Lucerne University of
Applied Sciences and Arts
HOCHSCHULE
LUZERN
Engineering & Architecture

Swiss energy efficiency measures implemented in the industrial sector: impact evaluation and conclusions

Marina Santoro
Lucerne School of Engineering and Architecture
Lucerne University of Applied Sciences and Arts, Switzerland

September 14th, 2016
Kalkscheune, Berlin

Outline

- **Introduction**
- **Energy consumption in the Swiss industry**
  - Overview
- **Energy consumption and savings, EnAW partners**
  - Results and potential
- **Conclusion and Outlook**

Hochschule Luzern
Engineering & Architecture

Swiss energy policy: legislation

1st commitment period

Phase I

1999 2000 2001… 2004 2005… 2008

Target CO_2: -10%

2008-2012
vs. 1990

Energy law:
-2% reduction p.a.

Cantonal law

CO_2 law

CO_2 law
Instruments

Climate cent
Transport fuel

CO_2 levy
Process & heating fuel

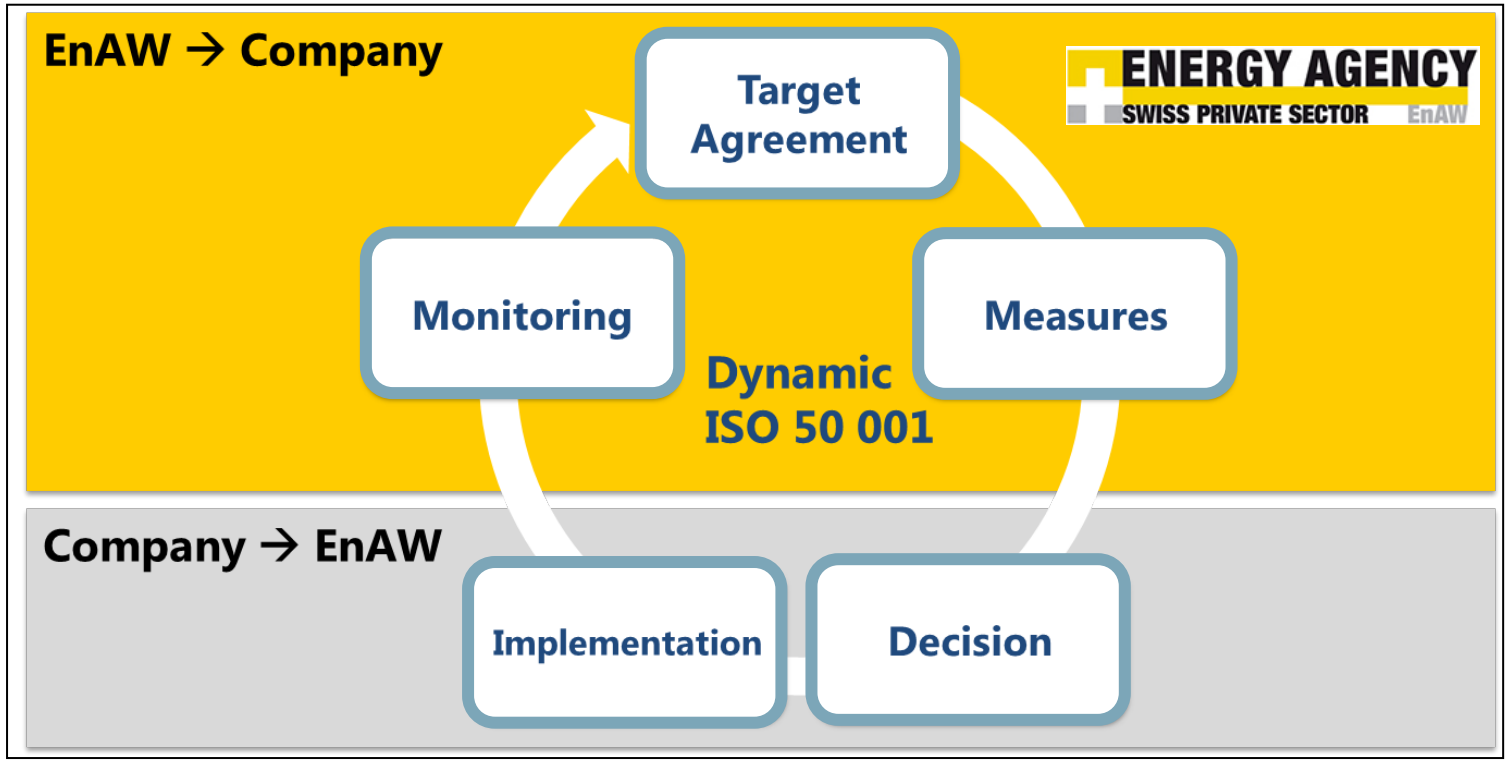
Cantonal law
focus on EII[1]

Phase I: voluntary agreements (until 2007)
Phase II: voluntary agreements, **formal commitments** and Emissions Trading System

[1]Energy Intensive Industries (EII): energy consumption≥500MWh electricity p.a. and ≥5 GWh heat p.a.; [2]SME: Small and Medium Enterprises;

Hochschule Luzern
Engineering & Architecture

EnAW – Target agreement mechanism
within the Energy target model



Triggering system since 2008: CO_2-tax[1] exemption, grid charges reimbursement, bonus and incentives

[1] http://www.bafu.admin.ch/klima/13877/14510/14511/index.html?lang=de
2008: 12 CHF/ton CO_2 ; 2010: 36 CHF/ton CO_2 ; 2016: currently 84 CHF/ton CO_2

Energy data of the Swiss Private Sector

Data set

ENERGY AGENCY SWISS PRIVATE SECTOR EnAW

Formal commitments, energy target model

- 14 sectors (NOGA 2008)
  - ~ 7400 measures
  - ~ 440 agreements (anonymized)
- Accumulated energy savings, by sector, carrier and category, *i.e. production technology, infrastructure, utilities, etc.*
- Energy consumption (from 2006)

Swiss Federal Office of Energy (SFOE)

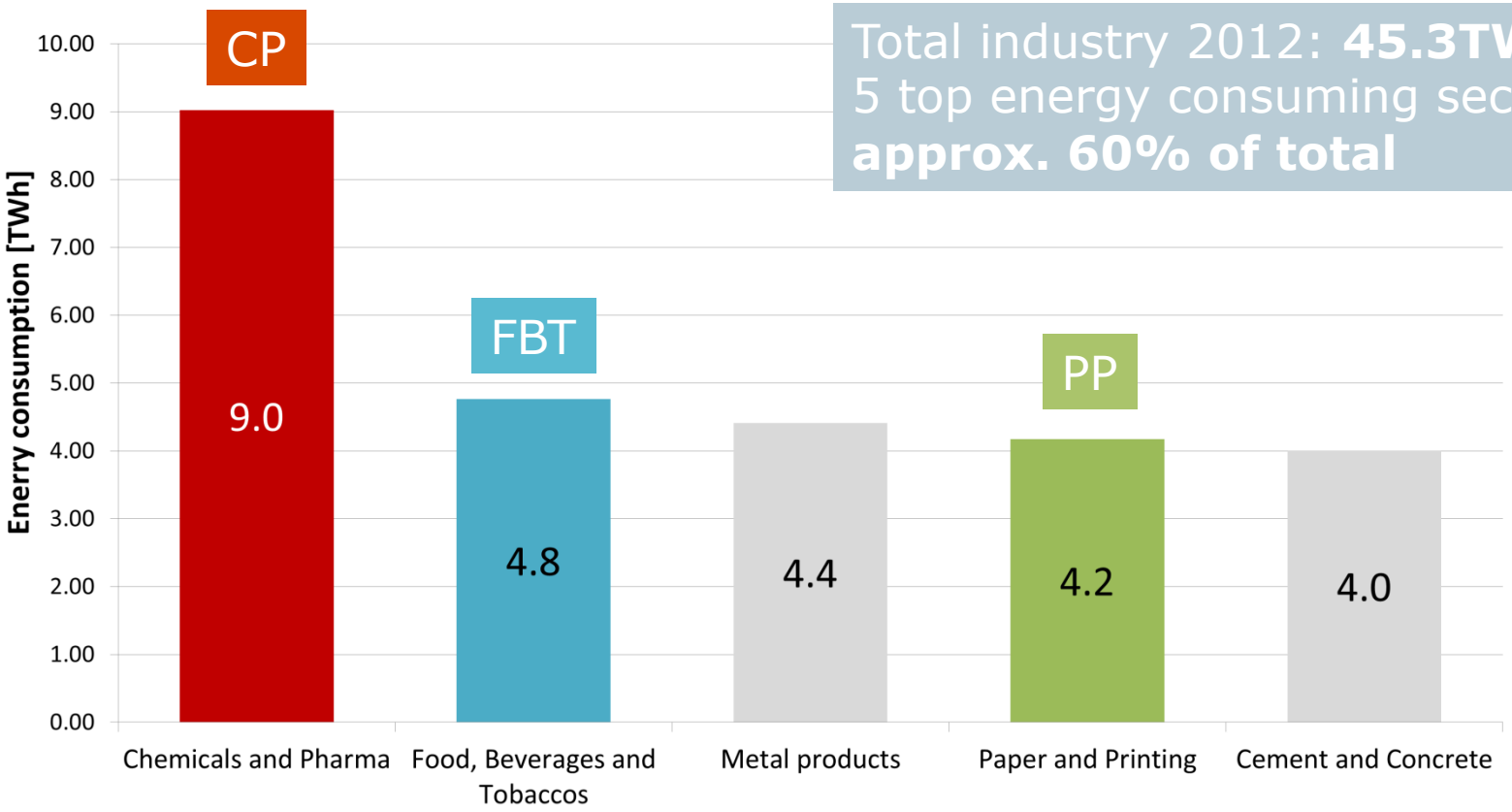
Sector-specific energy consumption data

Statistics: Swiss industrial sectors characteristics

Hochschule Luzern
Engineering & Architecture

Focus on top energy consumers (2012)

Data SFOE



Total industry 2012: **45.3TWh**
5 top energy consuming sectors:
approx. 60% of total

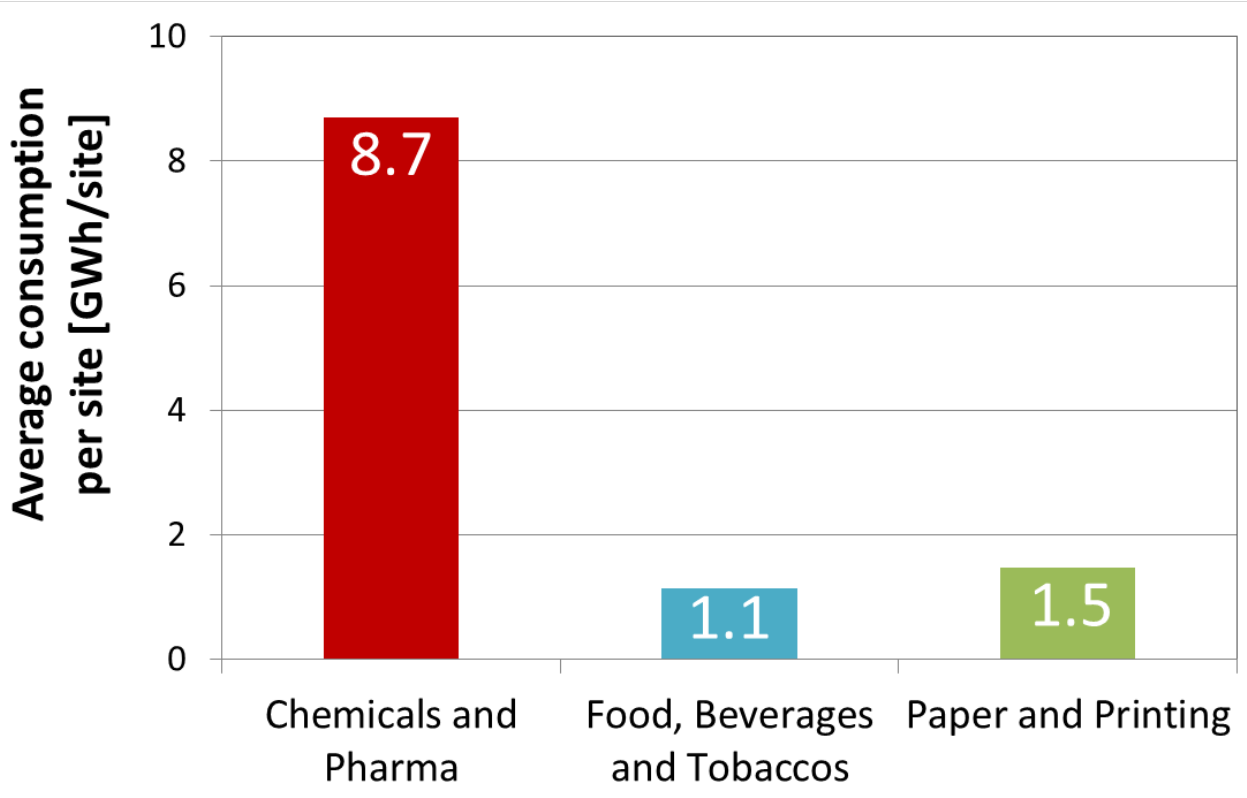
Top 2: approx. 30% of total
CP + FBT + PP: approx. 40% of total

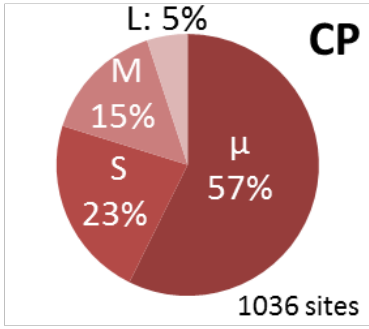
Sources: SFOE 2014, Energieverbrauch in der Industrie und im Dienstleistungssektor, Resultate 2014
SfOE & Prognos AG, 2015, Analyse des schweizerischen Energieverbrauchs 2000-2014 nach Verwendungszwecken

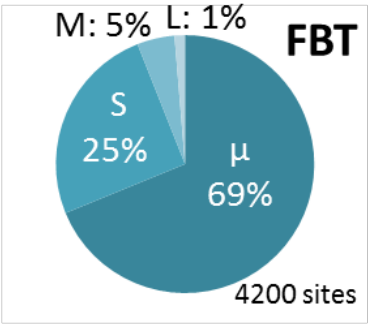
Hochschule Luzern
Engineering & Architecture

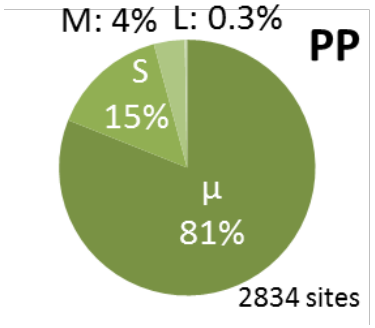
Sector-specific characteristics (2012)

Statistics SFOE









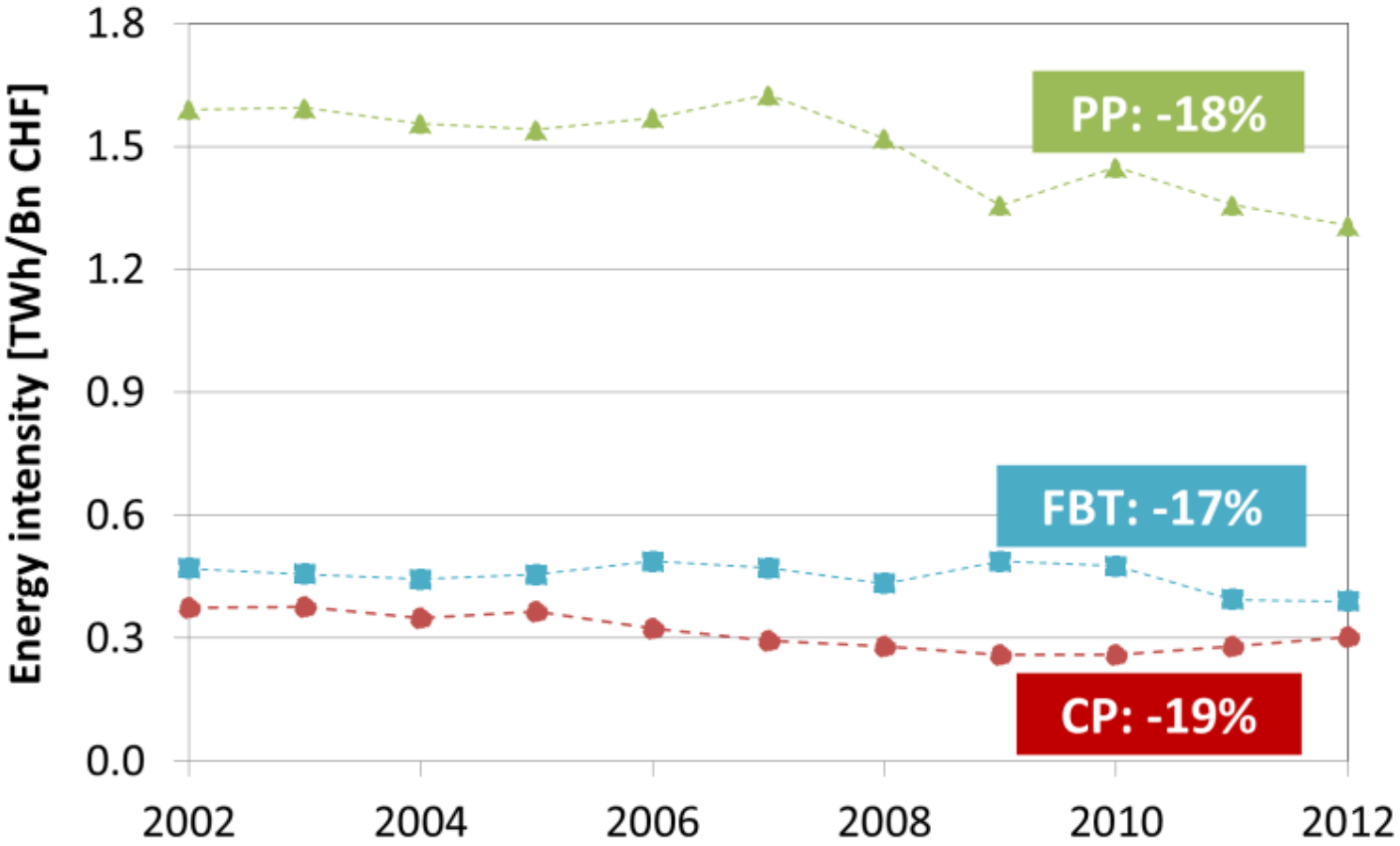
CP: highest average consumption/site and larger sites
FBT: highest # sites, lowest average consumption/site

Sources: FSO Arbeitsstätten und Beschäftigte nach Jahr, Wirtschaftsabteilung (NOGA 2008), Grössenklasse und Variable
µ enterprises: 0 to <10 FTE; S enterprises: 10 to <50 FTE; **M enterprises: 50 to <250 FTE; L enterprises: ≥ 250 FTE**

Hochschule Luzern
Engineering & Architecture

Similar energy intensity evolution

Data SFOE



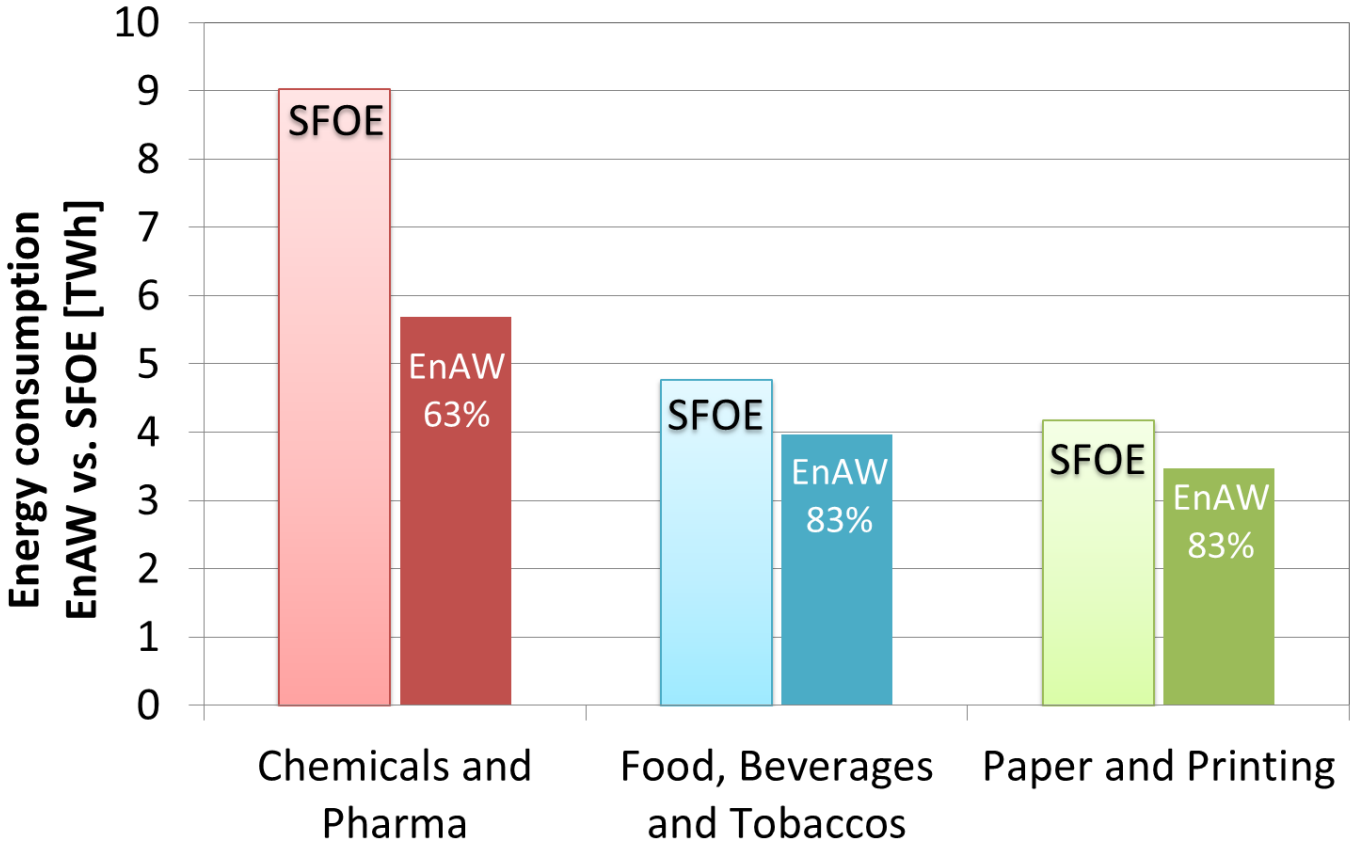
Significant higher absolute energy intensity of PP

Sources: FSO, T3a.2 Industries production account

Hochschule Luzern
Engineering & Architecture

Coverage EnAW data 2012

Data comparison SFOE vs. EnAW

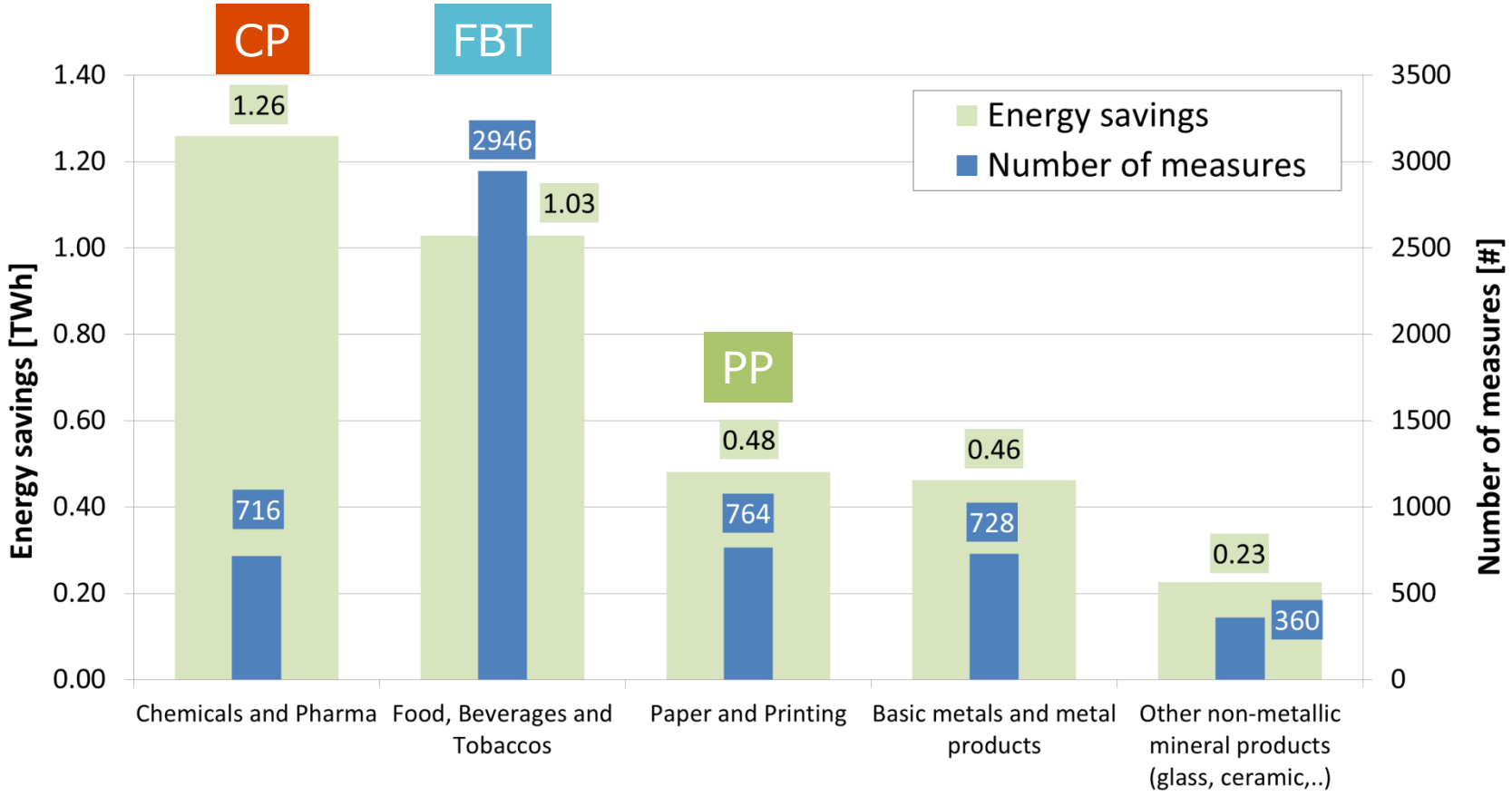


Representative data in these 3 sectors

Hochschule Luzern
Engineering & Architecture

Energy savings and number of measures (2012)

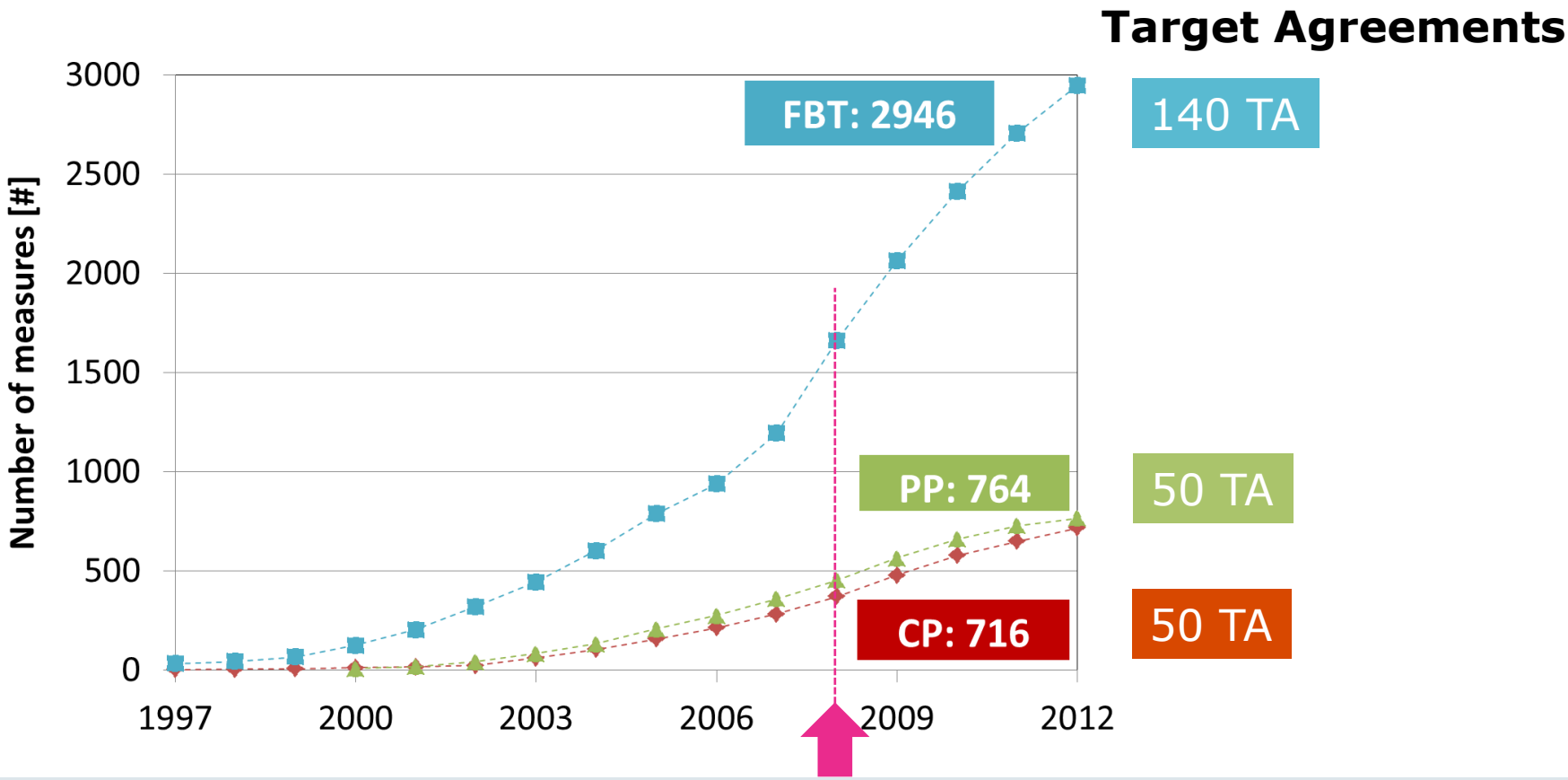
Data EnAW



CP achieved highest energy savings
FBT implemented most measures

Number of measures: implementation over years

Data EnAW

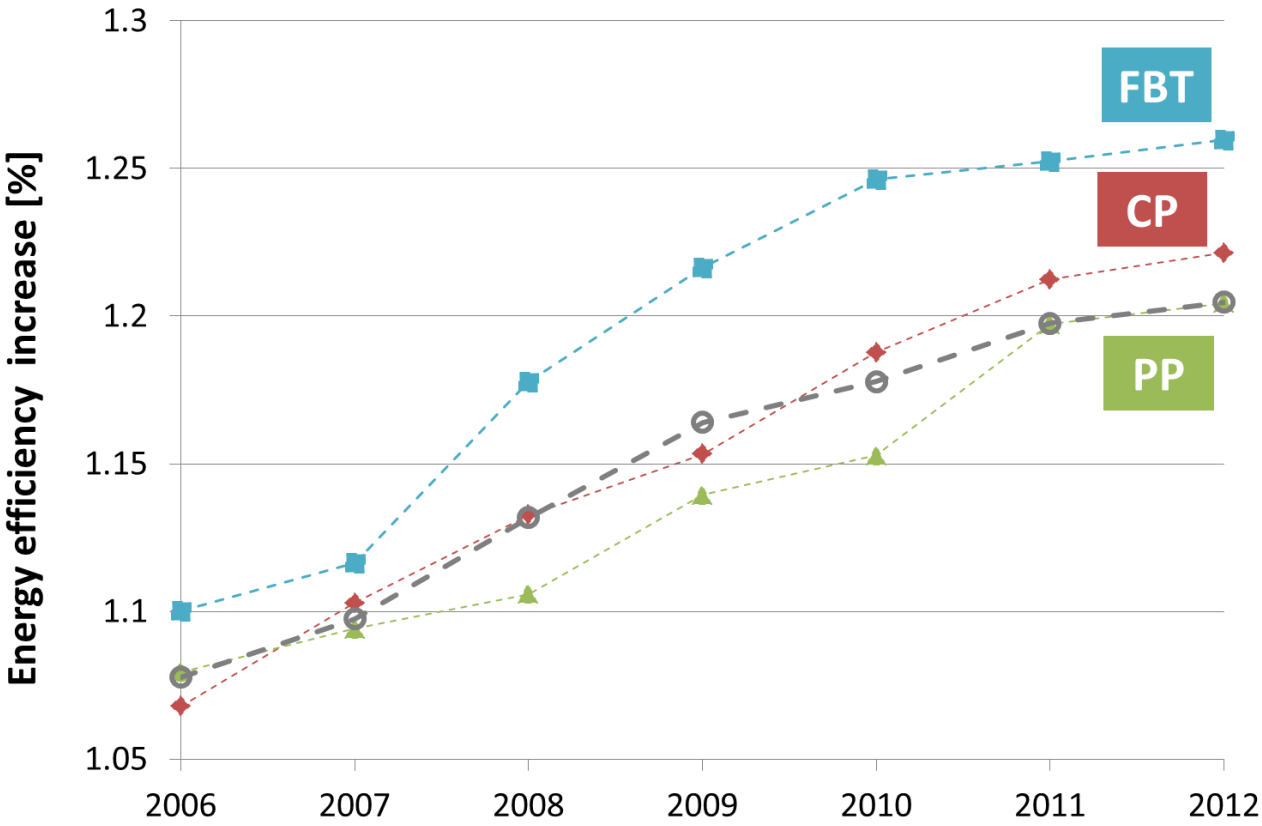


2008 CO_2 levy: highest attractiveness in **FBT**;
Number of Target Agreements (TA) ~ 3 times higher in **FBT**

Hochschule Luzern
Engineering & Architecture

Energy efficiency increase

Data EnAW



Average p.a.

2.66%

2.56%

2.12% **IND**

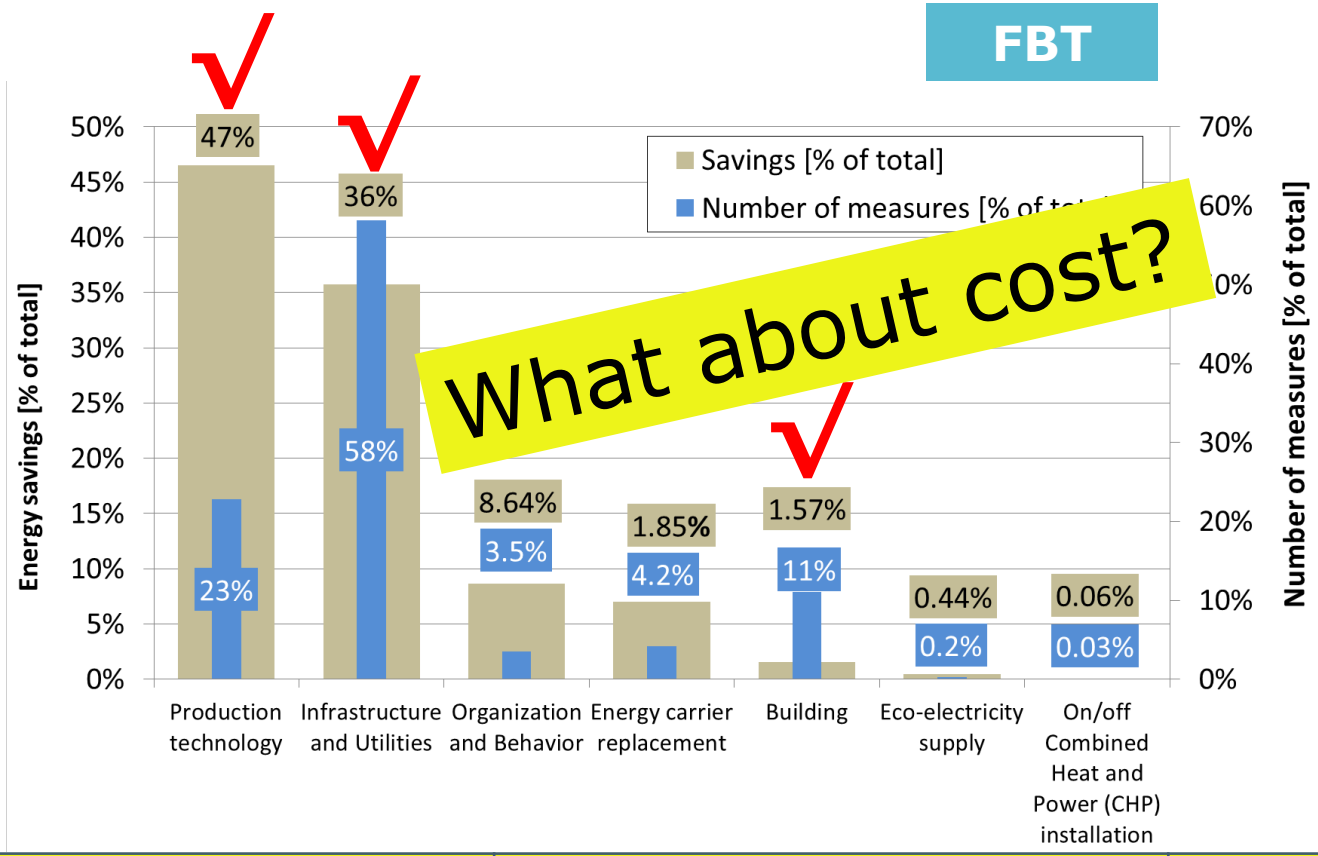
2.08%

Highest energy efficiency increase in **FBT** and **CP**

PP slightly below industrial average

Savings distribution over categories

Data EnAW



Production	Infrastructure & utilities	Building
High savings potential	Easier implementation No production downtime	Big efforts despite lower savings
Payback ≤ 4 years	**≤ 8 years**	**> 8 years**

Hochschule Luzern
Engineering & Architecture

Conclusions & recommendations

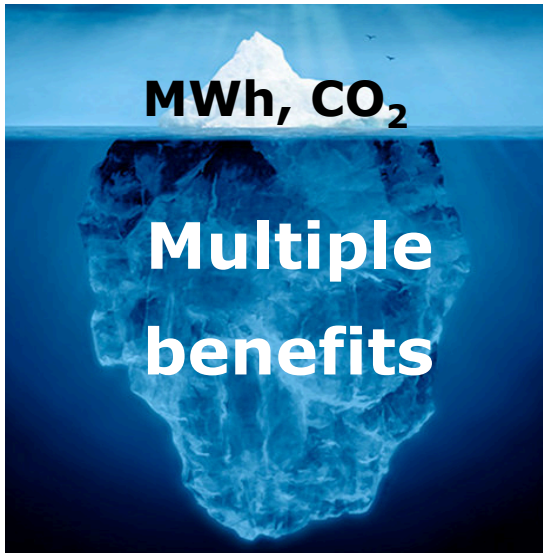
- Triggering system works
  → target agreement mechanism proved to be successful

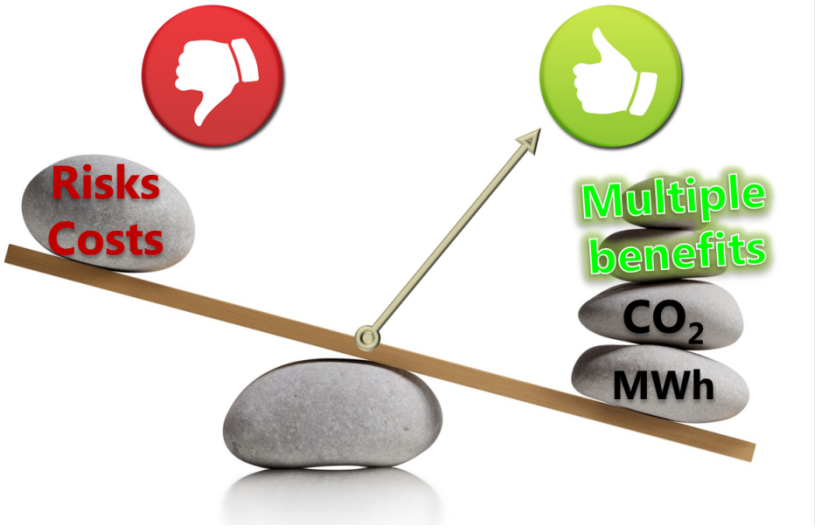
- Energy efficiency results to date are significant however potentials are not endless

- Future efforts need to reactivate untapped potential, i.e.
  → number of companies involved, e.g. in CP industry
  → measures implemented, e.g. in “production” category

How to further sell energy efficiency measures?

Multiple benefits of energy efficiency measures





- Objectively rank and prioritize EE-projects vs. other core business investments
- Align EE-programs, e.g. Target Agreements, with company's strategies to support business goals

Future policies need to emphasize strategic role of energy measures through comprehensive cost and benefits analysis

Thank you for your attention

Lucerne University of
Applied Sciences and Arts

HOCHSCHULE
LUZERN

Engineering & Architecture

Acknowledgements

Armin Eberle and EnAW moderators

ENERGY AGENCY
SWISS PRIVATE SECTOR EnAW

Martin Patel, Jibran Zuberi

UNIVERSITÉ
DE GENÈVE

Sabine Sulzer, Beat Wellig, Rishabh Saxena

Financial support of CTI
(Commission for Technology and Innovation)

EFFICIENCY
OF INDUSTRIAL
PROCESSES

In cooperation with the CTI
Energy
Swiss Competence Centers for Energy Research
Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Swiss Confederation
Commission for Technology and Innovation CTI