The built environment of the Netherlands

‘An outlook on energy-neutral new construction and sustainable existing buildings’

Energy Innovation Agenda
Energy Innovation Agenda

A sustainable energy supply is one of the most important challenges for the current Dutch cabinet. Its ‘Schoon en Zuinig: new energy for climate’ policy (known as S&Z) and the Nederland Ondernemend Innovatieland (NOI) programme define how the government plans to approach this problem over the next few years.

The S&Z programme primarily concentrates on breaking the social trend: the way in which we produce and use energy in the Netherlands must change. The NOI focuses on making better use of current knowledge and innovative entrepreneurial skills to resolve social problems.

The Energy Innovation Agenda adds this innovation policy to both the S&Z and NOI programmes, which results in a single agenda for energy innovation. The core of the agenda is a themed approach based on the work achieved by the Energy Transition Platforms. The systematic detailing of the themes provides the basis for this implementation programme.

The Innovation Agenda concerns the full range of Energy Transition. This is why a themed approach to the policy measures has been selected, whereby the themes correspond to the scope of the seven existing Energy Transition platforms:

- Bio-based raw materials;
- New Gas;
- Sustainable electricity supply;
- Sustainable mobility;
- Chain efficiency;
- Built environment;
- The greenhouse as a source of energy.

Context and summary

The Built Environment Innovation Agenda is part of the Dutch Strategy to reach the goal of having one of the cleanest and most efficient energy supplies in Europe in 2020. This strategy, called Schoon & Zuinig (S&Z). One of the main sectors on which S&Z focuses is the Built Environment (both residential and commercial buildings).

The main objective is to ensure that, in 2020, the Built Environment reduces CO₂ emissions by 6-11 Mton/year. Considerable CO₂ reductions are possible by both existing and new buildings. Over the past few years a wide variety of new techniques have become available, although large-scale application is still in its infancy. We need to work our way up this learning curve, so that financial and institutional bottlenecks can be removed. Collaboration between the government, construction sector, housing corporations and private home-owners or tenants is extremely important.

The Platform for Energy Transition in the Built Environment (PeGO) advises the government on ways to achieve these objectives.

This Built Environment Innovation Agenda (BEIA) is based on recommendations by bodies such as PeGO, and describes the route along which energy innovations could be encouraged and implemented on a large scale. The BEIA consists of three programmes: Thinking, conceiving and developing new energy techniques, concepts and collaboratives forms, Doing, where small-scale basic techniques and concepts are implemented in practice and closely monitored, and Scaling Up where successful concepts and techniques are implemented on a large scale.

On the supply side, the programmes Thinking and Doing focus on stakeholders that are ‘early adopters and early majority’, with Scaling Up concentrating on the ‘late majority’. On the demand side, Thinking and Doing are primarily implemented in close collaboration with the segment known as ‘Cultural Creatives’. Scaling up is aimed at the general public.

**Intended results:**

If national policies remain unchanged, the total net primary energy consumption for the Built Environment in the Netherlands will develop to a level of 1000 PJ/year. The total transition scenario ensures that, around 2040, energy consumption in the Built Environment will be reduced to a level of 100 PJ/year.

The BEIA specifically focuses on removing obstacles and bottlenecks to innovation, such as research into market creation, attractive forms of financing, and persuading stakeholders to implement innovative projects. In particular, competent and careful monitoring of demonstration projects (Doing) form the basis for selecting market-ready concepts and optimising innovations.

When implementing these concepts, it is vital that the BEIA be implemented in close collaboration between the federal government, stakeholders (developers, builders), as well as the demand side of the market and knowledge institutes.
Other measures in Schoon en Zuinig, related to the built environment

The Dutch government is tightening the Energy Performance Requirements (EPR) for new residential buildings, by 25% in 2011, up to 50% in 2015 (compared with 2007), and aims for energy-neutral construction in 2020. The EPR for commercial buildings are also being tightened, so that (in 2017) new buildings will be 50% more energy efficient. An energy label is currently being introduced for existing buildings.

Energy suppliers, together with housing corporations, builders and installation companies, have drawn up the plan known as Meer met Minder, which focuses on existing residential and commercial buildings. Their plan is to ensure that, in 2011, 500,000 buildings will be 20-30% more energy efficient. The year 2011 will also see 100,000 existing homes using sustainable energy supplies. Measures to achieve this include various subsidy schemes.

The Cabinet has also made agreements with housing corporations concerning energy performance improvements to homes in the rental sector.
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Introduction

Drastic changes are required in the development and building sectors if the government’s CO₂ reduction targets (which form part of the S&Z objectives) are to be met. This requires innovation, which includes searching for new technical concepts with respect to energy and energy management, as well as better harmonisation of the stakeholders within the construction sector, in order to provide the space necessary to develop and implement new energy concepts. This may also allow the costs of failure (generally estimated as 10% of the development costs) in the development chain to be reduced. There is clearly a need for a total ‘sector transition’. 
The ‘Meer met Minder’ covenant is used by the government and various commercial organisations to define their intentions to reduce CO₂ emissions in the existing built environment by 100 PJ by the year 2020. This covenant views creating the space for innovation and taking innovative measures as one of the most important steps forward. In its Lente Akkoord ‘saving energy in new construction’, the government set out its ambitions for new buildings, in consultation with development and commercial construction organisations. Drastic innovative steps will be required to achieve these objectives, similar to those required in the existing building sector. The MJAs (long-term agreements) for Higher Education, University Medical Centres (UMCs), and several financial service providers, include advanced agreements for conserving energy in their total building stock.

Characteristic elements of these covenants, and for achieving the targets set therein, is that efforts will focus on a small number of innovative subjects until the year 2020. The first priority for both existing and new buildings is to develop new techniques and concepts to conserve energy, and thus reduce CO₂ emissions. Of course the concepts for new buildings may deviate from those used for existing buildings. The existing infrastructures, which vary in age, may also act as restricting factors. Considering the relationship between the number of existing buildings and the number of new constructions built each year, this plan does not include a good balance between the investments in new constructions and those for existing buildings. However, experience shows that new techniques are primarily developed in new buildings, which are then also applied in existing buildings (perhaps customised or modified where necessary).

This means that selecting innovation alone for the existing buildings, at this point in time, would not be wise. Commercial stakeholders and knowledge institutes need to be encouraged – as soon as new energy concepts are developed they should undergo small-scale practical tests so that they can be evaluated. Leading commercial stakeholders play an important role here. As soon as new concepts have been proven in practice, they should be promoted throughout the country as quickly as possible, thus also encouraging more conservative stakeholders to apply these concepts, and thus ensure that they become ‘standard’ applications.

**Outlook on energy-neutral new construction**

The Built Environment Innovation Agenda aims to encourage and realise the necessary activities and instruments required, both innovative steps for existing buildings and innovation in new buildings. The main objective is to define a programme to ensure that the 2020 targets are achieved.

Implementing this total programme will require a considerably larger budget than is currently available; this limited budget means that only certain programmes can be implemented that are in line with previously defined plans, and where specific results can be achieved, thus creating an outlook of what can actually be achieved in terms of energy-neutral new buildings. As soon as additional resources become available over the forthcoming period, then current activities will be scaled up and expanded.
General objectives of the
Built Environment theme within
the Energy Innovation Agenda

Objective: to accelerate the application of sustainable energy concepts in the Built Environment in order to realise the objectives of the S&Z programme.

Main targets are:

• energy-neutral new buildings from 2020 onwards;
• the total energy consumption by the Built environment should be halved in 2030, compared to 1990 levels.
In order to realise this considerable social task, this theme focuses on almost all segments of the Built Environment sector. The most important characteristic of this energy transition is the fact that it concerns the transition of an entire sector, rather than ‘just’ a technology transition. This means that technological innovations, process innovations, new collaborative agreement concepts, and conditional innovations, must all be developed in a cohesive and inter-related manner.

The market aspects concerning the supply and demand aspects for the Built Environment are shown in the following overview. Both the demand and supply sides of the market incorporate stakeholders ranging from those where innovations take over quickly (‘innovators’ on the supply side and ‘greens’ on the demand side), through to stakeholders that only apply these concepts at the end of the product’s life cycle or when legislation demands it (‘cowards’ on the supply side and ‘followers’ on the demand side). Based on this simple principle, all the different types of categories on both the demand and supply side play a role in achieving energy innovation in the Built Environment.

The various building segments on which this theme focuses include:
- housing: new residential construction and renovation
- commercial (non-residential) buildings: new construction and renovation in offices, schools, hospitals and other non-residential buildings
- spatial development: new developments and revitalisation/land-use plan
Programme descriptions and relationship to each other

The ambitions defined in the S&Z programme cannot be realised in a single phase: this requires a continuous process of thinking, developing, implementing, monitoring, evaluating, adjusting, releasing and distributing to the market. This applies to technical innovations, process innovations and new collaborative concepts, to remove various institutional obstructions and to create indispensable conditions for energy transition throughout the sector: the achievement of conditional innovations.

“Successful transitions are the result of cohesive changes at various scale levels”
(Rotmans)

Freely translated into research programmes for this theme, three programmes have been selected that work at various scale levels:
• The first level is where new technologies, building concepts and construction processes are developed: i.e. ‘thinking’.
• The second level operates the ‘action’ programme (‘doing’), which realises the developed concepts in practice, where the extent of the implemented concepts in each of the underlying projects is such that large-scale expansion is safeguarded: for example, not just a few residences, but at least 50-100 at the same time.
• The third level is where proven concepts within the ‘scaling up’ phase, are transferred to the early majority, whereby scaling up to larger numbers is completed, and concepts are disseminated more widely in the market, to eventually be accepted as the industrial ‘standard’.
This innovation programme is implemented in two phases: in around five years time, commercially viable concepts will be realised at increasingly ambitious levels, so that (compared to the reference year of 1990) successively 45% and 60% CO2 savings in total primary fossil energy consumption will be realised. This creates a vision of the last phase, which will achieve completely CO2-neutral new construction.

**Programme 1: Thinking**
- Developing technical production innovations through industry, together with knowledge institutes;
- Practical design of new forms of collaboration throughout the entire construction sector;
- Developing the synthesis between process and technique, focusing on actual realisation of integral concepts, at individual building and area levels;
- Developing performance indicators and monitoring instruments, for learning-by-doing and scaling up projects;
- Developing market drivers to encourage the demand for energy-efficient building concepts among end-users.

**Programme 2: Doing**
- Realising technical innovations, process innovations, new methods of collaboration, and conditional innovations as part of specific large-scale example projects;
- Encouraging the creation of an ‘early market’ (innovators and early adopters);
- Evaluating and learning from projects, in order to achieve a phased increase in higher energy ambitions.

**Programme 3: Scaling Up**
- Promoting the application and use of (technical, process-based and conditional) innovations by all stakeholders in the construction sector;
- Promoting the application of new methods of collaboration between stakeholders in the building sector;
- Encouraging the demand for energy-efficient building concepts by end-users.
Most important obstructions to realising the objectives in the Built Environment sector
The traditional, and primarily sequence-based, building chain contains no structure to support and encourage innovation on a practical level. The obstructions that exist under the framework of the Built Environment Innovation Agenda can be summarised into three categories, such as those also shown in the ‘Energy Innovation Agenda’ dated 3 July 2008 (compare Appendix 1).

**Bottlenecks with respect to Process**

1. The knowledge of, and demand for, increasingly better energy-efficient building concepts by end-users and building stakeholders is insufficient. The lack of an ‘early market’, where innovators and early adopters meet the explicit and latent needs of the demand side, is a real hurdle in the step from prototype development to commercial product.

2. The challenges to the Built Environment imply an integral collaboration between stakeholders that collectively focus on values (rather than costs), where institutional obstructions currently stand in the way throughout the current building culture. The required collaboration and organisation of the building process, including the funding thereof, is not yet ready for implementation.

**Bottlenecks with respect to Technique**

3. Applicable technologies are not yet sufficiently developed, or are still considered (technically/financially) risky, in the context of the integral concepts to which they should apply. The necessary technologies are not yet commercially available. Co-development by industrial and knowledge institutes does not happen very often.

4. The performance ambitions (energy, indoor environment, etc.) for integral building and spatial concepts require harmonisation between various technologies. There are still too few examples of these types of cohesive system concepts. There is little knowledge among market parties regarding these concepts. Harmonisation with European developments is underdeveloped, and facilities for the research structure are absent for some application areas.

**Synthesising Process and Technique in the implementation**

5. The theoretically achievable energy performances are not (or seldom) found in practice. There is often no clear reason for this, because systematic monitoring, focusing on improving concepts, rarely occurs: the innovation cycle is therefore not closed, and the necessary technology roadmaps are missing.

6. There is no group of trendsetters (a mixture of knowledge institutes, market stakeholders and financial institutions) that connect the building and energy worlds, and there are insufficient incentives for integral collaboration between parties, which could remove all current institutional obstructions.
Objectives per programme and obstructions addressed
‘Thinking’ programme objectives:
To develop more commercially interesting system concepts for both existing and new buildings. Setting up integral concepts and realising both technological and process-based solutions. Orientation concerning the way in which market demand can be influenced.

Innovation objectives for new buildings for the period 2015-2020:
• 10% reduction in fossil-based energy consumption for heating and cooling
• 50% reduction in fossil-based fuel consumption for electricity consumption at building level
• 50% electricity, generated sustainably, at location level

Innovation objectives for existing buildings for the period 2015-2020:
• 50-75% reduction in fossil-based energy consumption for heating and cooling
• 25-50% reduction in fossil-based fuels for electricity consumption

The centre of gravity lies in the approach to obstructions numbered 1-5.

‘Doing’ programme objectives:
Realising over 80 large-scale, innovative example projects:
• Approx. 2000 sustainable newly-built residences, with increasing ambitions up to 2012.
• Approx. 2000 sustainably improved existing residences, with increasing ambitions up to 2012.
• Approx. 15 projects in the commercial/non-residential building sector (existing and new buildings).
• Three locations with sustainable integral spatial development, including sustainable generation potential, for example for residential areas, industrial estates or, preferably, combinations thereof.

NB: Discussions are currently taking place between the covenant partners of the Spring Agreement, concerning the specific content of the Excellent Areas; the outcomes and agreements made will be included in the Innovation Agenda at a later stage.

This will include practical and specific solutions to the obstructions numbered 2-6.

‘Scaling Up’ programme objectives:
With respect to the new residential building sector, increasingly lower EPR’s, are first introduced in example projects, then in the Excellent Areas from the Spring Agreements, and finally on a national scale. A similar scaling up effect is achieved by increasingly bringing the measures under the Meer met Minder (More with Less) programme to a higher level throughout the project period up to 2020.

By 2020 primary energy consumption is expected to fall by around 15% (150 PJ) throughout the entire Built Environment sector. This is based on a fairly stable total primary energy consumption (building-based, use-based and area-based) if policies of approximately 1,000 PJ remain unchanged (see also the outcomes of reference estimates). After these years of preparations, energy savings will increase quickly, so that by around 2030 total energy consumption will be reduced by 50%.

Scaling Up moves the centre of gravity when tackling obstacles numbered 1 and 6.
5

Which sections of the innovation chain do the programmes focus on, and which activities are being developed?
The programme ‘Thinking’ requires a combination of development-oriented and application-oriented research: a special programme is required in order to develop technologies and advance knowledge concerning process and system innovations in the Built Environment. Continual and intensive development of new knowledge and technology is required in order to realise these progressive ambitions. This will ensure that more commercially viable system concepts are developed, for both existing and new buildings.

Within the ‘Doing’ programme, innovative projects are tested in practice, thus allowing new opportunities to be applied, demonstrated and tested. This means focusing on encouraging innovators and early adopters (10% of the market), spread over various locations, to prepare for scaling up these new innovations over the rest of the market.

The ‘Scaling Up’ programme focuses on disseminating knowledge and experience from the innovators and early adopters to the remaining market stakeholders (the ‘main pack’). More target groups (both inside and outside the sector) will then gradually become better informed and enthusiastic.

The information/knowledge that is so important to other early adopters and the target groups during the following scaling-up phase (opinion leaders in the early majority/mainstream) will be systematically collected and disseminated.
What is the Netherlands’ international position in this area, and how does the Built Environment Innovation Agenda improve this?
Considering the historical developments within the Netherlands and Europe it is clear that, although there is intensive cooperation at European level, the Netherlands is one of the leaders when it comes to developing building concepts with a high energy efficiency from a comprehensive vision of the Built Environment. However, other European countries are ahead of the pack when it comes to implementation, particularly as their governments create a demand and market. Germany and Austria, in particular, can serve as good examples to the Netherlands.

The Netherlands’ main strengths primarily lie in its existing track record, with respect to formulating successful policy that focuses on improving performance of the energetic building quality and the way in which innovative ideas to achieve this can be encouraged. This was started in 1995 with the implementation of the EPN (energy performance norm) / EPR scheme. With respect to developing integral building concepts, Germany, Austria and Belgium (in addition to the Netherlands) are also active, particularly concerning the Passive House concept, which is one of the elements for building concepts within this theme. New regulations (possibly Europe-wide) are expected to accelerate this development in the near future, which will offer significant market opportunities for the Dutch business community.

A three-wave approach (increasing target levels of large-scale demonstration/icon projects) is currently being undertaken, as defined by the working plan PeGO (Platform energy transition built environment) innovation group and included in this document, which will also act as an example for drawing up the research agenda for the Built Environment at European level. This primarily concerns the work via the Joint Technology Initiative Energy Efficient Buildings (JTI E2B) for the next 10 years. The JTI E2B includes Energy in the Built Environment, as set out in the Strategic Research Agenda (SRA) of the European Construction Technology Platform (ECTP). The vision of the Building Future, with respect to implementing developments to realise an energy-neutral Built Environment during this century, forms the basis of this theme within the ECTP. Building Future has been developed by TNO-ECN, and is one of the most important sources for this theme. For the Dutch business community (for the JTI E2B organised via Deltaneth) as well as for the R&D representation within the ECTP, it is important to ensure a good coupling, both in terms of content and organisation.

The knowledge transfer programme for (and by) governments in the Eracobuild programme (19 EU Member States) will also be used to exchange and disseminate knowledge and experience.
Which instruments will be used, and why have they been chosen?
‘Thinking’:
The Thinking programme requires an applied research programme, in which innovators from industry and engineering bureaus work together with the knowledge institutes to develop new techniques, process and system concepts, including those developed in other countries. The programme is characterised by the setup of integral concepts, and the discovery of technological, process-based and financial solutions. Programmes will be promoted by the trendsetters from the stakeholders group, and then specified further via a collaborative agreement between knowledge institutes, universities and engineering bureaus. Close collaboration with trendsetting companies (the ‘innovators’) will mean that the research is strongly anchored in the relevant knowledge infrastructure. Previous experience has shown that this is not an automatic process. A number of current instruments do not appear to function sufficiently. The development of appropriate instruments is therefore also important.

Instruments:
1. Research into the possibilities of influencing consumers, and increasing the percentage of ‘positive’ consumer groups. (Compare research studies by Prof. Dr. Ir. Anke van Hal).
2. Research into a widely supported system in order to steer towards ‘value’ rather than ‘costs’ (for example, by using the results of the work of PSI Bouw), and develop incentives for setting up an early market.
3. Developing technical concept lines for building and/or spatial development: the first contours have been sketched (for both new and existing residential buildings) of a number of currently suitable concepts, such as the ‘passive house’ and ‘energy’ concepts. Within the innovation programme, these will be detailed further, and other concepts will also be specified and defined, both for housing renovation and commercial buildings.
4. Developing innovative concepts for building and/or spatial development with a high CO2 reduction target also requires the development of innovative components and systems/subsystems. In consultation with commercial stakeholders, a number of so-called ‘cross-themes’ have been identified (e.g. domestic hot water, indoor climate etc. - see Appendix).
5. Developing a widely supported system to determine the Total Cost of Ownership (TCO), and to determine the total consumer expenses, and translate these to financial instruments.
6. Setting up benchmark studies by comparing the performance of various systems, equipment or organisations, so that entrepreneurs can position themselves in relation to their competitors.
7. Guaranteeing theoretical performances in practice (sturdiness). This should be achieved via monitoring, with feedback to the relevant study.
8. Using, and further developing, the ‘data and knowledge’ currently managed by SenterNovem.

Additional information:
• Research: it is essential that the innovation cycle be a closed cycle, particularly because the challenges that result from the increasing ambition levels demand this. This is why knowledge institutes are involved with both the implementation and the development, as well as engineering bureaus and suppliers.
• Knowledge transfer: experience has shown that it is important that this instrument be implemented together with the developing parties. Previous experience shows that commitment throughout the entire process can only be guaranteed if developing parties (not involved in commercialising technologies and concepts) do not need to fund these development and implementation activities, which act as support measures for parties working under the ‘Doing’ programme.
• Research infrastructure: the research infrastructure needs to be expanded, with a separate facility for the work focusing on integral renovation concepts.
‘Doing’:
This programme requires the use of instruments that encourage innovators and early adopters to actually apply these new techniques, processes and system concepts. The consequences for consumers and users alike are highlighted and monitored in practical use. This concerns demonstration/icon projects, feasibility studies and regulations that offer space for establishing a path of sequential development phases and energy ambition levels, at building, suburb and/or area levels.

**Instruments:**
- **Tender schemes** for practical development of innovative concepts, as a challenge. It is very important to evolve from ‘separate projects’ to ‘cohesive projects’. This creates demonstration/icon projects that broadly demonstrate the opportunities/performances, and create large-scale pilot projects. Coalitions of trendsetting companies and innovative local authorities, supported by knowledge institutes, are achieving demonstrable projects with increasing ambition levels of 45-60% CO2 reduction. The scheme therefore needs to offer the space to create a path for sequential development phases and energy ambition levels.

- **Challenger’s credit**: helps innovative entrepreneurs to bridge the gap during the first steps to commercialisation.

- **Green financing**: it is essential that the large amount of projects in the Excellent Areas mentioned in the Spring Agreement have sufficient green financing resources. Considering the considerable objectives in these areas, this mainly concerns large amounts of additional costs. At the time of writing this brochure, this option was still under development.

‘Scaling Up’:
This programme requires knowledge transfer among innovators, as well as between innovators and early adopters and early majority, plus extensive information for consumers.

Useful monitoring of the example projects and development of structural measures and conditions, should make it possible to scale up new development concepts. Additional target groups (inside and outside the sector) will gradually be informed and mobilised into action.

**Scaling Up** creates a direct link with the covenants in the Built Environment: Meer met Minder (More with Less), the Spring Agreement on Energy Conservation in New Buildings, and the ‘Covenant on Energy Conservation in the Corporate Sector’. Scaling Up will closely involve the implementation organisations and projects for these covenants in knowledge transfer from the Built Environment Innovation Agenda to the mainstream policy.

**Instruments:**
- **Platform of Trendsetters and ‘main pack’ stakeholders**: a high-level coalition with connections to the European Technology Platforms, for scaling up the market for trendsetter activities and ensuring a supporting lobby for energy transition.
- **Developing regional roadmaps for energy-neutral areas**: clear and integral conversion of climate and energy targets from EU level, via national level, through to locally controlled level.
### The Dutch innovation market

#### Measurements and instruments

<table>
<thead>
<tr>
<th>Demand</th>
<th>Green Consumers</th>
<th>Cultural creatives</th>
<th>Regular audience</th>
<th>Laggards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Innovators</td>
<td>Single construction &amp; renovation concepts and technologies (EOS)</td>
<td>Innovation agenda B.E.</td>
<td>Innovators</td>
</tr>
<tr>
<td></td>
<td>Early adopters</td>
<td>Covenants: Meer met Minder Klimaatkoord</td>
<td>Lente-akkoord (excl. Excellent gebieden)</td>
<td>Rules &amp; Regulations</td>
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<td></td>
<td>Early majority</td>
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<tr>
<td></td>
<td>Late majority</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Laggards</td>
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- Knowledge transfer (information and training) to the building and installation sector.
- This primarily concerns ensuring the input for the activities by the coalition partners in the Spring Agreement and for the More with Less programme. Sub-instruments include:
  - Publications and informational material for ‘scaling up’ efforts towards end-users
  - Toolkits and other resources
  - Building centres
  - Masterclasses at universities and technical colleges

- Demonstration projects that show the opportunities/performances. By actively involving the opinion leaders in demonstration projects, the early majority can be convinced of the added value provided by new concepts.
- Benchmark studies, where entrepreneurs can position themselves in relation to their competitors.
- The development of Excellent Areas, as approved in the Spring Agreement, where higher energy performances apply than the national legal energy performance.
- Based on the knowledge gained in the demonstration/icon projects and toolkits, the ambition level for More with Less will be increased periodically. The first target is to increase this level (as quickly as possible) to at least Label A level, then to A+ and (after 2020), to level A++.
- Green financing: see the relevant section under the ‘Doing’ programme.
- Information and campaigns that focus on end-users/consumers: clear calculation models need to be produced for end-users, so that specific information can be given concerning the actual expected energy savings, as well as costs and financial benefits. Financial and legal incentives, coupled to clear information on reducing building-related and household energy consumption, or energy consumption in offices, must convince end-users to live and work in a more energy-efficient way. Additional advantages with respect to comfort, health and a continually low energy bill need to be clarified.
The relationship between the proposed instruments, as response to the observed obstructions, is shown in the following table:

<table>
<thead>
<tr>
<th>Obstruction</th>
<th>Programme Thinking</th>
<th>Programme Doing</th>
<th>Programme Scaling up</th>
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<tr>
<td>Market demand by end-users still insufficient, 'early market' is absent</td>
<td>Research into creating a market Green financing</td>
<td>Communication regarding example projects Green financing</td>
<td>Information for end-users/consumers Plan of attack for obstructions market introduction and scaling up Green financing Legislation and regulations</td>
</tr>
<tr>
<td>Collaboration, organisation and financing of the construction process is insufficient</td>
<td>Research into 'drivers' for process innovation</td>
<td>Benchmarking Example projects</td>
<td>Supervising platform Knowledge transfer 'Best practices'</td>
</tr>
<tr>
<td>Technologies insufficiently developed or still not commercially available</td>
<td>Feasibility studies Applied research programme Knowledge centre</td>
<td>Example projects Knowledge centre</td>
<td>Knowledge transfer 'State of the art' Toolkits</td>
</tr>
<tr>
<td>Insufficient harmonisation of technologies in cohesive system concepts</td>
<td>Applied research programme Knowledge centre</td>
<td>Example projects Knowledge centre</td>
<td>Knowledge transfer 'Integral concepts'</td>
</tr>
<tr>
<td>Too great a distance between theory and practice</td>
<td>Technology roadmaps Monitoring Masterclasses</td>
<td>Example projects</td>
<td>Regional roadmaps Toolkits</td>
</tr>
<tr>
<td>Lack of a cohesive group koploppers die bouw-'en</td>
<td>Applied research programme</td>
<td>Example projects</td>
<td>Supervisory platform</td>
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An instrument can sometimes remove several obstructions. Colours make this more visible.
Which stakeholders are involved in implementation?
Surrounding the programme, stakeholders are being organised that can actually start working on innovation. The approach taken is not a ‘closed shop’, as anybody may participate. National stakeholders when volume is required, local and/or regional stakeholders that have expertise in certain niche areas, within the larger context. The commission is so large that nobody can be missed. Particular attention is required for comparable platforms that represent trendsetters, or where innovative concepts are developed and commercialised.

At this point in time, known platforms include the Stichting Passief Bouwen (passive building foundation), the Stichting PassiefHuis Holland (PHH), the project group Duurzame Energie Projectontwikkelaars Woningbouw (sustainable energy project developers for residential buildings, or DEPW) and the Dutch Green Building Council. For commercial buildings, the Rijksgebouwendienst (government building service) is an indispensable partner.

We consider intensive collaboration with market stakeholders to be very important, to facilitate the exchange of knowledge between trendsetters, and to promote the forwarding of experience to the main pack. The best way to organise this collaboration with market stakeholders still needs to be defined. It is important that a (yet to be formulated) ‘platform of market stakeholders’ recognises knowledge demand, disseminates practical experience, encourages reflection of practical developments and maintains the dialogue between research and application. This platform should also act as a social convenor for scaling up and anchoring innovation boosts, by signalling and resolving obstructions. This platform should also be connected to comparable initiatives in other countries and to international committees, and thus function as hub of an international network.

To facilitate the implementation of the above, we plan to set up a programme bureau that will implement the programmes in close collaboration with other relevant parties.
9

Relationship with other programmes
The programmes ‘thinking’, ‘doing’ and ‘scaling up’ operate according to a fully continuous process, where new techniques undergo practical tests via trial projects, are then evaluated, and are eventually implemented in the marketplace before becoming a sector standard (similar to rapid prototyping).

There is a close relationship to other innovation concepts within the government. Many of these themes are directly related to the Built Environment because their innovations are often partially applied within the Built Environment. This sector primarily accepts the transition task as a sector transition, rather than a technology transition, which results in the many fruitful and successful relationships with other themes.

This particularly applies to spatial development (one of the five elements on which the Built Environment Innovation Agenda focuses), which will facilitate the connection to other themes. Specific aspects from the other themes that are clustered here include:

- Useful utilisation of residual heat from horticultural greenhouses (theme: Greenhouse as a source of energy)
- Decentralised gas application/infrastructure (as also described in GRASP, New Gas theme)
- Climate-neutral town and Plug-in suburb (theme: Sustainable Mobility)
- Solar-PV and Decentralised Infrastructure (theme: Sustainable Electricity Supplies)
- The cross-sectoral themes of Heat and Climate-Neutral Suburbs/Towns
- The details of the precise relationship with other innovation programmes still needs to be developed, in consultation with the other departments.
How will implementation of these programmes help to achieve the objectives of Clean and Efficient?
The three programmes in the Built Environment provide a specific contribution to achieving the S&Z objectives:

- By developing, realising and learning from the renovation example projects under Thinking, Doing and Scaling Up, the ambition levels of the More with Less programme can gradually be increased.
- Specific preparations will be implemented for tightening the energy performance (of new building) by 25% in 2011, and 50% in 2015 (reference year = 2007).
- With respect to developing, realising, and learning from new building projects under the Thinking, Doing and Scaling Up programmes, the Excellent Areas can be realised first, followed by those of the national and Spring Agreement objectives.

The intended effect of the Innovation Programme is defined below in the section ‘Vision – a specific contribution to a sustainable quality leap’. This shows the development of the total primary energy consumption in the Built Environment, divided into residential buildings (purple line), commercial building (red line), sustainable spatial development (yellow line) and the sum of all three: the transition scenario (green line).

This concerns energy consumption of both building-related and user-related energy consumption, brought about by measures to reduce demand and integrate sustainable energy generation within the Built Environment. This also includes the intended effects of the Spring Agreement, the Excellent Areas and the More with Less programme. It is important to realise that the programmes mentioned in this plan make a significant and complete effort to achieve the aforementioned objectives.
What will implementation of these programmes achieve in terms of ‘the Netherlands as an Enterprising and Innovative Country’?
The Netherlands can act as an international example of social innovation in the Built Environment, by implementing the chosen manner for realising this innovation agenda, in close collaboration with the many various stakeholders (commercial stakeholders, knowledge and educational institutes, interest groups and the various government departments). The combination of long-term knowledge development, plus the practical realisation of large-scale example projects (icon projects), the unique setup and approach to the programme, will confirm international attention to the knowledge and innovation capacity, as mobilised by this country.

It is therefore important, within the setup and approach to the innovation programme, that this includes the entire chain of instruments, both existing and new, to support the development, practical application and market introduction of ambitious innovations. This programme therefore provides optimum conditions for sustainable and intelligent business activities with respect to energy conservation, both on the domestic and international markets.

The Built Environment market is currently primarily focused on national and even regional elements, both for the European regulations (EPBD, Energy Services Directive, emissions trading etc.) and EC ambitions it is becoming increasingly clearer that the Built Environment, particularly with respect to Energy in the Built Environment, currently stands on the starting line of a far-reaching internationalisation.
Planning and milestones
Under the framework of the first pilot project, the UKR (unique opportunities scheme) opened the ‘Towards energy-neutral living’ project during the spring of 2008. Since then, 15 projects have received a subsidy of 500,000 euro.

The first tender for commercial buildings (offices and schools) is planned for the spring of 2009. The total delivery time for all projects is around five years. Originally the planning ran from 2007-2012, but this is currently set between 2008-2014.

Note: Ambition 3 – electricity used during construction is not included in this plan.

- The yellow lines show the route taken by concept development (Thinking)
- The red lines show the route taken by building realisation (Doing)
- The green lines show the information exchange between the various development projects.
- The blue line shows the maintaining of the process.

The three programmes (Thinking, Doing and Scaling Up) all have their own milestones. Information on the total relationship has been given previously. The results (from the Thinking programme) mainly concern preparation and support of the Doing programme (and to some extent also Scaling Up), while the results from Scaling Up primarily focus on Doing.

The most important milestones probably initially derive from the Doing programme, such as:
- two groups of new residential building projects
- two groups of renovation residential projects
- two groups of commercial projects (new)
- two groups of commercial projects (renovation)
- two groups of integral spatial development projects
As an example, the following milestones concern the first two years:

**2009:**
- organisation of platform and programme coordination has been completed
- the first 45% of the example projects have been started or realised
- monitoring of 45% of the projects has been started and is operational
- knowledge transfer from 45% of the projects for More with Less has been started
- the first 45% of the commercial building tender (offices and schools) has been prepared and implemented
- the first 45% of the office and school projects has been started
- cohesive research programmes have been started
- preparation for spatial development projects

**2010:**
- 60% of the tender projects for residential building has been prepared and implemented
- the first 60% of residential building projects has been started
- monitoring 60% of the projects has been started
- the first tender concerning regional development has been prepared and implemented
- the first regional development projects have been started
- the monitoring of regional development has been started

**Go/no go:**
Within the range of activities to be realised, the following will always be maintained:
- Continual support by stakeholders
- Communication concerning and maintenance of the chosen direction
- Creating space and security to arrive at the necessary innovation
- Realisation of clearly defined (intermediate) results
- Account for the intermediate achievements

**Risks:**
The programmes within this theme assume a long-term commitment by all parties concerned: governments, commercial stakeholders, knowledge and educational institutes. The greatest risk is the early cancellation or modification of the objectives, and the need to change course ‘halfway’, or the cancellation of the commitment. All stakeholders need to keep the others motivated. Although the programmes should be characterised by a high level of flexibility (‘open innovation’), the chosen direction must be maintained. It is essential that the innovation programme and the instruments used are supported by the market stakeholders; innovation can only be successful if market stakeholders remain fully committed.
All communication about this programme or activities which will be part of this programme will have a fired phrase in which is stipulated that as well this programme as the activities are part of the Energy Innovation Agenda, which is part of the Schoon & Zuinig strategy.
Appendix I

Obstructions to process innovation
1. Insufficient demand from end-users.
2. Insufficient incentives for integral collaboration.
3. Insufficient supervision of the process.
4. Primarily focusing on costs during the construction and installation process, rather than on benefits. Insufficient focus on values and a widely support system.
5. Insufficient education in the building and installation sector. Increasingly advanced technology is being used in becoming increasingly advanced concepts, so this is a significant obstruction.
6. Insufficiently clear and integral transfer of climate-based and energy targets at EU level, down through national and local levels.
7. Insufficiently consistent government policy in the past: the various schemes and instruments used were not harmonised, thus causing institutional obstructions.
8. Too large a gap between trendsetters and the main pack in the building world, plus lack of an ‘early market’, whereby the step from prototype development to commercial product is hampered.

Obstructions to technological innovation
9. Insufficient codevelopment by industrial and knowledge institutes. Applied technologies are insufficient developed, or are still seen as technical and/or financial risk in the context of integral concepts for which they must be applied. In some cases the necessary technologies are not yet commercially available.
10. Insufficiently clear picture to allow presentation of (integral) technologies: the performance ambitions (energy, indoor environment etc.) for integral building and spatial concepts requires harmonisation of various technologies. There are still not enough examples of this type of cohesive system concepts.
11. Insufficiently clear picture of eventual knowledge gaps.
12. Lack of industrial policy concerning energy management, although there are good industrial opportunities to be gained.
13. Insufficient harmonisation with the European Technology Platforms.
14. Insufficiently clear research infrastructure with a good link between fundamental and applied research, with the starting point primarily focused on integral issues.
15. The lobbying of innovators is still weak and fragmented, which forms a practical obstruction for innovation, primarily for the coupling between the trendsetters and the main pack, and between the translation of innovation experiences to regular policy.

Synthesis of implementing process and technology
16. Insufficient facilities to demonstrate new integral residential concepts.
17. Lack of monitoring: the theoretically achievable energy performances are not (or seldom) seen in practice. The collaboration and organisation of the building process required, including the financing, is still fragmented.
18. No clear technology roadmaps with an integral approach as starting point.
19. Insufficient link between the building and installation practice and fundamental/applied research.
20. There is an enormous gap between trendsetters and the main pack.
21. There are no facilities for commercialising integral concepts on a large scale.
22. The necessary collaboration/synthesis between the building world and the energy world is currently absent.
23. Insufficient lobbying: no effective coalition to organise the innovators’ lobby group.
IEnergy Innovation Agenda - The built environment - An outlook on energy-neutral new construction and sustainable existing buildings

Renovatieprojecte Vestia Den Haag. Fotografie: Hans Pattis
Energy Innovation Agenda - The built environment - An outlook on energy-neutral new construction and sustainable existing buildings

Nokcollector Lobith, Fotografie: Hans Pattist
Appendix II

An overview of the objectives set by various programmes and covenants:

Schoon & Zuinig:
• 2% energy conservation, 20% sustainable share of energy production and 30% CO₂ reduction in 2020.
• Tightening of the EPC for new residential buildings, to 0.6 in 2011 and 0.4 in 2015.
• Realisation of (fossil-based) energy-neutral (new building) in 2020.
• New commercial buildings constructed in 2017 must achieve 50% better energy performance (RGD one phase earlier) compared to current situation.
• Halving of total energy consumption in the built environment in 2030.
• Survey on implementing norms for existing buildings (e.g. from 2015 all buildings must have at least a C label before sale/rental).

NB: Halving the energy consumption in the Built Environment in 2030 implies a larger reduction objective for energy consumption for individual buildings (new and existing), because new buildings that are not energy-neutral or energy-positive, mean a net expansion of the total energy consumption for the total Built Environment, as long as the number of new buildings is greater than the number being demolished.

Klimaat-akkoord:
• Government buildings will be climate-neutral by 2012.
• The term ‘climate-neutral’ will be further defined and monitored.
• Tightening of the EPC for new residential buildings, to 0.6 in 2011 and 0.4 in 2015.
• The aim is that new buildings will be energy-neutral in 2020, and that energy consumption by residences and buildings will be reduced by over 50% in 2020.
• Local authorities will take an active approach to innovative construction (referring to PeGO plans).
• Support for at least 10 suburbs that experiment with innovative energy-saving and/or sustainable generation techniques.
• Research into encouraging the useful utilisation of residual heat and/or sustainable heat.

Lente-akkoord:
• Improving the energy performance of buildings (in 2011) by 25% compared to 2008, and by 50% in 2015.
• 5-10% of new building volume should be 25% more energy-efficient (Excellent Areas) than legally required.
• Energy-neutral new building in 2020.
• Creating clarity around the method of taking area-oriented (not per plot) sustainable energy measures.

NB: The objectives mentioned in the Spring Agreement concern building-related energy consumption.
Innovatieagenda Energie - Gebouwde Omgeving - Uitzicht op energieneutrale nieuwbouw en duurzame bestaande bouw