Mini-symposium “Green deal for social housing - new approaches for industrial-scale, zero energy renovation concepts” was arranged on September 23rd 2014 at the Amersfoort Centre of Sustainable Renovation (Centrum voor Duurzaam Renoveren), which trains and educates students in sustainable renovation and at the same time is an (energy)renovation shop for house owners in the region.

The objective of the mini-symposium was sharing lessons from the Dutch programme “De Stroomversnelling” with European partners in the NeZeR project, getting feedback on the approach and on the Nearly Zero Energy Building Renovation (NZEBR) concepts.

Arthur Lippus and Jasper van den Munckhof from Portaal and Platform31 presented the objectives, methods and lessons of “De Stroomversnelling”. The social housing in the Netherlands is relatively old, about 50% was built between 1950 – 1970. The building quality of these houses is tolerable and their thermal insulation is poor. The financial position of housing corporations is also not strong enough for huge investments.

De Stroomversnelling is a programme supported by the Dutch national government, in which the zero energy concept for the existing housing stock is stimulated. The key objective is to renovate 111,000 rental houses to “zero-on-the-meter” level until the year 2020. To achieve this objective four major construction companies Volker Wessels, Dura Vermeer, Ballast Nedam and BAM have been invited to develop and demonstrate their technical solutions for this challenge. The idea is that the renovation methods can be gradually scaled up to industrial production levels by employing prefabricated building elements in the renovation. Parallel to this technical challenge important changes in legislation and regulation are made in order to solve the problem of split incentive for social housing associations as owner of the renovated houses. Presentations of the technical concepts for zero-on-the-meter renovation in social houses were given by Volker Wessels, Dura Vermeer and BAM.
Sustainability manager **Onno Dwars** from Volker Wessels presented their three prototypes used in nearly zero energy renovation of social housing. Their key NZEBR components are good isolation, triple glazing, airtight design, controlled balanced ventilation, underfloor or air heating, air/air heat pump, utilization of solar energy and right choice of building materials. The focus is on the customer: tenants must be given an attractive and easily comprehensible proposition highlighting the comfort, attractiveness and nearly zero energy use of the renovated home.

**Bauke Geuzenbroek** from Dura Vermeer gave a presentation about the green deal for social housing. In their nearly zero energy renovation projects the key features are 3D scanning, “Dry and Precast” (No wet processing), industrialization, Plug & Play, realization in under 5 days, innovativeness utilizing knowledge also from other sectors, lifecycle approach, sustainability and hybrid systems. They use a smart façade with isolation and tubing for the heating system and modular roof units with e.g. solar panels. Monitoring the building is important for guaranteeing the promised energy use. Lessons learnt: 1) develop a production version, 2) invite the co-makers also to owners to have them committed, 3) think out of the box but sometimes you need to be realistic also, 3) have a committed project team which really believes in the project, 4) remember that the price is a crucial issue: the total living costs must stay same after the renovation.

The third construction company presentation was given by **Loes Spiertz** from BAM, a company which operates in more than 40 countries. According to their experience the critical factors are customer satisfaction and building without errors. They use 3D scanning for prefabrication of whole wall sized facades. An energy module in the backyard includes the heat pump and the ventilation system. Innovative Google camera is used for instructing the worker, also new innovations for utilizing excess energy are being searched. The renovation is done in ten days: https://www.youtube.com/watch?v=5Do2IMB8xQs
Jasper van der Munckhof explained the principles of Energiesprong (energy leap). The building sector needs to be more industrialized and there need to be more integrated solutions. The associations retrieve refurbishment costs through tenant’s energy plan and this extra cash flow helps to finance the renovation (Figure 1). The social sector acts as a stepping stone to the private market: when the production processes have been industrialized with the social sector renovations, renovation of the private market will be the next step. The private home owner deal has already started in September 2014. In this deal the bank will act as the investor and the refurbishment investment will be an extra mortgage to the bank, paid with the savings in the energy costs so that the living costs stay constant before and after the renovation.

Figure 1. Financing the renovation in social sector.
René van Genugten from AEDES, the association of Dutch housing associations, gave a presentation about the perspective from the side of the social housing sector. The target for the social housing is reducing the average energy index from current 1.73 into 1.25 representing the energy label class B by the end of 2020. This reduction will bring 33% energy saving from 2007 until 2020. At the present rate of renovations the target 1.25 cannot be reached in 2020. As there are no legal obligations, the increase of renovation ambition needs to be based on motivation: bottom up approach is therefore necessary. This means creating the sense of urgency, enthusiasm and support amongst tenants, landlords and local authorities. The benefits for different parties are:

- government: CO₂ reduction, improved housing stock quality
- landlords: improved quality of the building
- tenants: better living comfort

The four key success factors are: more, better, faster, cheaper. The investment costs can be reduced through innovation, industrialisation, standardisation and integration.

Senior advisor Pauline Sparenburg from the City of Amersfoort gave a presentation about the perspective from municipalities: NZEBR in Amersfoort. The target of Amersfoort is to have a zero CO₂ emission on 2030. The share of dwellings in the total CO₂ emission was 34% in 2007. Amersfoort has a program on climate change including heat scans, solar scans and street ambassadors. There have been co-creation in over 50 workshops and meetings together with house owners and 4000 renovations have been made with increase of 2 energy class steps or at least energy class B. A declaration of intent for zero energy renovation has been signed in 2013 by e.g. social housing companies, school boards and municipality. The target for this declaration is that in 2020 at least 2000 houses and 9 schools will be in zero energy level. The role of the municipality is starting the action and deciding on the targets, involving necessary organisations/businesses, co-creation, connecting actors, providing knowledge, creating publicity.

Consultant Yvonne Feuerhahn from the city of Amersfoort gave a presentation about occupants’ view on NZEB renovation. People accept a renovation more easily when their personal wishes are met. There are basically three reasons why people would want to renovate their home to NZEB level:

1. Collective urgency reasons (e.g. energy costs rising, dependency on Russian gas, threat of climate change). Only 3-5% act because of urgency reasons.
2. Individual rational reasons (paying a lower or zero energy bill, wanting a comfortable house), 10-20% act because of rational reasons.
3. WOW-factors (healthy home, getting more space/new look/new kitchen/new bathroom), rest of the population.

Consultant Mirjam Pronk from the City of Rotterdam presented Versnelling010, a co-operation of 16 Rotterdam-based organisations (housing associations, energy companies, maintenance companies, banks) to join efforts in accelerating energy saving results in existing housing stock and other buildings. The goal is the renovation of 10 000 houses before 2018, where 7000 come from social housing sector and 3000 from the private housing sector. The joint efforts consist of right communication, loans, package deals and financing options. First 1 200 renovations have already started during year 2013. The role of the municipality is throwing the first stone, inviting parties to join and making the work important. This contains also new roles for the local government, such as facilitating initiatives and adopting new areas of expertise: large scale co-operation, building of business models, marketing. The necessary four levels of communication are municipality-wide, neighbourhoods, street (1 on 1) and specific target groups (e.g. home-owner associations).
**Onno van Rijsbergen** from Woonbond, the Dutch union of tenants gave the perspective from tenants. Their goals are lowering housing costs (rent + energy), making houses more comfortable, having healthier living conditions and CO₂ emission reduction. The tenants need to be joining as partners in this process. Their problems need to be taken into account and solved during the renovation if possible. The real energy saving also needs to be guaranteed. The tenants basically have a positive attitude according to NZEBR but thorough evaluation and monitoring is needed to show the real energy savings.

**Ad Straub** from TU Delft gave an overview of the EU project Cohereno, which objective is to strengthen collaboration of enterprises in innovative business schemes for realizing NZEB renovations in single family houses of the private housing sector. The project focuses on eliminating barriers for collaboration, providing enterprises with guidance on how to collaborate and on developing services for the different customer segments. In this way ad-hoc demonstration projects will be replaced by NZEB renovations in a volume market. Cohereno has performed a survey among NZEB home owners, which showed that higher educated residents with an average or above average income living in somewhat older households have the most positive attitude towards NZEBR. The home-owners need one single-trusted contact point during the whole renovation process. The solution given by Cohereno are renovation stores offering private home-owners total concepts for achieving the NZEB level: information, advice, products, tailormade design proposals and execution of renovation works.

During the whole symposium the audience was active in asking questions and expressing opinions:

- It should be kept in the mind that the energy systems will be changing in the coming years.
- The tenant is not interested in the type of the insulation, only that the insulation works.
- Comfort and good look are important in social housing.
- Tenants are afraid that the rent will be increased after the renovation.
- Rewarding system needed for the tenant: they need to pay extra if they use more energy than planned, needs to have also a warning system.
There was also discussion about NZEBR in different European countries. In Finland prefabricated TES-elements have been used in INNOVA renovation project. In Sweden there are yet no experiences about using prefabricated renovation elements, but there has been some research on the subject. Energy performance contracting is not widely used in the residential housing sector of the Netherlands.

The mini-symposium ended with a site visit of Soesterberg “zero-on-the-meter” renovation demonstration project. In Soesterberg the social housing company Portaal is renovating 109 row houses from the sixties towards “zero-on-the-meter” dwellings. Two pilot houses have recently been completed and were visited.

The renovation concept has been developed and executed by construction company BAM. It is the intention that future renovations will be executed within 12 days per dwelling.

The renovation concept entails the following elements:

- the houses will become all-electric, so there will be no gas supply anymore;
- a prefab, adjustable hood with insulation and PV panels is applied over the existing roof
- the insulating façade elements are placed outside the existing brick wall, these elements are covered with a composite material which is light and waterproof
- the roof is covered with PV panels
- an battery set stores electric energy from the PV panels
- space heating is supplied with a heat pump (air to water), hot water pipes are integrated in the walls
- heat recovery ventilation, ventilation channels are integrated in the new façade elements
- the technical installations are placed in a special energy module in the backyard
- each house gets a new bath room and toilet using glass wall panels
- induction cooking unit in the kitchen
- the yearly net energy consumption will be (nearly) zero,
- the total cost of rent and energy will remain the same,
- the tenant pays an energy performance fee to the housing company. The height of this fee is based on the average energy cost over the past three years
- if the tenant consumes more energy than expected he is billed for this by the energy company

Movie: https://www.youtube.com/watch?v=pvUB_60A_ns