Behavioural change based energy efficiency at Volvo Construction Equipment, Braås, Sweden

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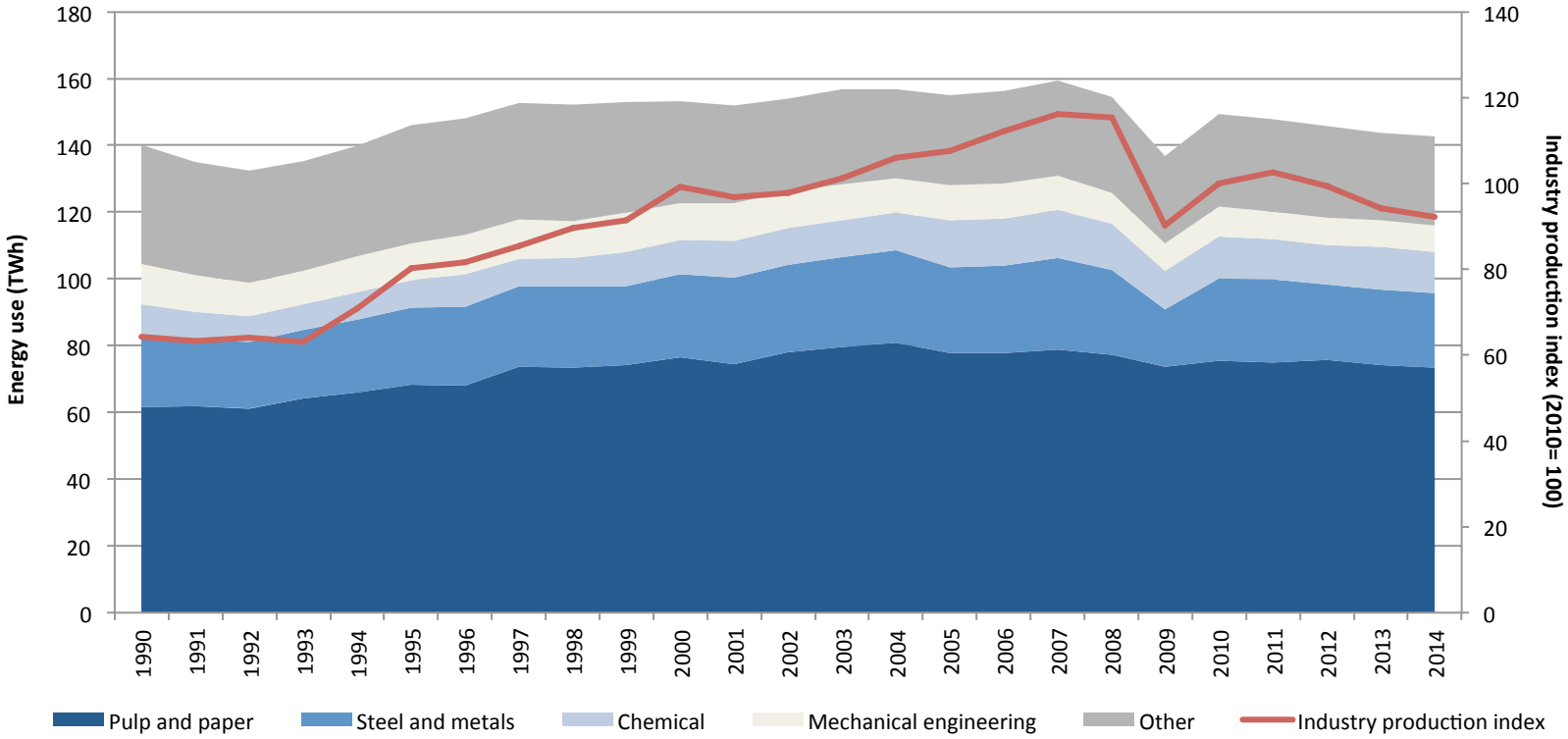
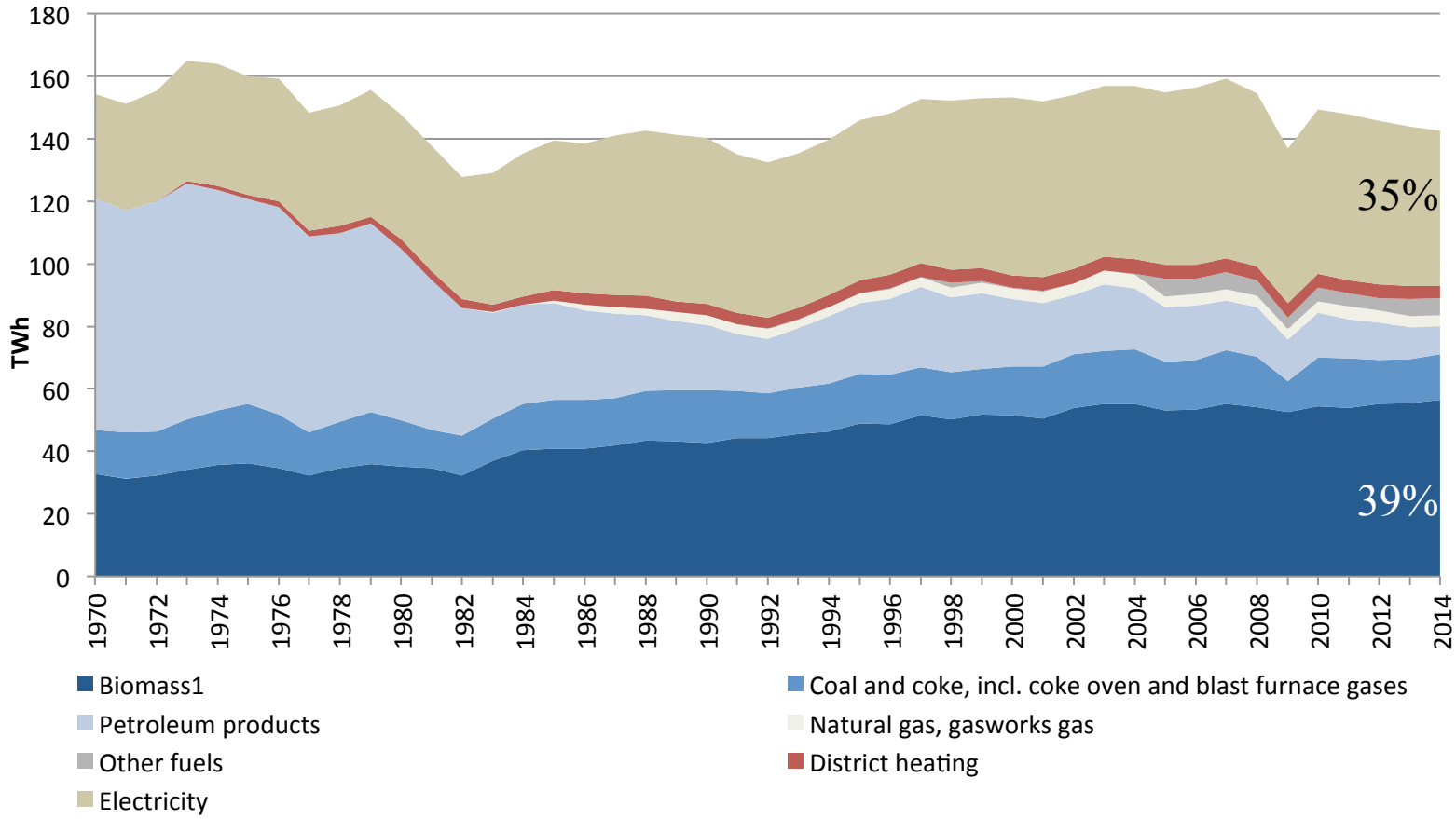
Sweden - Increased production at stable final energy use



Industrial energy efficiency increased by 36% between 1993-2010, target is to further improve the energy efficiency by 50% by 2050 (IVA, 2003)

(Source: Energiläget 2016; Statistics Sweden, industriproduktionindex 2016)

Sweden – increased electricity use in industry

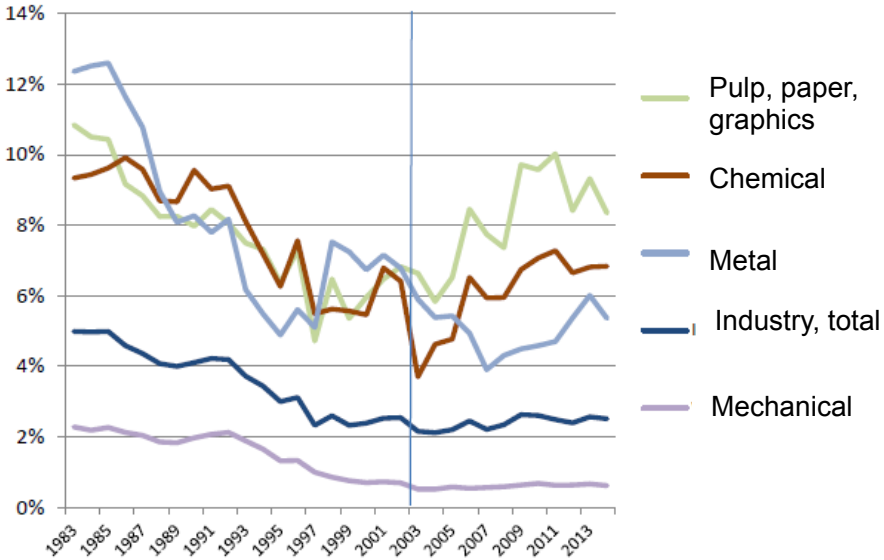


(Source: Energiläget 2016)

Barriers to industrial energy efficiency

- Priority given to core business; energy cost small portion of variable cost
- Lack of knowledge of energy efficiency
- Lack of consideration for life cycle costs and investment
- Operating budgets are located in different parts of the financial system
- No strong external demands for increased energy efficiency
- Focus usually on technological investment
- Difficult to change everyday behaviour

Share of energy cost in total operating cost of different industrial sectors, 1983-2014



Souce: IVA, 2013. Energieffektivisering av Sveriges industri: Hinder och möjligheter att nå en halverad energianvändning till 2050

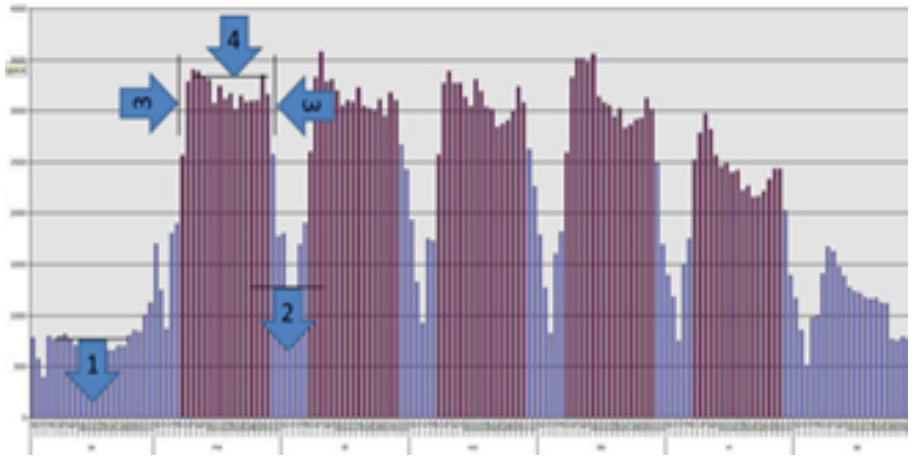
Volvo Construction Equipment, Braås, Sweden

- Manufacturers of articulated haulers
- Production and product development
- 850 employees
- Volvo group core values

> "You can install all the energy meters in the world, they won't do anything if the people aren't engaged."
>
> Raytheon Electrical Engineer
> Michael A. Norelli IV 2010

Four ways to reduce energy use at Volvo CE

1. Reduce idle energy use during the off-production weekends (Saturday-Sunday)
2. Reduce idle energy use during the off-production hours during weekdays (night time)
3. Increase number of off-production hours during the weekdays without compromising production
4. Reduce energy use during production hours

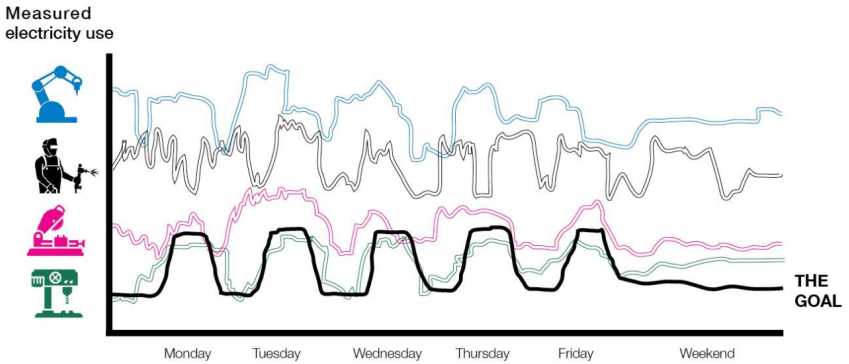


1 & 2 during 2013-15

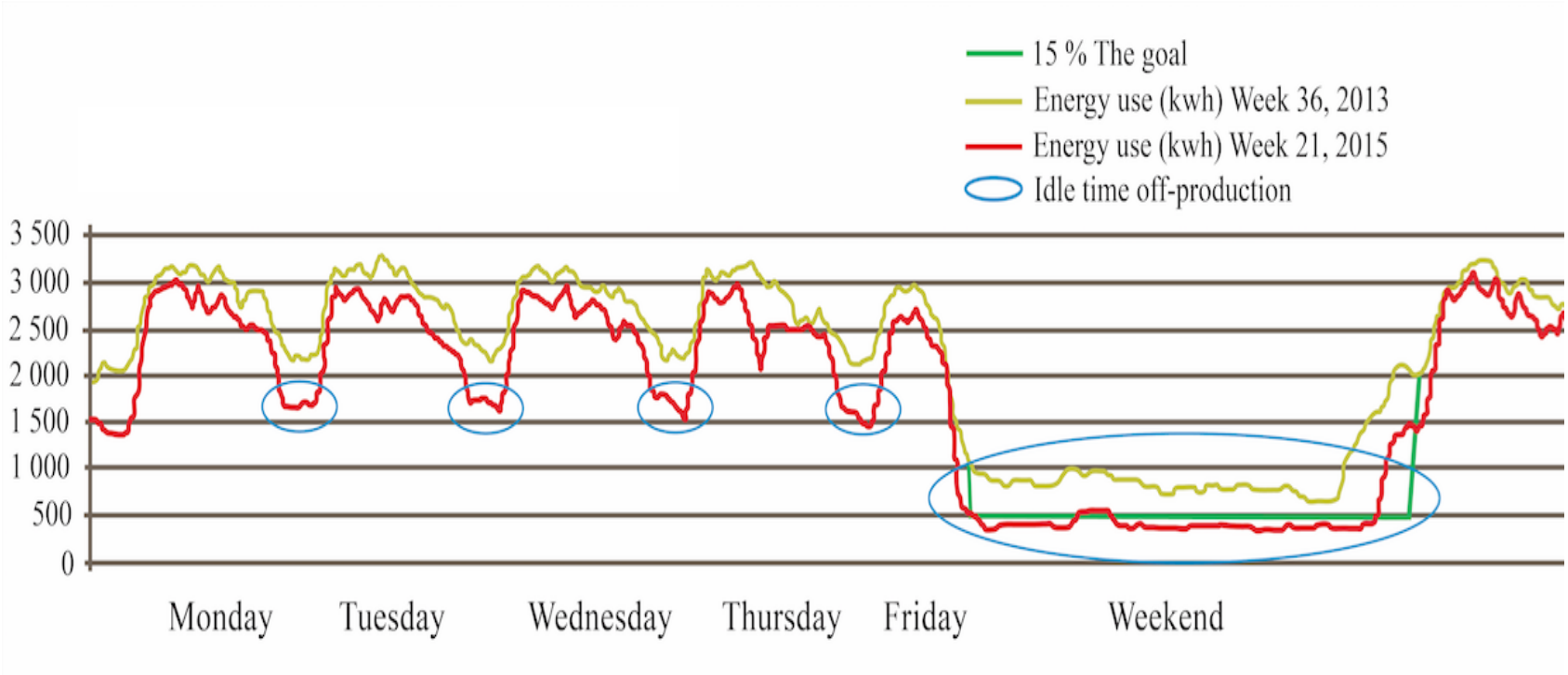
Project setup

Project setup

- Measurement of energy use of all production equipment over a week
- Operational leader approaches the production leaders and group leaders, explain the purpose of the project
  - Started with one production leader most interested in the project
- Visualization and potential reductions
- Production leaders set own goals and draw action plans
- Feedback, operational leader weekly meeting with group leaders
- results reported to Swedish coordinator of the project who reports to global responsible



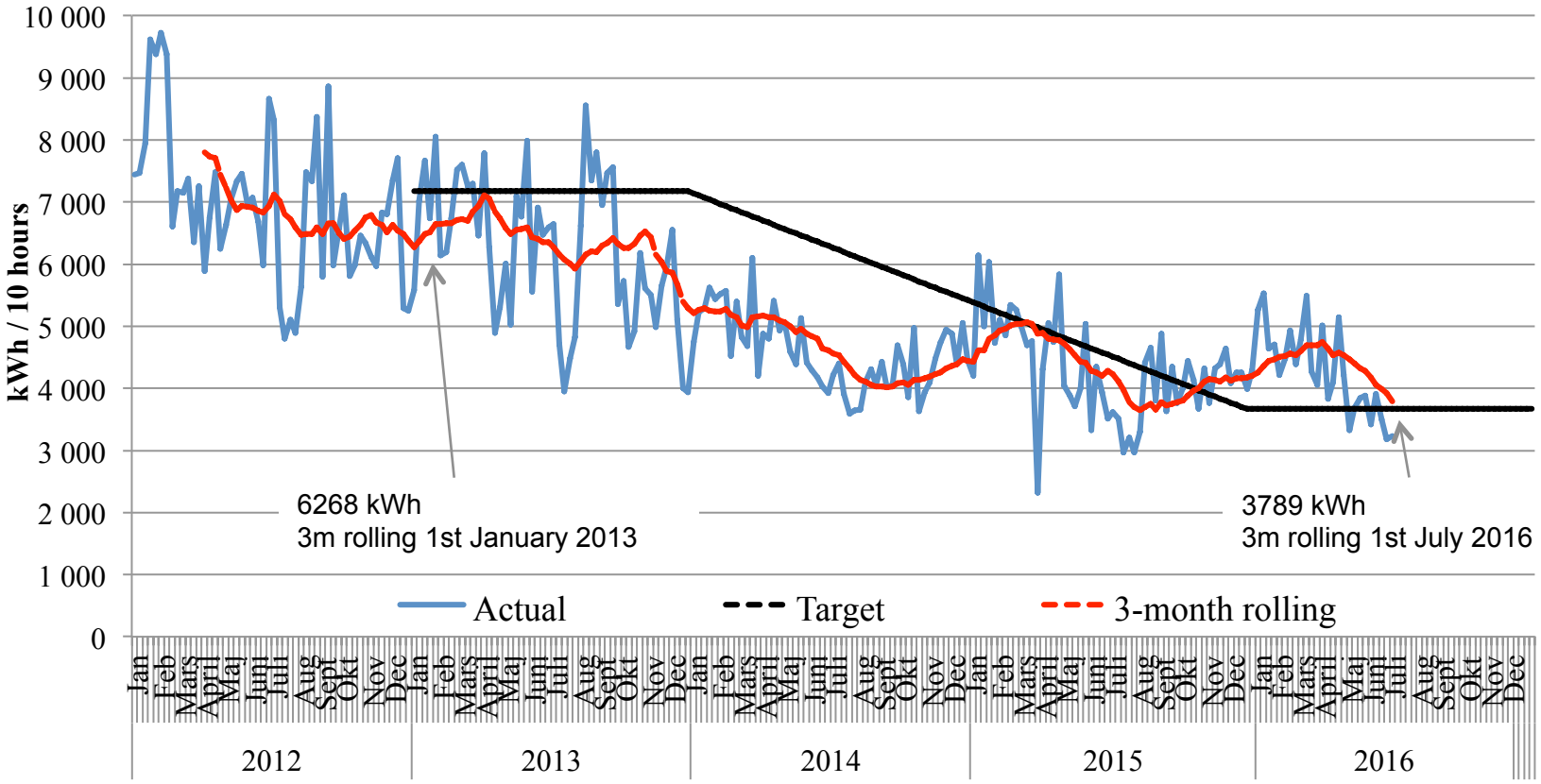
Hourly electricity use, Braås plant, 2013-15



Relative idle electicity use

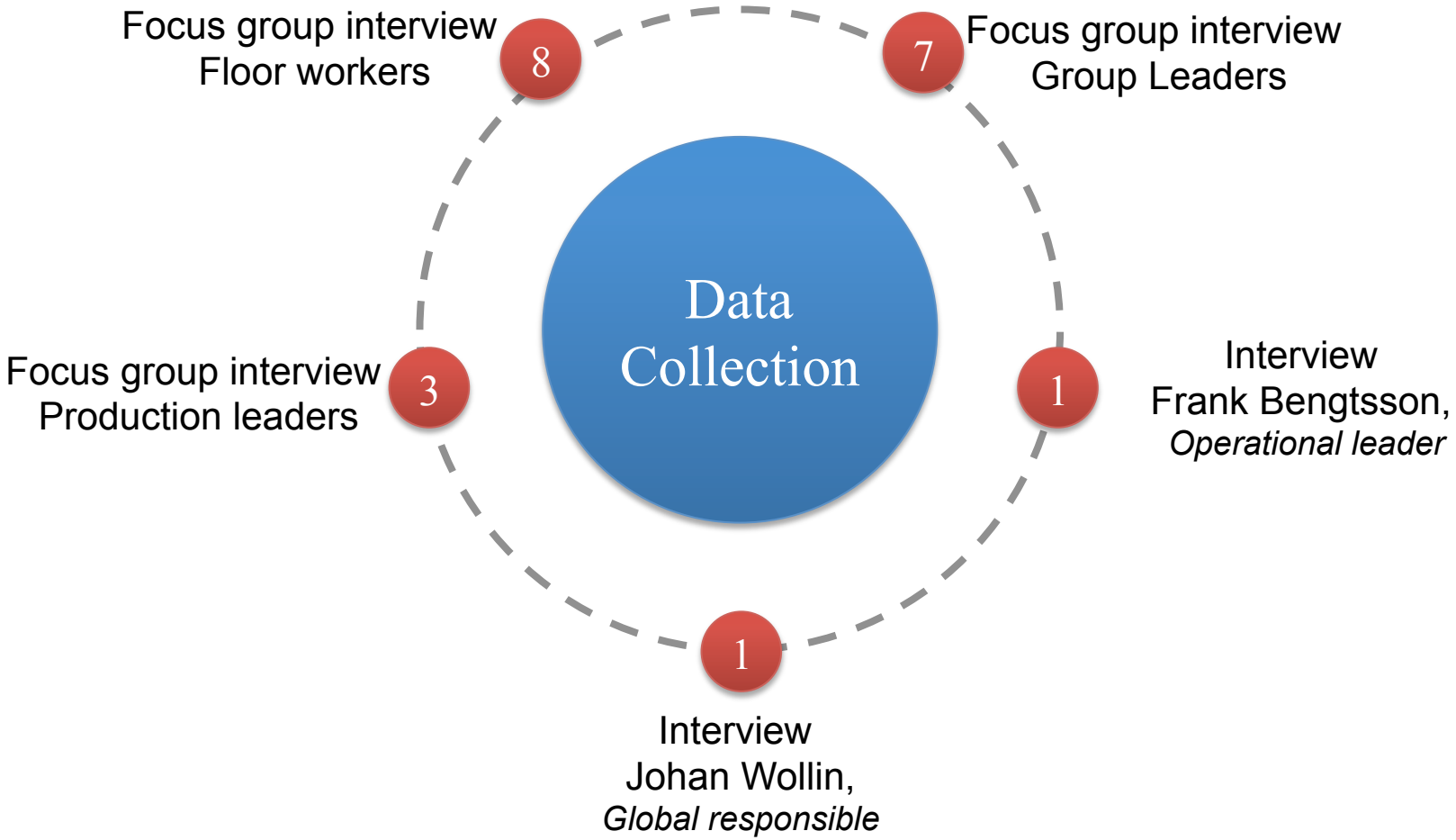
=100∗Idle electricity use (kWh during 10 idle hours, *7 PM Sat. to 5 AM Sun.*)/Production electricity use (kWh during 10 idle hours, *7 AM Mon. to 5 PM Mon*)

39.5% reduction in idle electricity use since 2013 (total electricity reduction of 11.2%)

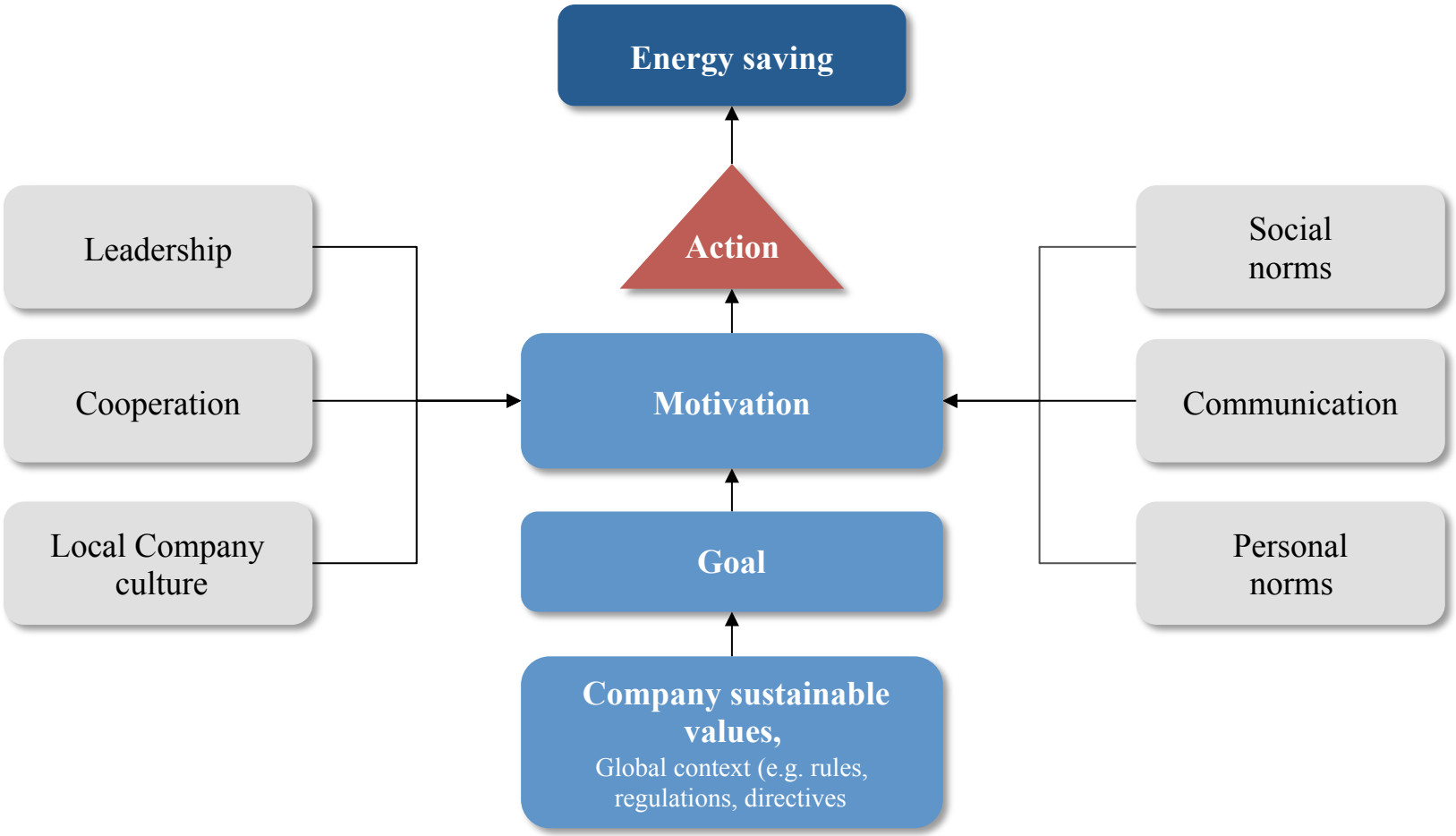


Source: Rickard Alm, Volvo Construction Equipment, Braås Sweden

Survey


Focus group interview
Floor workers
8
7
Focus group interview
Group Leaders
Data
Collection
Focus group interview
Production leaders
3
1
Interview
Frank Bengtsson,
Operational leader
1
Interview
Johan Wollin,
Global responsible

Theoretical framework



Observation

Leadership

- **Production leader**: “Our operational leader is very passionate about this project!”. “If Frank wasn’t there, I couldn’t manage it on my own, support by someone is needed.”
- **Production leader**: “It is really important to have a driver (operational leader), who sets up goals and motivates.”
- **Production leader**: “Frank (operational leader) said that he will fix everything. We just needed to help him by placing ourselves in the front row and say ‘this is what we should do and I believe in this’; after that everything on this project kept rolling on.”

Cooperation

- **Group leader**: “We have done a precise work and tested all the machines energy consumption together. We shared our knowledge around what you should not turn off for the weekend.”

Local company culture

- **Production leader**: “We are a big global company, this project is not about just money. Local initiative and interest is big.”
- **Group leader**: “It is now a culture that people are more aware of energy saving and have it as a habit.”

Communication Set-up

- **Production leader**: “One of the good things Frank (operational leader) did was, visualizing the results and potential reductions.”
- **Group leader**: “I only would like to get even more feedback about quality and how things are going.”

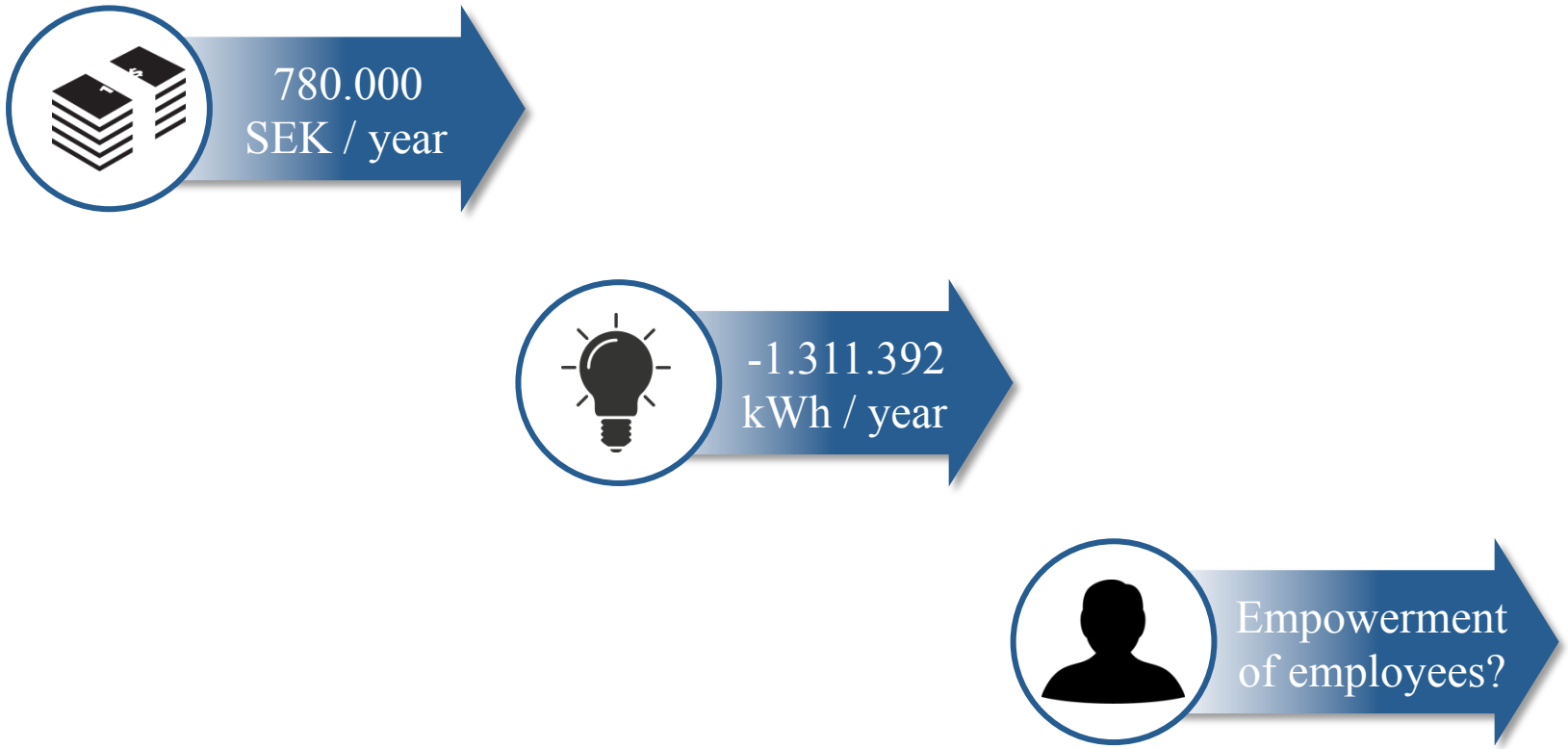
Personal norms

- **Production leader**: “I give importance to minimizing energy use at home; for example, I use solar panel, have water-saving showers, only use LED lights and wood for heating”
- **Group leader**: “Savings could go to our piggy bank as reward.”

Social norms

- **Production leader**: “We live in Småland, we are environmentally smart and do not want to be polluters.”

If they can do it, you can do it…



Conclusions

Possible to reduce industrial energy use through behavioural change

- Set goal
- Dedicated operational leader whom the production staff listens to and trust
- Involve the workers
- Measurement and feedback

Future work:

- How to set goals?
- Impact evaluation: economics (dedicated employee vs. savings) and non-economic (e.g. employee motivation, productivity, brand value etc)
- Perception of floor workers: some floor workers are not entirely convinced of the relevance of the project
- Comparative assessment with approaches in other plants

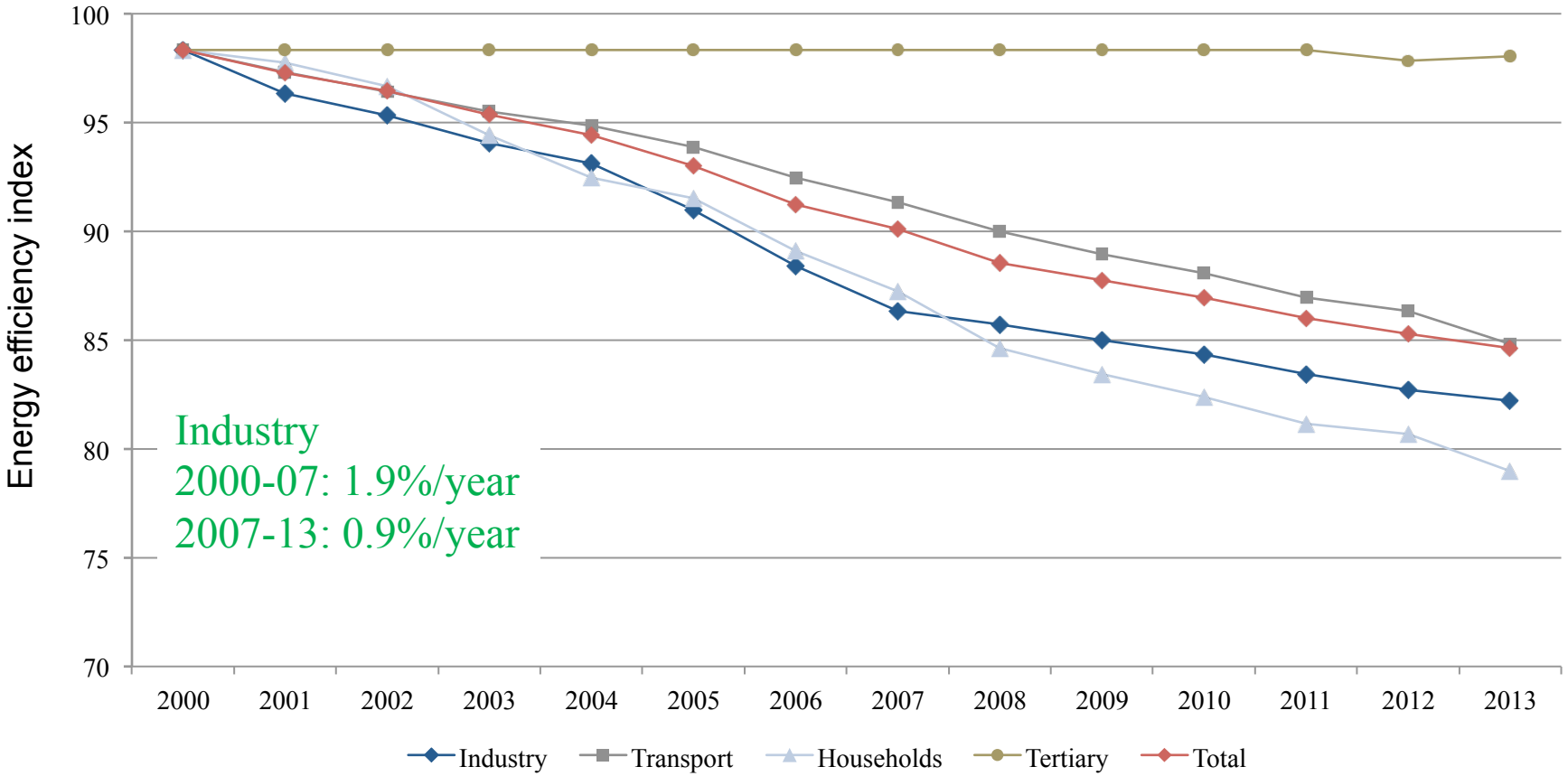
Thanks!

Questions / Comments

Best practice	Observation
Goal as motivational factor[4]	– Regular follow ups of progress – Goals to chase
Create awareness[1]	– Explanation of project in bigger picture – Energy reduction at home
Tangible, specific information[2]	– Measurement of each machine – Potential for reduction
Cooperation[5]	– Proudness & 'we' feeling – Breaks are taken together as a team – Role model & guide for Volvo Group
Collective responsibility[3]	– Team leaders checking on/off machines – "Controller" rotates within the team
Culture characterized by environmental values[6]	– "Common sense" – Has become a habit
Opportunity to be visible and be acknowledged[3]	– Value employee opinion & knowledge – Involvement in decision making

4- Foss & Lindenberg, 2013 5- Lindenberg & Foss, 2011 6-Sorrell, et al., 2000 7-Rohdin & Thollander, 2006

Energy efficiency of the EU industry since 2000



ODYSSEE-MURE, 2015. **Synthesis: Energy Efficiency Trends and Policies in the EU:** An Analysis Based on the ODYSSEE and MURE Databases (Figure 8), http://www.odyssee-mure.eu/publications/br/energy-efficiency-trends-policies-in-europe.html, accessed on 2016-02-26

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