I guess galvanize support around the development of those so that we can see faster action on em, embodied emissions.

**Emilie Grenier:** Thanks, Kevin. Do you think LCA models will be standardized as many different softwares are spitting out different results depending on the inputs?

**Kevin Lockhart:** I dunno that I can speak to the standardization, but when I look at codes and I had an interesting question responding to our recommendations that, that did highlight the work being done at NRC with the L C a squared initiative and the construction Innovation 4.0 or Construction 4.0.

I think those those tools are being developed and ideally positioned to back codes. Codes again, need to be deployed at scale across the entire country. And where something might work on an indi individual project, we have to consider a broader range of of projects that it will be used for.

Standardization of anything I'm a fan of. But in terms of this, I think that the the goal would be to have those those assets developed by NRC and then alternatives. And we've seen the same in en energy efficiency where we're, where we've seen government tools processes deployed first and then the sector builds off of those and can go even deeper.

And Yeah there's a number of good examples in that in that vein.

**Emilie Grenier:** Thank you. Ty is asking, I think a related question. Are environmental product disclosures EPDs done on a standardized basis? And do they need to be?

**Kevin Lockhart:** I think there's a couple of different variations of doing, so there's a similar approach to each.

But that aspect is still being developed. Or sorry, the standardized approach isn't there. And it's whether or not we need one is, again, similar to the question before. I think it would be a benefit, but whether or not it's a requirement for moving forward is hard to speak of.

What I think we need in EPDs is N LCAs is both and as mentioned in the presentation particularly in the next few years to find a simplified way to to have either material or whole building lifecycle analysis done so that it can really reach the smaller builders.

It can really reach the builders or. developers that, that really want to tackle emissions in the now versus down the road. When we look at em, embodied emissions. Right now the requirement is 2030, or sorry, the requirements are expected to come in 2030. There's also an additional adoption period.

And so that means we're really looking at it 2032, so nine years of waiting for action. And so I think the building sector can really, by acting quickly developing those tools, developing the confidence in both LCAs and EPDs, can help accelerate that action. And whether it's through codes or through different standards at federal, provincial level or at the municipal level. I think anything that, that the sector can do to advance advance the maturity and the confidence that, that we can have in LCAs and EPDs will advance action on embodied emissions.

**Emilie Grenier:** Great. Thanks Kevin. Are there any thoughts of looking at whole life carbon rather than net zero energy or low embodied carbon in isolation? Since there are often trade-offs that would move away from the optimal points of each in order to get to the lowest whole life carbon design.

**Kevin Lockhart:** I think My best answer to that would be opposing that question in the ongoing consultation that closes Monday. So that's a lot of work for the weekend.

But it I think those are the types of questions that the codes development as well as the sectors are struggling with is how do we reach that that optimal balance and where do different requirements fit into the system? As I mentioned, codes are only one part of a, an ecosystem of building decarbonization.

And and there, there are inherent limits to that, to the role in that system. And I think that some of those questions are we'll will be answered in the coming years.

**Emilie Grenier:** Great. Emissions are only considered with respect to kilowatt hour or also kilowatt demand?

**Kevin Lockhart:** Good question That I'm not sure I can answer but we'll look into.

**Emilie Grenier:** No worries. And I think a final question for you, Kevin. Good work fielding all of these. How does Efficiency Canada's work fit with other organizations such as the C A G B C?

**Kevin Lockhart:** I think we're part of a an ecosystem that helps advance the the net zero economy.

And so really the role we play is person sound research. And so looking at some of the questions that were asked today and and beyond and trying to figure out what the the correct policy approach is reviewing the current policy landscape, figuring out where we need to be and what the approach to get there.

Communicating it through forums like this and through to our website. And then building a community around that as well. And and then using that community engaging that community to then advocate for change in the policy system. And I think that ties in nicely with other organizations who may offer education and training or skills development or support in the form of things like incentives.

And then working with organizations like, lc three to help then bring that to the relevant decision makers and then I, I guess disseminate those lessons throughout.