Appendix B

Net Zero Energy Housing (video transcript)

https://www.youtube.com/watch?v=gm_EIE99W0o

Source: De Stroomversnelling / 23 February 2017

Worldwide we use and waste a lot of energy, much of which is used on our homes. At the same time, we pay high energy bills in order to live in houses that are actually often uncomfortable because of humidity, moulds and draughts. What can we do about this? The Dutch initiative *Energiesprong* (Energy leap') has come up with an idea.

The team at *Energiesprong* has developed a method to develop existing housing into 'Net Zero Energy' houses. Net Zero Energy means that the house regenerates as much energy as it needs for heating, hot water, lights and household appliances, resulting in a warm and comfortable home.

This is made possible by the use of new technologies such as prefabricated facades, new smart heating and cooling installations, and isolated rooftops with solar panels. People don't even have to leave their homes because the transformation is completed within one week. After a Net Zero Energy makeover, the house looks bright and modern from the outside and no longer has moisture or drafts inside. This makeover comes with a 30-year warranty on both the energy and indoor climate performance.

This all sounds great, but who is going to pay for it. The principle is that the money you normally spend on your energy bills, combined with reduces repairs and maintenance costs, pays for the renovation. So, you get a makeover for your house without any additional costs.

Hundreds of people in the Netherlands already enjoy more comfortable living conditions following their successful Net Zero Energy makeovers, and new makeovers are taking place every day. So how did the Dutch do it? In order to implement this change, an initial group of social housing associations joined forces to secure a market for these performance-based makeovers.

Furthermore, adjustments in government regulations were implemented. These included allowing housing associations to charge tenants an Energy Service Fee for providing them with a Net Zero Energy house. At the same time, an evaluation of the new refurbishments was undertaken by banks in order to provide affordable financing to the social housing associations. An independent market development team at *Energiesprong* coordinated all these activities to ensure that

each of the required market conditions would be fulfilled at the same time. Together, this creates the right market conditions for innovative companies that want to invest in, and develop, these Net Zero Energy makeovers. These are all built on prefabrication and industrialisation allowing performance to be driven up, and costs down.

To learn more, go to Energiesprong.eu.

Appendix C

Passive Housing Explained (video transcript)

https://www.youtube.com/watch?v=CasrjYhZB1M

Source: Hans-Jörn Eich / 5 November 2013

Does your house have a heater in the basement? Maybe a fireplace? Probably a central air conditioner and maybe an (air conditioner) window unit. Did you ever wonder if this was necessary? In 1991 a physicist in Austria, Dr. Feist, built the first passive house. Here is what he did:

- Proper insulation. *It just like wearing the right winter jacket. It also does not need a heater.*
- No air-leakages. *There should be no holes, small or large to let hot air out off the house.*
- No thermal bridges. *A thermal bridge is like a road for heating energy in which warmth can travel right through your walls. As a matter of fact, most of our houses have thermal- highways in their walls where heat can easily travel to the outside.*

Plus: the house needs proper windows, most of the time houses need triple-pane glass, it needs to be oriented properly so that the sun can heat it in the winter and shade is provided in the summer, and the house uses an HRV (Heat Recovery Ventilation) that provides the inside with fresh air without letting the heat out.

Add all these things up and it turns out that your house does not need a heater or air-conditioner. So where does the heat come from? A passive house needs 90% less energy, and that can easily be supplied by your body heat.

Appendix D

Circular Economy (video transcript)

https://www.youtube.com/watch?v=zCRKvDyyHml
source: Ellen Mac Arthur Foundation

Living systems have been around for a few billion years, and will be around for many more. In the 'living world' there is no landfill. Instead, materials flow. One species' waste is another's food. Energy is provided by the sun. Things grow, then die, and nutrients return to the soil safely. And, it works.

Yet, as humans we have adopted a linear approach. We take, we make and we dispose. A new phone comes out, and we ditch the old one. Our washing machine packs up, so we buy another. Each time we do this, we are eating into a finite supply of resources, and often producing toxic waste. It simply can't work long-term. So, what can?

If we accept that the living world's cyclical model works, can we change our way of thinking so we too operate a circular economy? Let's start with the biological cycle. How can our waste build capital, rather than reduce it? By rethinking products and components, and the packages they come in. We can create safe and compostable materials that help grow more stuff.

So what about the washing machines, mobile phones, fridges? [the technical cycle] We know they don't biodegrade. Here, we are talking about another sort of rethink. A way to cycle valuable metals, polymers and alloys, so the maintain their quality and continue to be useful beyond the shelve live of individual products.

What if the goods of today became the resources of tomorrow? It makes commercial sense. Instead of the 'throw-away and replace culture' we have become used to, we adopt a new one, where products and components are designed to be disassembled and regenerated.

One solution might be the way we see 'ownership'. What if we actually never owned our technologies. We simply license them from the manufactures?

Now, lets' put these two [biological and technical] cycles together. Imagine if we could design products to come back to their makers. Their technical materials being reused, and their biological parts increasing agricultural value. And imagine that these products are made and transported using renewable energy. Here we have a model that builds prosperity long-term.

The good news is, there are already companies out there that are beginning to adopt this way of working. But the circular economy is not about one manufacturer changing one product. It's about all the interconnecting companies that form our infrastructure and economy coming together. It's about energy. It's about rethinking the operating system itself. We have a fantastic opportunity to open new perspectives and new horizons. Instead of remaining trapped in the frustrations of the

present, with creativity and innovation we can really rethink and redesign our future.

What to know more: see MOOC **Circular Economy: an Introduction** on EdX: https://www.edx.org/