# Whole House Solutions
# The current evidence base

## *Three new European studies*

Christine Liddell

# *Three new European studies*

## *Study 1*

TU Delft

Delft University of Technology

## Majcen et al., 2016

*"Up until recently, international research papers which evaluated actual energy consumption post-retrofit had to base their analysis on theoretical models.*

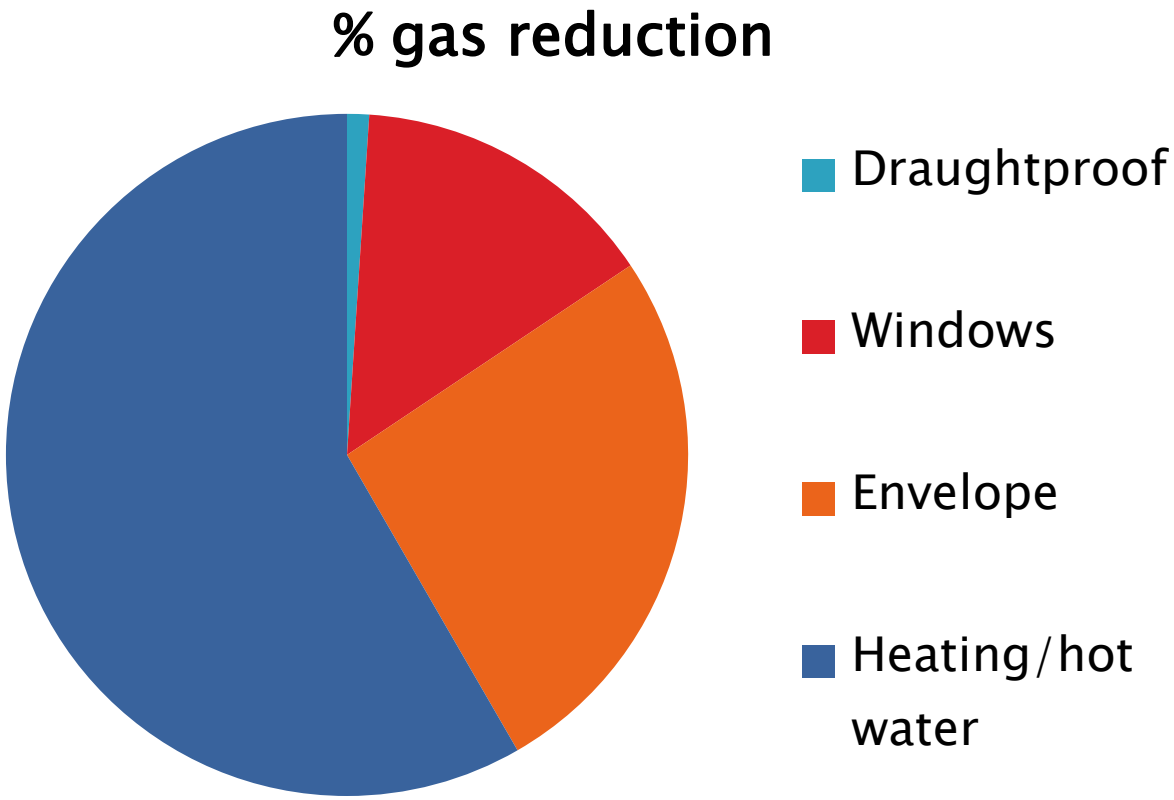
*Now that actual housing stock data are available, it emerges that these sometimes overestimated the benefits of retrofits by as much as 50%, and sometimes underestimated benefits by as much as 30%."*

# “Now that actual housing stock data are available….”

**Dutch housing stock study**

- **31,000 retrofitted homes**
- **No uniform strategy for renovations**
- **All with only one new energy efficiency measure installed**

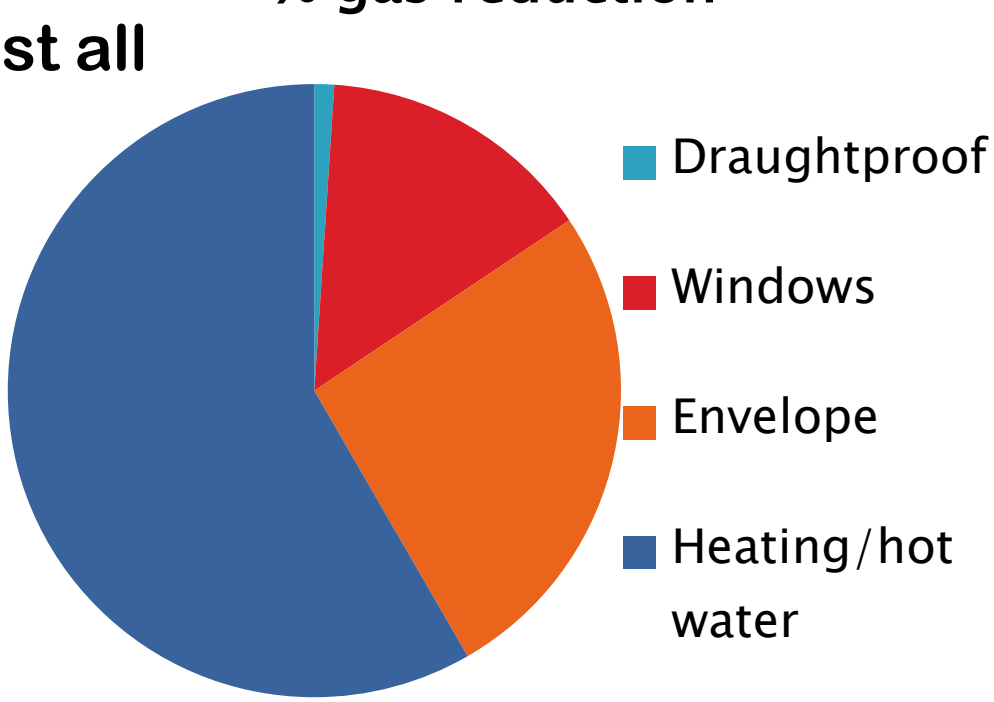
# Majcen et al., 2016
# 31,000 retrofitted homes
# one measure installed



# 31,000 retrofitted homes

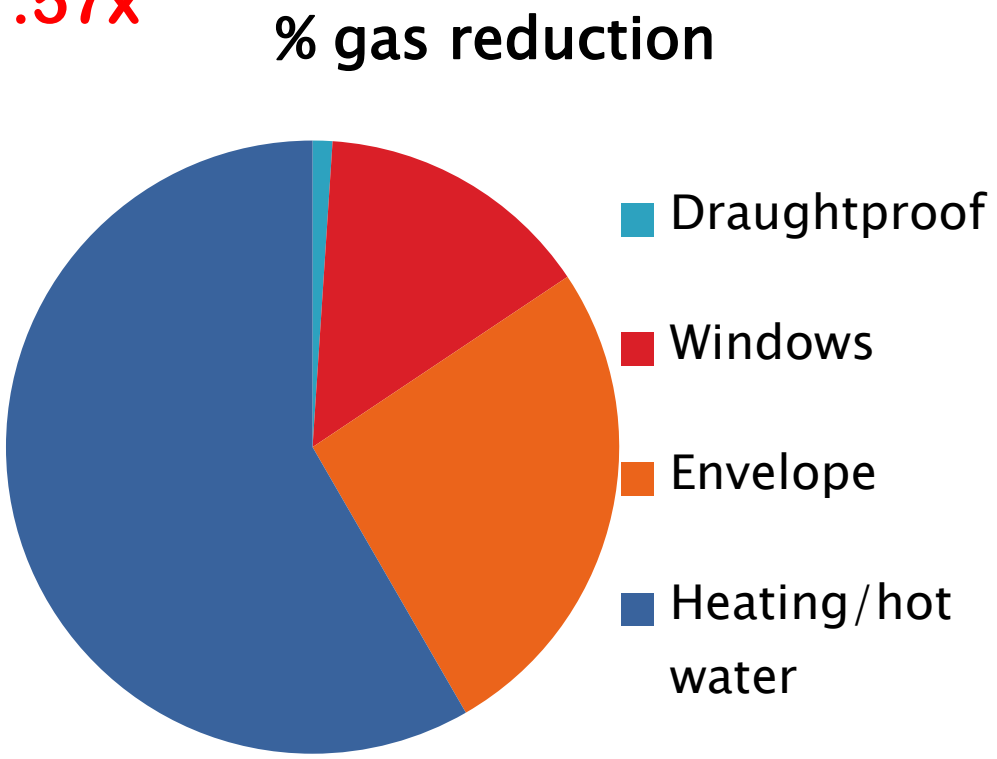
- Window replacement was seldom deep – probably underestimates potential

- A new boiler has the same order of impact, in almost all situations.



# 31,000 retrofitted homes

- Where 2 measures were installed:
  - one measure saved 1x
  - two measures saved 1.57x



# *Three new European studies*

## *Study 2*

# Hamilton et al., 2016
# English housing stock
# 169,000 homes

- Home Energy Efficiency database (n = 16.4M homes)


- What measures did each home have?

- Linked to energy supplier meter point data

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**Hamilton et al., 2016**
**English housing stock**
**169,000 homes**

- **Improved fabric measure: 4% less gas**
- **Improved heating measure: 10% less gas**
- **Improved fabric + heating measures: 12% less (*not 14%*)**

**Hamilton et al., 2016**
**English housing stock**
**169,000 homes**

- **Improved fabric measure: 4% less gas**

***Cavity, not loft insulation made this difference***
***Ceiling effect for loft insulation in evidence***

- **Improved heating measure: 10% less gas**

***More than half of this from boiler replacement (gas to gas replacement)***

**Hamilton et al., 2016**
**English housing stock**
**169,000 homes**

# BUT….

- **Choosing the optimal combination meant that reductions in gas consumption were *better than additive.***

***Three wisely chosen measures installed together increased savings by 40% more than doing them one at a time.***

# *Three new European studies*

## *Study 3*

# Simpson et al., 2015
# 20 real-life case studies

| Retrofit measure | % less gas |
|---|---|
| Loft insulation | |
| Ground floor | |
| Wall | |
| Draught | |
| Full double glazing | |
| Boiler | |
| | |
| ALL AT ONCE | |

# Simpson et al., 2015
# 20 real-life case studies

| Retrofit measure | % less gas |
|---|---|
| Loft insulation | 7% |
| Ground floor | 3% |
| Wall | 15% |
| Draught | 4% |
| Full double glazing | 16% |
| Boiler | 10% |
| | **(55%)** |
| | |

# Simpson et al., 2015
# 20 real-life case studies

| Retrofit measure | % less gas |
|---|---|
| Loft insulation | 7% |
| Ground floor | 3% |
| Wall | 15% |
| Draught | 4% |
| Full double glazing | 16% |
| Boiler | 10% |
| | (55%) |
| Installed all at once | 62% |

# Two key concepts when planning for Whole House Solutions

**Bespoke** – find the optimal combination

A new boiler in a low EE house works 440–1300 hours more in a year (Simpson et al., 2015)

The new boiler can be sized for the new fabric

**Concierge service** – boost uptake through making it comfortable

**Hamilton et al., 2016**
**English housing stock**
**169,000 homes**

**The UCL team's conclusion:**

***"This research shows that these savings are achievable using widely available technologies and insulating techniques that rely on an existing deployment system and skill base."***

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