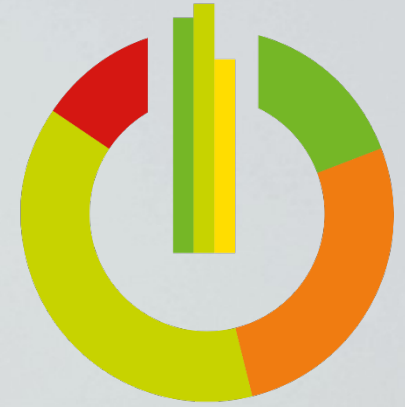


# Demand response: An option for energy efficiency networks? 需求响应： 能效网络的一种选择？



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# LEEN GmbH

LEEN is a spin-off of Fraunhofer Society established in 2009

LEEN公司创建于2009年，是弗劳恩霍夫协会的衍生公司

LEEN currently operates or supervises networks in Germany, Austria, Belgium, Ukraine, Jordan, Nigeria

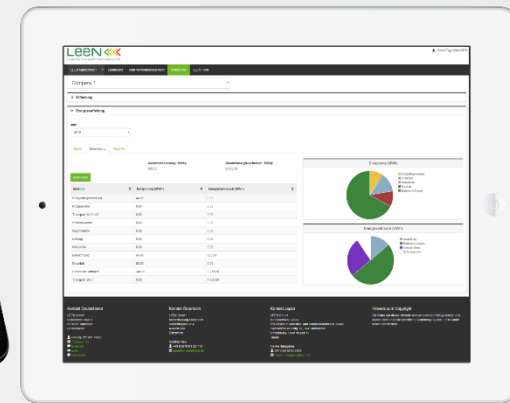
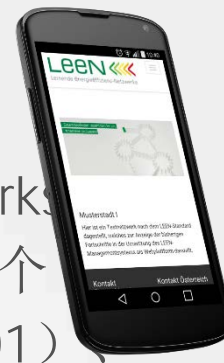
LEEN目前在德国、奥地利、比利时、乌克兰、约旦、尼日利亚运营或指导能效网络

LEEN has developed **leenize**, an online solution for auditing (ISO 50001) and central planning and monitoring of energy efficiency measures at any number of company sites.

This includes energy efficiency networks

LEEN开发了**Leenize**应用，它是可以为多个企业的现场能效措施提供审计（ISO 50001）

集中规划和监控的在线解决方案，其中包括能效网络



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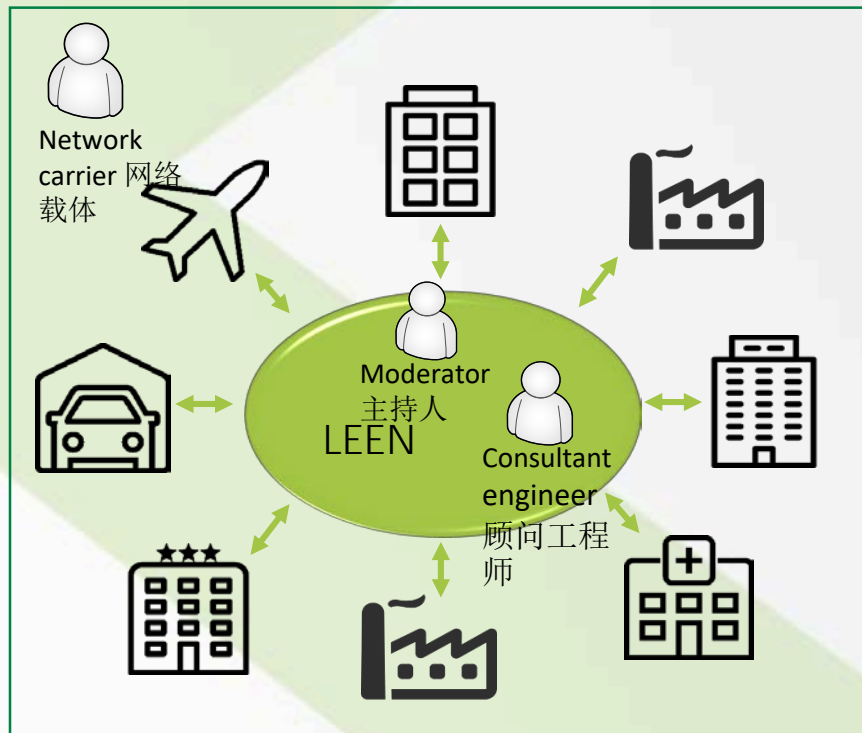
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- Network concept and some results  
网络概念和部分结果
- Demand response in networks  
网络中的需求响应

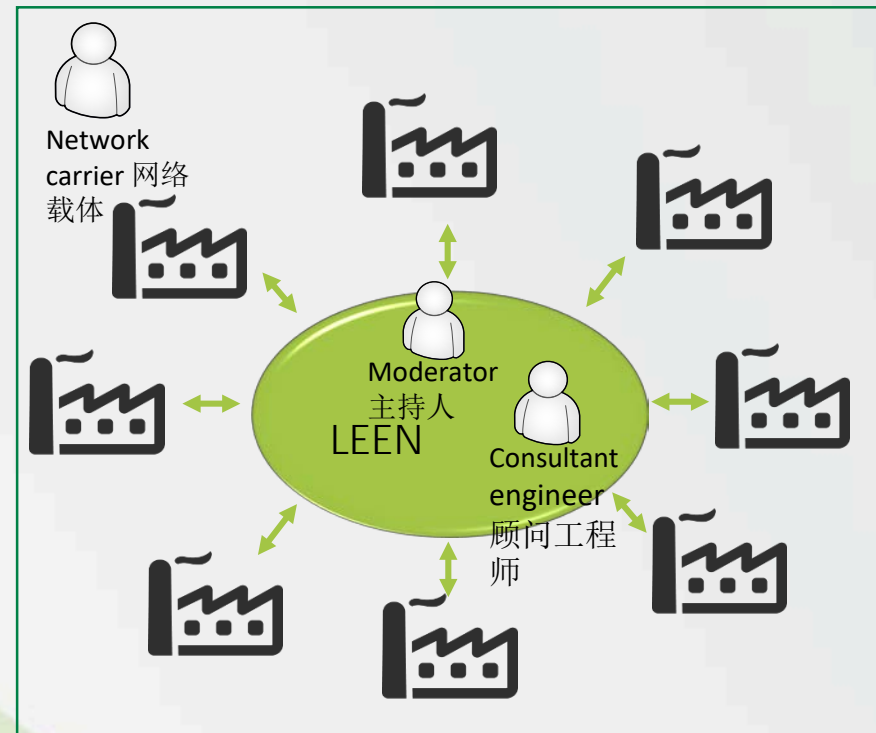


# Typical network types 典型网络类型

## Regional 区域网络



## Sectoral (including in-house) 部门网络 (包括内部)



# How it works – an overview

## 工作流程——概览

### LEEN energy audit<sup>plus</sup>

(6 to 12 month)

LEEN能源审计plus

6-12个月

List with measures including technical and economical evaluation

If required: audit report

If required: ISO 50001

Common target setting on:

- Energy reduction
- CO<sub>2</sub> reduction

措施列表

包括技术与经济评估

如果需要: 审计报告

如果需要: ISO 50001

共同目标设定:

- 节能
- 减排

### Network meetings

(3 to 4 years)

网络会议

3-4年

Team building process by moderated meetings

通过主持会议促进团队建设过程

- Site visits - 现场参观
- Presentations from experts - 专家报告
- Experience exchange on planned and realized measures - 计划中的和已实施措施的经验交流

Hotline

热线

Annual monitoring of measures

措施实施的年度监控

Communication of network activities

网络活动的交流

- Conducting energy audits: Identifying and evaluating saving potentials (lead: consultant engineer) 进行能源审计: 识别和评估节能潜力 (负责人: 顾问工程师)
- Conducting network meetings: Experience and knowledge exchange to speed up the implementation (team building process) (lead: moderator) 举办网络会议: 交流经验与知识, 加快实施 (团队建设过程) (负责人: 主持人)
- Implementing measures (lead: participants) 实施措施 (负责人: 参与方)
- Public relation: Advertising the network and its participants (lead: network carrier) 公共关系: 宣传网络及其参与者 (负责人: 网络载体)



# Profitability of realized measures 已实施措施的盈利能力

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- Energy savings 10 companies 1.4 million €/a  
10家企业的能源节约 140万欧元/年
- Total investment 10 companies 2.4 million €  
10家企业的总投资 240万欧元
- Average pay back period 1.7 years  
平均投资回收期 1.7年

Source: EnBW Sales GmbH

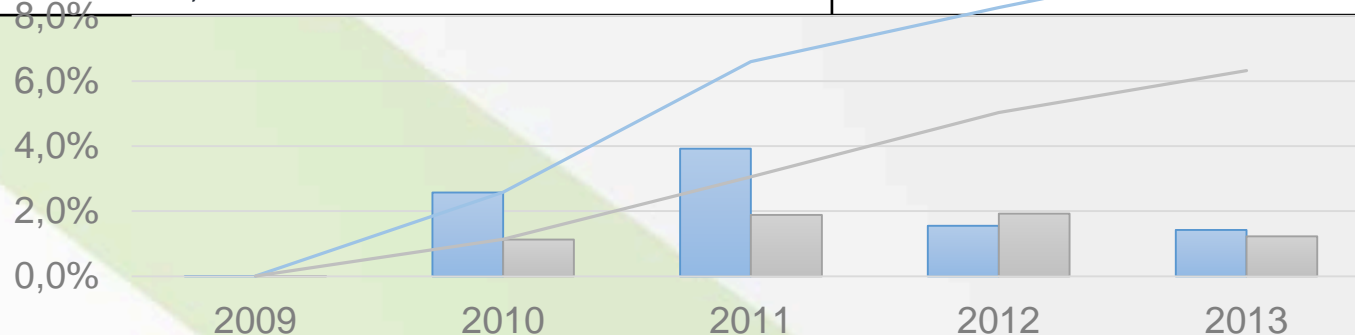




# Tire manufacturer: overall monitoring results (2009 – 2013) 轮胎制造商：整体监测结果（2009年 - 2013年）

37 measures implemented (11 out of the audit report)  
已实施37项措施（其中11项不包含在审计报告中）

Energy & CO <sub>2</sub> saved until 2013 至2013年减少的能耗与CO <sub>2</sub> 排放	Profitability 盈利能力
<ul style="list-style-type: none"> <li>Electricity 电力: 2,370 MWh/a 兆瓦时/年</li> </ul>	<ul style="list-style-type: none"> <li>Total investment 总投资: 940,000 EUR 欧元</li> </ul>
<ul style="list-style-type: none"> <li>Natural gas 天然气: 1,770 MWh/a 兆瓦时/年</li> </ul>	<ul style="list-style-type: none"> <li>Savings 节省: 490,000 EUR/a 欧元/年</li> </ul>
<ul style="list-style-type: none"> <li>District heat 集中供热: 2,890 MWh/a 兆瓦时/年</li> </ul>	<ul style="list-style-type: none"> <li>Payback 回收: 1.9 years 年</li> </ul>
<ul style="list-style-type: none"> <li>CO<sub>2</sub> reduction CO<sub>2</sub>减排: 1,560 t/a 吨/年</li> </ul>	<ul style="list-style-type: none"> <li>IRR 内部回报率: 52%</li> </ul>



■ Energy efficiency per year  
 每年能效提升  
— Cumulative energy efficiency  
 累积能效提升

■ CO<sub>2</sub> reduction per year  
 每年CO<sub>2</sub>减排  
— Cumulative CO<sub>2</sub> reduction  
 累积CO<sub>2</sub>减排



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# Opening remarks

## 开幕词

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Currently there is no practical experience with demand response as a topic within energy efficiency networks in Germany and abroad (except peak load management)

目前德国和国外能效网络中，还没有需求响应相关的实践经验（峰值负荷管理除外）

A single network integrating the question of demand response was planned, but was halted due to a restructuring process of the network carrier.

曾计划建设整合需求响应相关问题的单一网络，但由于网络运营商的重组过程而停滞。

The presentation cannot give right now an answer if the network approach is useful to support DR strategies.

该报告现在无法回答网络方法对于需求响应策略的支持是否有用这一问题

Having the experience of energy efficiency networks it seems to be clear that the outstanding driver for DR will be profitability. Hence, frame conditions must be set accordingly.

拥有能效网络的经验，我们清楚地看到，需求响应优秀的驱动力是有利可图的。因此，必须相应地设置框架条件。



# Demand response – company perspective

## 需求响应——企业视角

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Do I have an energy consumption that can be shifted?

我有能耗可以转移吗？

- processes that are not time-critical 时间并非关键的流程
- processes whose products can be stored 产品可以储存的流程
- Processes with slow emerging effects 影响缓慢出现的流程

If yes 如果是：

1. How big is it?  
能耗有多大？
2. How easy can the shifting process be established (fully automated)?  
转移过程的难易程度（全自动）？
3. How long is the maximum time period of the shift (minutes, hours, days, weeks)?  
转移周期最长多久（分钟、小时、天、周）？
4. Is it profitable?  
是否有利可图？



# Demand response – company impressions

## 需求响应——企业印象

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Asking network companies about DR  
向网络公司询问有关需求管理的问题

- All network companies know about peak load management  
所有参与网络的公司都了解峰值负荷管理
- Hardly any company knows the general concept of demand response  
几乎没有公司了解需求响应的通用概念
- Industrial companies are more open minded towards the DR concept  
工业企业对需求响应方案持更加开放的心态
  - Industry: If we have a profitable potential, we would be willing to use it  
工业：如果有盈利潜力，我们愿意使用它
  - Service: Only, if it works full automated and does not interfere with our service  
服务业：仅当它完全自动化运行并且不会干扰我们的服务时，才会使用
- Industry: If core business is affected there is a favour for a manually controlled process  
工业：如果核心业务受到影响，则倾向于手动过程控制



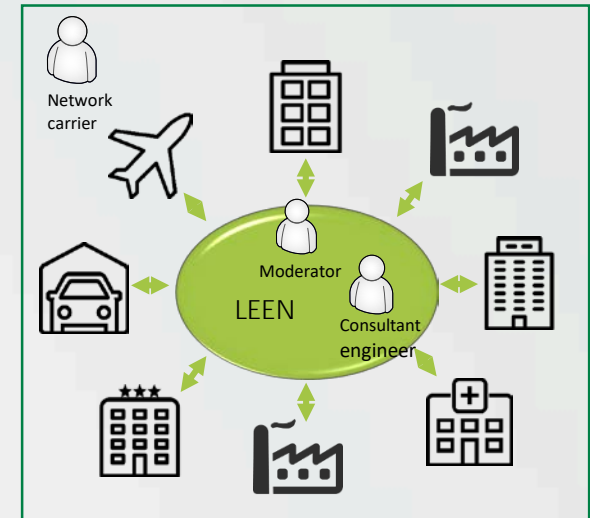
# Demand response – regional networks

## 需求响应——区域网络

### Relevant aspects of regional networks

#### 区域网络的相关方面

- Structure of load profiles are probably different  
负载配置的结构可能不同
- The companies are located in one region  
这些公司位于同一区域
- The relevance of DR for single participant probably differ  
需求响应的相关性对单个参与者来说可能不同



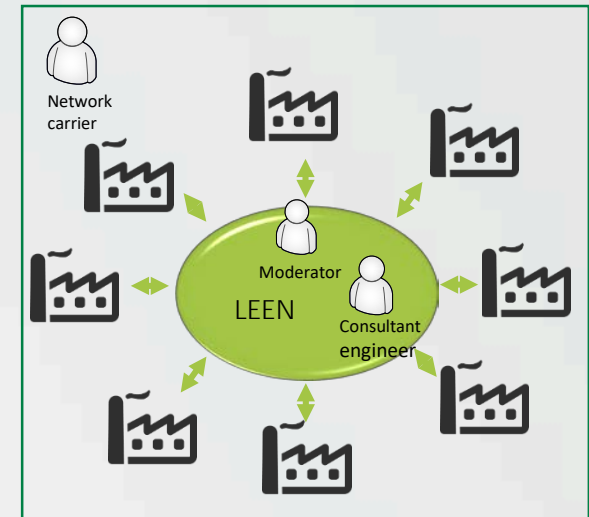
# Demand response – sectoral networks

## 需求响应——行业网络

### Relevant aspects of sectoral networks

#### 行业网络的相关方面

- Structure of load profiles is probably similar – limited flexibility?  
负载配置的结构可能类似——灵活性有限?
- The companies are not necessarily located in one region  
这些公司不一定位于同一区域
- If network related DR requires revelation of a production process competition might be a problem  
如果网络相关的需求响应涉及到生产过程，那么竞争可能是一个问题



# Demand response – local optimization

## 需求响应——局部优化

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Local optimization: The network optimizes the aggregated load profile

局部优化：网络优化了聚合的负载配置

- Driver: cost optimization  
驱动因素：成本优化
- Optimal network profile does usually not lead to an overall optimization of the demand for a given supply structure  
最佳网络配置通常不会导致对给定供应结构需求的整体优化

=> Not a promising approach for the integration of RES

=> 不是一种前景广阔的可再生能源整合方法



# Demand response – global optimization

## 需求响应——全局优化

Global optimization: The network optimizes according to the requirements of the electricity market

全局优化：根据电力市场的需求进行网络优化

- Driver: cost optimization  
驱动因素：成本优化
- The network carrier (utility) can act as an aggregator  
网络载体（公用事业）可以作为整合者
- The network offers a comparable large flexibility potential:  
Interesting partner for aggregators  
网络提供了相当大的灵活性潜力：对整合者有兴趣的合作伙伴

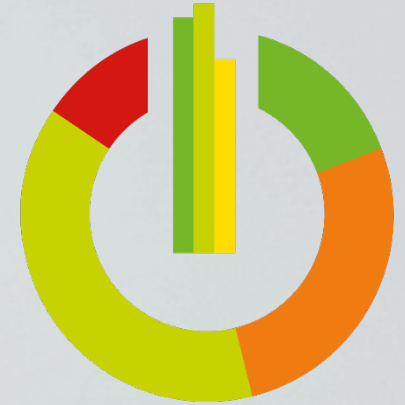
=> Promising approach for the integration of RES, if an according legal frame work is given

=> 如果有相应的法律框架，那么这是整合可再生能源有前途的方法  
Networks in industrial parks operating with a energy service provider seem to be an ideal partner for DR.  
与能源服务提供商合作的工业园区网络似乎是需求响应理想的合作伙伴。





# Q&A 问答环节



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