

**Interreg**



CENTRAL EUROPE

European Union  
European Regional  
Development Fund

**Dynamic Light**

TAKING  
**COOPERATION**  
FORWARD



training



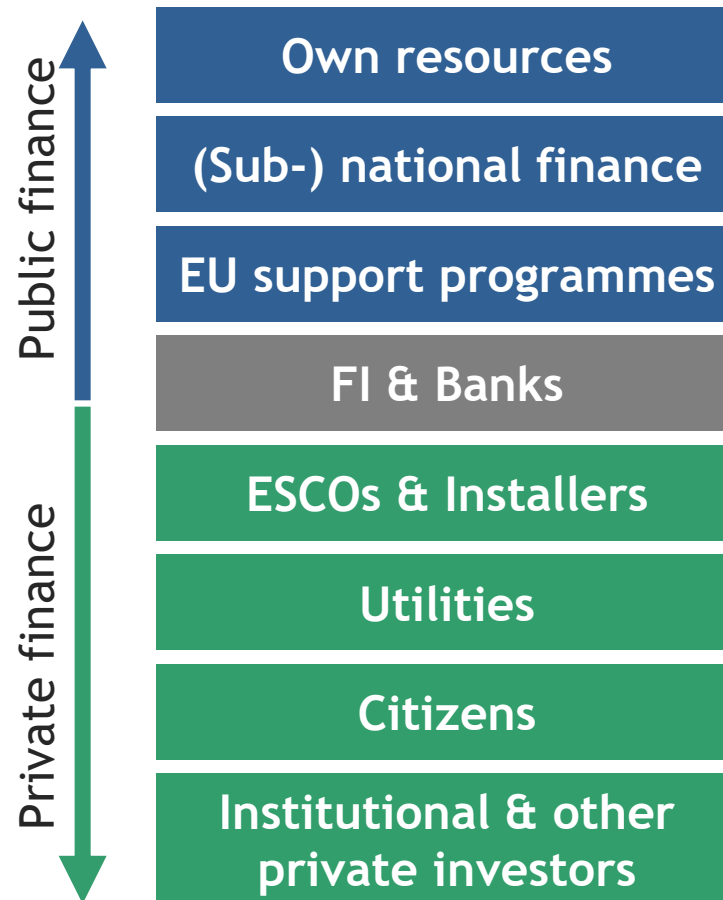
Financing models for energy-efficient urban street lighting



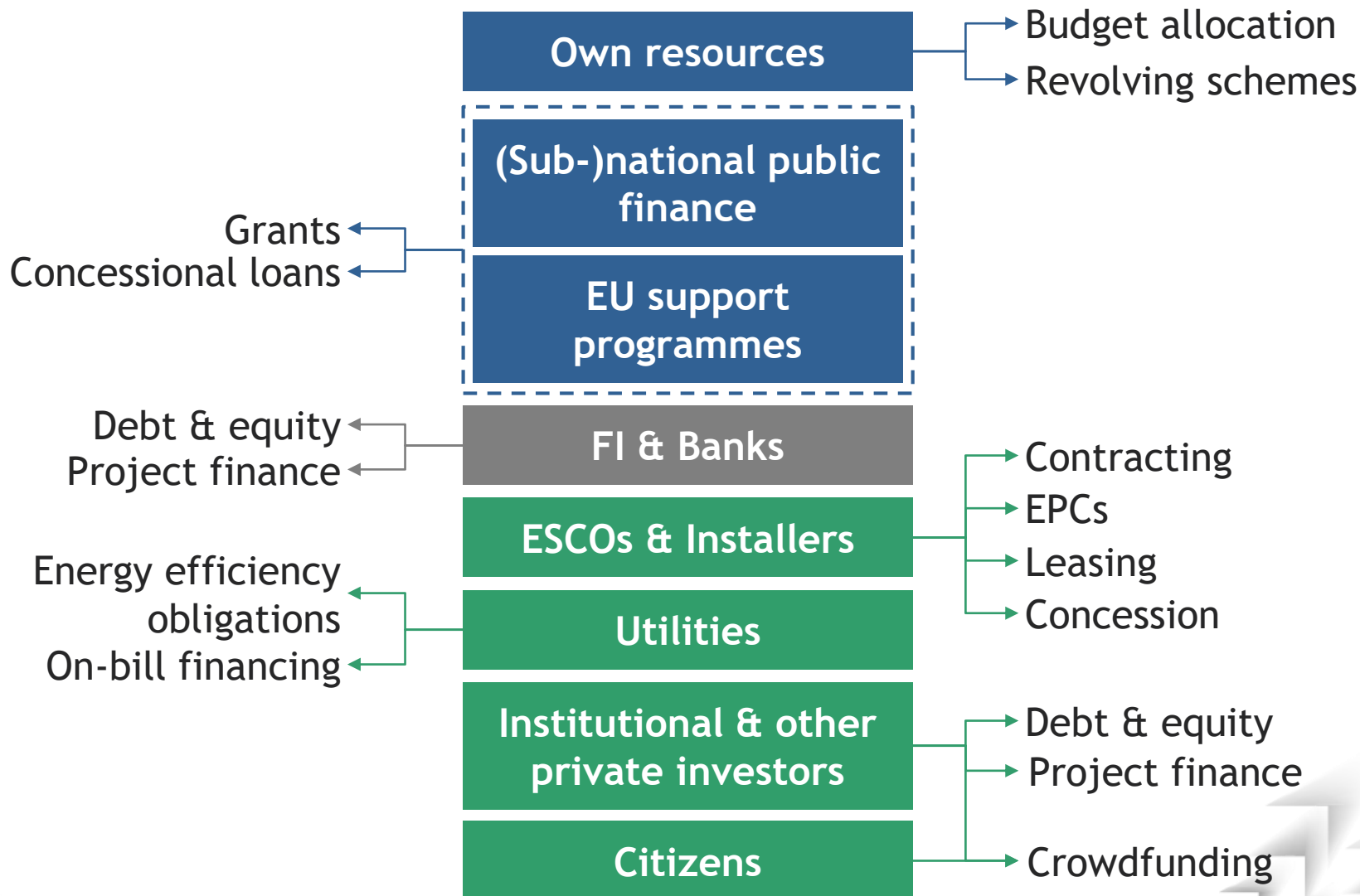
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# Funding sources - recap



# Matching sources and models



# Self-financing

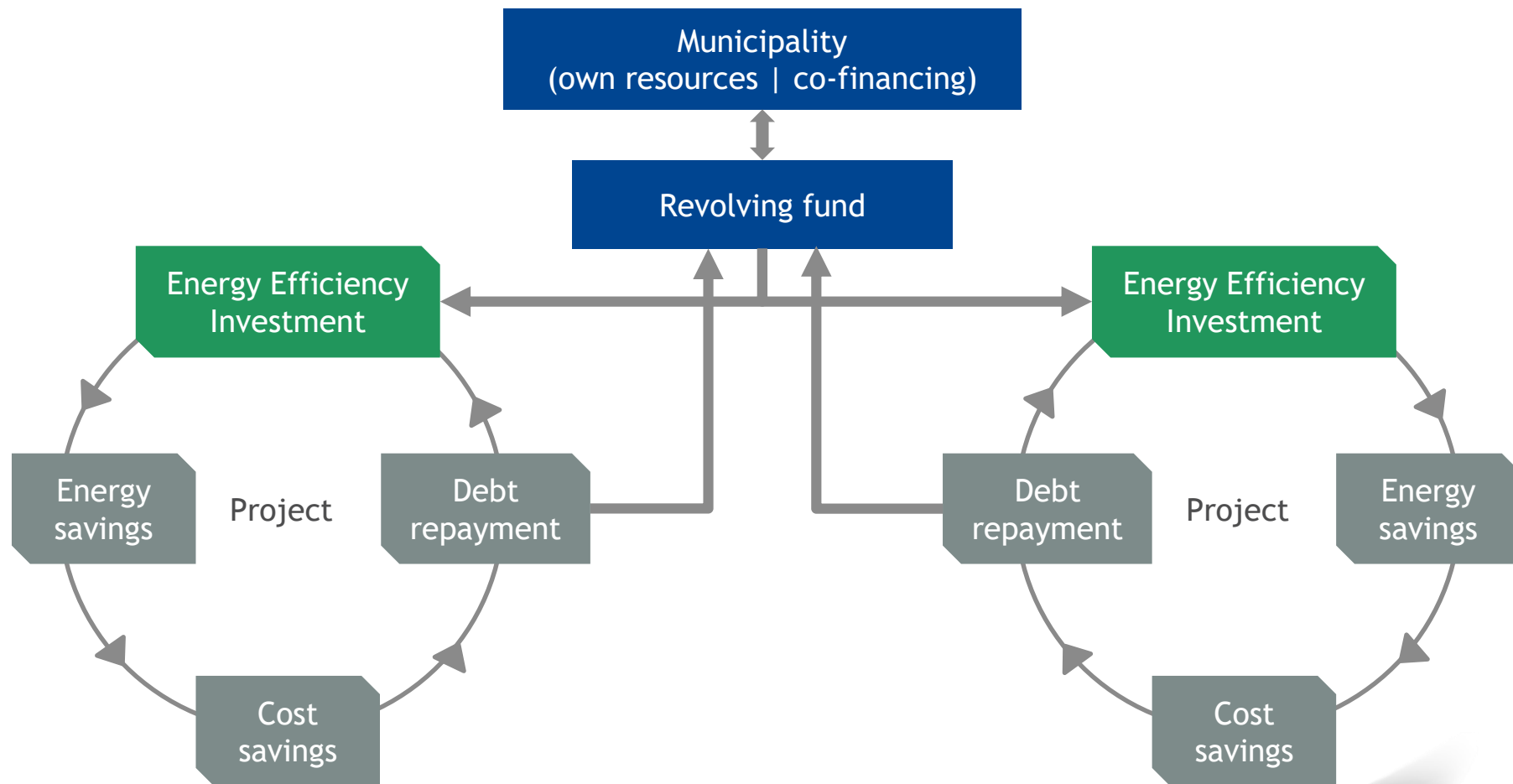


# Self-financing

- 1) Municipal budget
- 2) Revolving schemes



# Self-financing | Revolving schemes



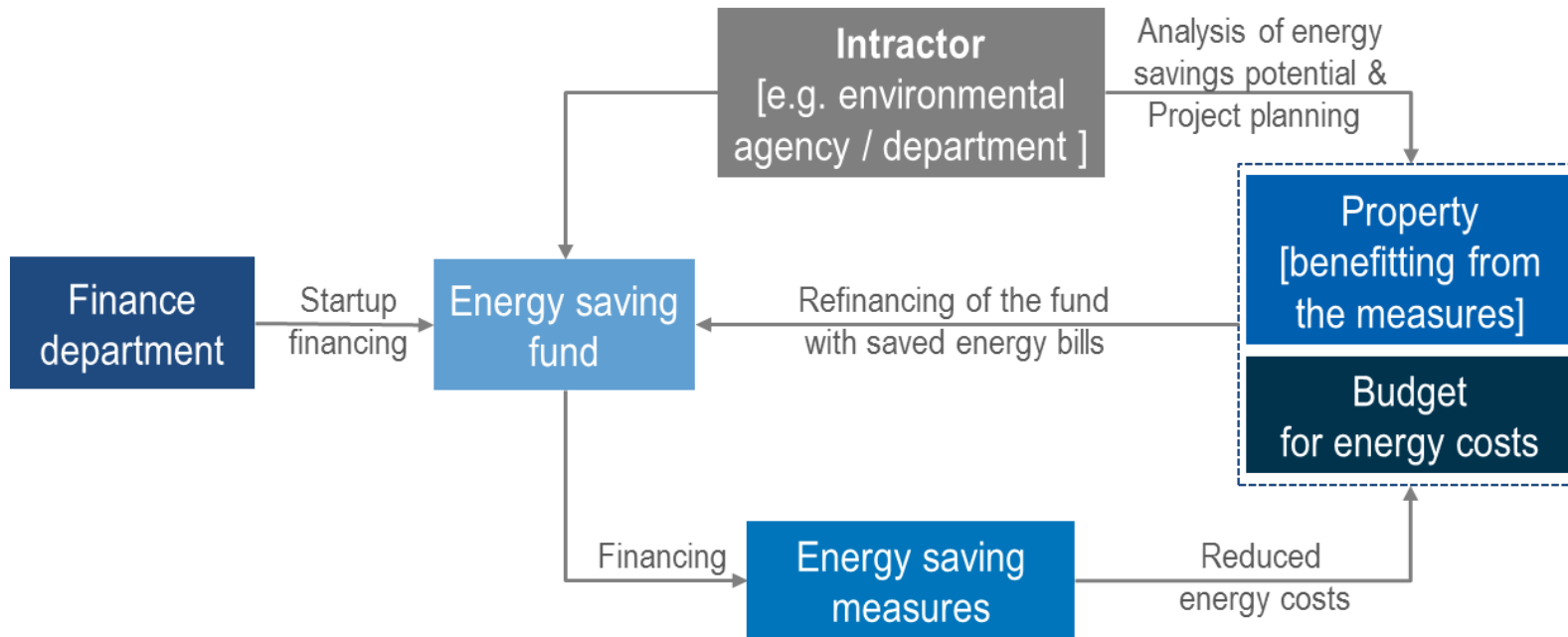
Source: ESMAP (2014) in Novikova et al. (2018)

# Self-financing | Revolving schemes

- Intracting (internal performance contracting)
- Internal revolving fund with outsourced services
- External revolving funds with multiple financiers



# Self-financing | Intracting (internal performance contracting)



## Advantages for municipalities:

- do not need external capital
- pay no interests on capital and can reuse capital
- cooperate within their units

## Disadvantages for municipalities:

- carry full up-front cost and all project risks
- may achieve lower project efficiency vs when the upgrade is delivered by private actors

**Projects financed by this model:** municipal infrastructure projects

**Jurisdictions that applied this model:** started in Germany, now France, Italy, Croatia etc.



## Architecture

- Municipality(s) initiate a revolving fund, provide capital and manage the fund
- Small municipalities share management costs and initial funding in a merger
- Fund provides financial instruments to external service providers
- Savings are redirected to the fund

## Other features

Projects financed by this model:

- Long-term and multi-aimed cities
- Any project which savings could justify setting up the fund and operational cost

Jurisdictions that applied this model:

- An example is Litomerice, Czech Republic

## Advantages

Municipalities:

- Enable long-term and sustainable funding to their own projects via energy savings
- Can finance operational costs via fees to service providers, interest rates and energy savings

## Disadvantages

Municipalities:

- Need political commitment, institutional and human capacity and time to establish the fund
- Recover costs only in the long-term
- Require dedicated and experienced staff for management and governance



# Self-financing | External revolving fund with multiple financiers

## Architecture

- Revolving fund uses external funding sources and lends to municipality(-ies)
- Initial capital can be provided from public and private sources
- Becoming self-sustaining over time, finance operational costs by services fees & interest rates

## Other features

Projects financed by this model:

- Scale and type of the project depends on available funds and priorities

Jurisdictions that applied this model:

- National level: Bulgaria and Croatia
- Municipal level: The Hague, Netherlands

## Advantages

Municipalities:

- Have a wide range of possible financial resources by being open to private investors
- Allow private investors to be part of urban development projects

## Disadvantages

Municipalities:

- Are confronted with higher complexity in the initial setup and high cooperation between various stakeholders
- May be confronted with political concerns, given private entity management of public and private funds



# Debt-financing



- 1) Loans (concessional or commercial)
- 2) Bonds



## Architecture

- Municipal bonds are issued by the local government or their agencies
- Bonds work similar to a loan, meaning the issuer has to pay an interest rate and/ or return the debt at maturity
- Bonds can be certified as *green bonds* by an independent institution

## Other features

Projects that can be financed by this model:

- Any project, if the municipal has access to a bond agency

Jurisdictions that applied this model:

- Becoming more common in Europe, examples are Gothenburg (Sweden) & Varna (Bulgaria)

## Advantages

Municipalities:

- Can issue bonds autonomously or in cooperation with bond agency
- Can decrease their cost of capital - lower interest rates compared to commercial loans

## Disadvantages

Municipalities:

- Should cooperate with municipal bond agencies, if possible
- Need to prepare extensively and costly to issue bonds autonomously
- Need a good credit rating, if acting autonomously



# Debt | Bonds case study: Gothenburg's Green Bonds (2013-ongoing)

## Context:

- Gothenburg implemented its **Green Bond Program in 2013** to raise capital for climate change and environmental projects

## Eligible projects:

- Mitigation, adaptation and climate resilient growth, and sustainable environment
- The projects have to be in line with the city's **Environmental and Climate Programmes**.

## Financing structure:

- Gothenburg has been issuing bonds for last four years. They can be purchased on the capital market by any mainstream investor
- The total capital raised via financial markets was **EUR 0.46 billion** (SEK 4.36 billion)

## Outcomes:

- Gothenburg was the first Scandinavian city and **the first city in the world to issue green bonds**.
- Since 2013, 11 projects have been financed with Gothenburg's green bonds, incl. energy efficiency measures in traffic lights, electric cars, bicycle infrastructure, sustainable housing, and district heating and other (as of 2016).



# Financing by ESCOs and private contractors

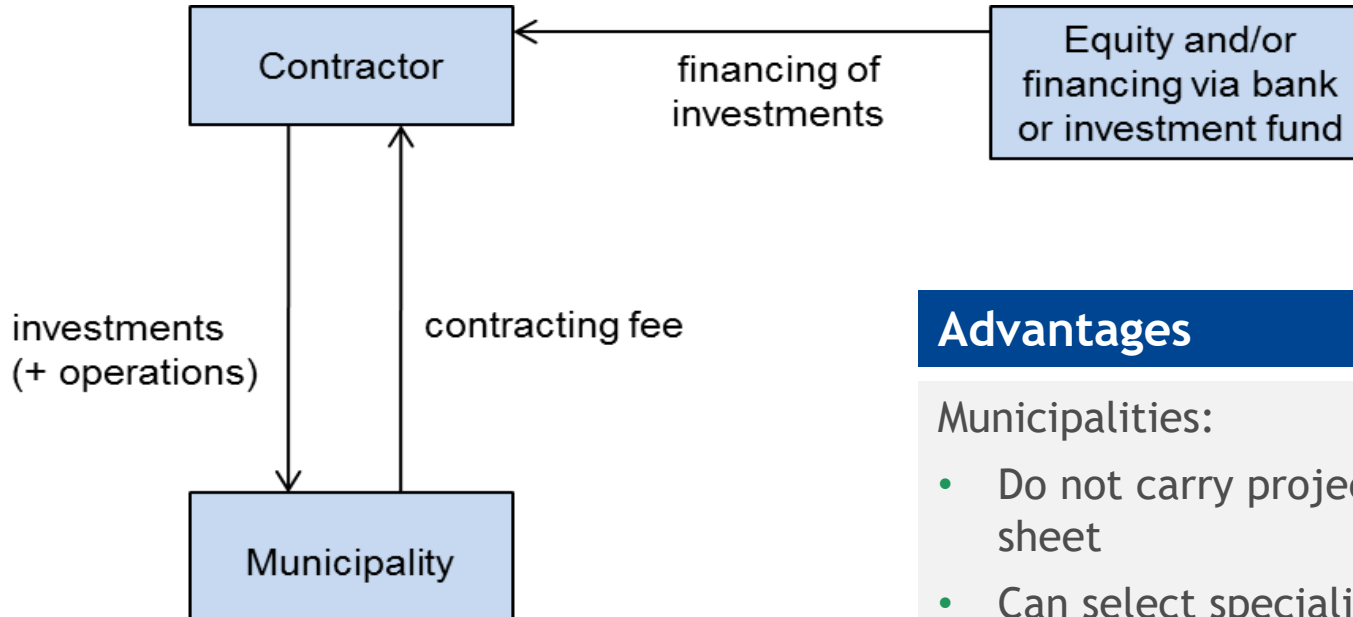


- **Contracting:**
  - Simple contracting model
  - Contracting with forfeiting and waiver of defence
- **Energy performance contracting:**
  - Guaranteed Savings
  - Shared Savings
  - Modernization with immediate savings of energy cost
  - Staggered savings
- **Leasing**
- **Concession**





# Contracting | Simple contracting model



## Advantages

### Municipalities:

- Do not carry project cost on their balance sheet
- Can select specialised companies via a tendering process

## Projects financed with this model

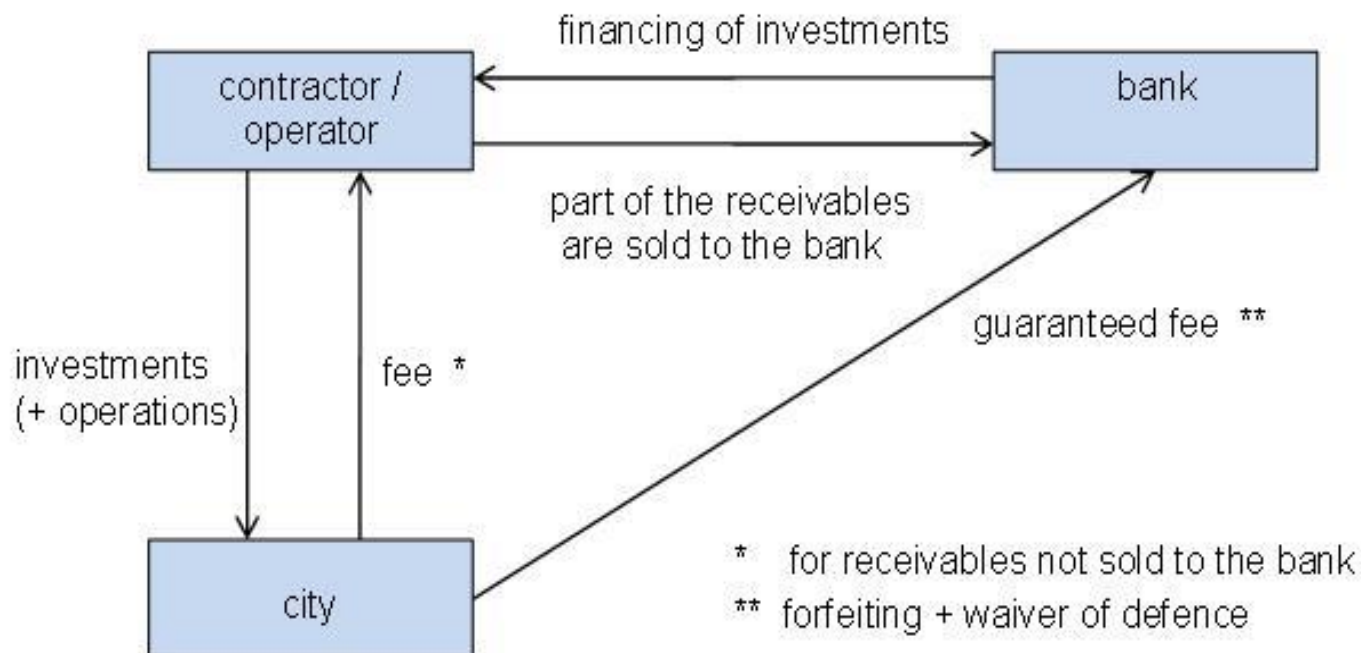
- There is no fixed size threshold, but a project volume of €0.5-1m is a reasonable minimum
- Widely applied for street lighting projects

## Disadvantages

### Municipalities:

- May face higher financing cost compared to concessional loans
- May face restrictions on use to public support

# Contracting | Contracting with forfeiting and waiver of defence and waiver of defence



## Advantages

- project is not on municipal balance sheet
- specialised companies selected via a tendering process
- lower interest rates than in the simple contracting model

## Disadvantages

- higher interest rates than in concessional loans
- high complexity
- must provide a guarantee for banks

## Energy performance contracting (EPC):

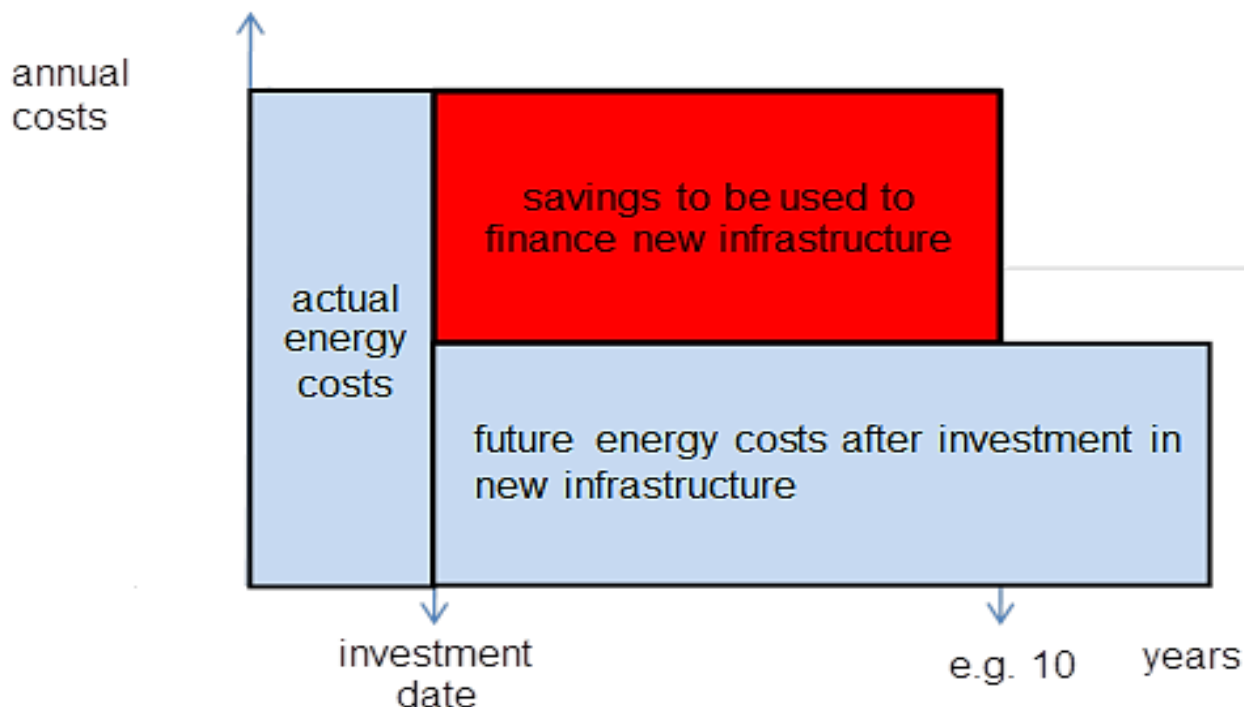
### By the savings achieved:

- Guaranteed savings
- Shared savings

### By the timing of modernisation:

- Modernization with immediate savings of energy cost
- Staggered savings
- Energy Performance Related Payment (EPRP)





- Projects with a high energy cost savings potential
- Municipalities should have sufficient financial resources to pay the fees as set in the contract

## Advantages

- Can implement projects at a fixed rate, without spending peaks
- Own the installed equipment after the contract expires
- Transfer the risk to the contracting partner

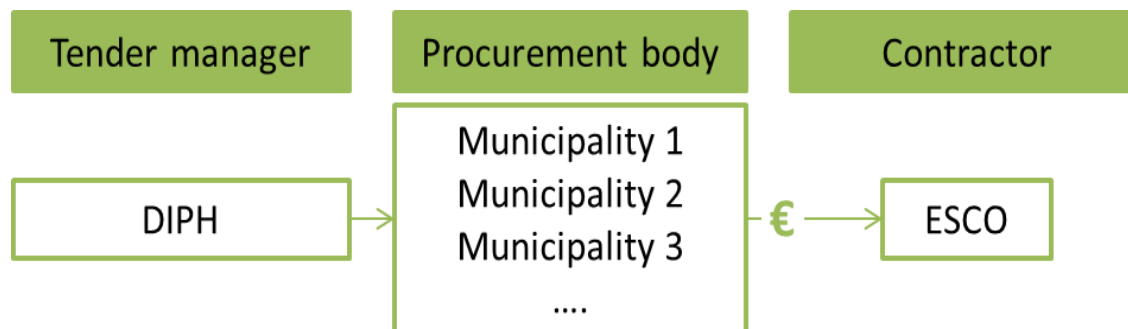
## Disadvantages

- Need to bear high energy prices / cost, otherwise the payback time is too long for private contractors
- Can hardly raise incentive for the contractor to go beyond the guaranteed savings

# EPC | Guaranteed savings study: Huelva (2015-2027)

**Challenge:** Individual projects are often too small to attract ESCOs

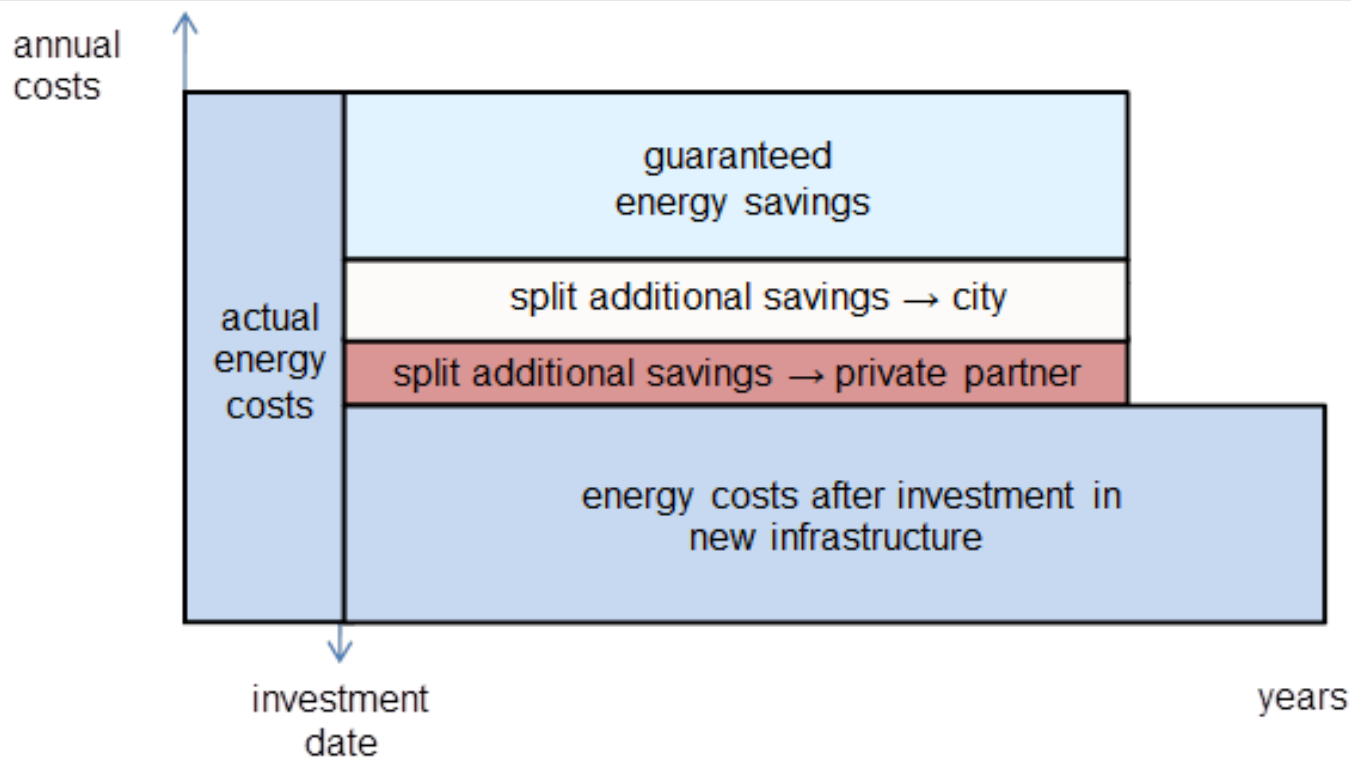
**Solution:** Developing a grouped tender process: bundling projects of several municipalities and tendering them as a group



## Project scope:

- Improving public lighting infrastructure and services in nine municipalities
- Mixture of energy service contract and energy performance contract with guaranteed energy savings
- Volume of EUR 7.1 million and average energy savings of 72.9 %.





- Projects with a high energy cost savings potential
- Municipalities should have sufficient financial resources to pay the fees as set in the contract

## Advantages

- Same as in EPC with guaranteed savings
- Achieve higher savings by setting an incentive for the contracting partner

## Disadvantages

- Need to bear high energy prices / cost, otherwise the payback time is too long for private contractors



# EPC | Shared savings case study: Nauen (2011-2016)

## Challenge:

- Budgetary constrains
- Outdated street lightning luminaries
- Uncertainty about future investment possibility

## Project scope:

- Replacing all HPM-based luminaires, which are 45% of total ~2,350 luminaires

## Contract:

- 5 years contract
- Modernization measures without LED technology
- Guaranteed energy savings of 43%
- Additional savings split 50/50 between the city and the private contractor

## Outcomes:

- Achieved slightly higher energy savings than guaranteed



# EPC | Modernization with immediate savings of energy cost

## Concept:

- Implementing improvements as short as possible so that energy savings can be achieved as quickly as possible
- Can be with guaranteed or shared savings

## Advantages:

- Allows for maximum energy savings
- Because new technologies, e.g. LED lamps, require less maintenance, the associated costs will be lower too

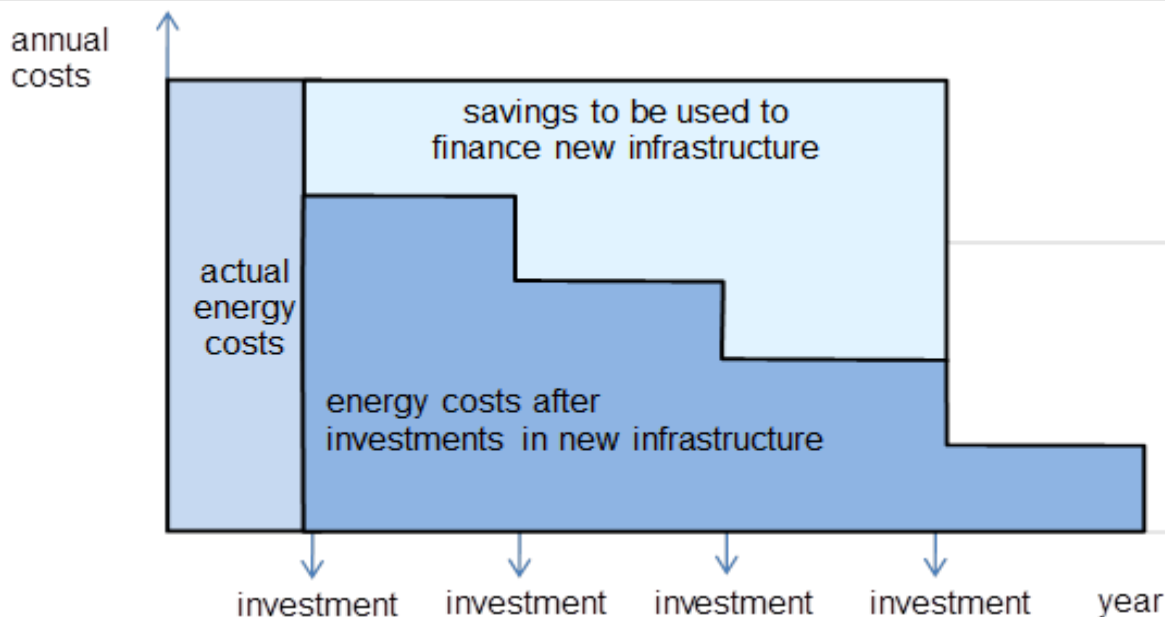
## Disadvantages:

- All luminaires will be modernised at the same time, regardless of age
- Prevents the city from modernising at a constant rate, e.g. 3% of existing infrastructure per year with the advanced technology
- Modernisation completed at the beginning of the contract will not incorporate any new technology at a later contract period
- By the time the work is complete, the street lighting is once again outdated





# EPC | Staggered savings



## Advantages

- Reasonable investment regime and modern infrastructure
- Suitable for projects with existing luminaires of different age and technology

## Disadvantages

Whole amount of energy and maintenance cost savings at later stages of the contract

## Case study: the city of Hilden

### Scope:

- Modernisation of (almost all) 5,000 luminaires and 2400 poles
- Operations management, incl. energy supply

### Contracting:

- Modernisation of the luminaires (the oldest first) at fixed intervals (after 5, 10, 15 and 20 years).
- Payments made by the city, but it recoups indirect costs in the form of energy savings.



## Concession:

- Outsourcing operation and maintenance of lighting infrastructure to a private sector company for a fixed fee by drawing up a concession agreement

## Leasing:

- 1) Selling street lighting infrastructure to a private contractor conditional on upgrade, operation, and management
- 2) Leasing it back from a private contractor for a fixed fee over a set period of time
- 3) Transferring ownership rights are back to the municipality at the end of the leasing contract



# Concession case study: Paris (2011-2021)

## Context:

- Public lighting is the second-largest source of energy consumption in Paris
- A goal to reduce city GHG emissions by 75% between 2004 and 2050

## Concession contract:

- Tender of EUR 450 million in concession fees to the private sector
- For the duration of the contract, the city transferred to EVESA the right to operate & maintain public street and traffic lighting, to provide technical support and assist in project and asset management
- EVESA has to guarantee energy savings of 42 GWh over 10 years
- Concession fees are financed from the city's local budget

## Intended outcomes:

- EVESA seeks to reduce street lighting energy consumption by 30% by 2020 by refurbishing 1/3 of all lights within the contract period
- In 2011-2014, urban lighting emissions have already decreased by 24%



# Leasing case study: Cesena (2015-2027)

## Context:

- Municipality objective is to decrease energy consumption by 30-40% and increase the quality of lighting in public spaces

## Project scope:

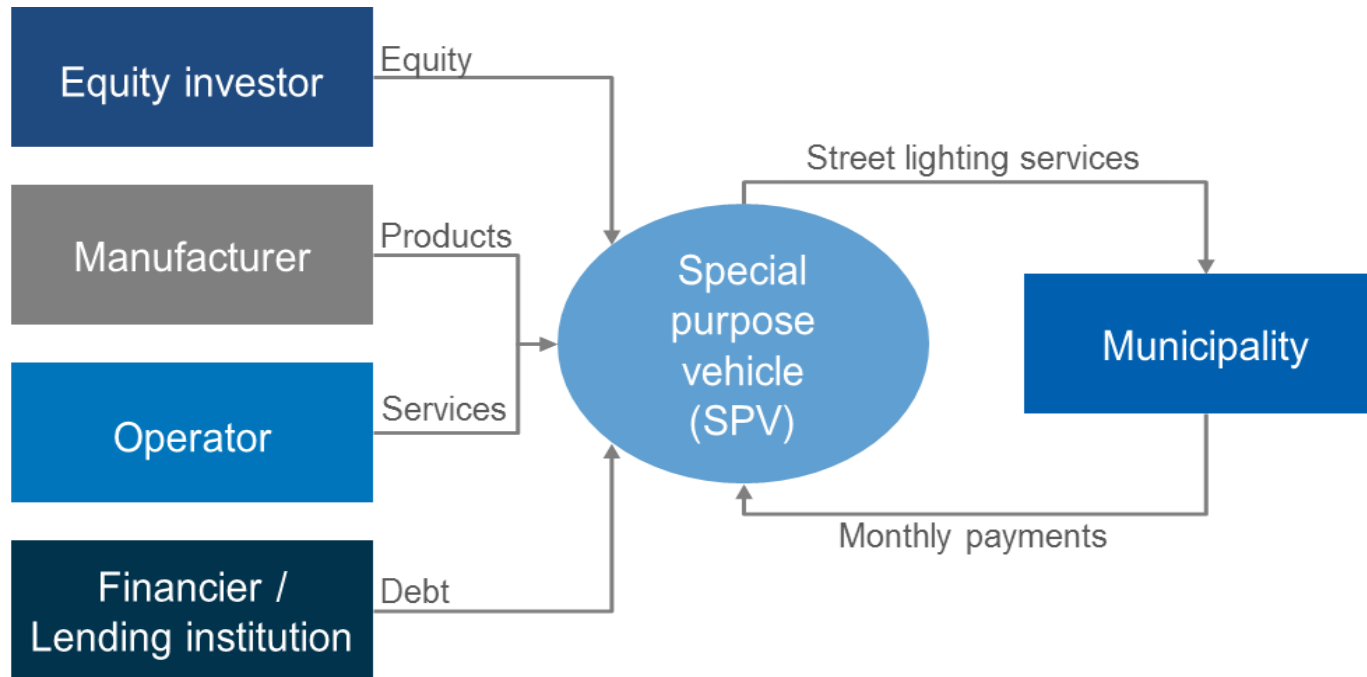
- Transfer of the ownership and management of the majority of light points and traffic lights to Hera Luce Ltd:
  - 15,830 light points owned by Hera Luce Ltd
  - 5,236 remain in municipal property
  - After 2027, Cesena will regain ownership of these light points
- First project: €2.3m to replace the most outdated lights with LED luminaires (4,880 light points)
- Second project: investment plan and update 15,830 light points



# Project finance



# Project finance | Special Purpose Vehicles (SPV) in Public Private Partnerships (PPP)



## Advantages

- Off-balance sheet finance
- Isolating project risks within SPV
- May foresee penalties if private partners fail to deliver the services

## Disadvantages

- High transaction costs related to the preparation and implementation of the special purpose vehicle
- For large projects only (> EUR 20 million) or consortium of several municipalities

# Financing by utilities

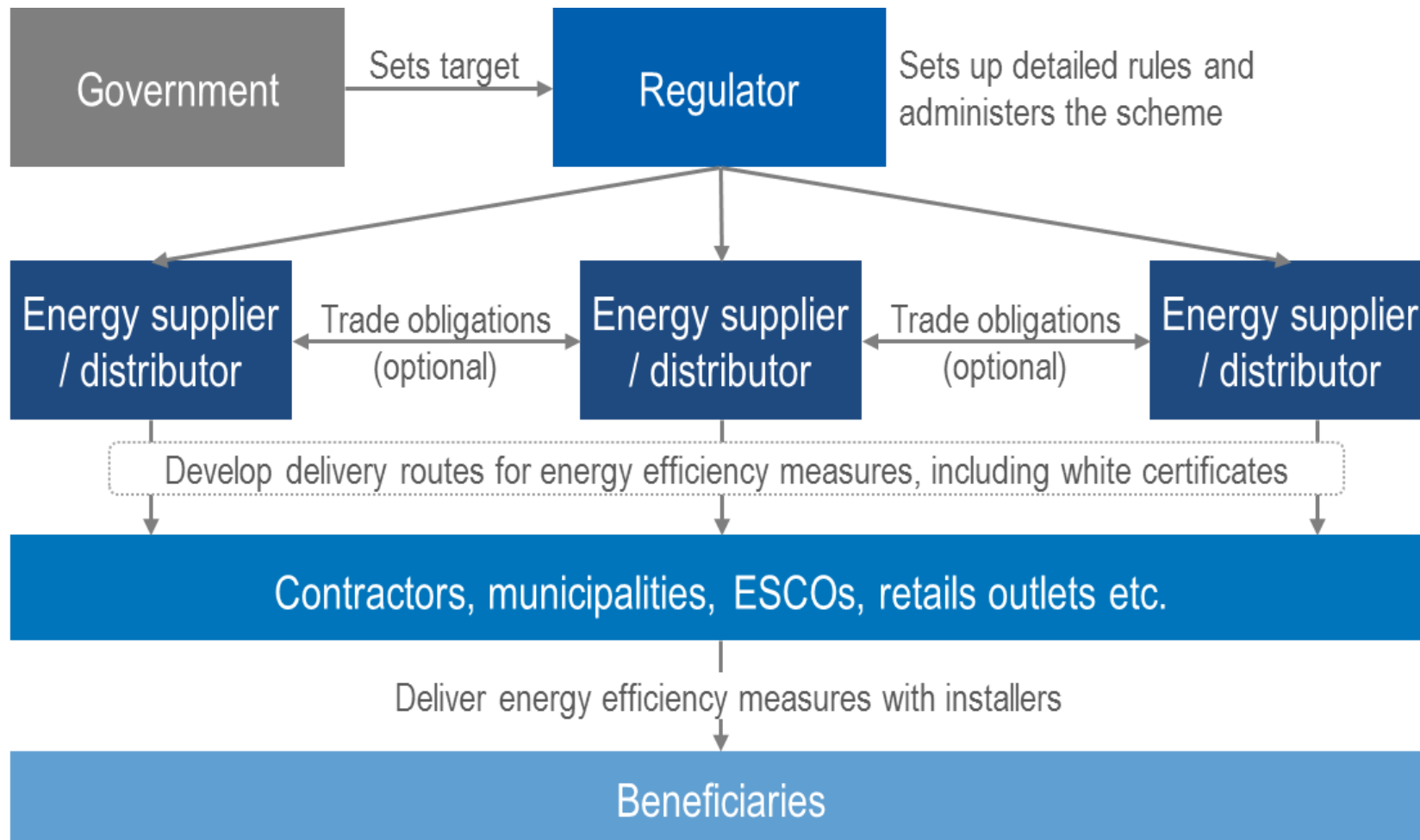


- 1) Energy Efficiency Obligation Schemes / white certificates
- 2) On-bill financing





# Financing by Utilities | model 1. Energy Efficiency Obligation Schemes (EEOS)



# White certificates case study: Italy (2004-ongoing)

**Objective:** Meeting EED requirements & boost ESCO market

## Scope:

- Requires electricity and gas distributors with more than 50,000 customers to meet the primary energy saving targets via energy efficiency measure
- Efficiency measures cover all end-use sectors, except energy generation
- For each verified ton of energy saved entities receive a white certificate
- Entities can either implement measures themselves, outsource implementation, or buy the certificates

## Implementation:

- 96% of the certificates are generated and traded by non-obligated parties
- As of 2015, 48mn certificates had been traded, 65% via bilateral agreements
- The scheme boosted the ESCO market. ESCOs account for 78% of the entities participating in the scheme, issuing 72% of total white certificates.
- In 2015, 64% of the certificates were issued for EE in the industrial sector, 4% of EE improvements related to lighting, 32% were in the civil sector



## Architecture

- Utility provides loan for up-front investment to municipality
- Municipality repays loan via its electricity bills
- Utility can require and monitor the use of specific technology for the upgrades

## Advantages

- Investment repaid through energy bills
- Simple implementation

## Disadvantages

- Rare in Europe. In U.S. used to target home and business owners but also for municipalities

## Case study: California

- Pacific Gas and Electric (PG&E) provides zero-interest loans of USD 5,000 - 250,000 to public institutions for up to 10 years for energy efficiency measures
- ~180,000 municipally-owned lights were updated, as of 2016
- Southern California Edison (SCE) provides similar loans of USD 5,000 - 250,000 for up to 10 years



# Financing by citizens



# Financing by Citizens | Crowdfunding

Make your research on how to do crowdfunding



Prepare your business plan and financial offer



Contact the platform(s) and submit your application



Create the pitch, by telling your story in a compelling way



The fundraising period: motivate the crowd



Post-campaign activities



- Fundraising relatively **small amounts of money from a large number of people** or investors through online crowdfunding platforms
- **Community around the project** - often people contribute to a specific campaign because of their interest in the project, apart from the financial returns
- **Multiple risks**: no guarantee of sufficient funding; problems with the crowdfunding platform; investors may be inexperienced or wish to exit; the process is not regulated; and it may be challenging to fulfil commitments to a multitude of small investors etc.



# Crowdfunding study: Bettervest crowdfunding platform

- Germany-based crowdfunding platform for climate-change mitigation projects
- **50 energy-efficiency projects** from **€4,000-€600,000** in Germany and other countries, as of 2017
- **Example: lighting upgrades in a public school in Szeged, Hungary:**
  - The school raised €46,400 from 92 investors through Bettervest
  - Expected energy savings of more than 70% and significantly reduced energy and maintenance costs
  - After securing funds, the school signed a 10-year lease-purchase contract with LED-LIGHT-Germany.
  - The contract transfers the obligations towards crowd-investors from the school to LED-LIGHT-Germany - the contractor will have 7 years to pay back 100% of the funds borrowed from the crowd-investors plus 7% rate of return.
  - The school pays LED-LIGHT-Germany €6,542 per year for upgrades and installation work.



**bettervest**  
*nachhaltig · effizient · rentabel*



# Conclusion



## Self-financing

- Budget allocation
- Intracting
- Revolving fund

## Debt-financing

- Concessional loans
- Commercial loans
- Bonds
- Institutional investors

## Financing by a private contractor

- Simple contracting model
- Contracting with forfeiting and waiver of defence

## Financing through energy savings (EPC)

- Guaranteed savings model
- Shared savings model
- Other energy performance contracting

## Leasing or concession to a private partner

- Leasing
- Leasing or concession to a private partner

## Project finance

- Special purpose vehicle (SPV)

## Financing by utilities

- Energy Efficiency Obligation Schemes
- On-bill financing

## Financing by citizens

- Crowdfunding





- **There is no one-size-fits-all** - different complexity, degree of autonomy of the municipality, risk sharing between municipality and private partner, number and kind of involved partners, costs, running time, etc.
- **Key considerations:**
  - a) **Availability of public policies and funding:** budget allocations, grants, concessional loans, revolving schemes, white certificate schemes
  - b) **Project size and bankability:**
    - The larger the project, the greater the need for private sector engagement
    - Should meet private investors risk-return requirements
  - b) **Maturity of the market for ESCO and energy service providers:** in mature markets, advantageous terms for EPCs, leasing, and concession models, incl. bundling several small-scale projects
  - c) **Municipality's borrowing capacity & finance from commercial financial institutions:**
    - Loans, bonds, project finance, equity, and other financial instruments
    - Projects must be financially sustainable
    - Cost of capital higher than through public support programmes

## More information:

<https://www.interreg-central.eu/Content.Node/Dynamic-Light/Guidelines-financial-models.html>

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