# METERING AMERICA

# BILLING/CIS AMERICA

THE metering and customer management MEGA-EVENT
for SMART electricity, water and gas utilities!


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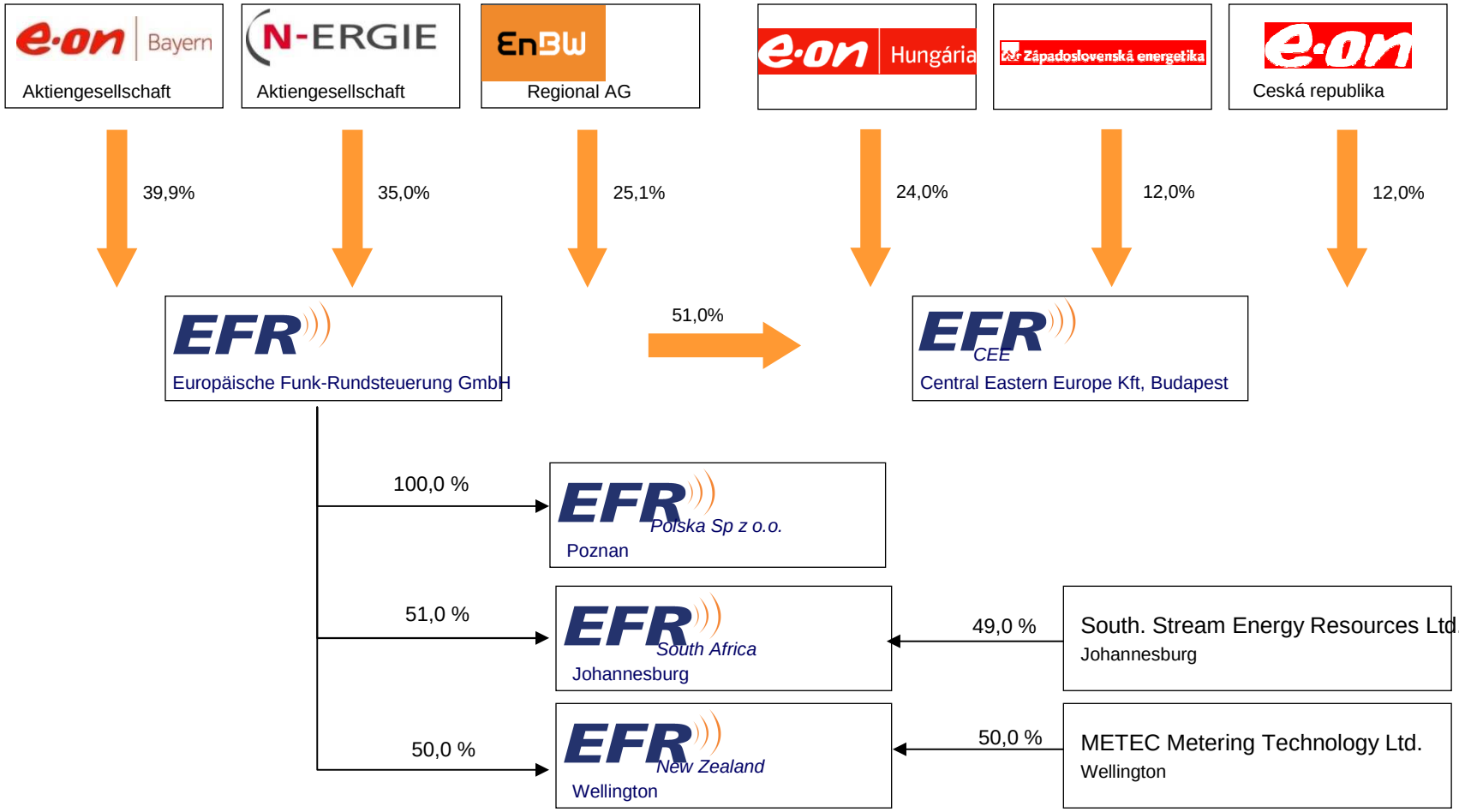
**EFR GmbH,** Germany

EFR
EUROPÄISCHE FUNK-RUNDSTEUERUNG

# Tariff and Load Management by wide area long wave communication - Introduction

- Company Structure and Business Model
- Applications and Markets
- Physics of Very Long Wave (VLF) Propagation
- Long Wave System Architecture
- Coverage Prediction for USA – Florida
- EFR approach to mix Long Wave Com. with Smart Metering

# •Company Structure and Business Model



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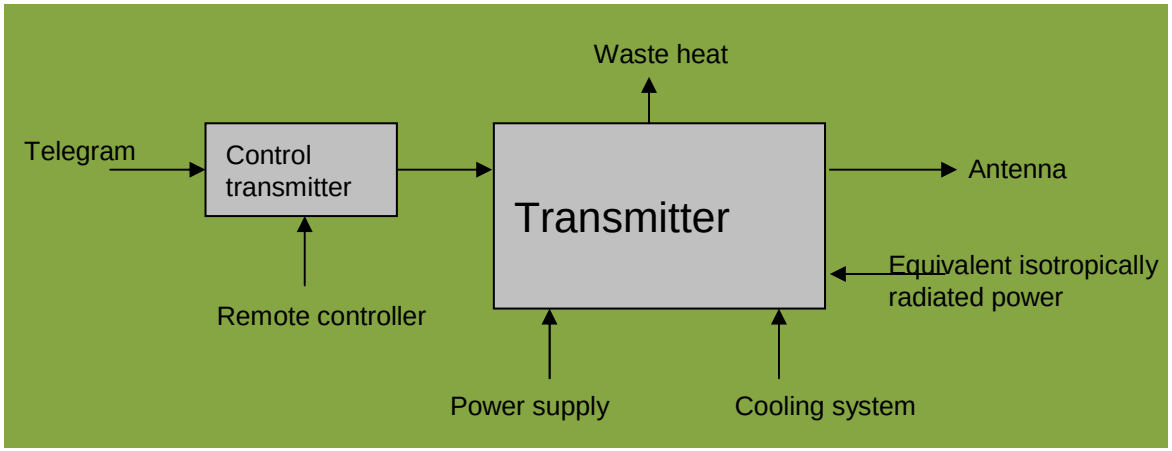
# • Very Long Wave (VLF) Transmitters

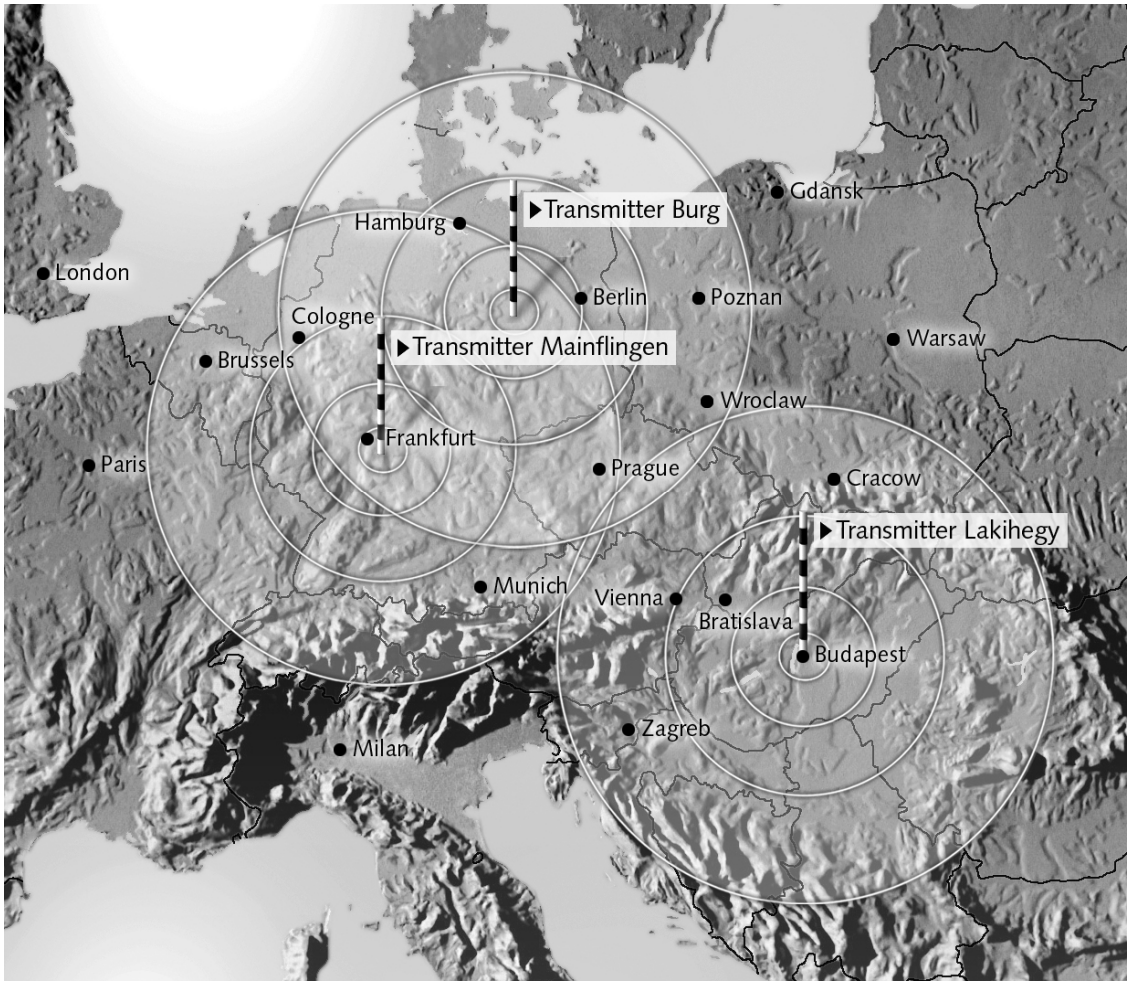
| | | | |
|---|---|---|---|
| Transmitting power: | Mainflingen | 100 kW | TRAM 100 LC |
| (transmitter types) | Burg | 100 kW | TRAM 100 LC |
| | Lakihegy | 100 kW | TRAM 100 LC |
| Carrier frequencies: | Mainflingen | 129.1 kHz | |
| | Burg | 139.0 kHz | |
| | Lakihegy | 135.6 kHz | |
| Type of modulation: | FSK (Frequency shift keying) | | |
| Frequency swing: | +/-170 Hz | | |
| Telegraph speed: | 200 Bd | | |



# • Very Long Wave (VLF) Antenna Systems

| | | |
|---|---|---|
| Antenna heights: | Mainflingen | 200 Meter |
| | Burg | 317 Meter |
| | Lakihegy | approx. 320 Meter |
| Antenna type: | Mainflingen: | |
| | T-Antennas | |
| | (Vertical antenna with top capacity) | |
| | Burg: | |
| | Double cone antenna | |
| | Lakihegy: | |
| | Double cone antenna | |
| Transmit direction: | | |
| | Omni-directional antenna | |

# • Very Long Wave (VLF) Covered Areas

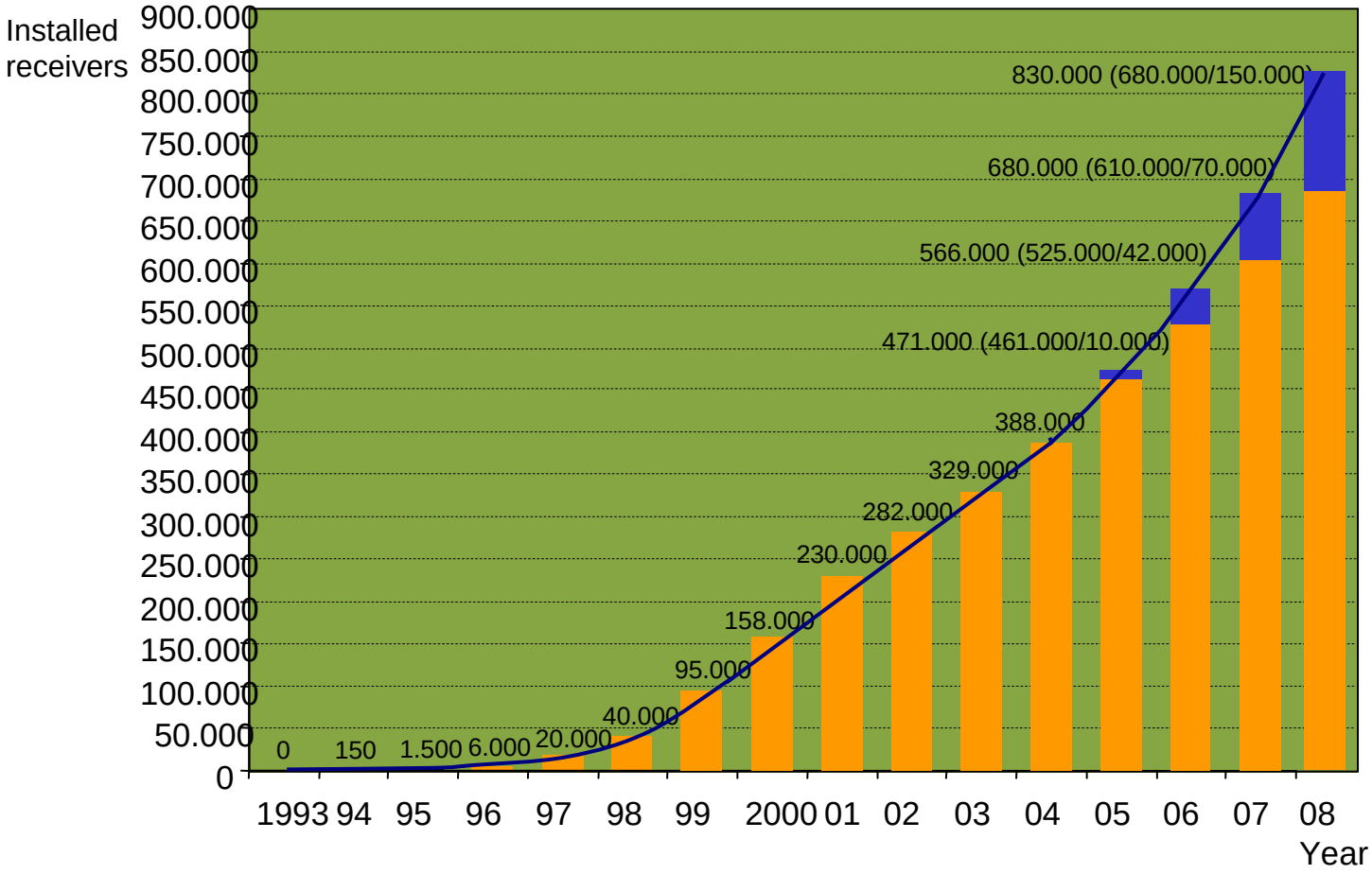



- Germany (main market)
- Austria
- Czech Republic
- Slovak Republic
- Hungary (main market)
- Croatia
- Parts of Poland
- 85 Companies
- Municipalities, regional suppliers, major utilities
- Tariff switching
- Street lighting
- Fast load management
- Generation control (wind, biogas, photo voltaic)

# • References


Versorgungsbetriebe Bordesholm
e·on Hanse
WEMAG AG
Stadtwerke Haltern
Stadtwerke Münster
e·on edis
RWE
envia NSG
VATTENFALL
AVU...
e·on Avacon
Stadtwerke Witten GmbH
Mainova
Strom Erdgas Wärme Wasser
Landeshauptstadt Dresden
west
ENERGIE und VERKEHR
HARZ ENERGIE
HSE
HEAG Südhessische Energie AG
ENSO
EWR
Stadtwerke Sindelfingen GmbH
N-ERGIE
e·on
E.ON Česká republika, a.s.
EnBW
Regional AG
e·on Bayern
ÜBERLANDWERK ERDING GmbH & Co. KG
Stadt Augsburg
Salzburg AG
Západoslovenská energetika
e·on Hungária

# • Number of radio receivers installed



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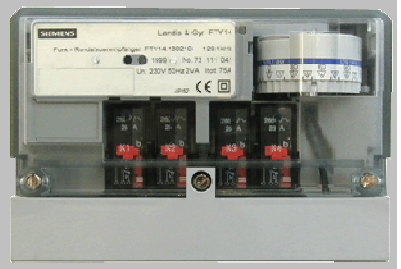
# • Radio receiver – technical properties

- Network connection via EN61037,transformer with galvanic insulation
- Antenna integrated into housing, removable
- Programming via optical interface as per EN 61107
- **Data transfer:** receiver frequencies:129.1 kHz 135,6 kHz 139.0 kHz
  **modulation:** FSK, radio transmission format as per DIN 19244,
  **telegram formats:** Semagyr-Top or Versacom,
  **Receiving level** >55 dBµV/m
- **Relay:** 1 to 6 bi-stable, potential-free relay with two-way contact. Position indication and manual operation
- **Accessories:** optical/acoustic alignment assistance, parameterization database, parameterization program et al.

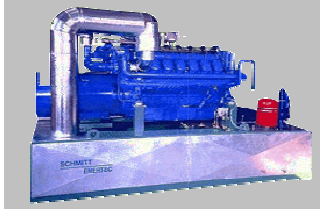


**See us at Stand 304**

# • Main applications

**Multi rate meters HT/LT switching**

**Load management**
Control of load groups
Control of generation



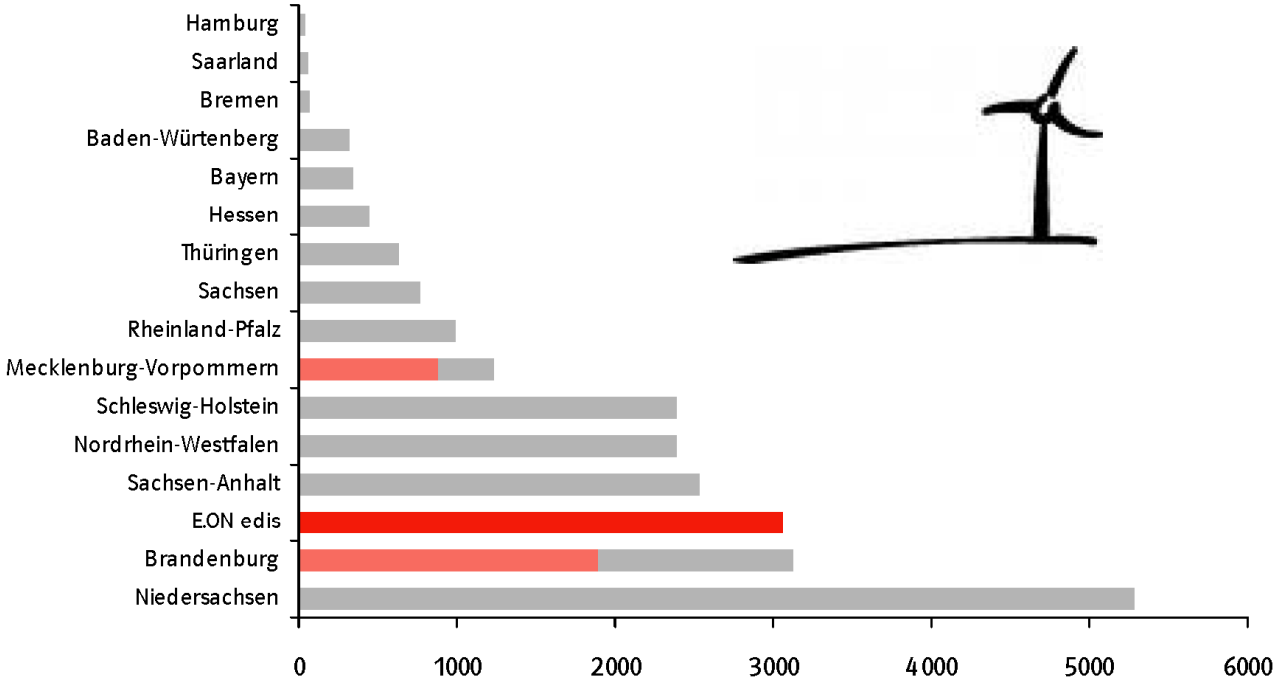
**Control of lighting equipment**

**Individual control**

# Examples of companies doing Load / Generation control

| Customer | MW Controlled | Comment |
|---|---|---|
| e·on edis | 2,100 MW | Wind Generation |
| e·on Avacon | 600 MW | Wind Generation |
| WEMAG AG | 25 MW | Wind Generation |
| energiequelle | 230 MW | Wind Generation |
| e·on Bayern | 2,500 MW | Heating Systems |
| Berlin.de | 20 MW | Street Lighting |
| All Companies | 500,000 households | Tariff Switching |
| envia NSG | 900 MW | Wind Generation, Solar & Biogas systems |

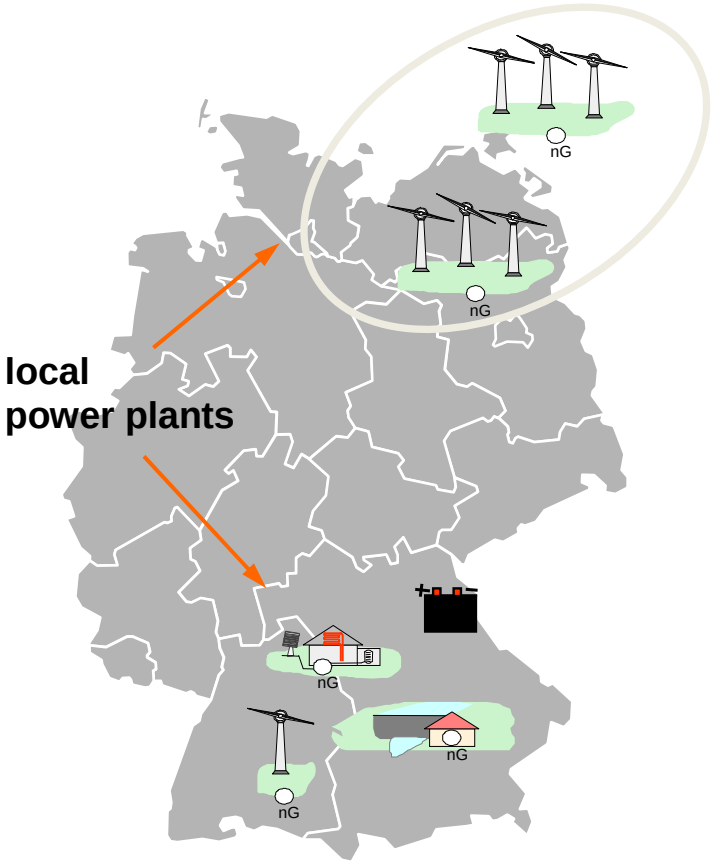
# Installierte Wind-Einspeiseleistung




Quelle: Bundesverband Windenergie e.V.

# • Control of local power plants

- **Aggregation a plenty of local power plants to so-called “virtual“ power plants by wide area long wave communication**
- **Control of energy feeding input by electric utility. The result:**
  **- Avoidance of grid overloading and instability**
  **- Economic grid planning**
- **Economic benefits opposite to other communication technologies**
- **Cost effective also by small power units**



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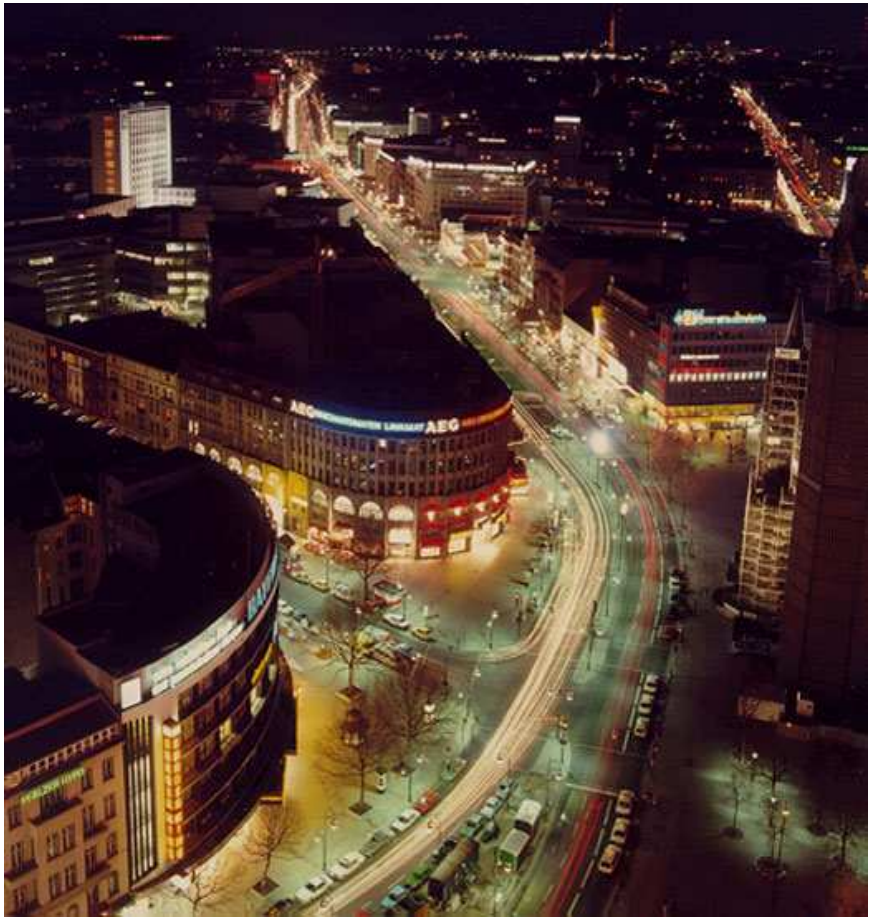
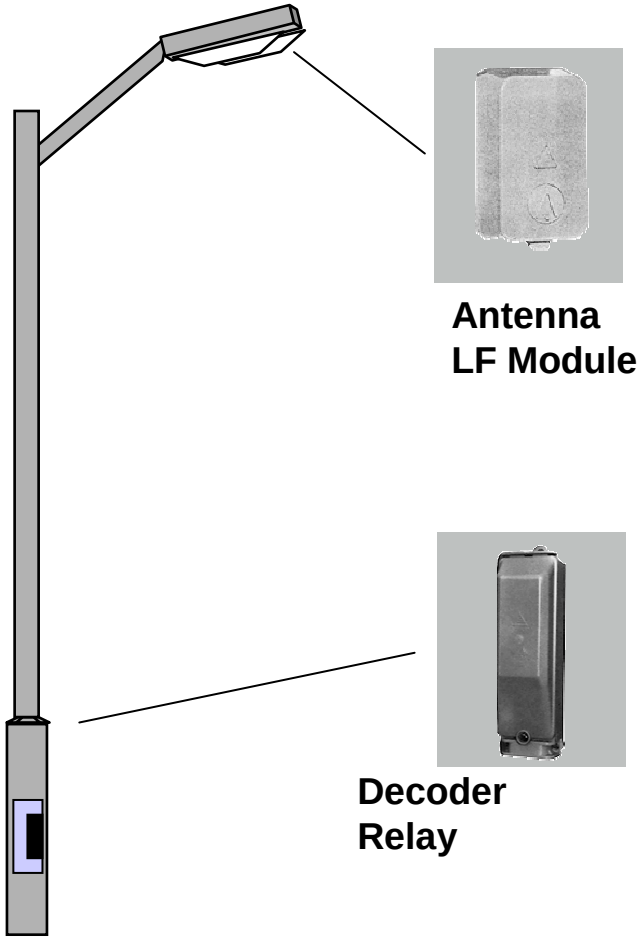
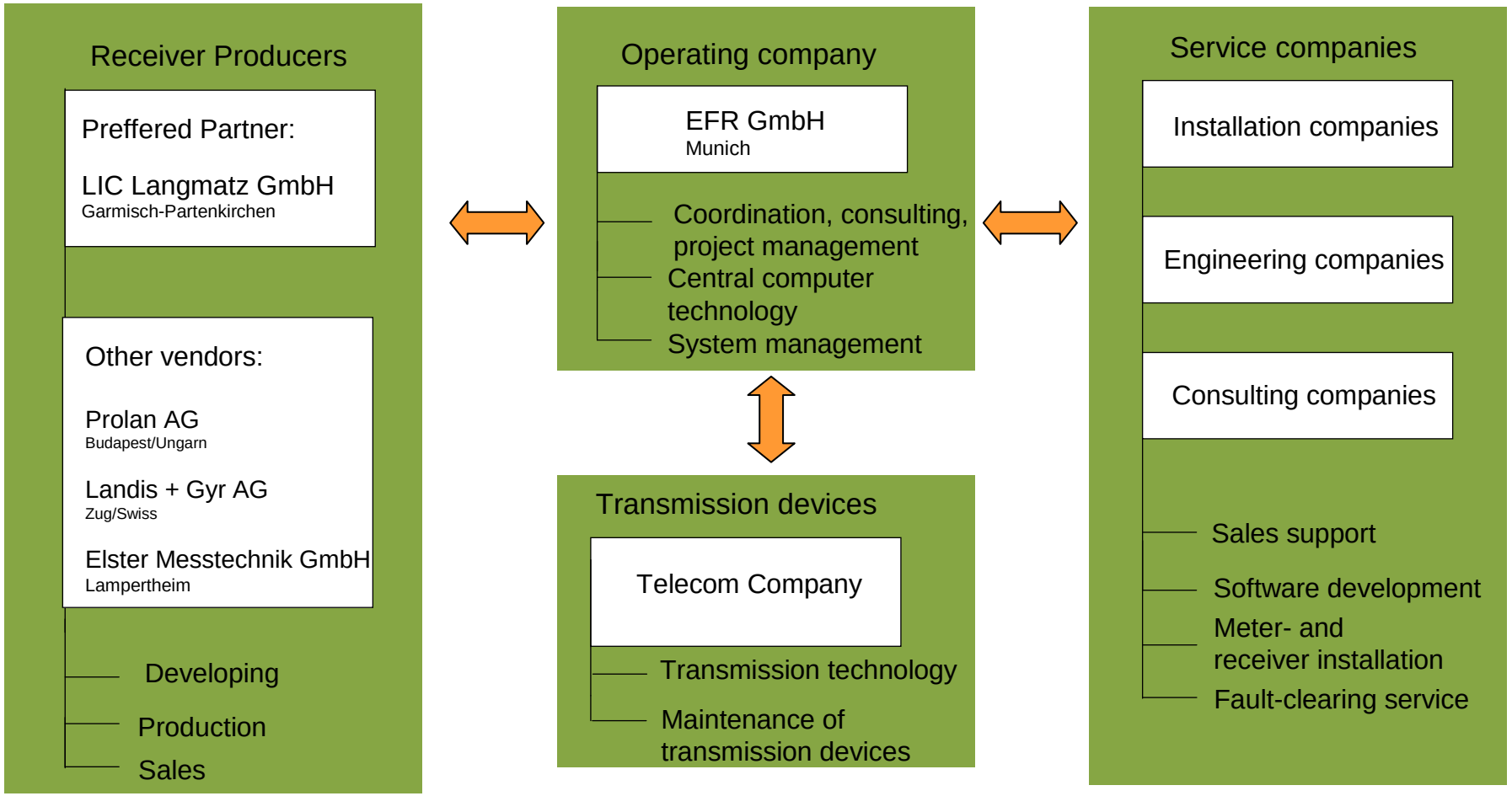
# • Lighting control



# • Cooperation partners



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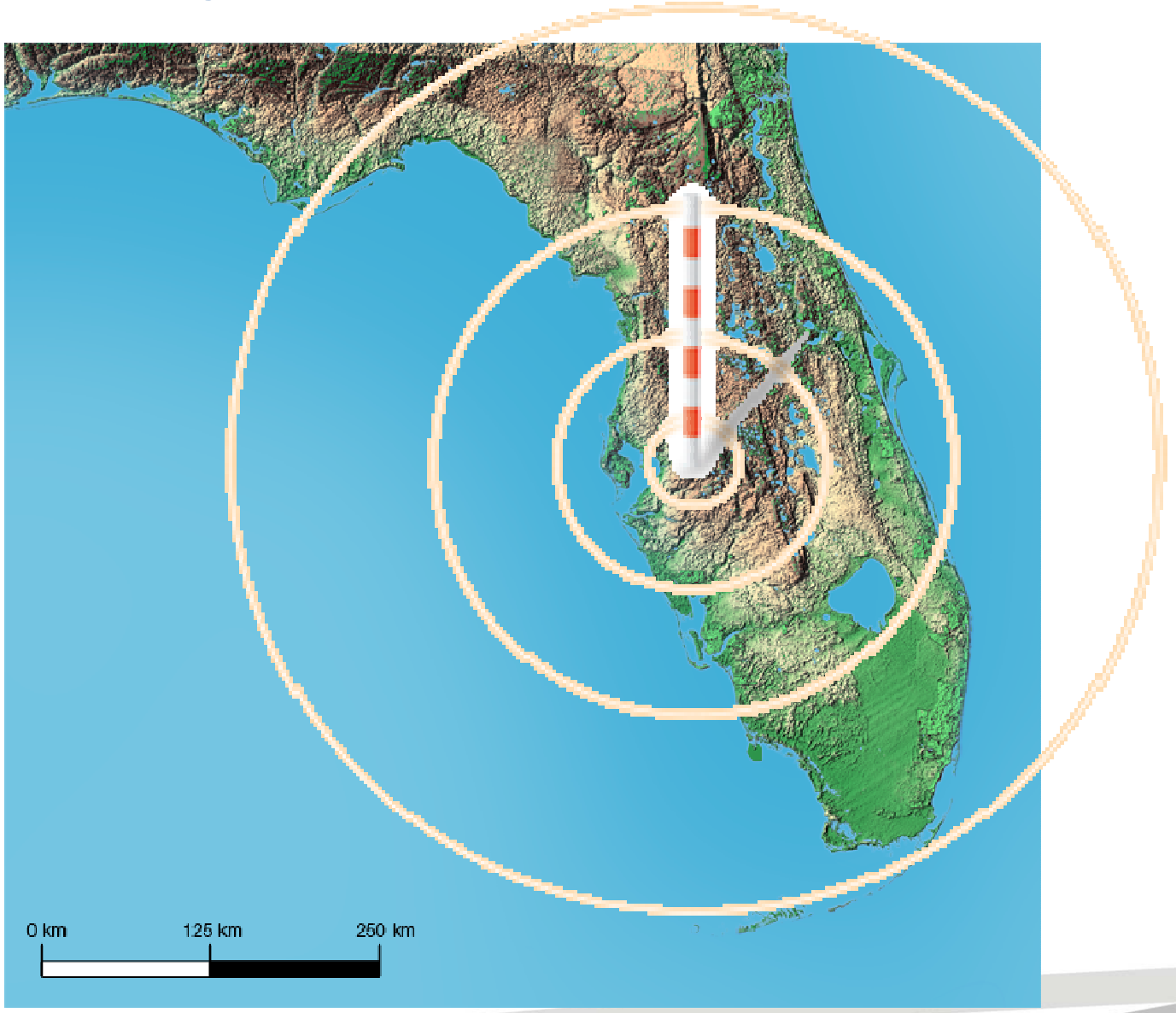
# • Coverage Prediction USA - Florida



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# EFR's approach is to mix existing solutions for shifting Smart Metering to Smart Grids enabled systems

**Smart Metering, ordinary solutions for**

**Data Collection/Meter Data Management services**

- Scheduled operation, not critical in terms of time
- State-of-the-art technology, specialized for this purposes

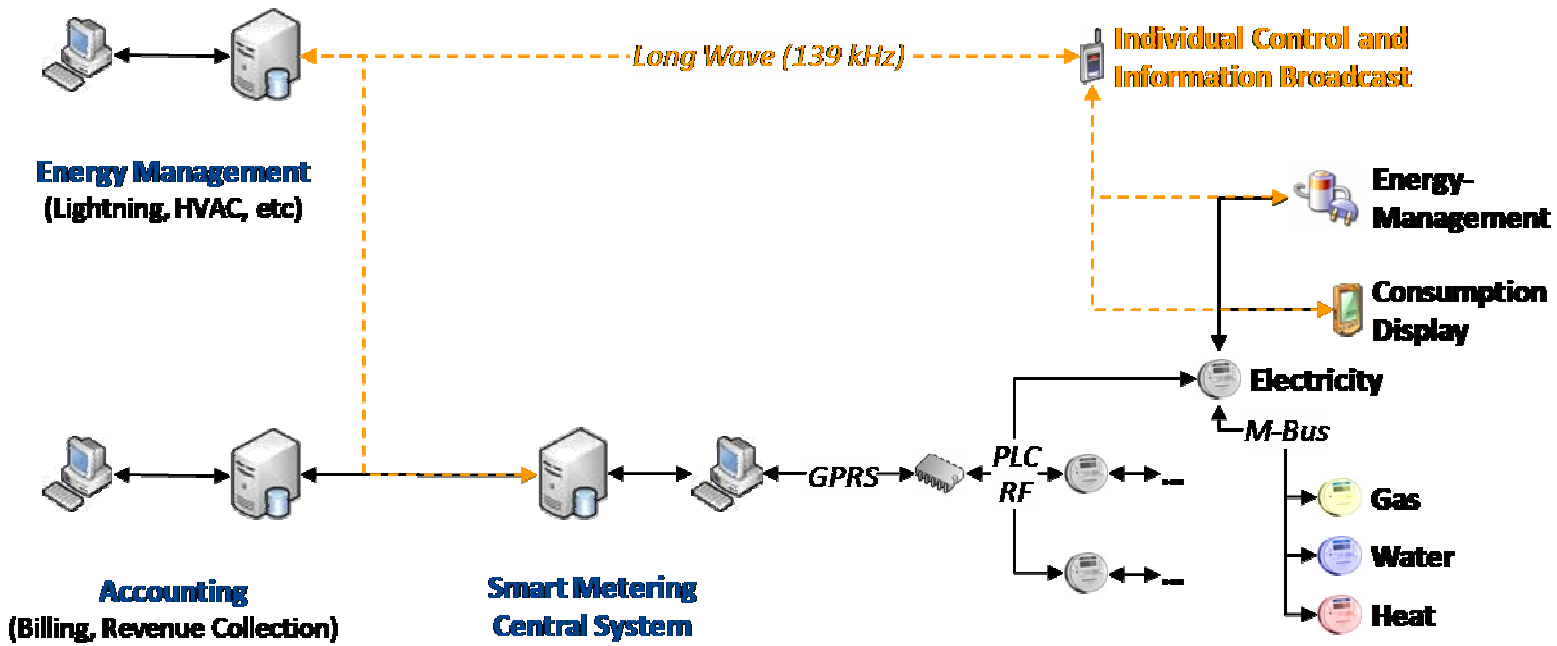
**Long Wave Radio, exclusive add-on for**

**Demand Response/Demand Side Management services**

- Fast (ad-hoc) broadcast of contents/tasks
- No expansion of pure metering infrastructure

# Smart Metering and Long Wave Radio systems will be integrated on central level and at customers premise

## Integrated System Architecture Smart Metering/Long Wave Radio



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# On central level Smart Metering and Long Wave Radio must work embedded in each individual workflow

**Installation** | **Meter Operation** | **Meter Reading** | **EDM/Accounting** | **Revenue Collection**

**Meter Logistics (Deployment)**

**Installation, Commisioning**

**Quality Control (Bug-fixing)**

**Data Collection (Remote Reading)**

**Data Provisioning**

**Event Recording**

**Balancing (Reporting)**

**Accounting (Energy Supply)**

**Commercial Dunning**

**Remote Disconnect**

**Master Data Management**

**Load Control (DSM/DR)**

**Supply Quality Monitoring**

**Customer Information (In-home services)**

**Customer Care Support (for all processes)**

# The key for customer acceptance is to provide convenient in-home information services as a “personal dashboard”

## Customer Information Terminal:

(In-home Display)

### Input from:

- Smart Meter
- Long-wave Broadcast

### Output to:

- Customer (inside premise)
- Secondary Management Systems

Energy Consumption

Energy costs

Carbon Footprint

Appliance Control

Load Control (DSM)

Load Shifting (Demand Response)

Supply Quality Monitoring

Consumption Reports

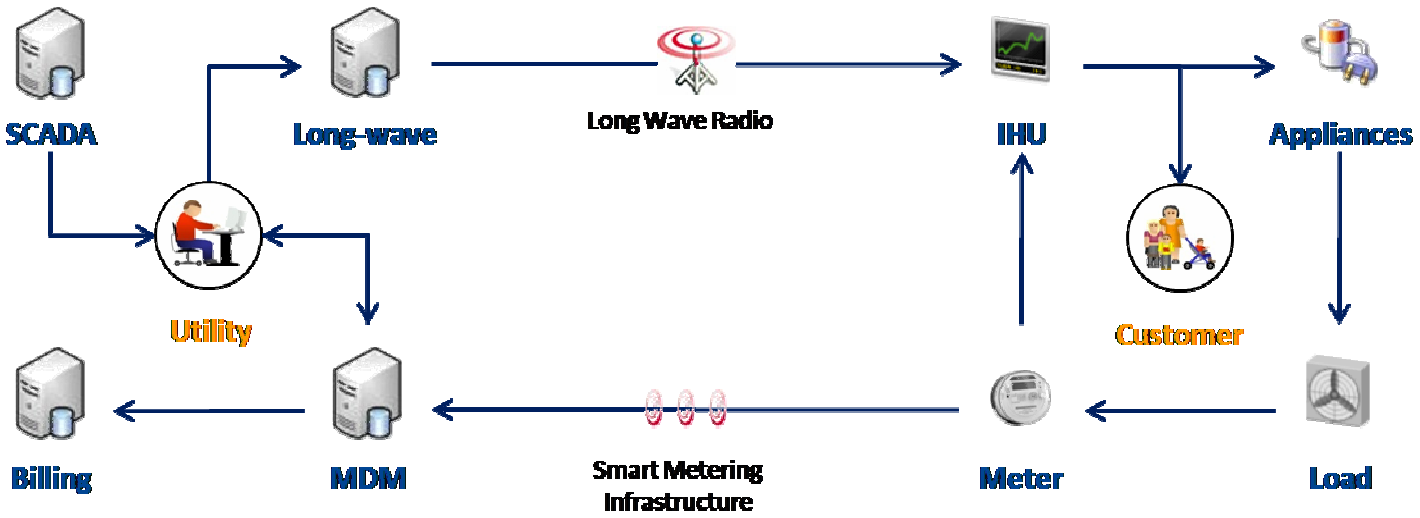
Consumption Benchmarks

Weather Forecast

Advertising Messages

# This integrated system layout enables the utility to perform a “closed-loop control” with any customer

## Use case oriented system environment enables Smart Grids



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Stand 304 @ Metering America 2009

# • Advantages of the system

- **Economical**

  **through low investment and operational costs**

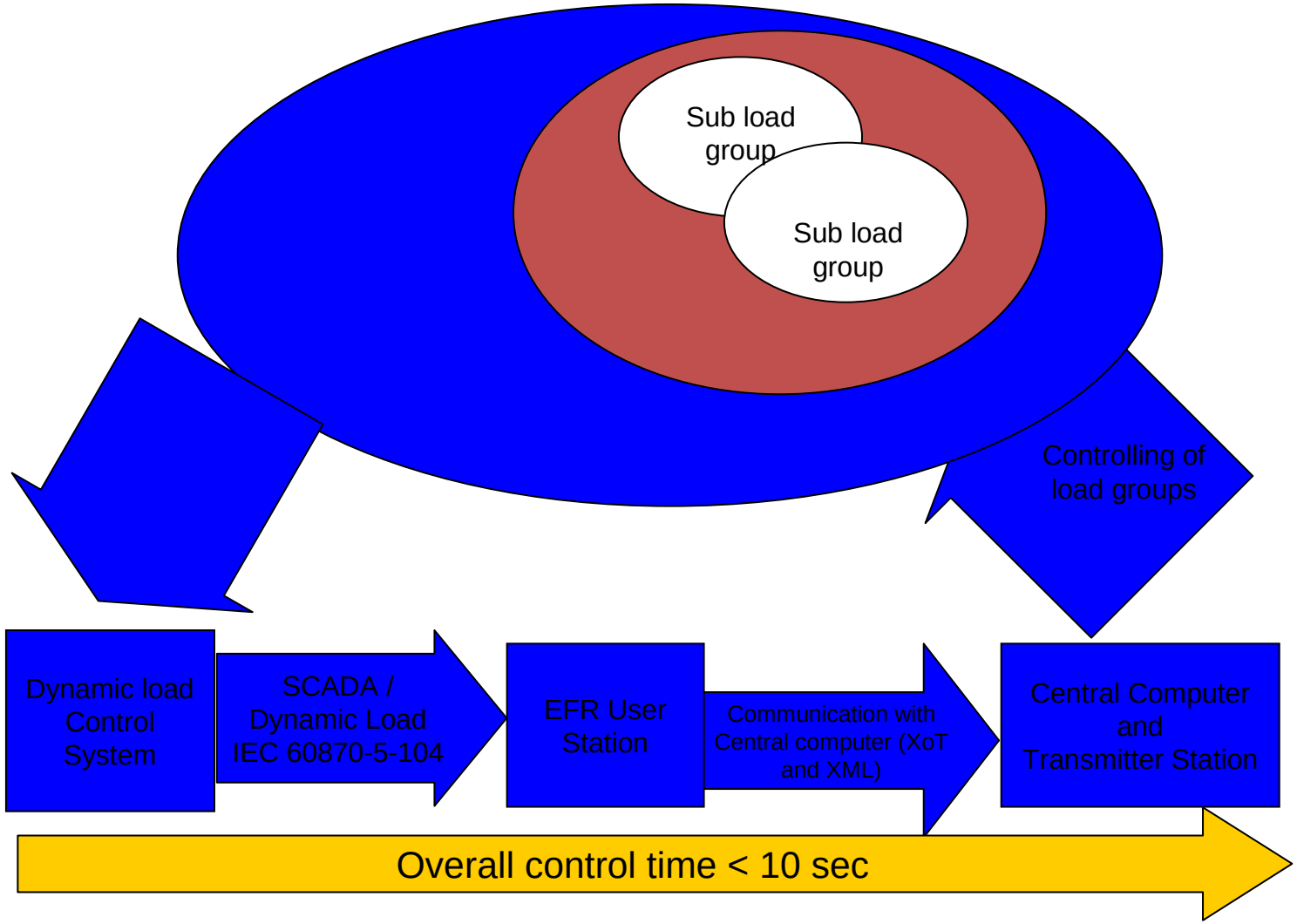
- **Independent of network**

  **without retroactive network effects, no effect on voltage quality**

- **Immediately available with blanket coverage**

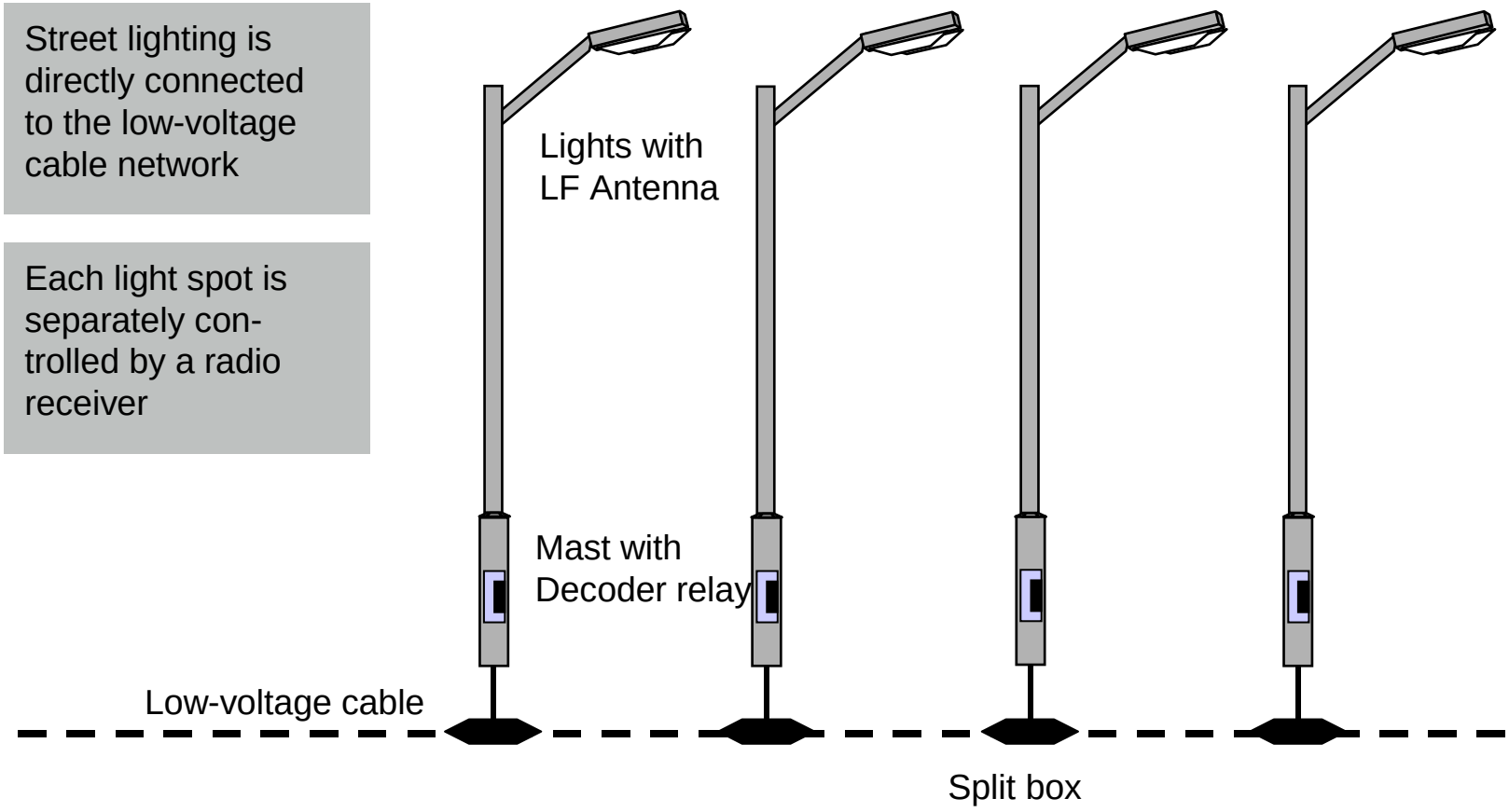
  **ease of installation**

  **flexible group and individual control options**


Sub load group
Sub load group
Controlling of load groups
Dynamic load Control System
SCADA / Dynamic Load IEC 60870-5-104
EFR User Station
Communication with Central computer (XoT and XML)
Central Computer and Transmitter Station
Overall control time < 10 sec

# • Options – individual control

- Street lighting is directly connected to the low-voltage cable network
- Each light spot is separately con-trolled by a radio receiver



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# • Option – group control

- Street lighting is connected to a separate cable
- Light spots are controlled in groups by a radio receiver