AN INSIGHT INTO THE ECODESIGN PROCESS – THE EXAMPLE OF STEAM BOILERS

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Agenda

- What is ecodesign?
- The ecodesign process
- The methodology of the preparatory study
- Steam Boilers
  - Scoping
  - Users and Technologies
  - Markets
- Outlook

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What is ecodesign?

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Ecodesign Scope

Past and Present: **EuP**

- Lighting
- Consumer Electronics
- ICT
- White Goods
- Motors and Motor-Driven Devices
- Air-Conditioning
- Heat Supply

Future: **ErP**

- Smart Meters
- Cables
- Window Products and Insulation

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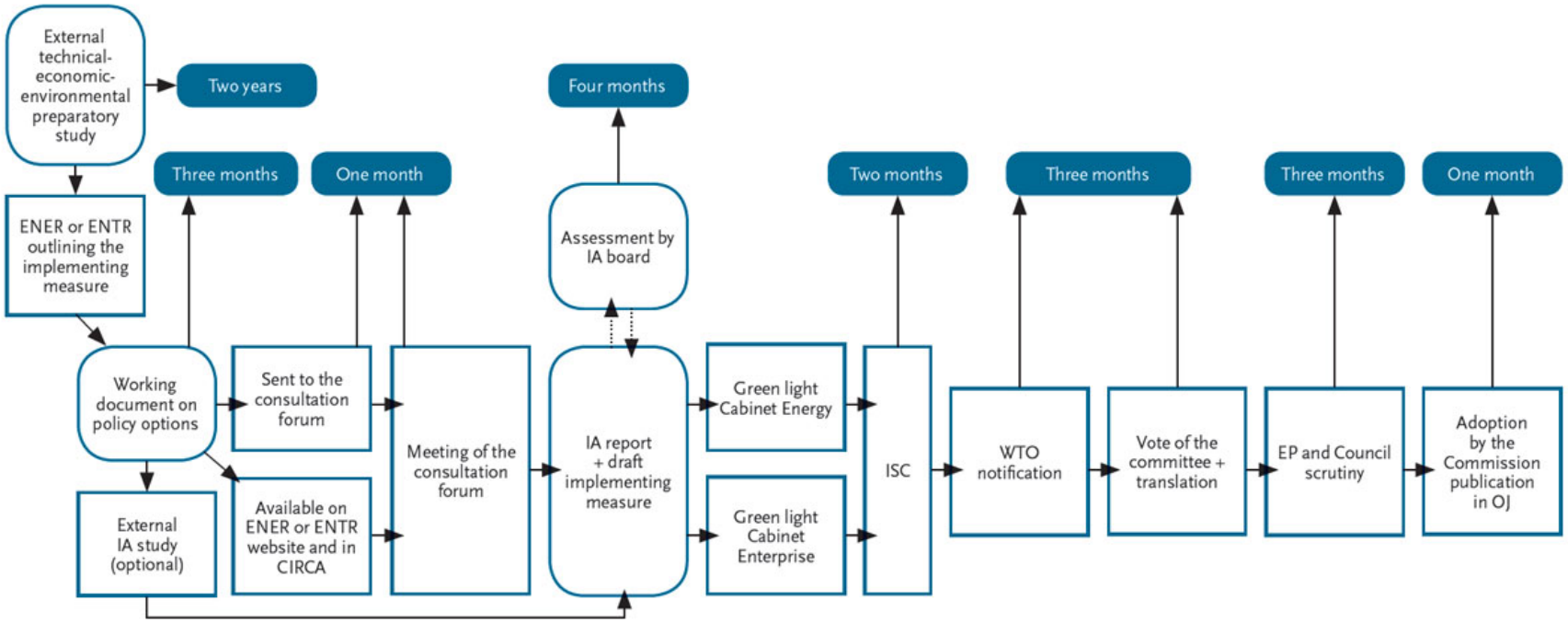
The ecodesign process



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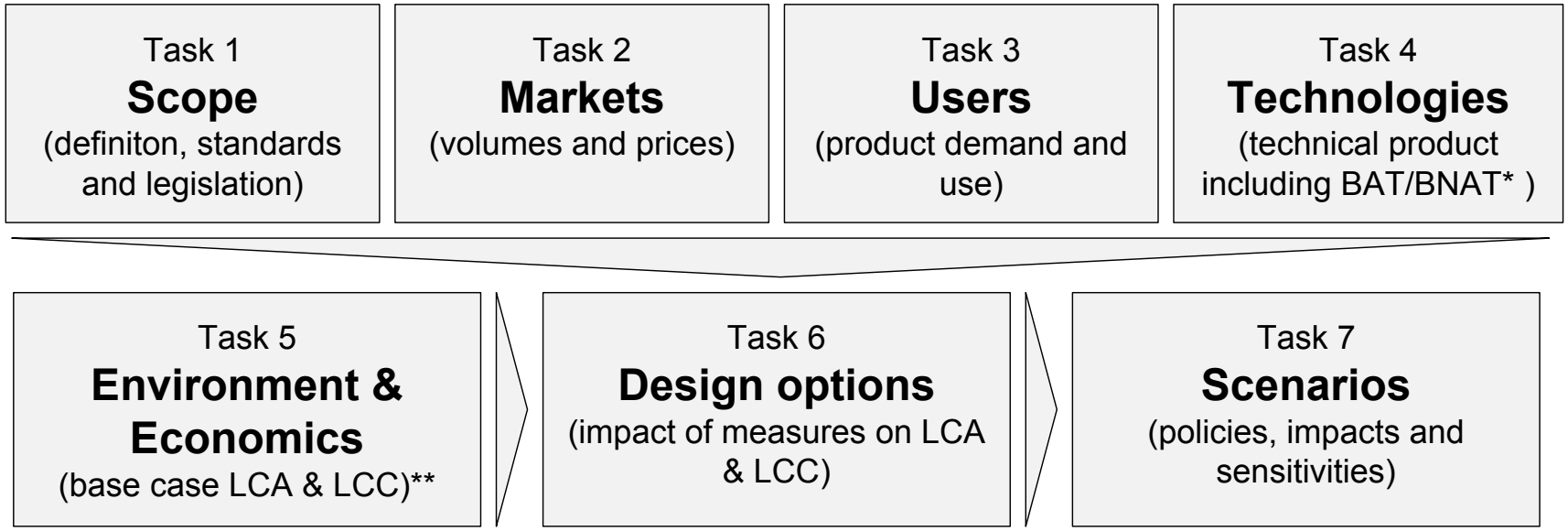
The preparatory study



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Steam Boilers

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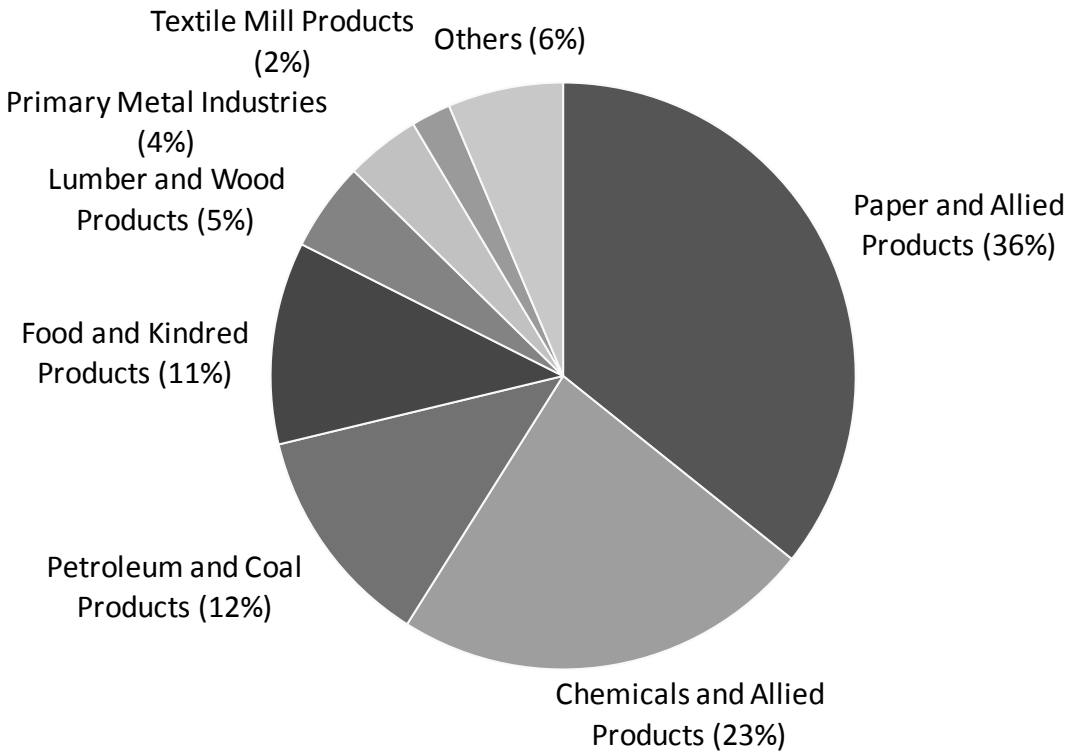
Industrial Applications of Steam



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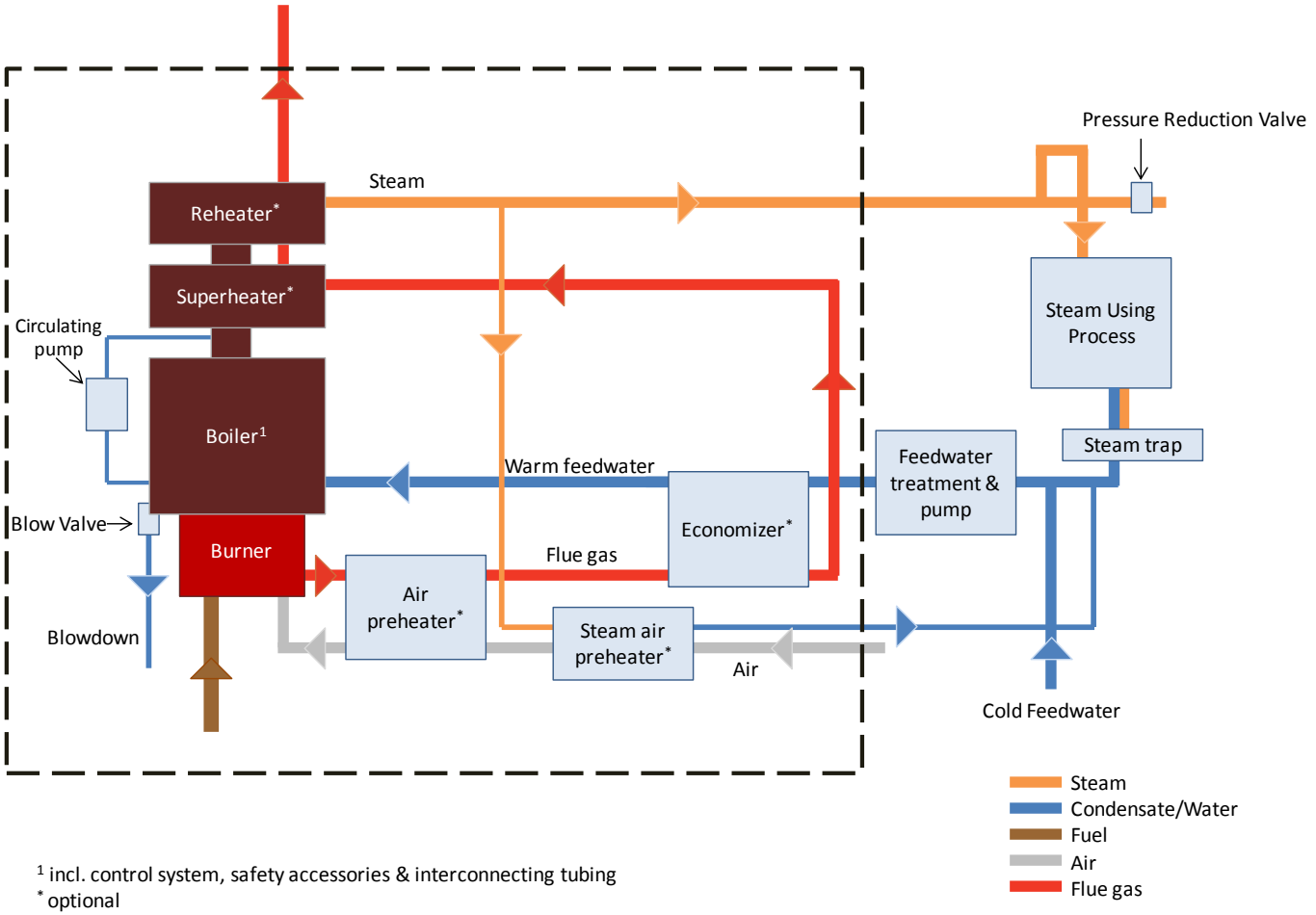
System Boundary – strict product scope



[1] incl. control system, safety accessories & interconnecting tubing
* optional

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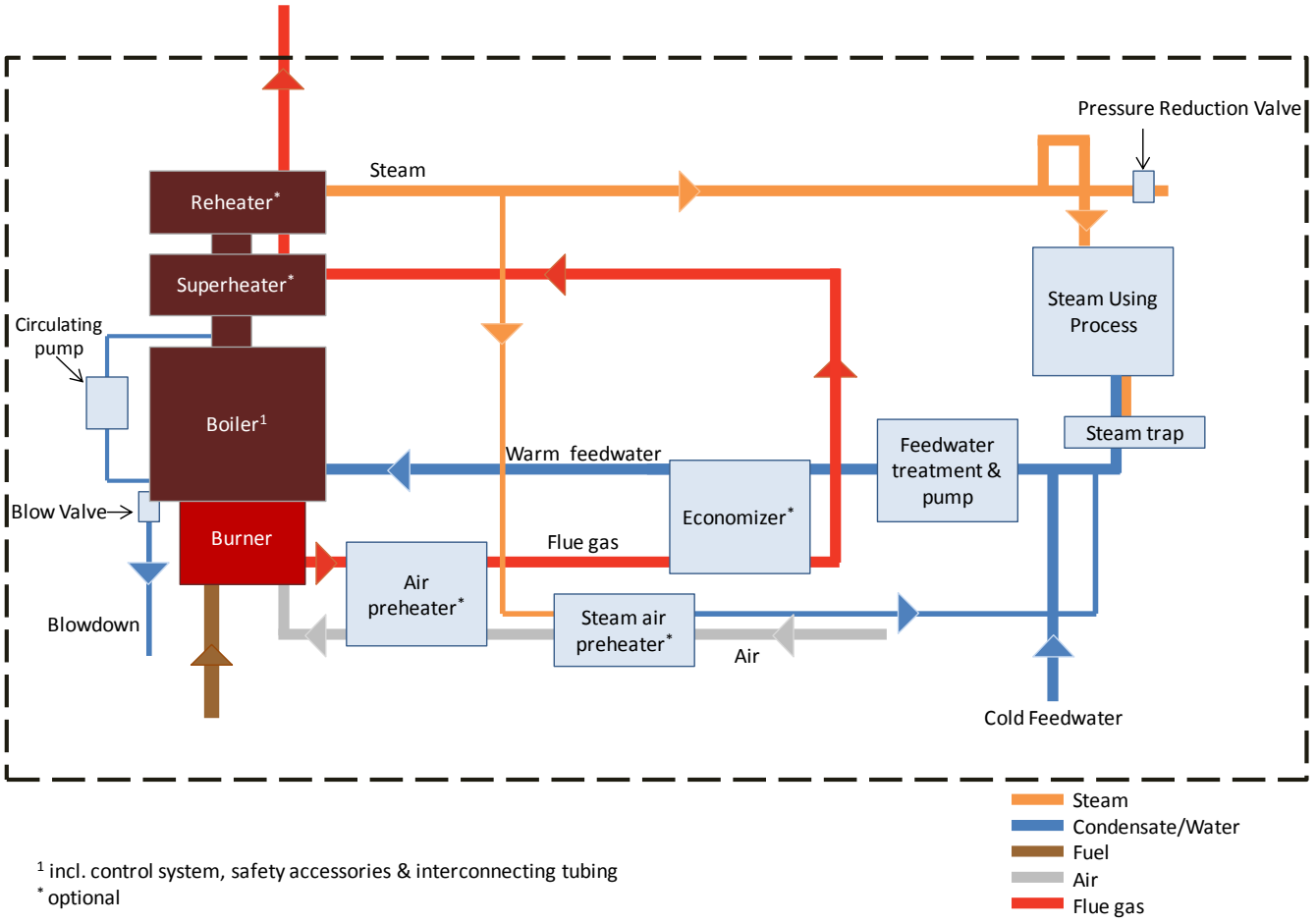
System Boundary – Technical System Approach



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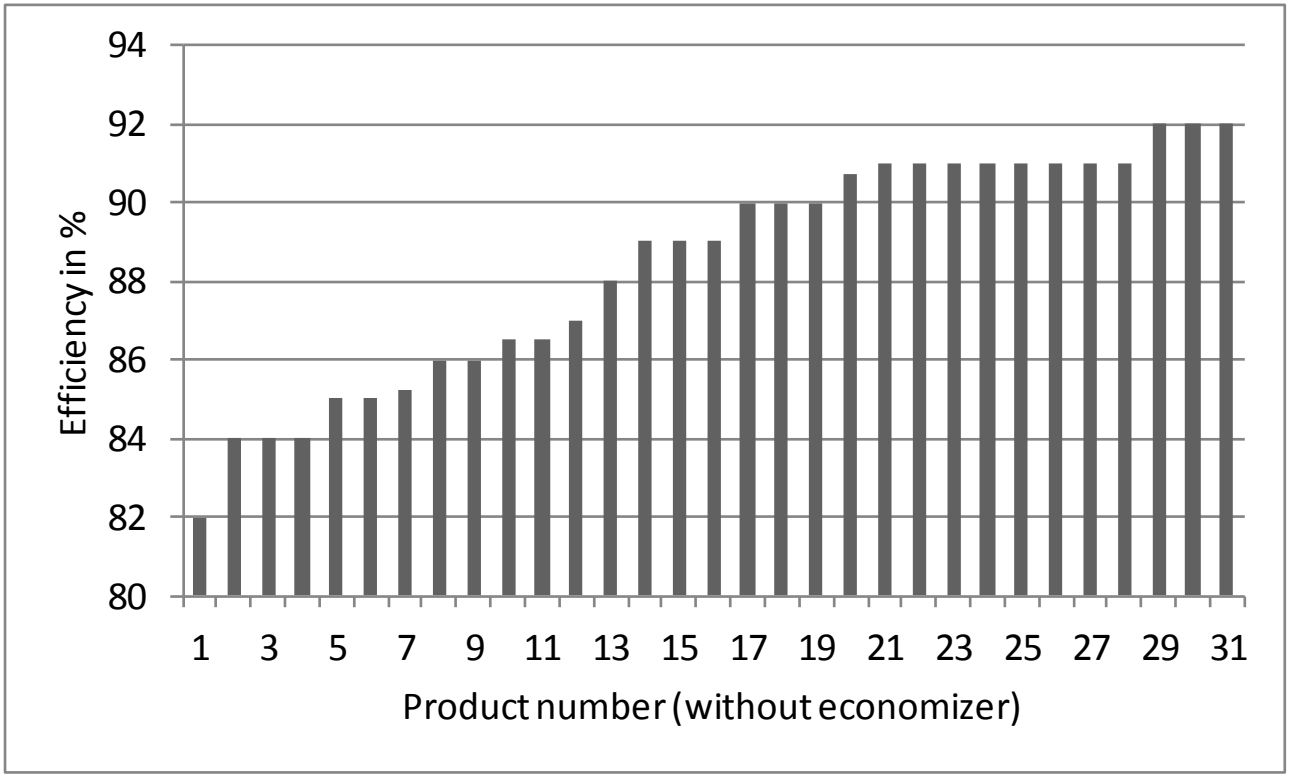
Extract of efficiencies of industrial steam boilers **without** economizer



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Economizer

- Heat exchanger
- It cools down flue gas by transferring heat to the feedwater entering the boiler.
- By heating up the feedwater, fuel requirements can be reduced and efficiency can be increased.
- 80% of all water tube boilers with an output over 2 MW are equipped with one

Source: European Commission, 2009, p. 143/144

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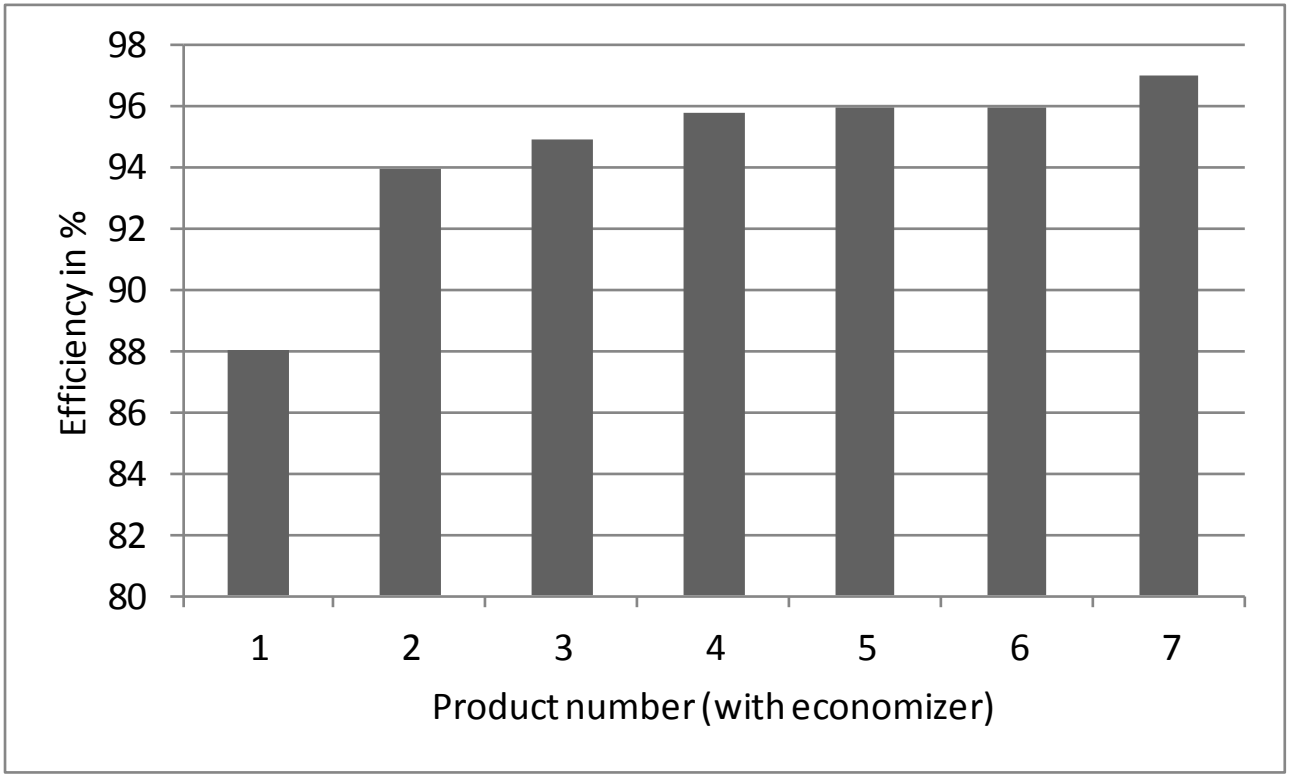
Extract of efficiencies of industrial steam boilers **with** economizer



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Users and technologies

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Industrial Assessment Center - IAC

- Industrial energy assessments for small and medium sized manufacturing firms
- Funded by the U.S. Department of Energy (DOE)
- Assessments performed by university professor + team of students
- Team composes report containing site specific recommendations

- Data collected in IAC Database
- Database represents over 12,000 industrial site visits and 87,500 Assessment Recommendations
- To qualify for an assessment the plant has to fulfill certain criteria
  - Gross annual sales ≤ USD 100 million
  - Annual Energy Consumption between USD 100,000 and 2.5 million
  - Less than 500 employees (=Large manufacturers are not included)
  - No technical staff whose primary duty is energy analysis

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Relevant Information

- 13172 out of 122057 Recommendations affecting steam boilers or steam using system
- 12581 out of 13172 Implemented (6322), not implemented (6209) or pending (50)

- Data includes
  - Implementation status (see slide 4)
  - Dollar and resource savings (see slide 5)
  - Implementation costs
  - Amount of resources conserved
  - Fiscal year in which assessment was performed
  - Payback period
  - SIC – Standard Industrial Classification
  - Products, annual sales, production hours, energy consumption, total energy cost

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Implementation Status

Recommendations are subdivided by their Implementation Status

1. Implemented
   - completely implemented after 6 to 9 months after assessment or plans definitely made to complete implementation within next 12 months (not exceed 24 months from the assessment date)
2. Not implemented
3. Pending
   - recommendations with implementation costs of $10,000 or more
   - Has to be implemented in 3 years otherwise listed as not implemented (not always the case)
4. Data excluded or unavailable

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Savings in US-Dollar

- IAC Database holds information on amount of resources conserved with the implementation of each measure
- Resources range from amount of energy used to administrative costs
- Savings are subdivided in 4 categories
  - Amount of primary resource conserved
  - Amount of secondary resource conserved
  - Amount of tertiary resource conserved
  - Amount of quaternary resource conserved
- Database does not include a column on total saving in US-Dollar
  - Total savings are derived from USD savings included in the 4 categories above

- All Costs (in USD) and Savings (in USD) are nominal values

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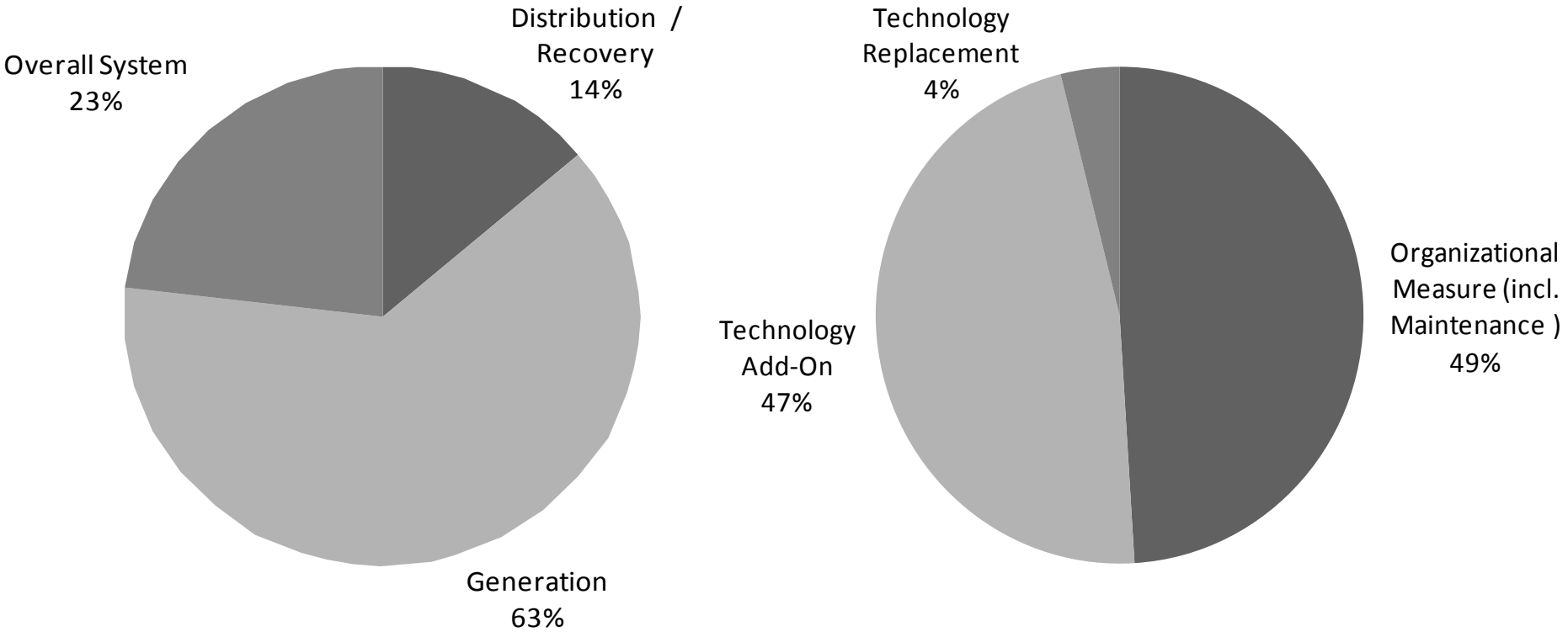
Distribution of Recommendations



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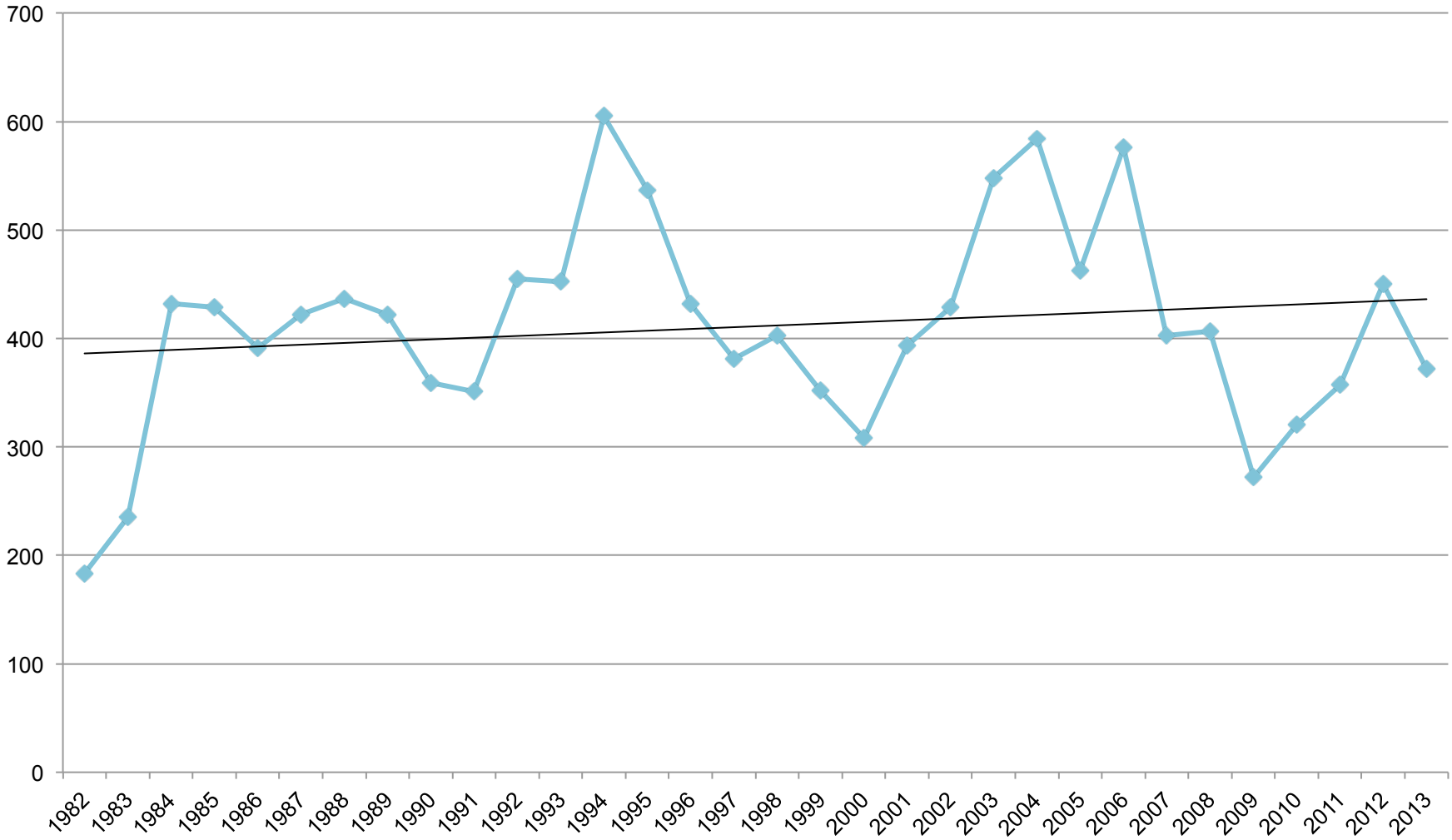
Number of recommendations per year*



*1981 and 2014 are not included in graphs focusing on the distribution by time (1981: 8 recommendations, 2014: 5 recommendations)

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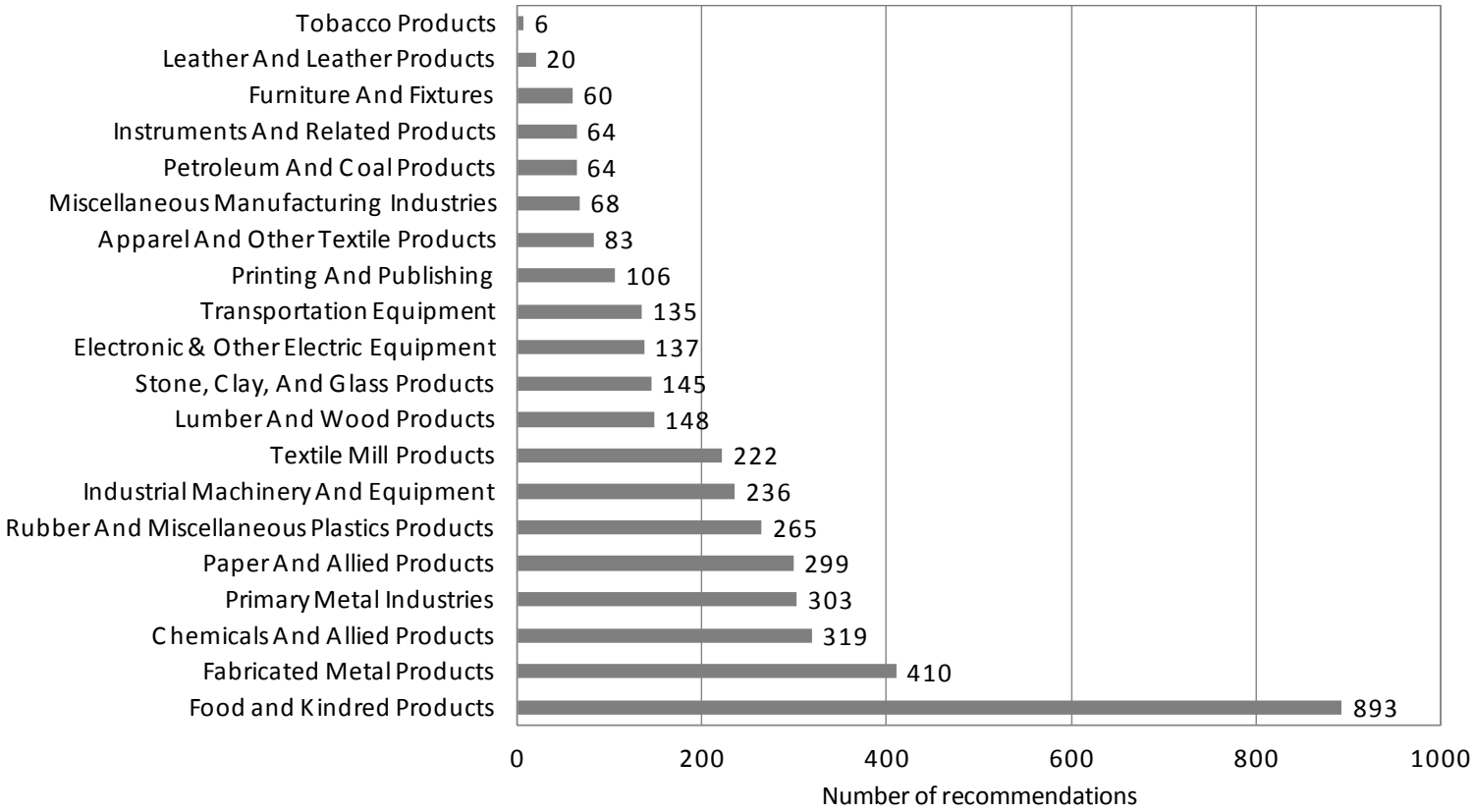
Number of recommendations for “generation” by sector



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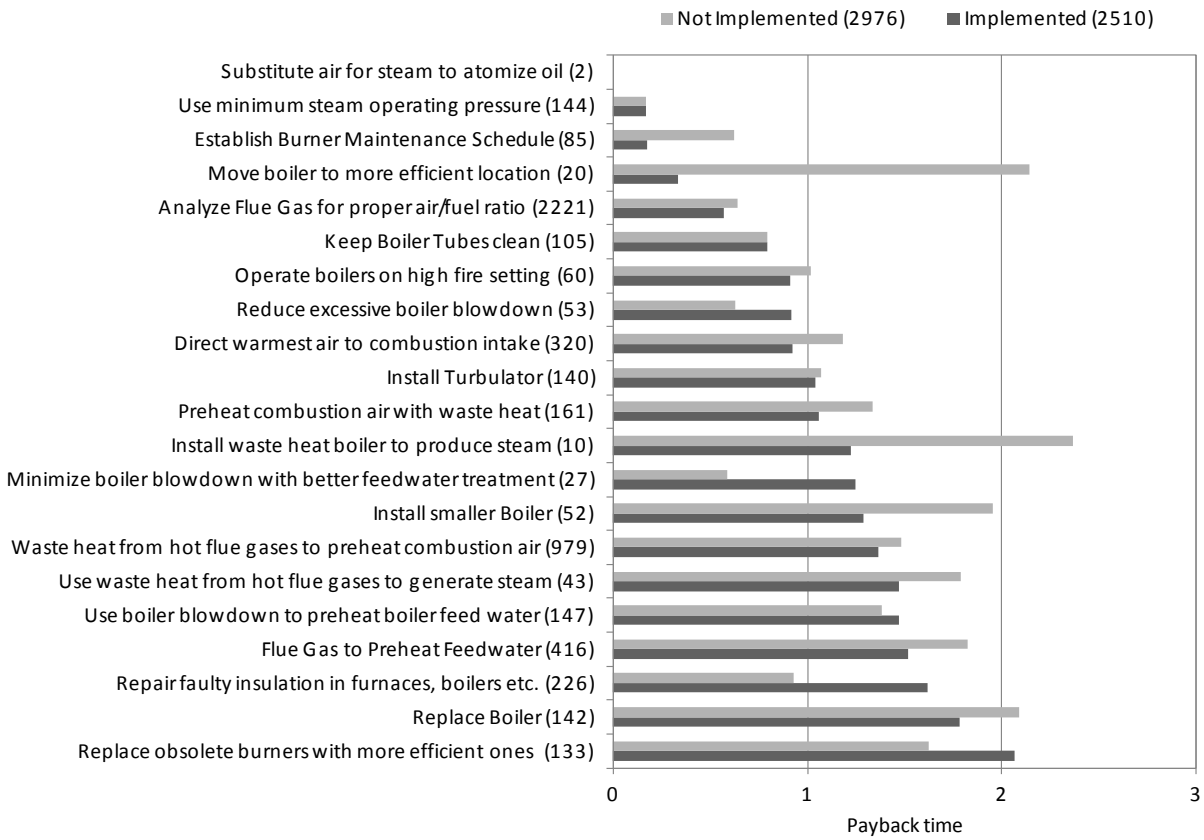
Average payback time of the measures of the subcategory generation



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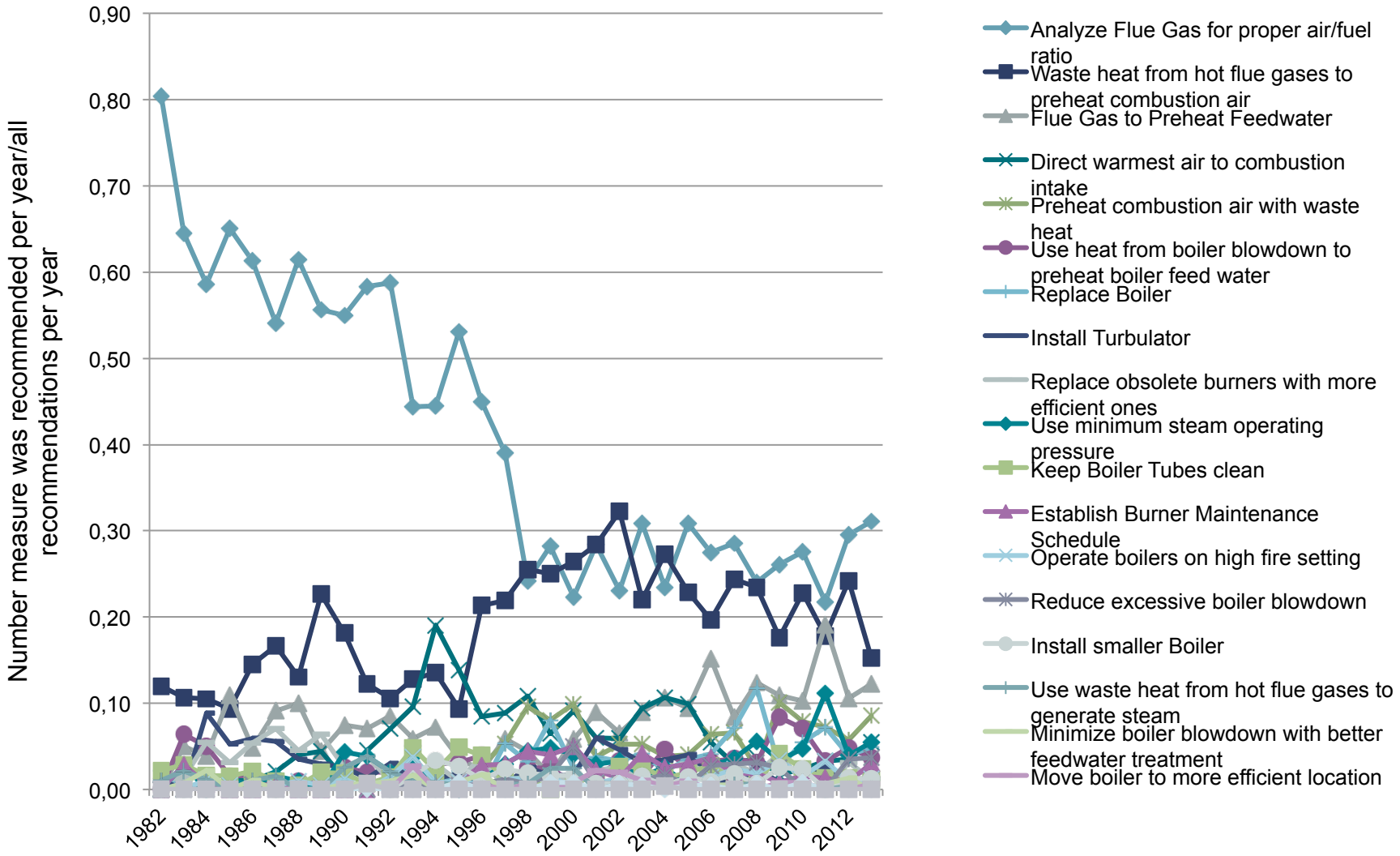
Distribution of Recommendations from 1981 to 2014*



*1981 and 2014 are not included in graphs focusing on the distribution by time (1981: 8 recommendations, 2014: 5 recommendations)

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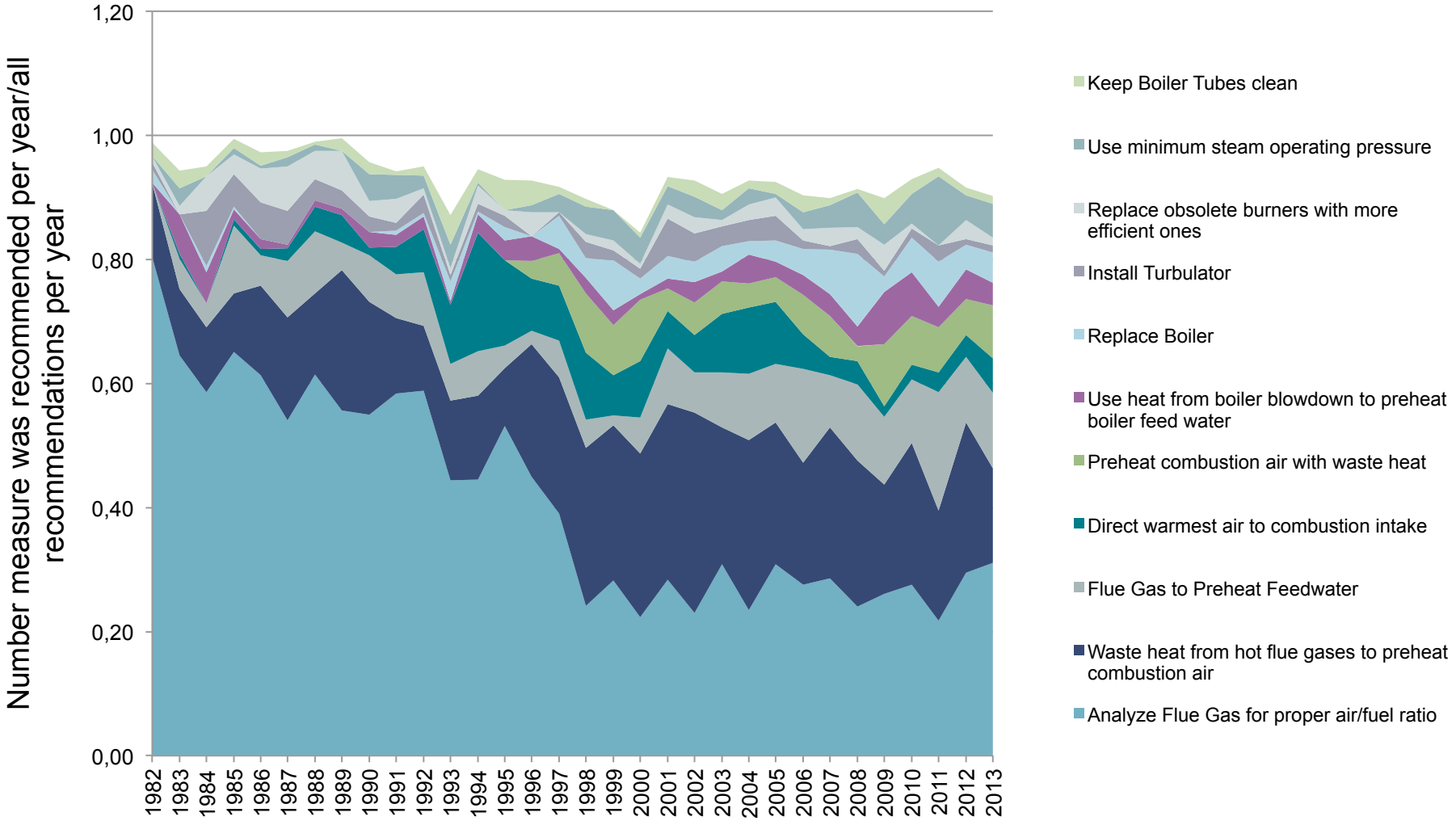
Distribution of Recommendations from 1981 to 2014 recommended more than 100 times - stacked



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Conclusion – Distribution of recommendations

- Measures recommended more than 100 times
  - Recommendations for measure Analyze Flue Gas for proper air/fuel ratio have decreased clearly
  - Preheat combustion air with waste heat increasing
- Measures recommended less than 100 times
  - Seem to be newer technologies which have been less common in the 80s

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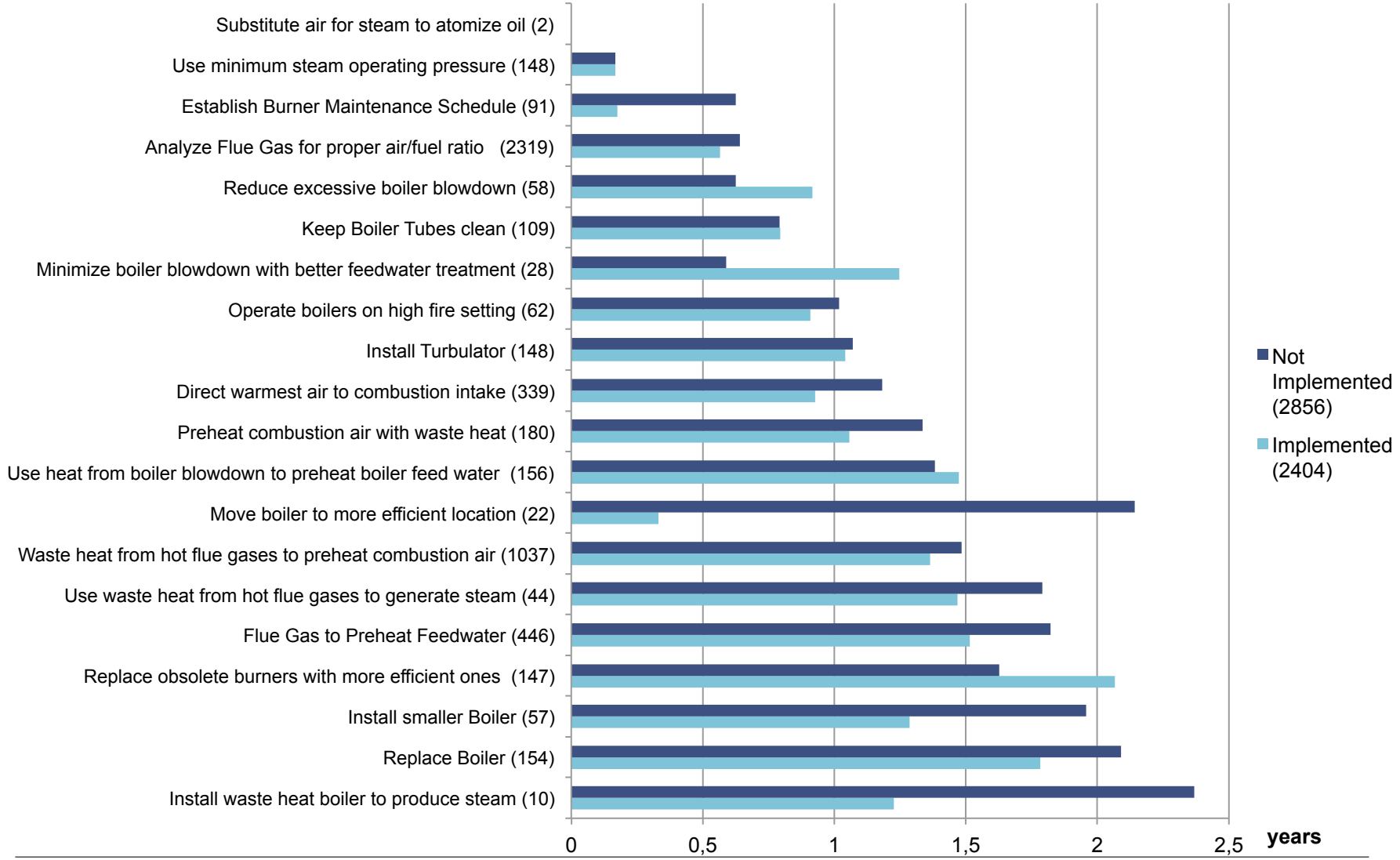
Average payback of single measures



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Conclusion

- 51% of all measure recommended are Organizational Measures
- Organizational Measures are least expensive
- Not implemented measures are in general more expensive
- Implementation costs might be increasing
- Short payback time

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Markets

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Based on:

- PRODCOM Data from 1996-2012
  - EU15 1996-2005
  - EU27 2003-2012

Assumptions:

- Life Expectancy: 20 Years (based on BDH)
- Import = Export
- All boilers produced since 1992 are still operating in 2012
- Given sold volume of watertupe boilers from 2008-2012 is incorrect

Required Information:

- Data for EU27 1992-2012

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PRODCOM

Approach:

- $Units_{EU27,\ 1996\text{-}2002}$ =
  Average variation of sold volume (EU15, EU27) during 2003-2005 + $Units_{EU15,\ 1996\text{-}2002}$
- Mean of sold volume from1996-2012 = sold volume from 1992-1995
- New sold volume of watertube boilers calculated by linear interpolation

Uncertainties:

- Life Expectancy
- Import = Export

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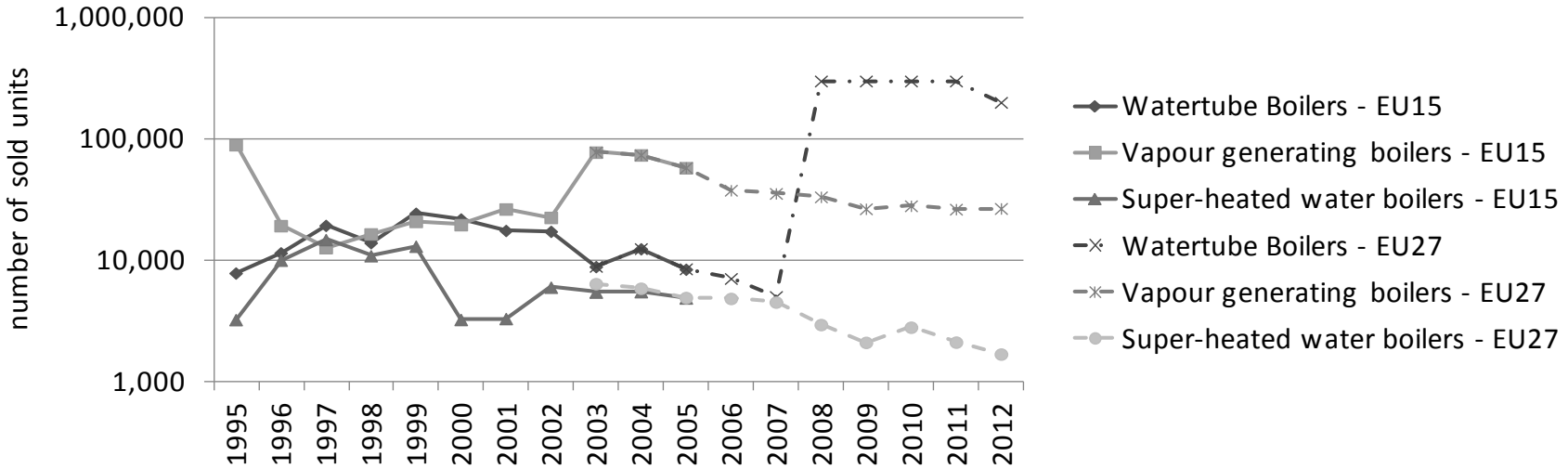
Historical development of sold boilers by type according to PRODCOM database.



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Different approaches for estimating the stock of boilers

	Food	Paper	Chemicals	Refining	Metals	Other	Total
US: Original data	10,610	3,460	11,980	1,200	3,330	12,435	43,015
Approach 1: Per capita	31,831	6,358	19,959	1,576	9,586	37,705	122,816
Approach 2: Per firm	135,559	15,789	26,523	598	170	99,107	354,215
Approach 3: Per energy use	10,396	2,235	7,969	-	4,112	-	34,747

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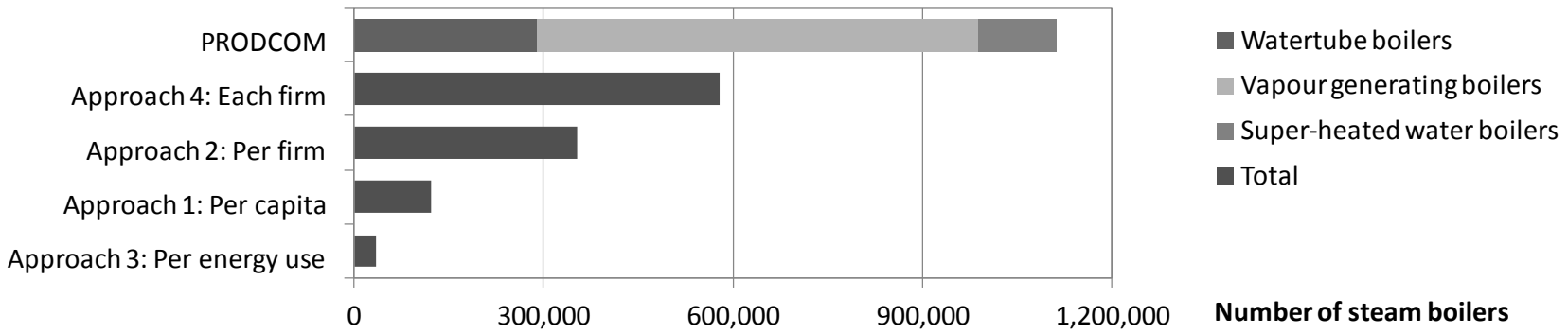
Results of different approaches for estimating the stock of boilers



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Outlook

- Study to be finalized this year.
- Large variety of steam appliactions in industry

  → System approach can hardly be implemented in the assessment
- B2B product markets are more difficult to be evaluated than B2C products

  → Data quality is often poor

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