

Setting Dutch Energy Performance Requirements for Existing Buildings

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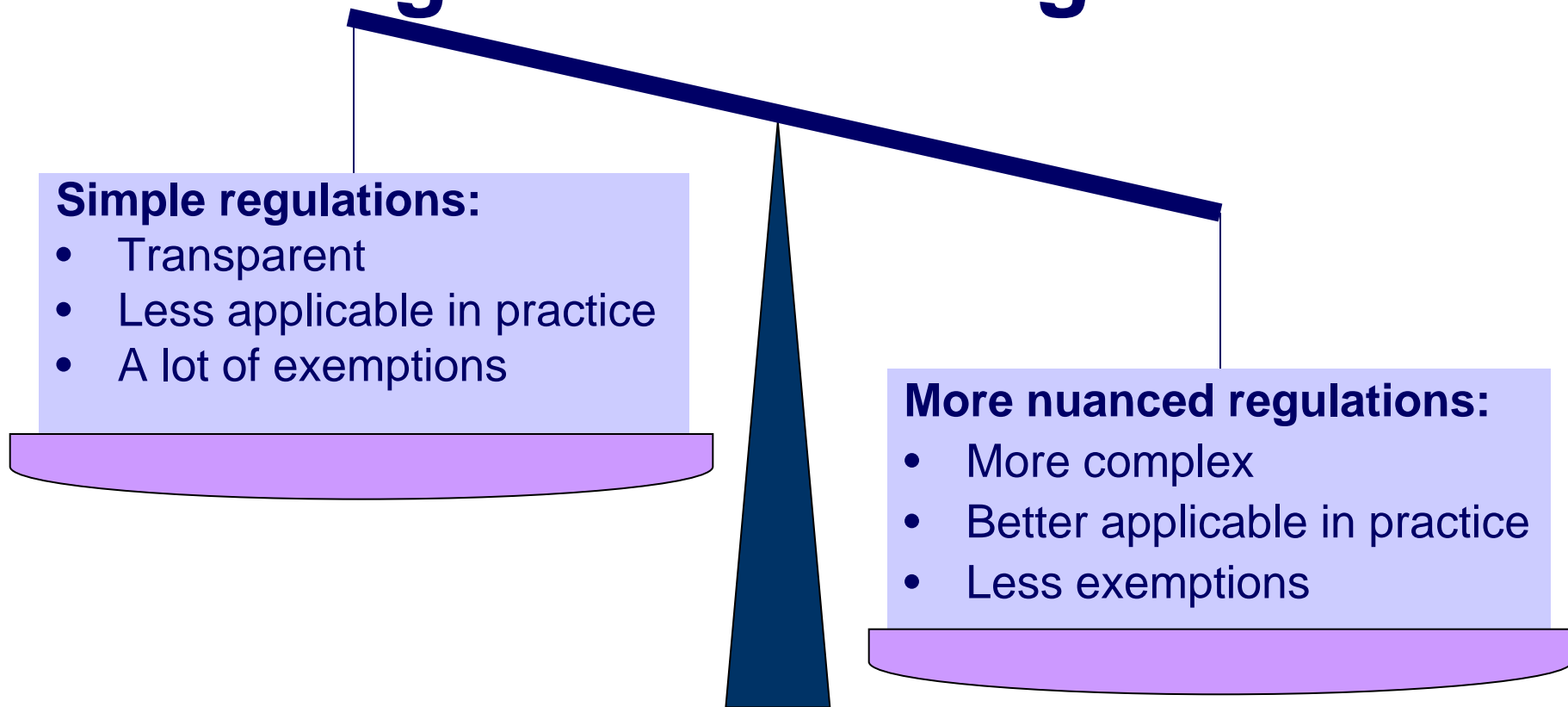
Existing building stock

- **Huge diversity in the building stock**
- **Cost and savings of measures are easier to perceive by the owner**
- **Cost benefit of energy measures interacts with maintenance condition**
- **Investment levels must be feasible (consider split incentives like rent and sale)**
- **Requirements must fit every building and must not be unreasonable.**

Type of the EP- requirements

- **Dutch requirements are set on component level**
- **When renovated (not just major renovation)**
- **Elements of the envelop**
(ground floor, wall, windows, roof)
- **Technical building systems**
(air-conditioning, space heating, water heating, large ventilation systems)
- **EPBD & Delegated Regulation requirement level:**
 - with a view to achieve cost optimal levels
 - technically, functionally and economically feasible

Finding balance in regulations



The level of the requirement influences this balance and influences the contribution to climate targets

Determine requirement levels

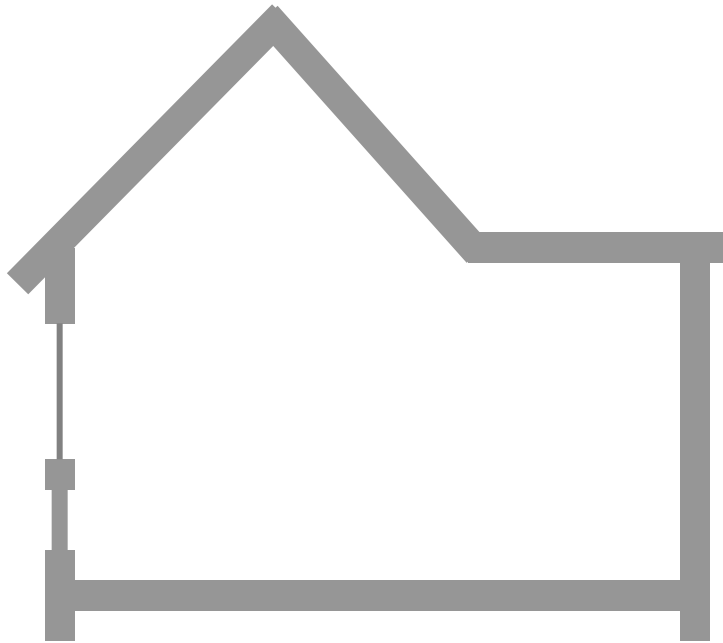
- 1. Energy savings for elements and systems based on characteristics derived from reference buildings**
- 2. Determine cases for building elements and technical building systems**
- 3. Analyse the cases (cost, benefit, feasibility)**
- 4. Check consistency of sets of measures in buildings**
- 5. Formulate the requirement levels**

Use of reference buildings

1. For **building elements** and a specific user pattern the energy need/m² is proportional to the U-value as is the saving. $\text{Saving} = C \times \Delta U$
C = function of gain/loss and determined based on reference buildings
(C deviates less than 10% for one user typology)
2. For **technical building systems** energy use and savings are related to energy need levels coming from reference buildings (capacity related default values for cost)
3. Check validity for **packages** of measures on a number of reference buildings

Analysis of building elements

Based on m² building element



– **Savings per m²**

$$\text{saving} = C \times \Delta U$$

– **net present value per m²**

preparation

investment

maintenance

replacement

Building element cases

Sloped roof

3 structures

Flat roof

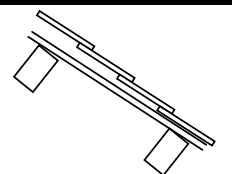
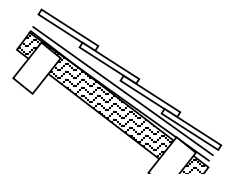
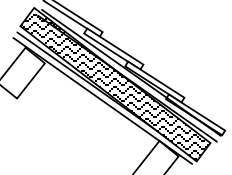
4 structures

Wall

10 structures

Ground floor

6 structures

Hellend dak	Maatregelen											
	Isolatie binnenzijde				Isolatie spouw				Isolatie buitenzijde			
	Mi 1	Mi 2	Mi 3	Mi 4	Ms 1	Ms 2	Ms 3	Ms 4	Me 1	Me 2	Me 3	Me 4
Basisconstructie												
 HD 1												
 HD 2												
 HD 3												

NPV curves sloped roof

Bouwdeel
Type gebouw
Periode
disconto
ontwikkeling energieprij's

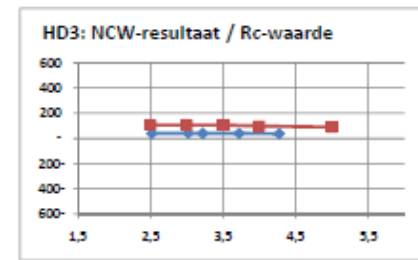
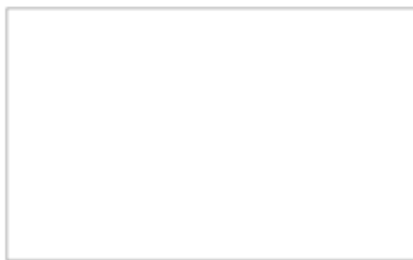
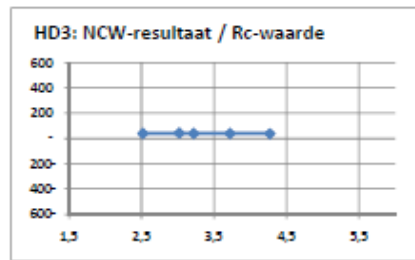
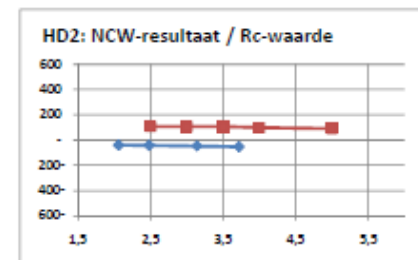
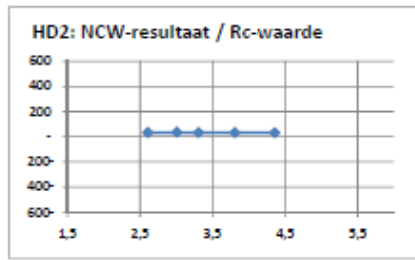
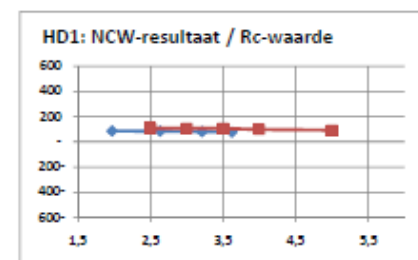
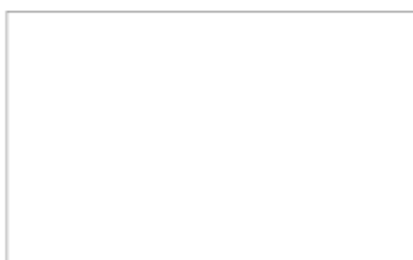
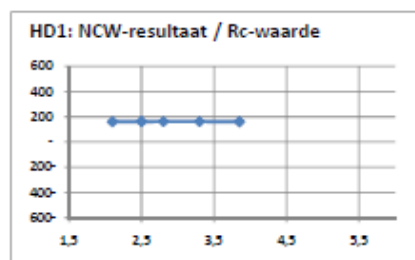
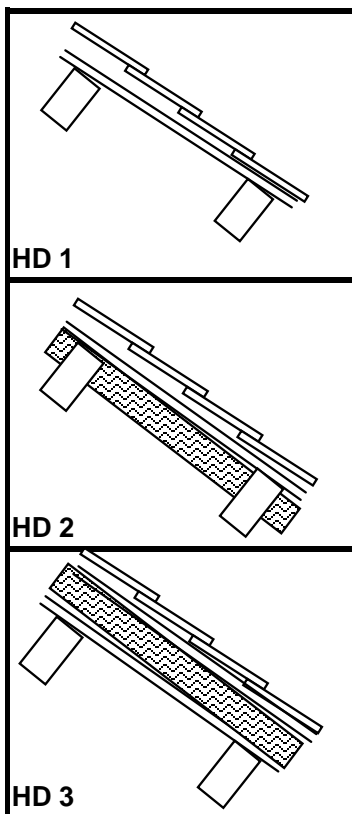
DAK
sport, matig verwarmd
LCC 20 Jaar
3,00%
5,90%

In rood opgenomen waarden betreffen het vervangen van compleet dakbeschot het resultaat van die maatregel is afgezet tegen een (theoretisch) ongeïsoleerd dak

Maatregelen binnen

Maatregelen spouw

Maatregelen buiten



Technical building system cases

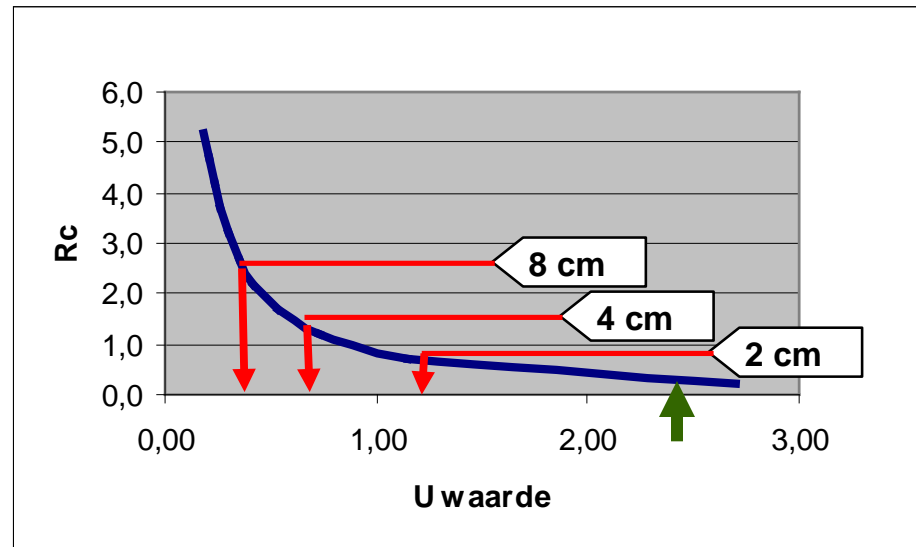
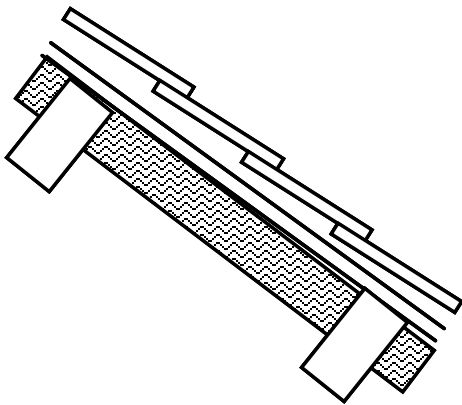
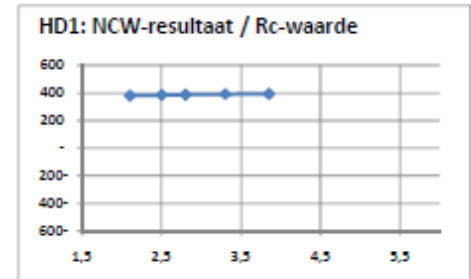
- **Space heating**
(gas boiler, gas fuelled heat pump, gas fuelled heat pump combined with gas boiler, electrical heat pump, electrical heat pump combined with gas boiler, electrical heat pump on exhaust air)
- **Cooling**
(compression cool unit, ground coupling, ..)
- **Water heating**
(electrical boiler, gas boiler, solar collector, heat pump boiler)
- **Ventilation?**
(heat recovery, ventilators)

Analysis of installations

- **Analyse technical building system cases based on energy need values/patterns for the installation; these are extracted from reference buildings**
- **Cluster installations based on function and size (capacity)**
- **Determine savings and costs per cluster**

Multi criteria decision

- Cost efficient and cost optimal
- Investing in energy saving measures
- Energy impact (primair)
- Practical feasibility



Intended regulation structure

- 1. Requirements for building element and systems (renovation measure dependent)**
- 2. In case requirements not feasible:**
 - realize a equivalent EP improvement
- 3. In case equivalent EP improvement not feasible:**
 - exemption of the requirements

Professional owners of building stocks may include EP-improvement targets in their portfolio management related to maintenance instead of case to case requirements (to be investigated on legislative feasibility)



Status

- 1. The approach has been applied and presented to stakeholders. It is considered to be valid**
- 2. Integration in legislation is ongoing**
- 3. In force in 2013**



Thank you