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Eficiência energética na indústria

Rafael Kelman – LEEN



Federal Ministry
for Economic Affairs
and Energy

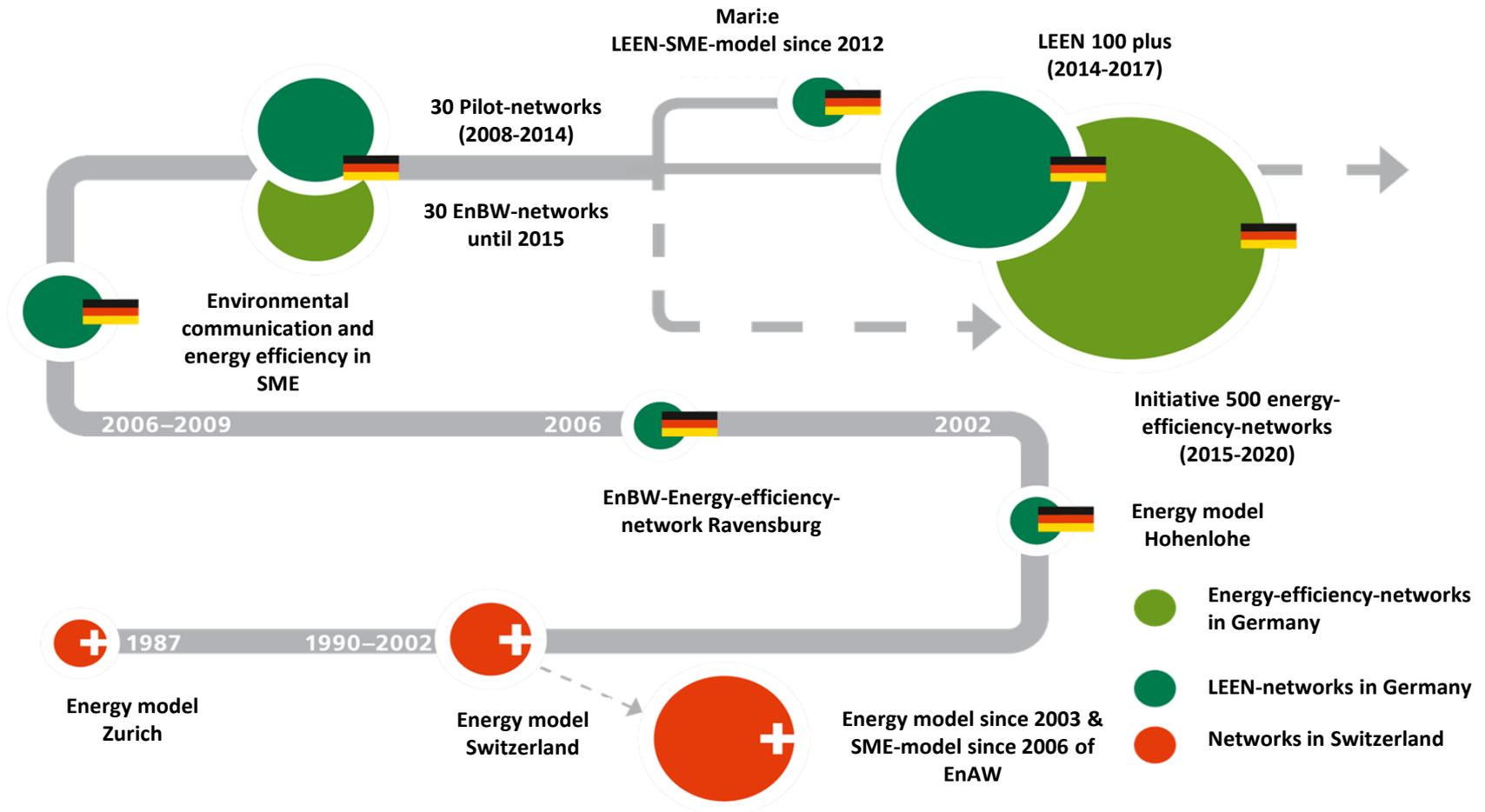


Learning Energy Efficiency Networks in the German Industry: Concept, results and future perspectives

Dr. Felipe Toro, IREES



History of the Learning Energy Efficiency Networks

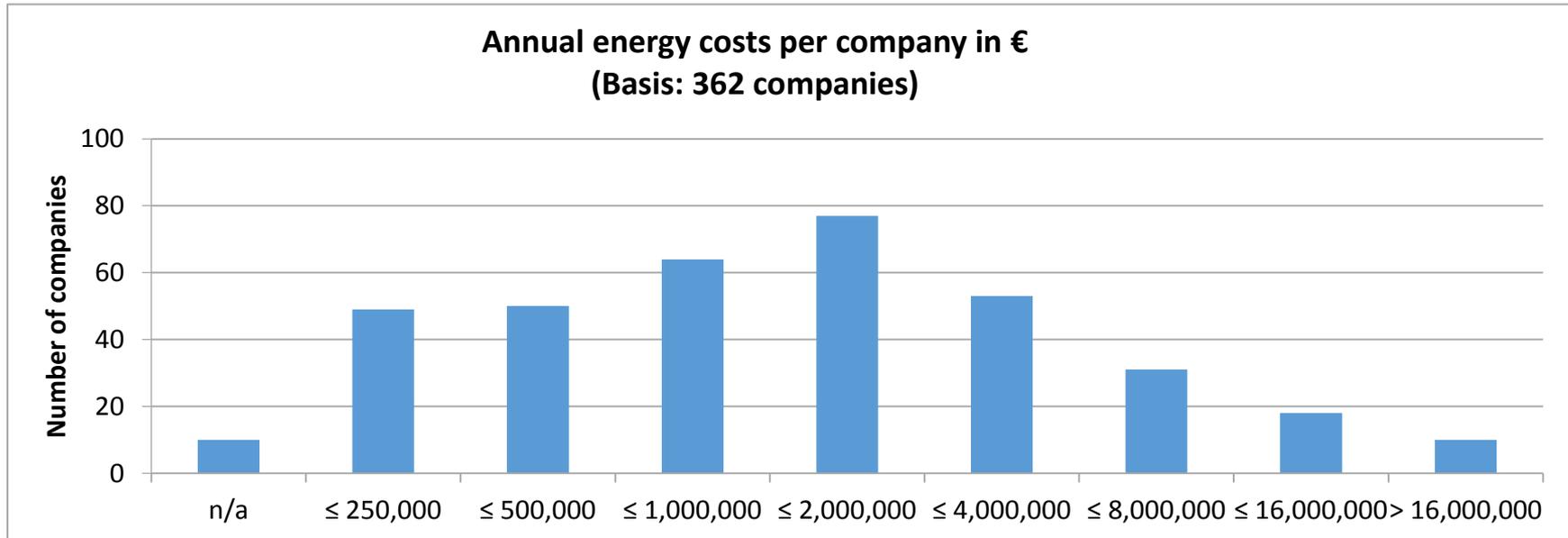


Who are the participants of the Networks?

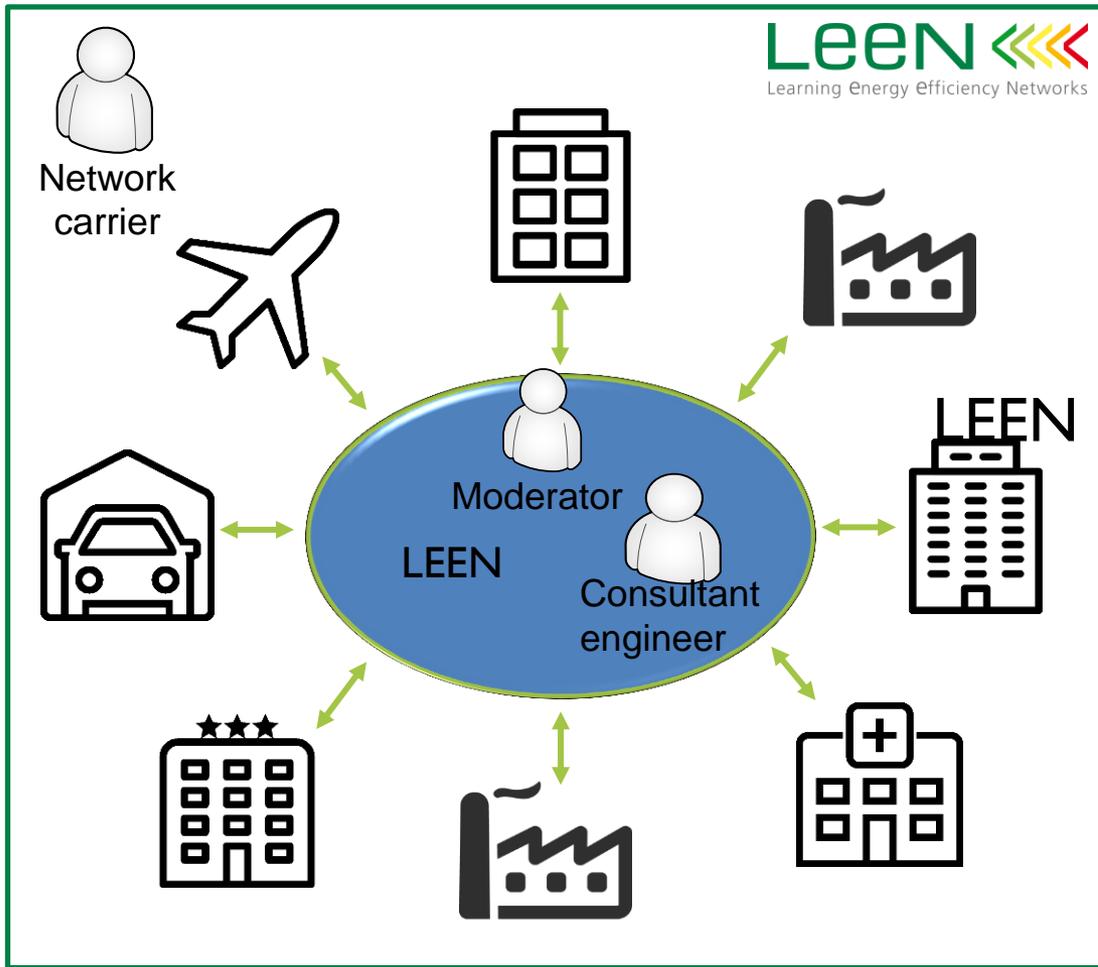
- 57 % of the factories are enterprise locations of a bigger company
- 54 % of the companies have energy costs between 500,000 and 4 million € per year
- For 75 % of the companies the reduction of energy (costs) has always been important!

Industry sectors:

- 74 % manufacturing
- 5 % healthcare sector
- 3 % energy suppliers
- 3 % trading



What are Learning Energy Efficiency Networks?

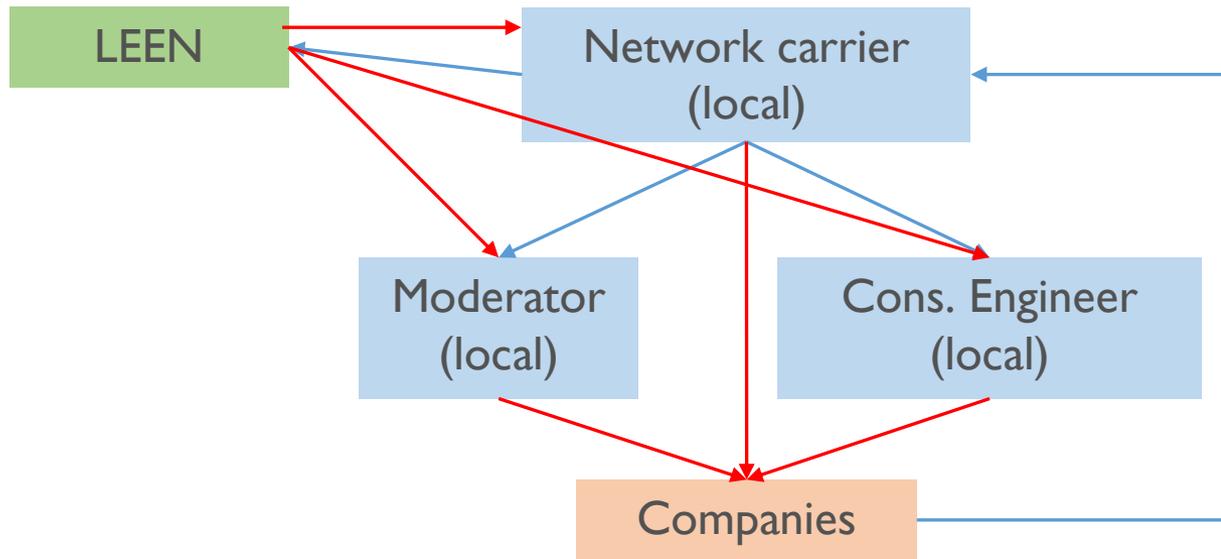


Quality assurance by:

- Standardized processes
- Experienced and certified LEEN moderators and consultant engineers
- IT-Tools, documents and templates to conduct a network (data management, technical und economic calculation, reporting)
- Platform for experience exchange and best practice examples



The ideal organizational structure of the networks

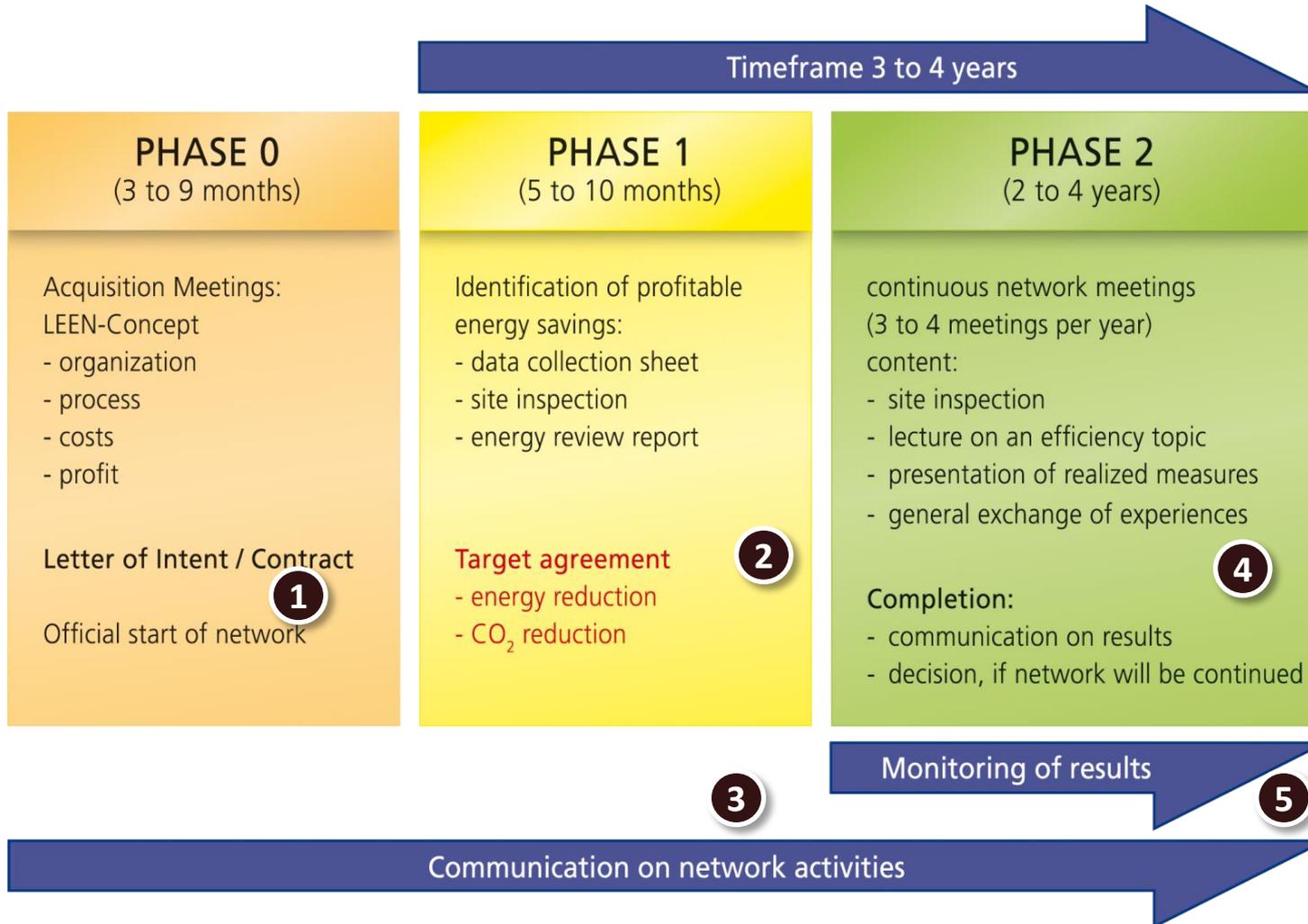


→ Money flow

→ Service & deliverance of LEEN MS



How does the *learning energy efficiency networks* work?



Elements of the LEEN Management System

LEEN web based platform (beta starts in Nov 2016)

- Energy audit (LEEN certified consultant engineer)
 - Data collection sheet
 - 17 technical calculation tools (prototypes)
 - ISO 50001 certified measures summary and sample report
- Network meetings (LEEN certified moderator)
 - Agenda
 - Minutes
 - Checked presentations of experts
 - Prepared site visits
- ISO 50001 certified monitoring tool



Measures overview: summary of identified measures

Overview	
Evaluated reports	366
Total number of measures	7,030
thereof quantitatively evaluated measures	6,030
thereof profitable measures (where IRR is greater than 12%)	3,580
Ø IRR of all profitable measures	31%
Ø Static pay back period of all profitable measures	3.2
Ø Investment per measure [EUR]	55,700
Ø Values per company/site (all profitable measures realized; IRR>12%)	
Ø Energy savings [MWh/year]	2,670
Ø CO ₂ emission reduction [t/year]	940
Ø Number of quantitatively evaluated measures	19
thereof classified as profitable	10
Ø Total additional investment [EUR]	580,000
Ø Reduction of energy costs [EUR/year]	180,000

Source: participating companies in the 30 pilot-network project



Monitoring of the energy efficiency networks

Evaluated monitoring reports		
Companies	No	210
Measures	No	1,980
Total consumption	GWh/a	14,100
Total energy saved	GWh/a	870
Electricity	GWh/a	340
Natural gas	GWh/a	275
Gasoline	GWh/a	80
District heat	GWh/a	39
Others	GWh/a	85

Average operational time of networks until monitoring:
Average yearly efficiency increase:

2,7 years
2,2%/a



Monitoring results of the Network: Karlsruhe

Category (Ø values per measure)	Value
Total number of measures	107
Ø Investment sum [€]	20,700
Ø Energy cost savings [€/a]	6,750
Ø IRR of all profitable measures	33.0 %
Ø Static pay back period of all measures[a]	3.0
Ø Energy savings [MWh/a]	98.5
Ø CO ₂ emission reduction [t/a]	25.6



Advantages of the LEEN Energy Audit

- A complete assessment of the saving potentials in crosscutting technologies and several process technologies
- An economic evaluation of the saving potentials (IRR, pay back period and net present value)
- Easy adaptation of measures for the measures based monitoring process
- Saving time due to a professional identification and evaluation of the energy efficiency measures

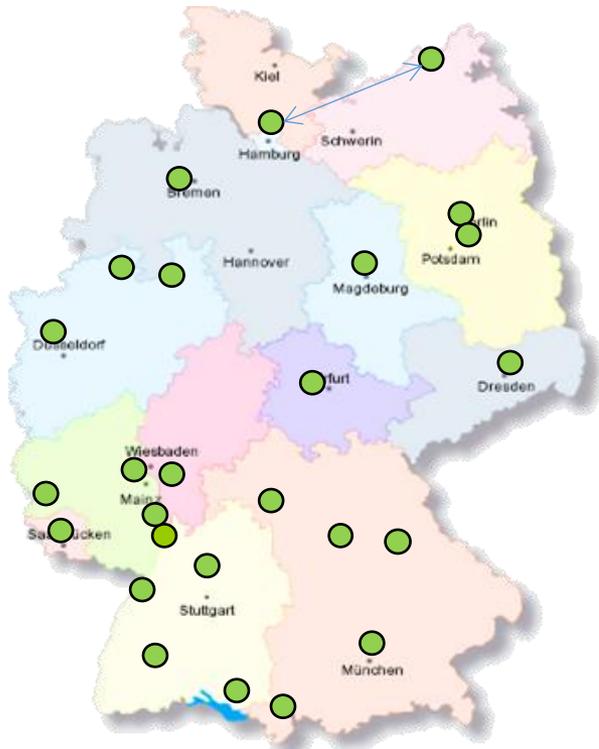


Advantages of the Network meetings

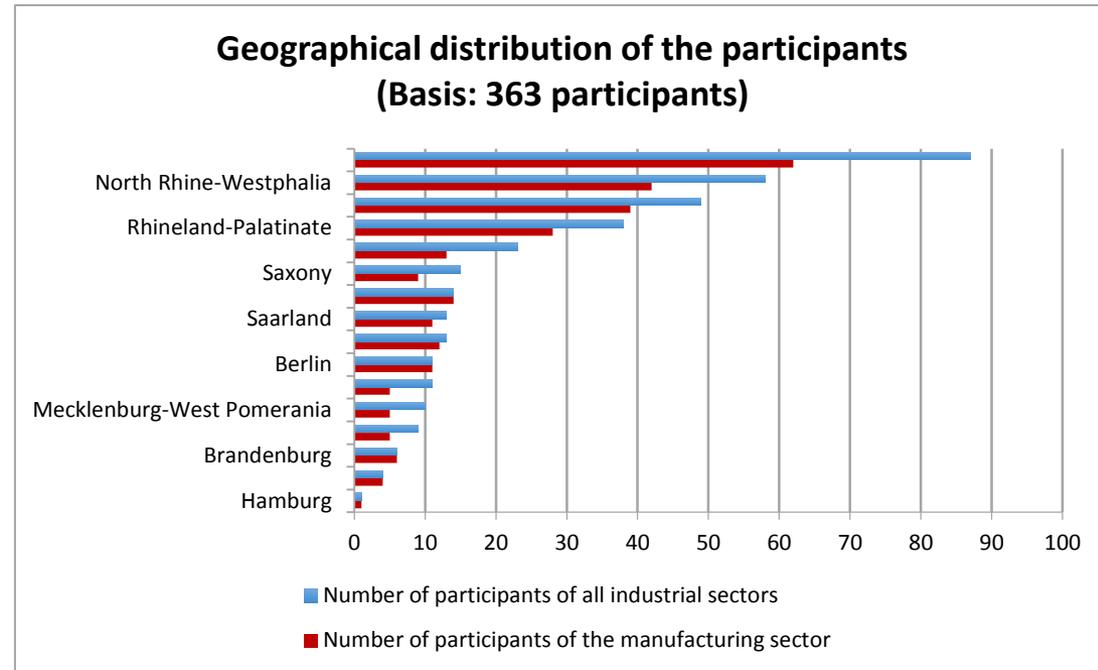
- Organization of an information network as a know-how pool
- Exchange of experiences to realize the measures by the participants (no intention to sell)
- Staff training, proven quality of experts (no advertising presentations)
- Saving time while acquiring information for the realization of measures
- Monitoring of realized measures including technical and economical evaluation
- Constant support via hotline
- Possible certification according to ISO 50001 and energy service law (EDL-G, energy audit EN 16247). Conformity proven by TÜV-Rheinland
- Strengthens the region



Overview of the 30 pilots network project



www.30pilot-netzwerke.de



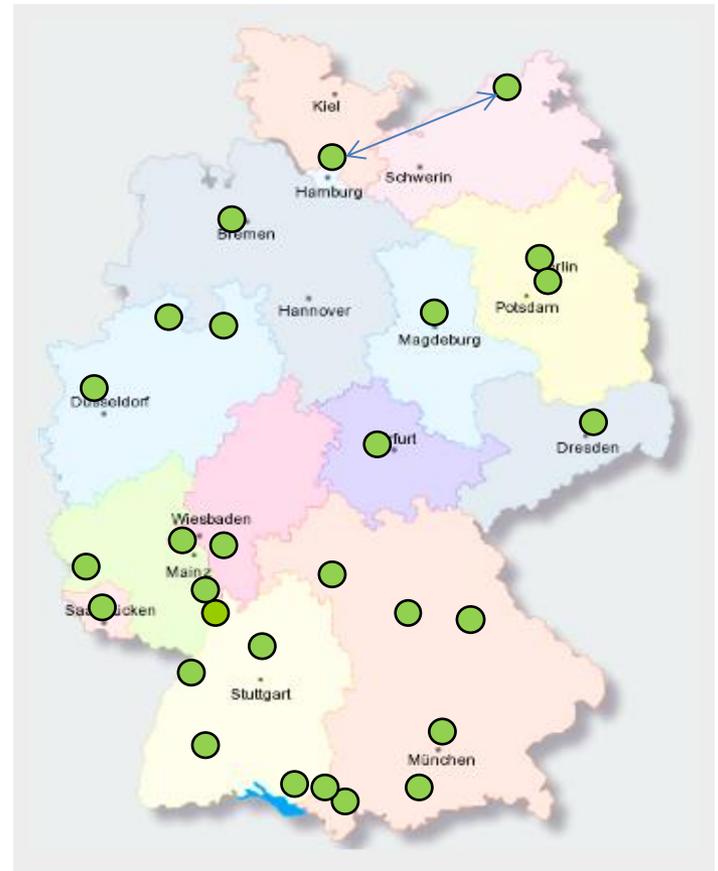
The 30 networks represent

- Total energy costs around 1 billion €/a
- Energy consumption > 15 million MWh/a
- CO₂ emission > 5 million t/a



Energy savings in the different networks

Ravensburg:	12,7 %	(after 5 years)
Franken-Oberpfalz:	8,7 %	(after 4 years)
Süd-West:	7,6 %	(after 3 years)
Hanse:	7,5 %	(after 3 years)
Heilbronn-Franken:	6,9 %	(after 3 years)
Karlsruhe:	6,1 %	(after 3 years)



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Example of a measure: Michelin Reifenwerk AG

- Process heat: Heating with exhaust vapours of the tire cooking
- Investment: 38,000,- €
- Energy carrier: District heat
- Annual savings:
 - Energy: 864 MWh
 - CO₂ emissions: 66 t
 - Energy costs: 51,800,- €
 - Amortisation: 0.7 a
 - IRR: 136 %



Impressions from the networks



Zufriedene Gesichter nach dem Rundgang (v.l.): Frank Wilhelm von L'Oréal, Bürgermeister Klaus Stapf, Umweltminister Franz Untersteller und Standortdirektor Pierre Haller



Future Perspectives and Markets

- Germany
- Austria
- Balkan region
- Belgium
- Sweden

- Scheduled:
 - Denmark, Finland, Netherlands, Norway, Spain
 - Morocco
 - South Korea
- Public support (projects): giz, German Export Initiative





Federal Ministry
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Institut für Ressourceneffizienz
und Energiestrategien

10 JAHRE
Energie im Blick.



Thank you

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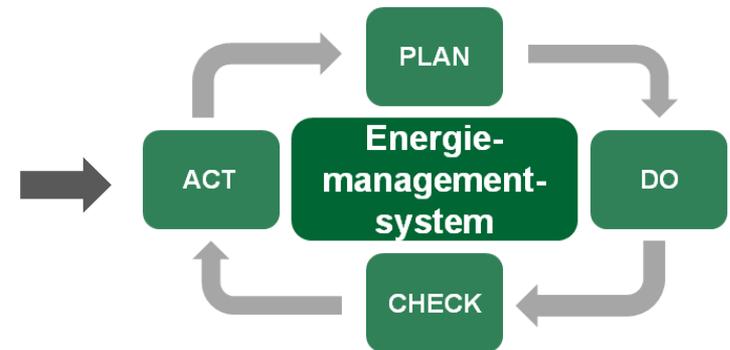
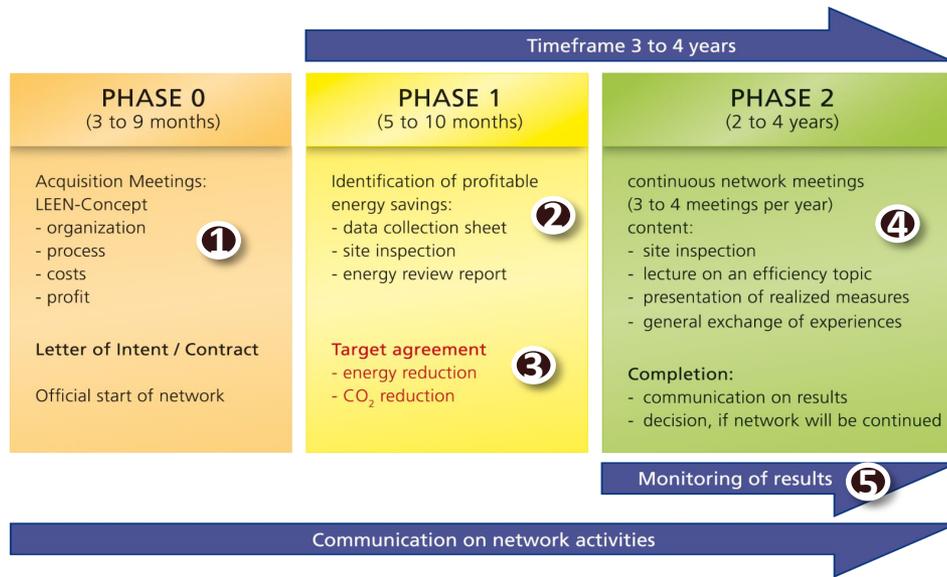


Energy review and measures overview

<input type="checkbox"/> Round figures <input type="button" value="New measure"/> <input type="button" value="Conversion to MWh"/> <input type="button" value="Delete measure"/>											
Name of measure		Purchased electricity	Light fuel oil	Wood chips	Time of use	Investment eff.	Additional investment (eff.)	Net present value (10%)	Internal rate of return i*	Static amortisation time	Dyn. amortisation time (10%)
Energy savings [Unit]		[MWh/a]	[MWh/a]	[MWh/a]	[a]	[€]	[€]	[€]	[%]	[a]	[a]
Investment today eff. (profitable measures)						110.000					
Sum profitable measures		290	600	-290	15		120.000	370.000	54,0%	1,8	2,1
Sum all measures		290	600	-190	20		340.000	330.000	23,0%	4,3	6,0
E03	Reducing electricity consumption (Base load)	65,0			10	2.000	2.000	41.065	350%	0,3	0,3
V01	free outflow of waste air via roof during summer	15,0			10	500	500	9.438	323%	0,3	0,3
L01	Retrofitting: mirror reflector/ clear screen cpping	30,0			10	3.000	3.000	16.876	108%	0,9	1,0
E04	Retrofitting:Eff1-drives	70,0			10	7.300	7.300	39.077	103%	1,0	1,1
H05	Biomass: Reduction the flow temperatur in the heating circuit		500,0	-500,0	15	25.000	25.000	126.643	80%	1,3	1,4
CA02	Reduction of the pressure in the compressed air network	38,0			10	7.000	7.000	18.176	58%	1,7	2,0
E02	Using standby set to reduce peak loads				10	3.000	3.000	7.446	56%	1,8	2,0
E01	Reduction of peak load				10	5.000	5.000	8.211	42%	2,3	2,8
OR01	Installation of an energy management system	50,0	14,0	11,0	15	20.000	20.000	29.618	32%	3,1	3,8
H06	Utilisation of waste heat from the injection moulding			200,0	10	10.000	10.000	9.137	29%	3,2	4,1
CA01	Retrofit heat recovery for compressor AM-37		85,0		10	15.000	15.000	13.158	28%	3,3	4,2
L02	Retrofitting of energy efficient lamps with electronic ballast	20,0			10	12.000	6.000	4.178	25%	3,6	4,7
C01	Insulation of refrigerant pipes and fittings	1,0			10	500	500	163	17%	4,6	6,5
C02	Utilisation of waste heat from cooling processes		259,0		10	68.000	68.000	17.798	16%	4,9	7,0
REN01	Installation of a photovoltaic system (PV)				20	120.000	120.000	-27.202	7%	11,0	-1
H02	Insulation of burner plate		1,0		10	500	500	-169	1%	9,3	27,5
BG01	Energy-efficient refurbishment of shed roof			100,0	40	150.000	100.000	-83.882	-1	60,7	-1



Some advantages of *learning energy efficiency networks*



Advantages: Energy audit report + list of measures + Monitoring are
ISO 50001 conform and auditable according EN 16247

