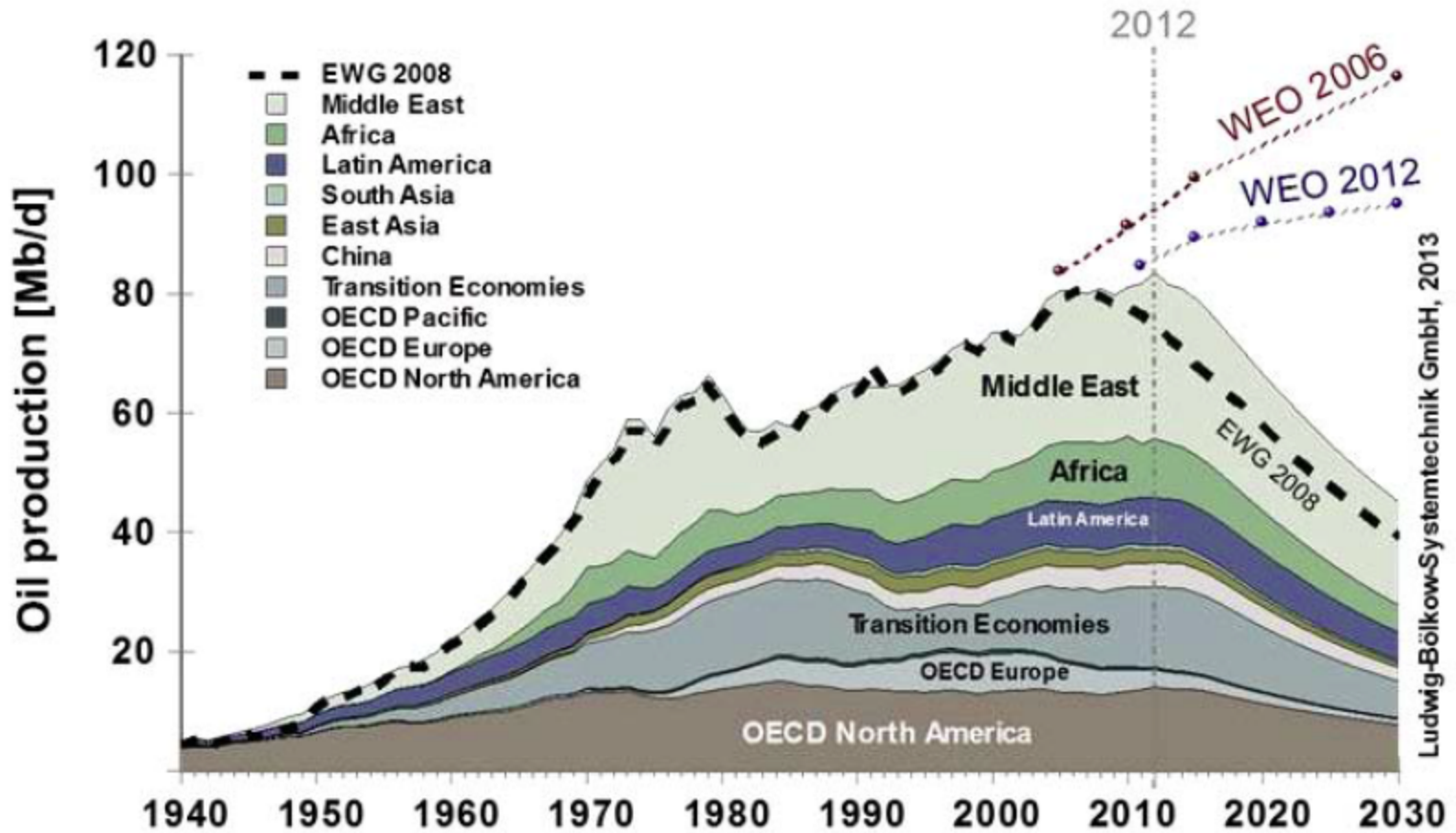


# Sustainable Refurbishment of the existing Stock of Buildings

Marginal costs and benefits of energy conservation measures?  
(More insulation or more photovoltaics?)

Marc Christen, IBI

# Oil Production World

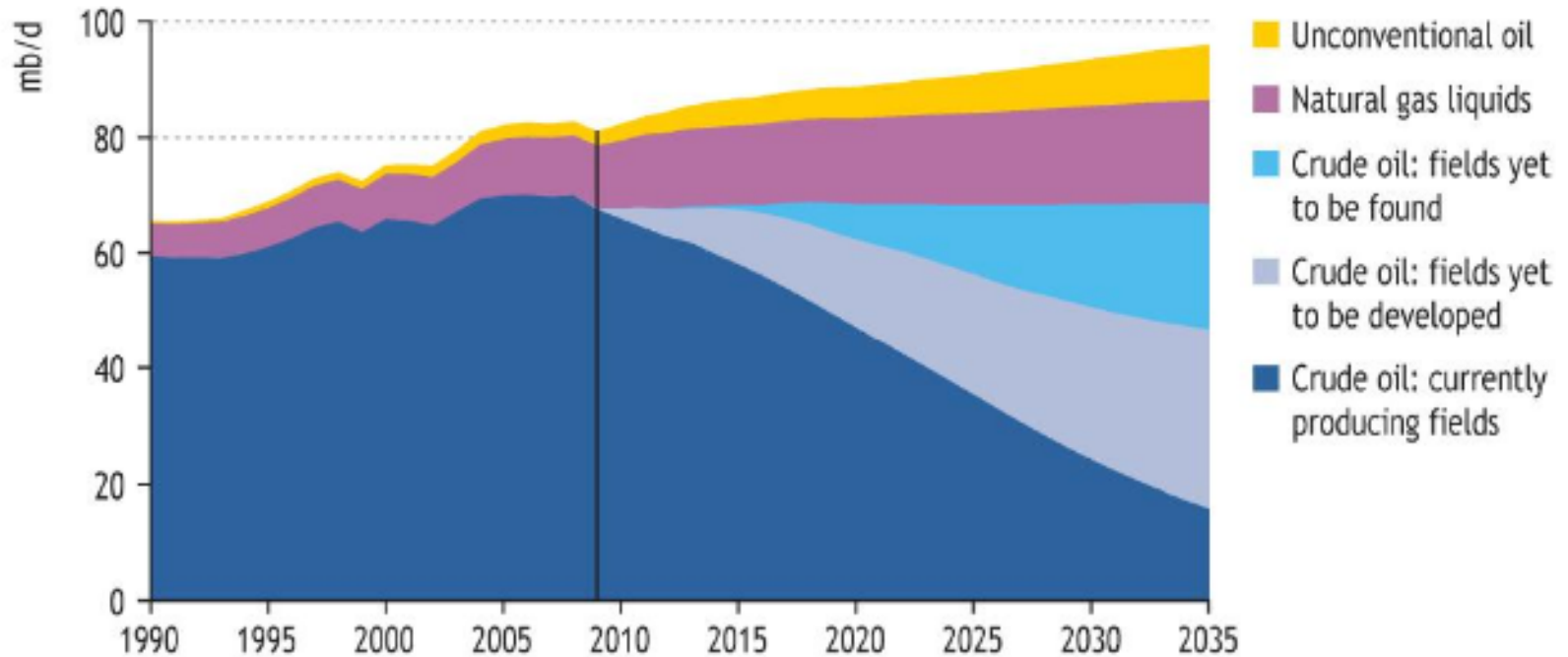


Ludwig-Bölkow-Systemtechnik GmbH, 2013

Source: EWG

# IEA WEO 2010 Oil Supply Projections

## World oil production by type in the New Policies Scenario



# Price of Oil (Peak of Oil)

## Facts:

- Price rose from 20-30\$/barrel (2005) to 115\$/barrel today (now constant)
- Production of conventional oil flat since 2005 (undulating plateau)
- 50% production growth from Natural Gas Liquids, LNG and Gas-to-liquids
- Exploration gains below consumption
- Reserves unknown

## Trends:

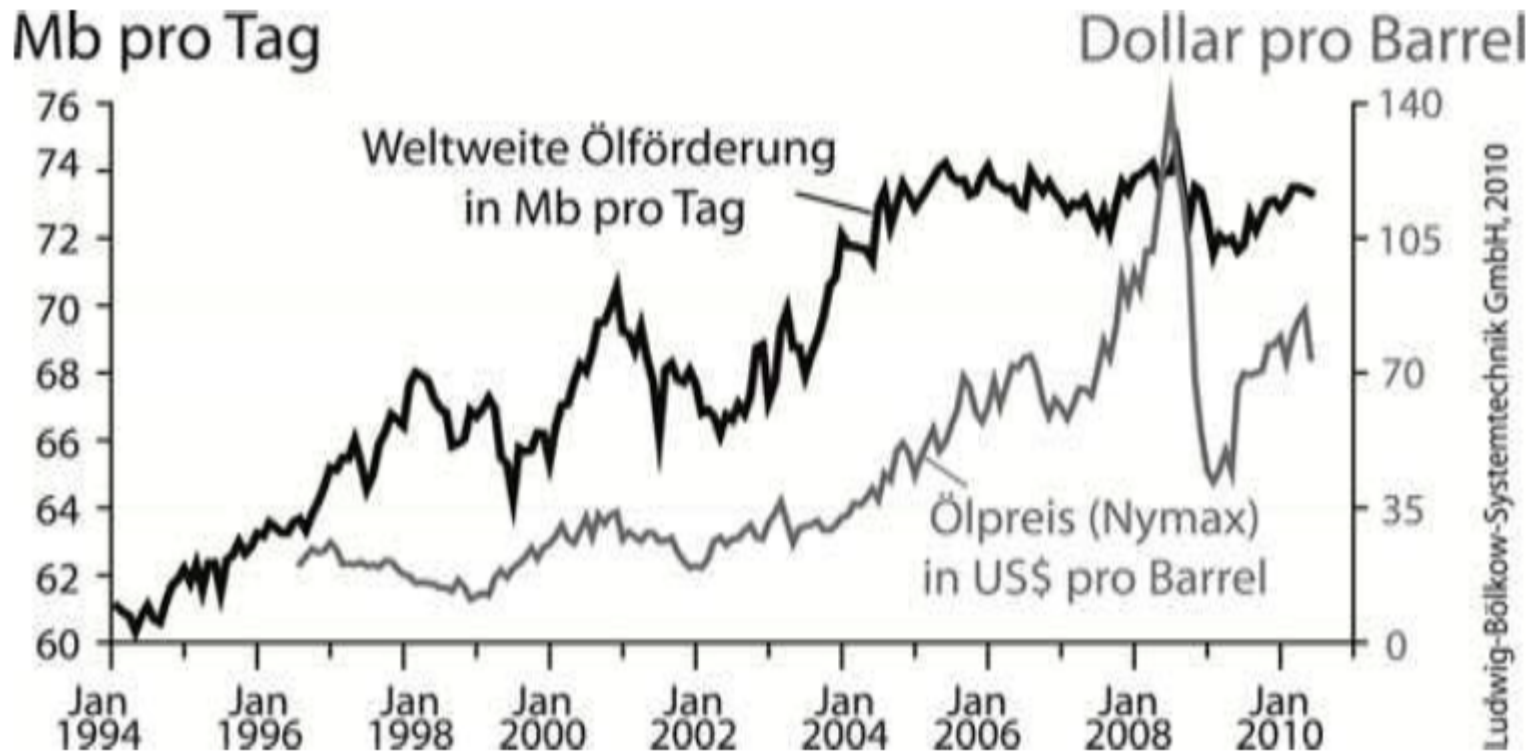
- Rising upstream spending (E&P) from \$250 billion (2005) to about \$650 billion (2013)
- Geology driving production costs up (Deepwater, Arctic)
- Technology bringing production costs down (Fracking)

## Questions:

- Has the oil price hit a wall at 110-120 \$/barrel? (Price elasticity)
- Can and will the oil industry keep investments up (depts, capex compression)
- Government takes (impact of tax reductions for oil industry)

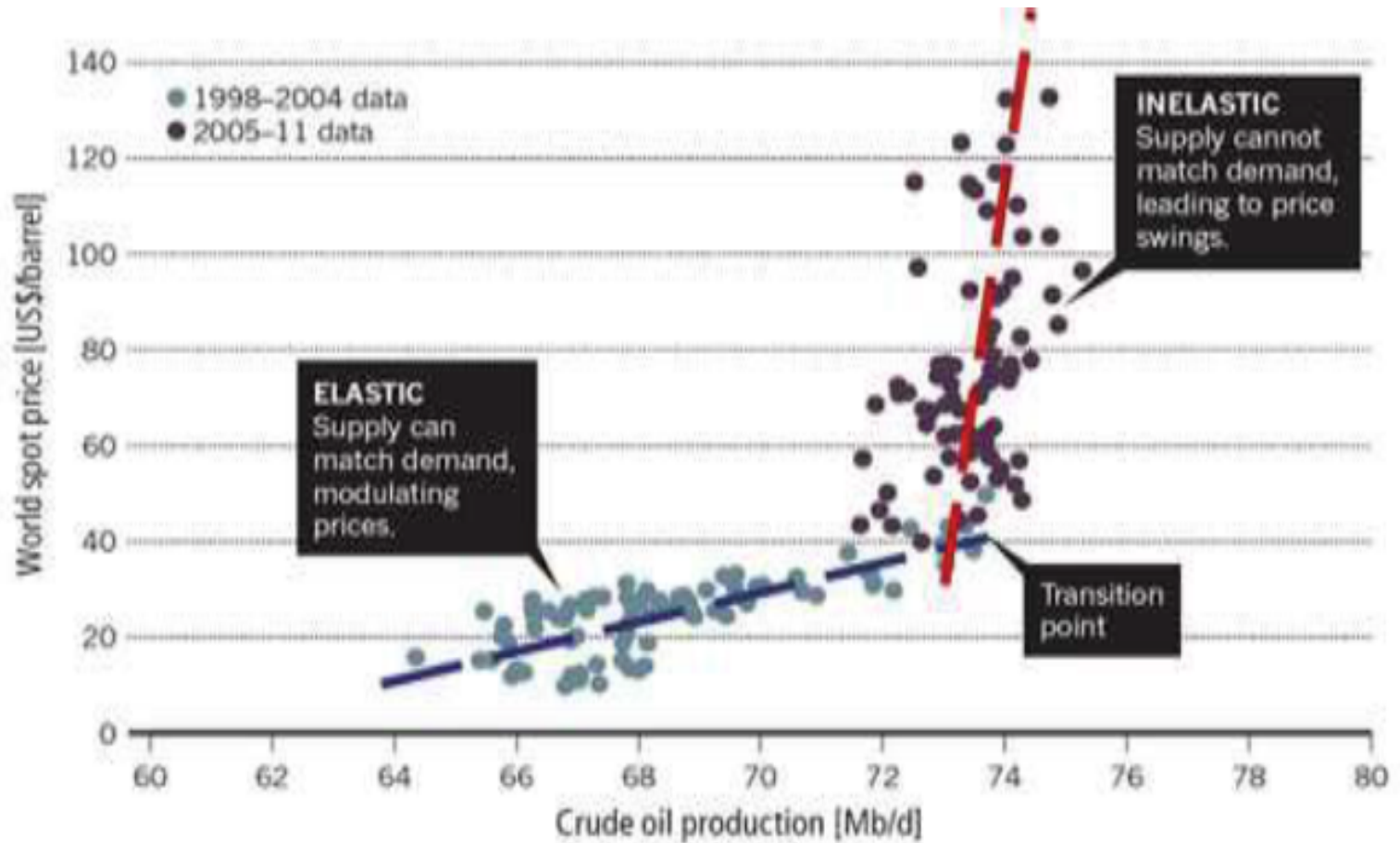
Source: Steven Kopits, Interview ASPO USA

# Oil Production World and Oil Price



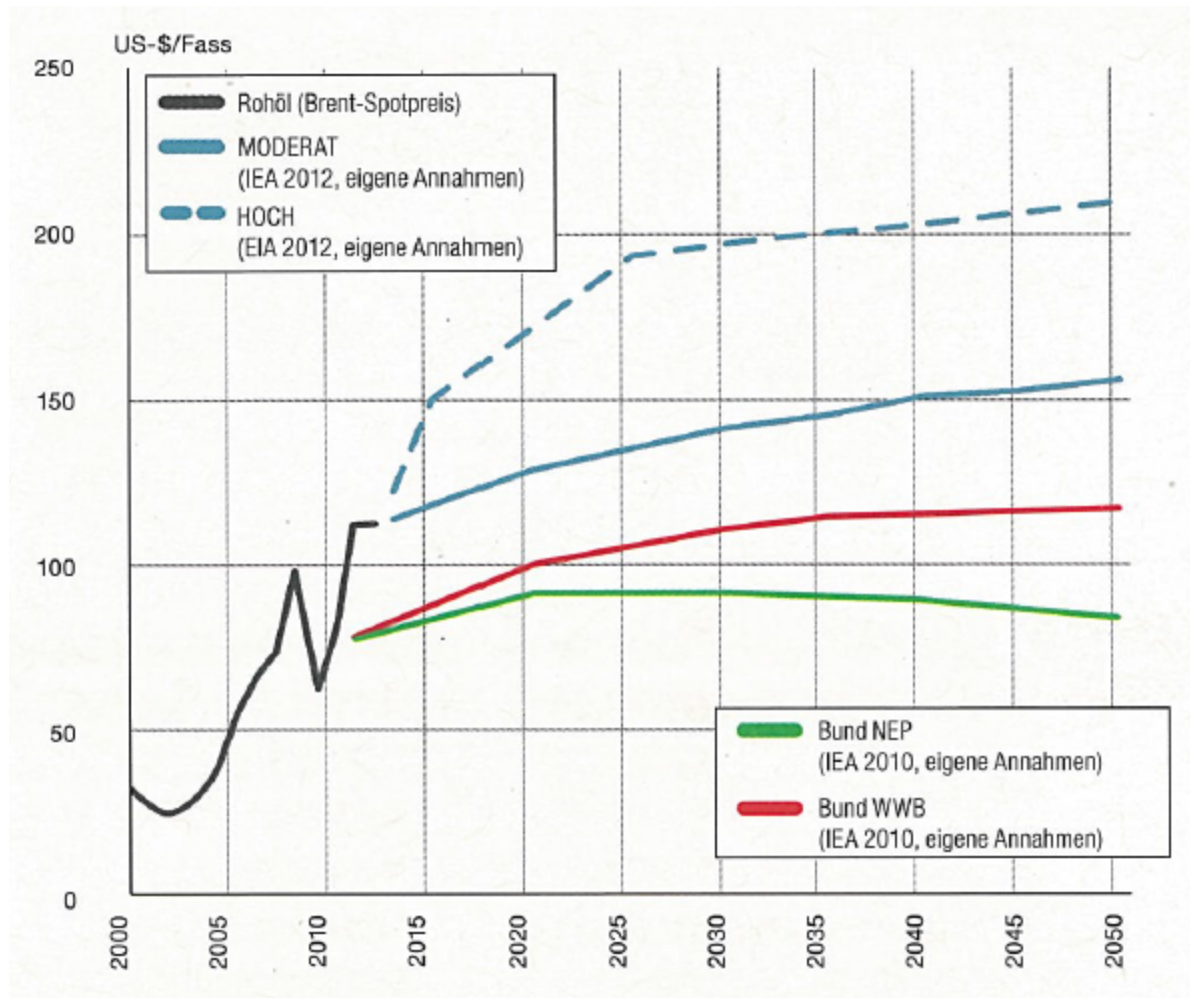
Source: EWG, Zerta

# Oil Production World vs. Oil Price



Source: EWG, Murray

# Swiss Energy Szenarios



Source: SES

New Energy Policy  
Business as usual

What is the Share of the existing Stock of Buildings  
on total Energy Consumption?

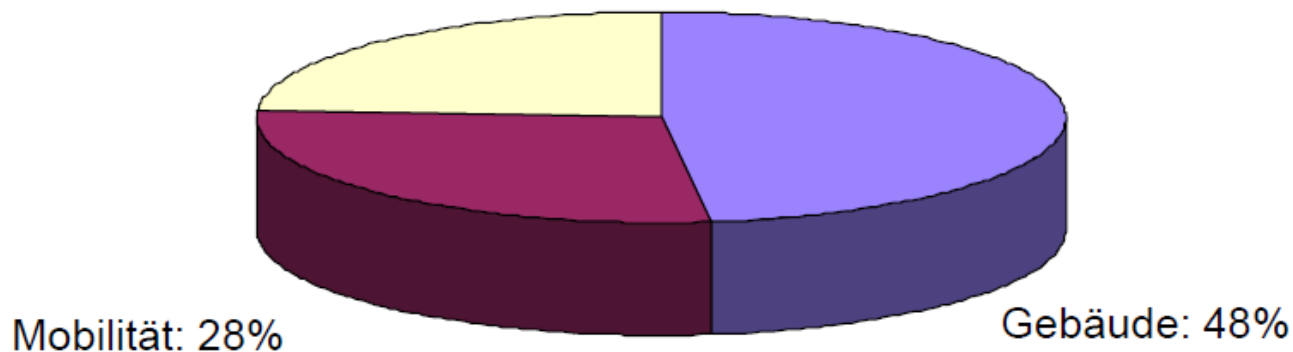
- a) 20-30%
- b) 30-40%
- c) 40-50%
- d) 50-60%



## Energy Consumption CH - Buildings

# ***Endenergieverbrauch Schweiz 2006***

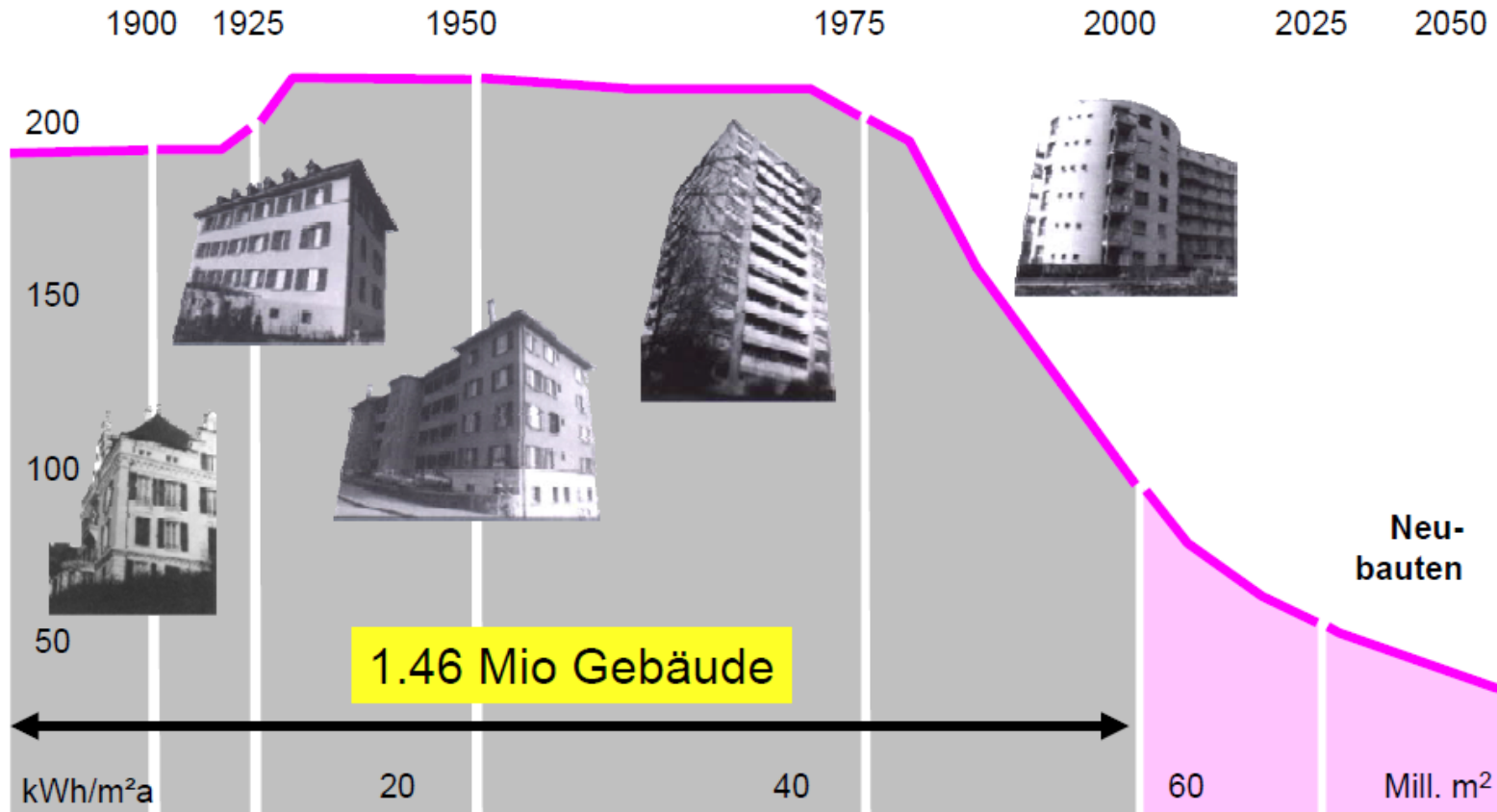
Industrie, Dienstleistung  
Gewerbe, Landwirtschaft: 24%



**davon 69% fossile Energieträger**

Quelle: BfE/ P. Richner EMPA

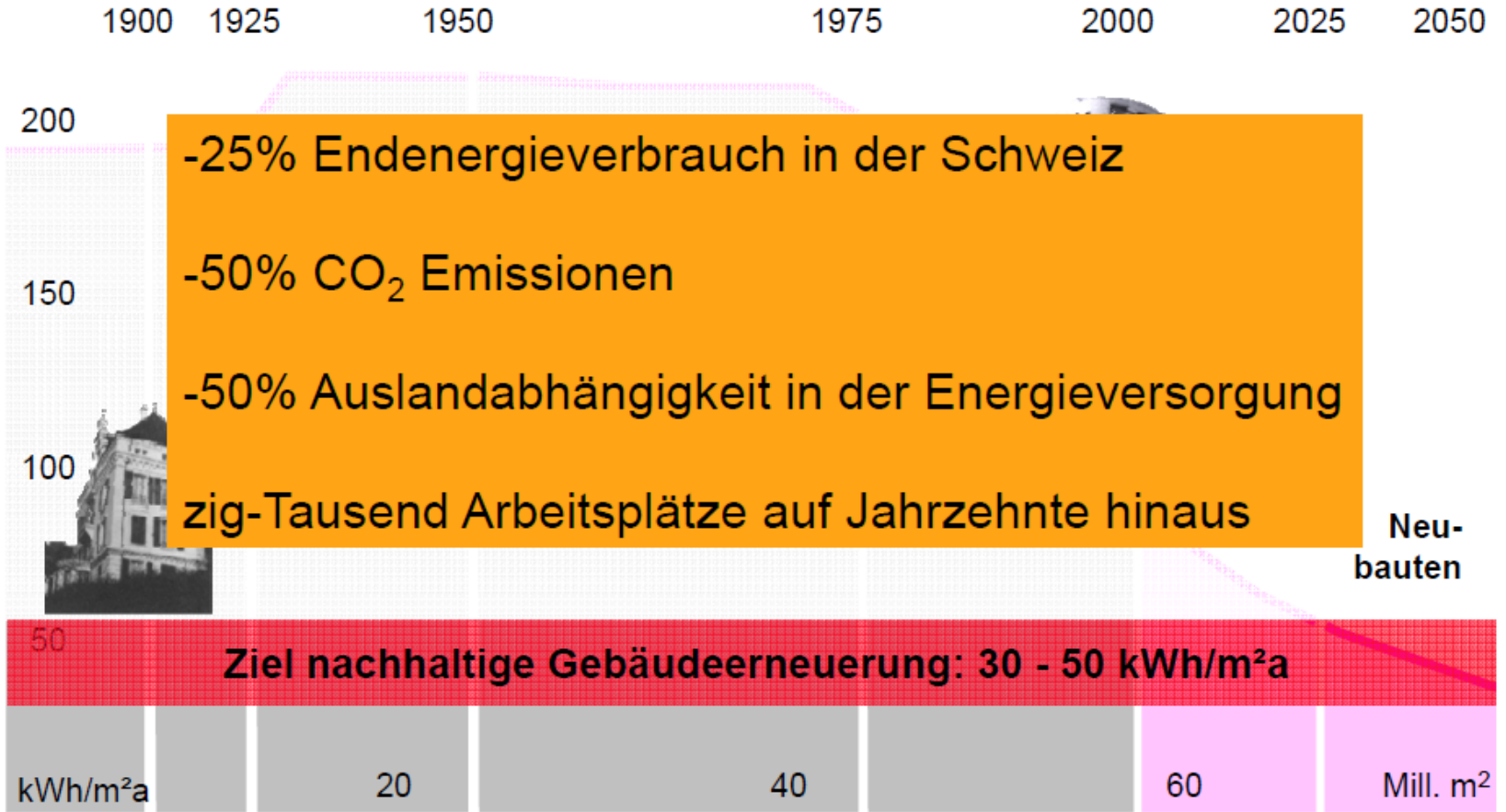
# Energieverbrauch Wohngebäude nach Baujahr



Quelle: P. Richner EMPA

# Benefits

## *Energieverbrauch Wohngebäude nach Baujahr*



Quelle: P. Richner EMPA

# Erneuerungsstrategie Gebäude

Zeitgemässe Raumaufteilung

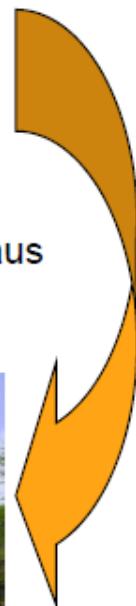
Energiebedarf senken

Effiziente Gebäudetechnik

Erneuerbare Energie



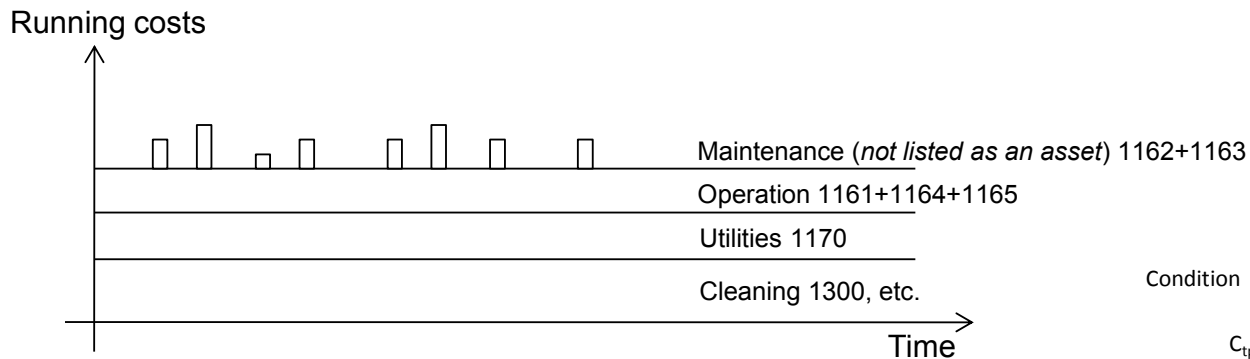
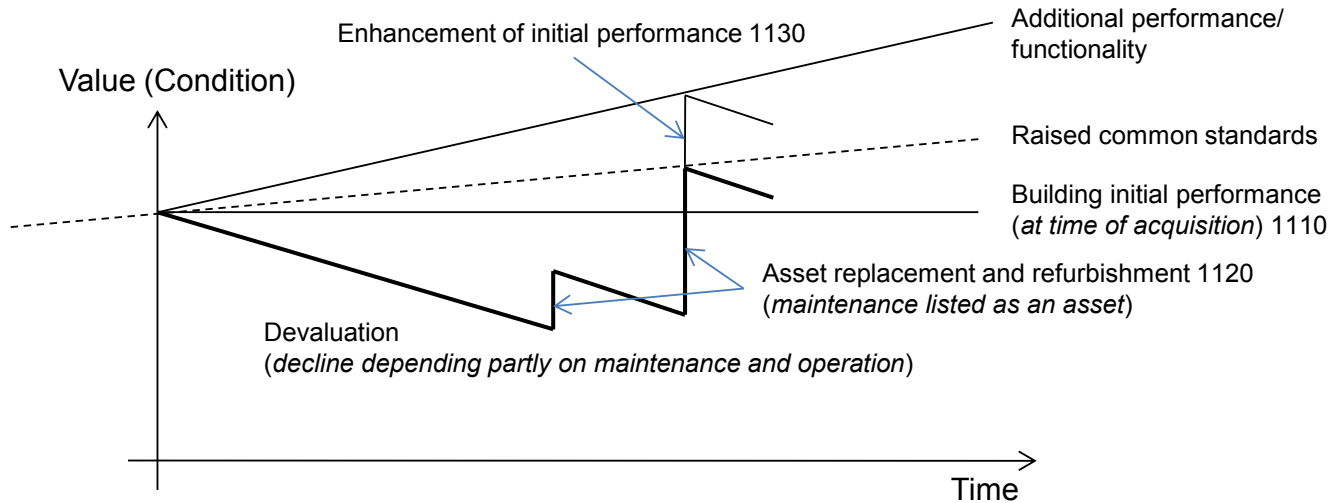
Renovationsprojekt Mehrfamilienhaus  
Zürich Höngg,  
Architekt Beat Kämpfen



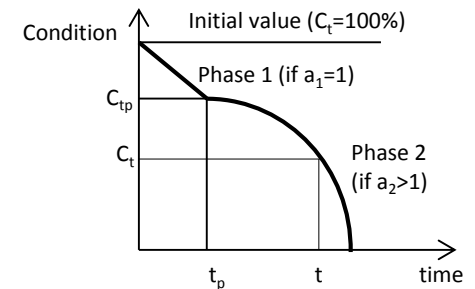
Quelle: P. Richner EMPA

What does it cost to get there?

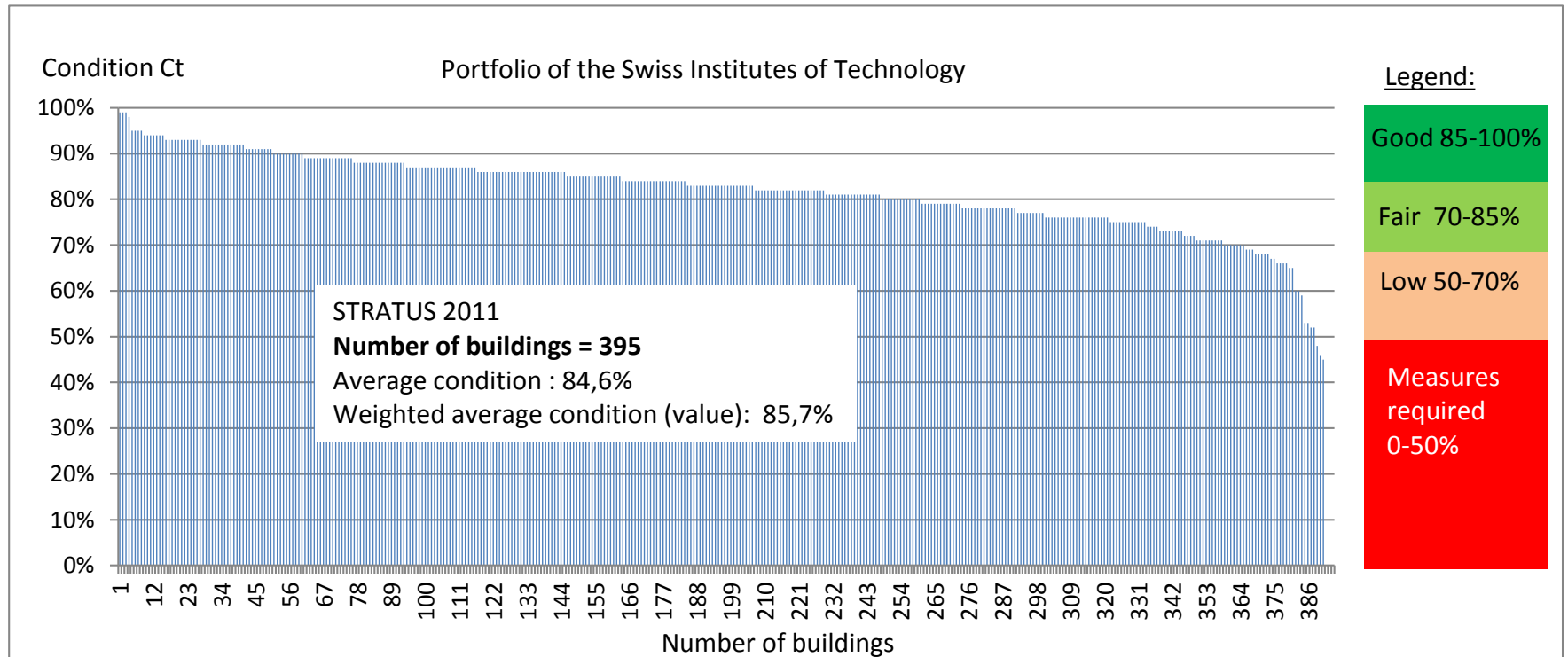
# Maintenance Planning of Buildings - STRATUS



Source: EN15221/4, Stratus



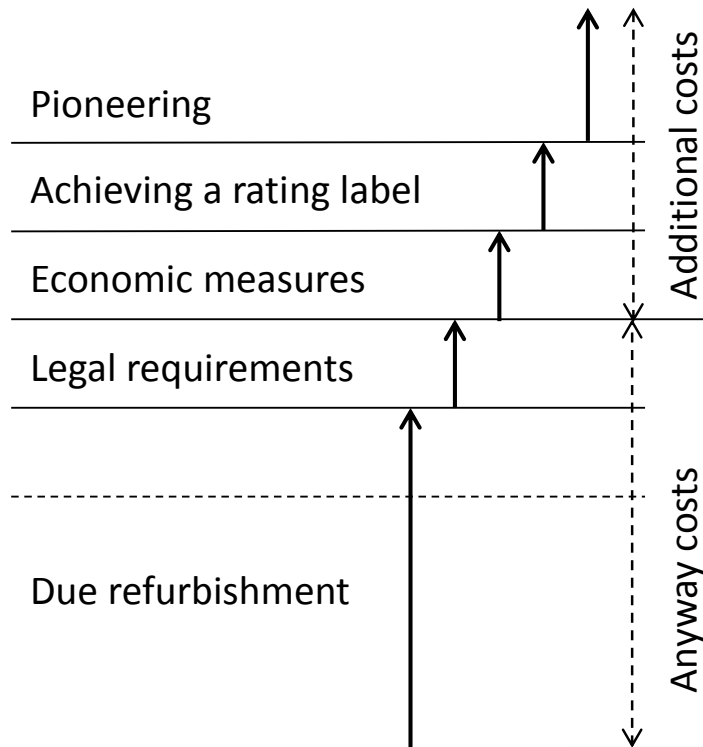
# Condition of the ETH-Portfolio (STRATUS)



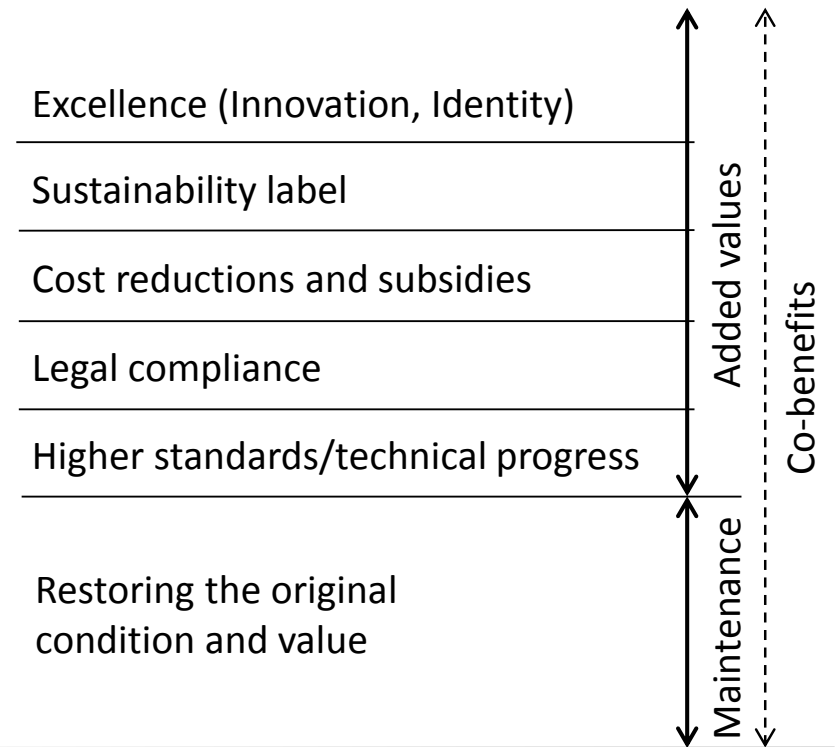
Source: Geschäftsbericht 2011 ETH-Rat über den ETH-Bereich

# Costs categories in energy conservation and associated benefits

## Cost categories



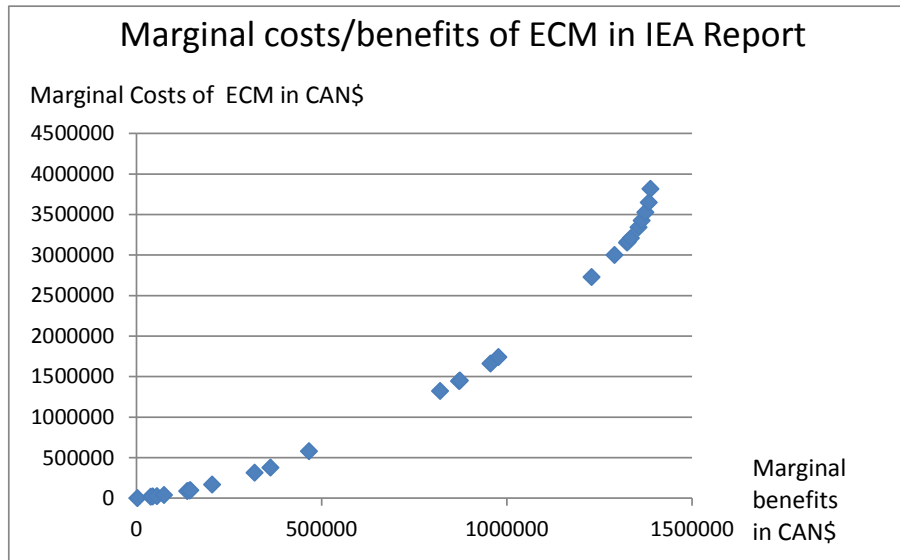
## Primary associated benefits



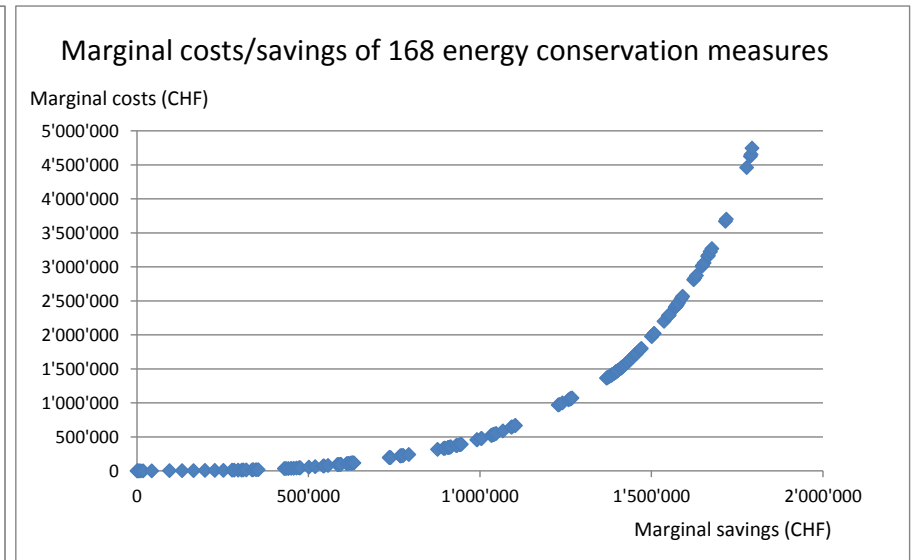
*Condition or value before refurbishment and energy conservation measures*



# Marginal Costs of Energy Conservation Measures in Buildings



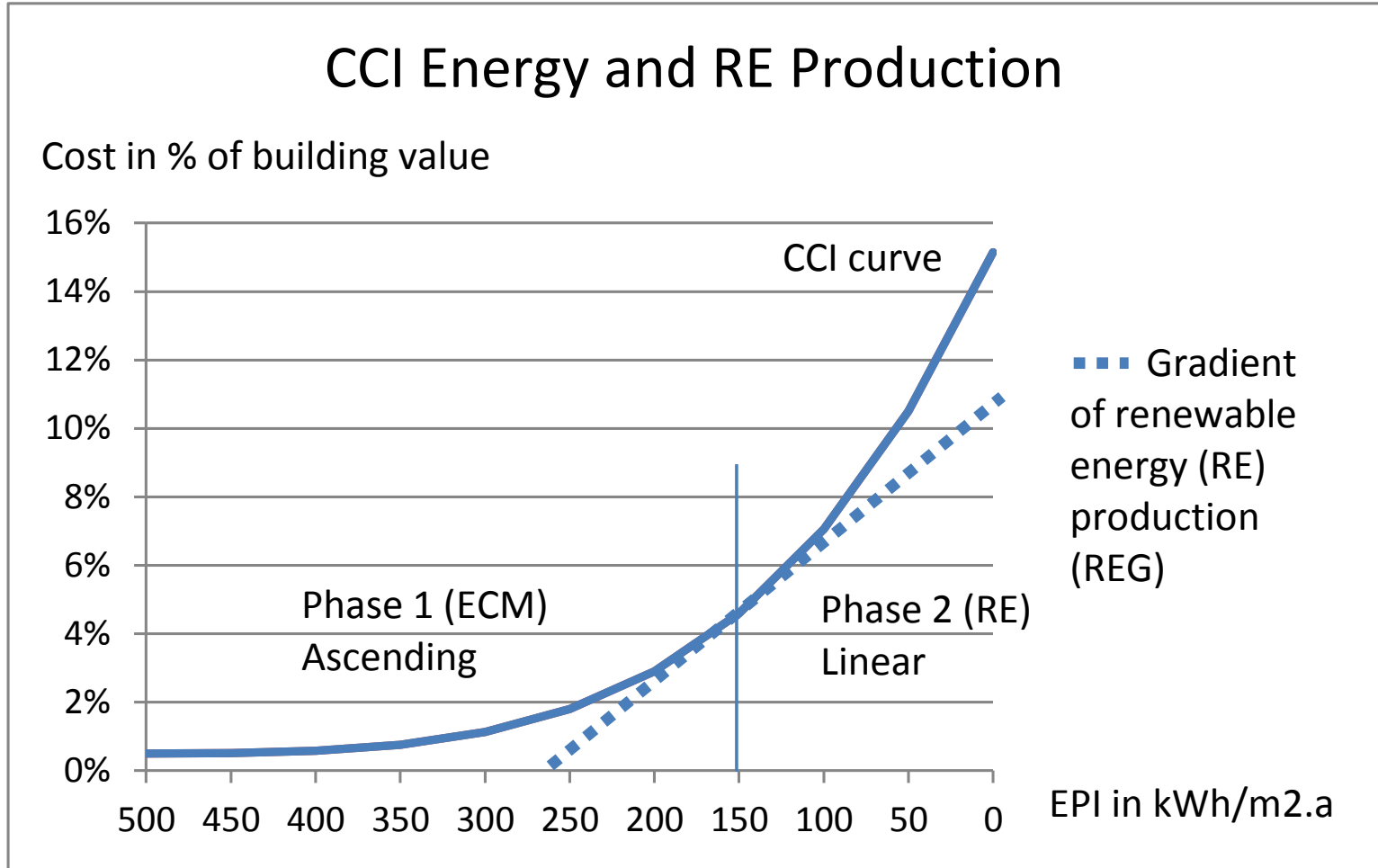
27 measures



168 measures in case study

-> The law of increasing relative costs is applicable (measures)

# More Insulation or more Renewable Energy?



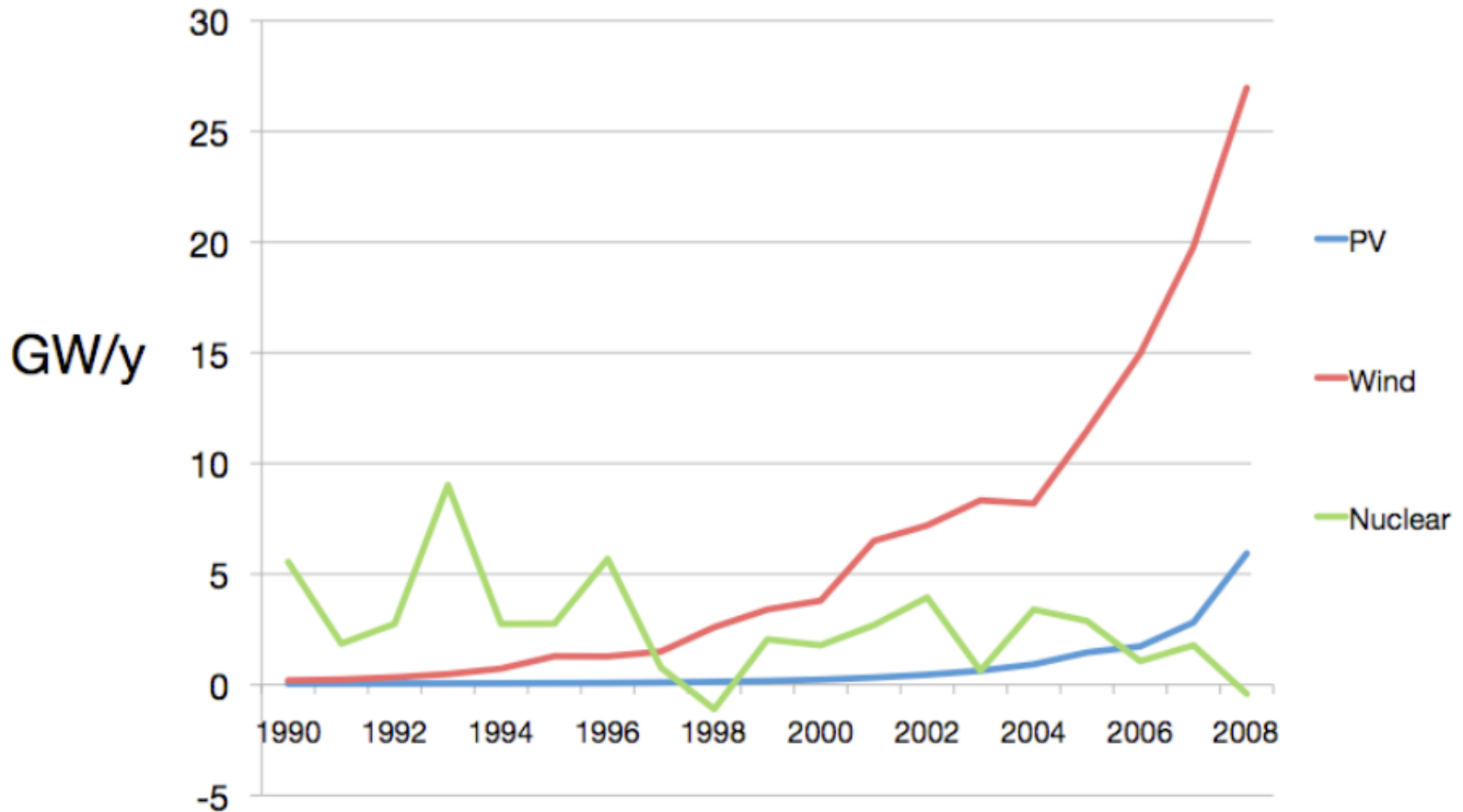
# More Insulation or more Renewable Energy? Seasonal Storage



Thank you for your attention

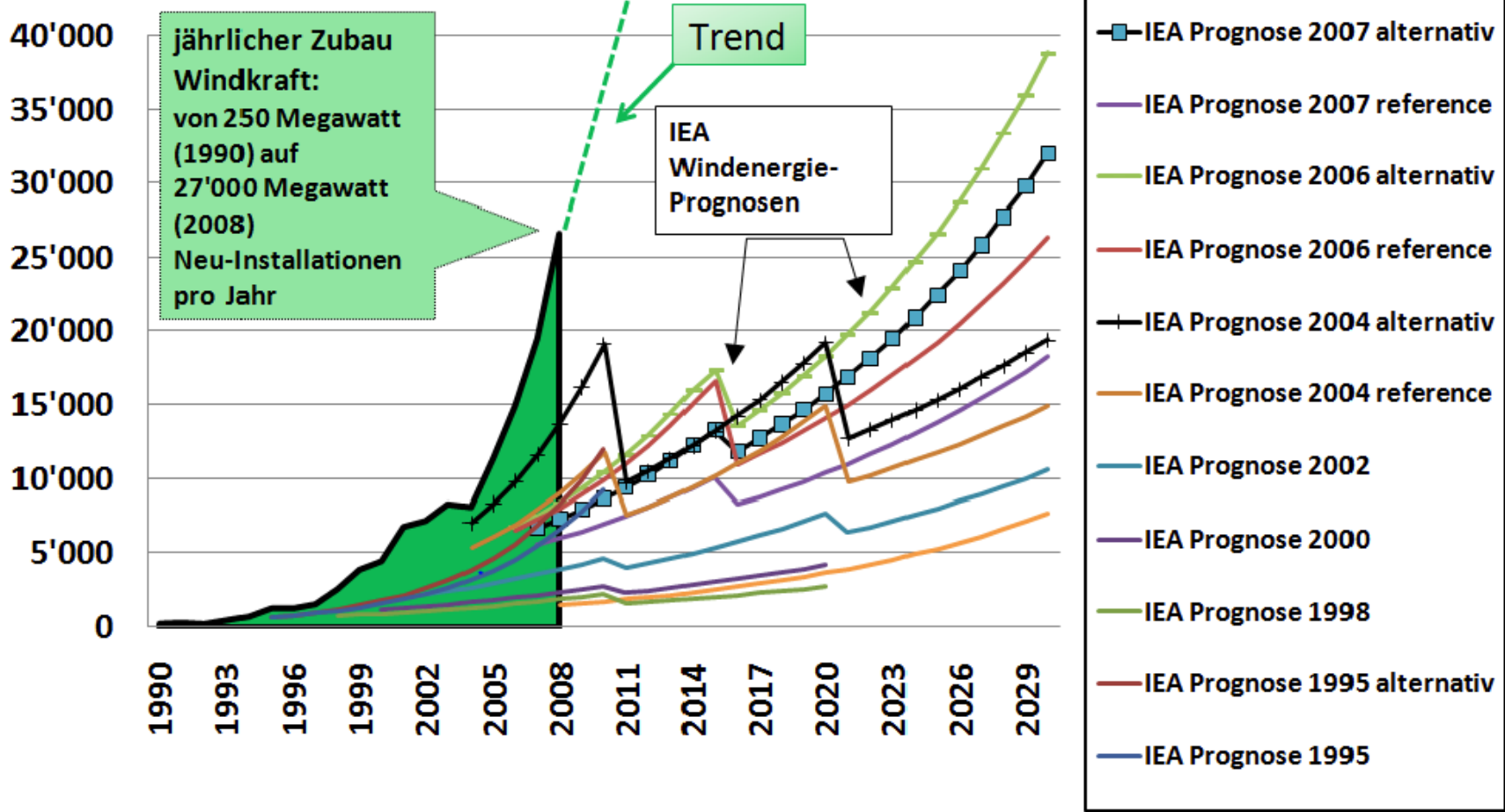
Questions to: [christen@ethrat.ch](mailto:christen@ethrat.ch)

## Global new grid connections by year, 1995-2008



Heute: beide rund 35 GW/a

# 18 Jahre früher als offiziell erwartet: 27'000 Megawatt Windkraft neu installiert (2008)



# IEA WEO Oil Supply Projections 2000-2010

