ENERGYSAVING FOUNDATION

FOUNDATION TO SAVE ENERGY

Energy Efficiency as a Means to Achieve Energy Security: SPOT LIGHT ON THE BUILDINGS SECTOR

THE Foundation to Save Energy

Astghine Pasoyan,

Executive Director

ENERGY SAVING FOUNDATION

FOUNDATION TO SAVE ENERGY

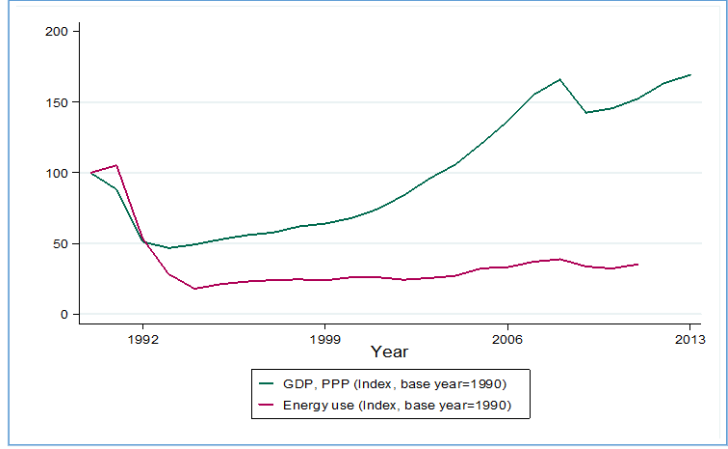
Mission: Founded in 2003, t*he Foundation to Save Energy (ESF) has promoted awareness and policy reform in energy efficiency and renewable energy areas. After the closure of the Alliance to Save Energy's operations in Yerevan, ESF also continued the Alliance's mission in Armenia.*

15 YEARS ESF

- Green & Sustainable Energy Policy and Planning
- Low-Income Energy Affordability and Efficiency
- Residential and Municipal Energy Efficiency, Housing Policy
- Sustainable Energy Financing Schemes
- Climate Change Mitigation and Renewable Energy
- Energy & Material Efficiency Auditing
- Renewable Energy Development
- Strategic and Project-level Environmental Impact Assessment
- Awareness Raising and Capacity Building

Where and who we work with

Sustainable Energy Policy & Planning, Assessment & Verification



Economic Growth and Energy Use in Armenia. WB 2014

ESF team has successfully helped promote EE & RES through:

- **NEEAPs:** National Energy Efficiency Action Plans (West Balkans, CIS)
- **REAPs:** National Renewable Energy Plans and Strategies (Armenia)
- **SEAPs:** Sustainable Energy Action Plans (9 cities of Armenia); and Verification of SEAPs (7 completed, 30 underway)
- **GCAPs:** Green City Action Plans (Yerevan, ***Gyumri pending*** *with Atkins & LDK Consultants*)
- **EIA/SEA:** Environmental Impact Assessment and Strategic Environmental Assessment of Investment Projects and Plans (Heating systems/WB, well-development /USDA, GCAP/EBRD)
- Energy Efficiency, Urban Heating, Building Energy Efficiency and Housing Policies, NZEB (Armenia, Ukraine, Moldova, Tajikistan, Albania, Kazakhstan, Macedonia)

Armenia's EE&RES Policies, Strategies, Regulations at Glance

Energy policies and instruments and their implementation

- Energy Law (private generators, LTAs, market liberalization):2001 amended in 2017
- Energy Sector Development Strategy 2005
- Law on Energy Saving and Renewable Energy 2004, amd.in 2016 (net metering, FIT)
- National Program on Renewable Energy and Energy Efficiency 2008
- 1st & 2nd National Energy Efficiency Action Plan 2010 & 2014
- 2012-2025 Long-Term Strategic Development Program 2011
- National Energy Security Concept 2013
- Least Cost Generation Plan up to 2036 2015
- RE Roadmap & SREP Investment Plan 2014

Secondary Legislation & Regulatory Framework

- Resolution 1504 on Mandatory EE In State Investment Programs 2015
- Draft Technical Regulation on "Buildings and structures/premises, construction materials and products. Safety"
- Technical Regulation on "Building Energy Efficiency" (EPBD transposition) 2017
- Normative-technical documentation on audits, certification & labeling, building energy codes

International Treaties

- Energy Charter Treaty and EU4Energy Initiatives
- Observer Status in Energy Community
- United Nations Framework Convention on Climate Change, INDC submitted, GCF active
- EU Covenant of Mayors
- Eurasian Economic Union documentation
- EU-Armenia Comprehensive & Enhanced Partnership Agreement (CEPA)

IFI & Donor activities in Energy Efficiency

United Nations Development Program (UNDP) / Global Environment Facility (GEF):

- Green Urban Lighting Project
- Improvement of EE in buildings Project
- EE in Municipal Heating and Hot Water Supply Project

United States Agency for International Development (USAID):

- Residential Energy Efficiency for Low-Income Households (REELIH) Program
- Energy & Water Program,
- LEDS Project and least cost generation planning
- STIP initiative and plans for water and energy efficiency solutions in fisheries

Eastern European Energy Efficiency and Environment Partnership (E5P)

- Grant co-financing for KfW, EBRD and EIB Loans in EE & RE

European Union

- SUDEP EE & RE for Spitak & Vayq Communities
- EU4Energy: Spitak, Vayq, Yerevan, Artik & Aparan
- NIF/NIP grant co-financing for selected IFI loan products

European Investment Bank/GCF

- Yerevan Public Building Energy Efficiency Project

World Bank/GEF

- Public/Municipal/Social Building Energy Efficiency Credit Line Via ESA Scheme

International Finance Corporation (IFC)

- Sustainable Energy Finance Project on-lending through banks for corporate and residential EE through 2 PFIs

European Bank for Reconstruction and Development (EBRD):

- Caucasus Sustainable Energy Financing Facility in Armenia providing corporate & residential energy efficiency loans through 5 PFIs with free TA & LEMA, and 10-15% grant investment incentives
- Direct loans with sovereign guarantees
- Leveraged funding from EIB

KfW lending activities and planned initiatives in the field of energy efficiency:

- Financing solar water heaters
- Housing EE mortgages
- EE in SMEs

Green for Growth Fund

- EE & RE Loans through PFIs

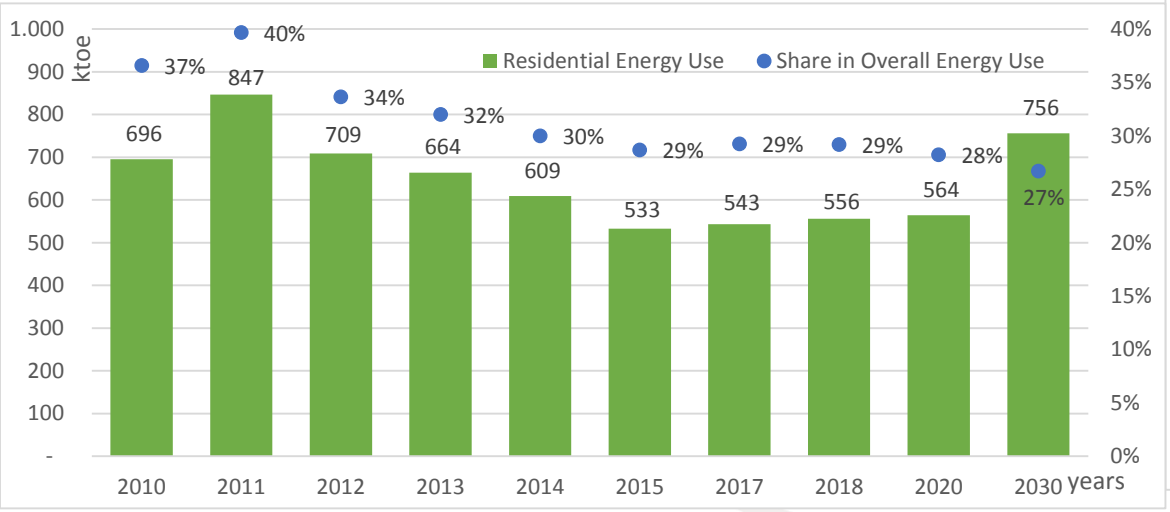
French Development Agency

- Residential EE Loans to low-to-middle income HH with 5-10% grant incentive through NMC

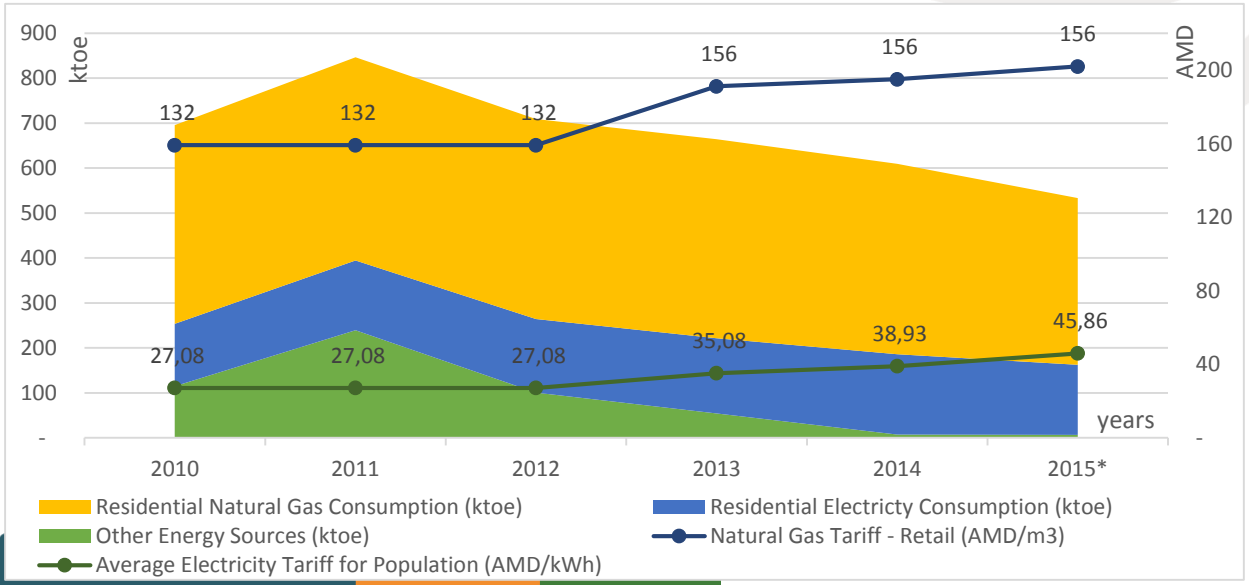
Energy Efficiency – why care?

Security	• import substantial share of energy resources
Deficit	• Growing demand & aging capacities leading to an emerging supply gap
Affordability	• Growing energy prices (in the long-run) & affordability concerns
Economic growth	• Export competitiveness
Environmental Footprint	• Local and global environmental concerns

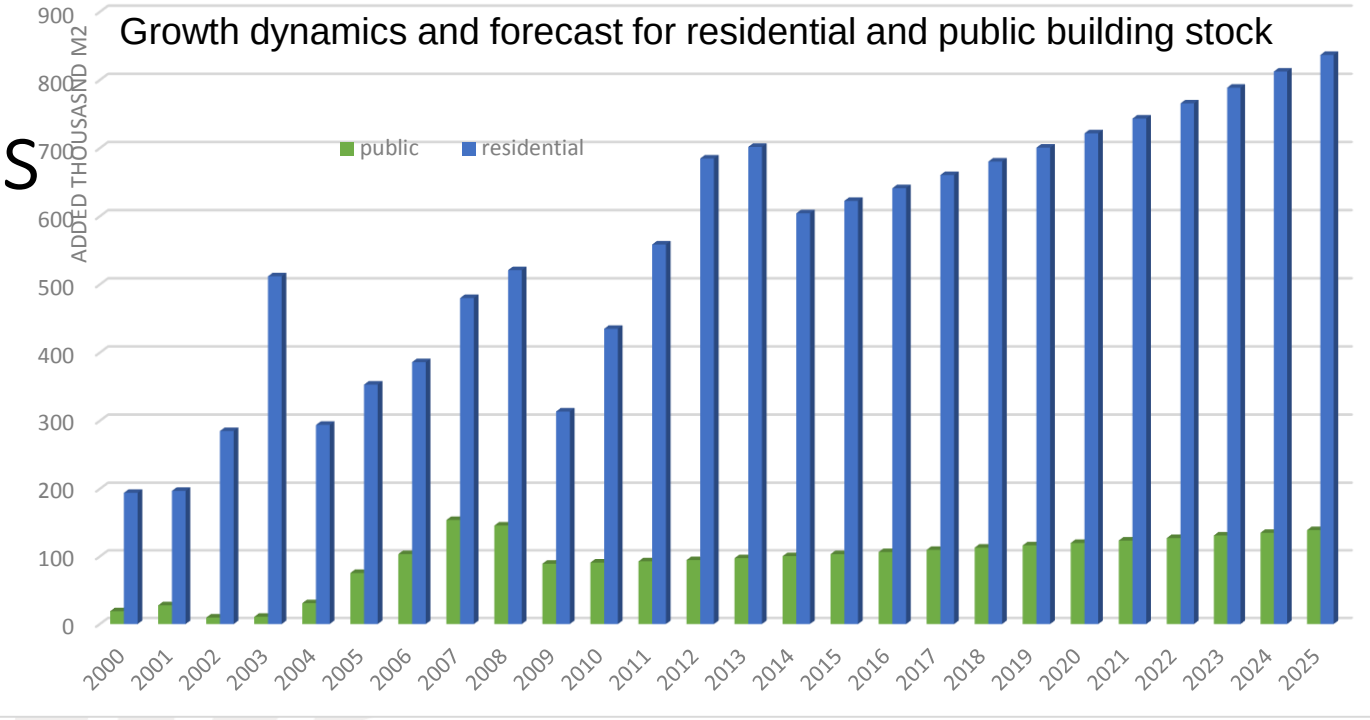
Buildings Sector/ Existing Residential Buildings

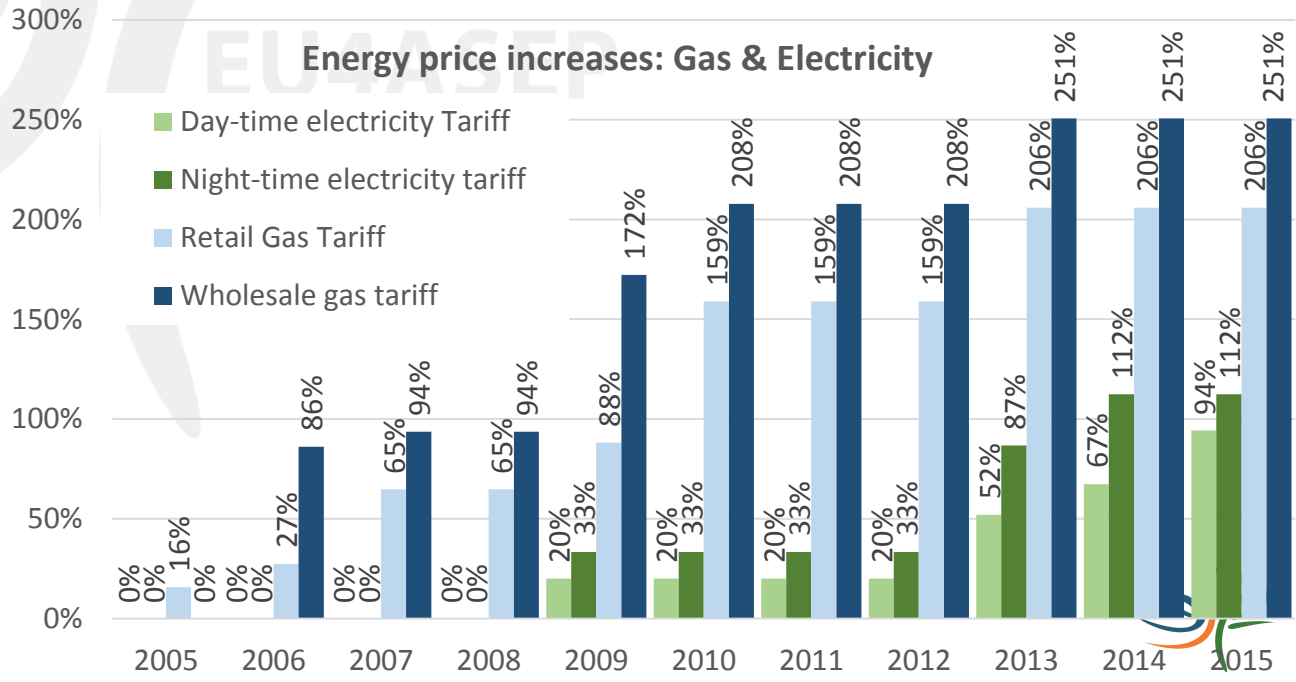


Energy Use in Residential Sector, 2010-2030.

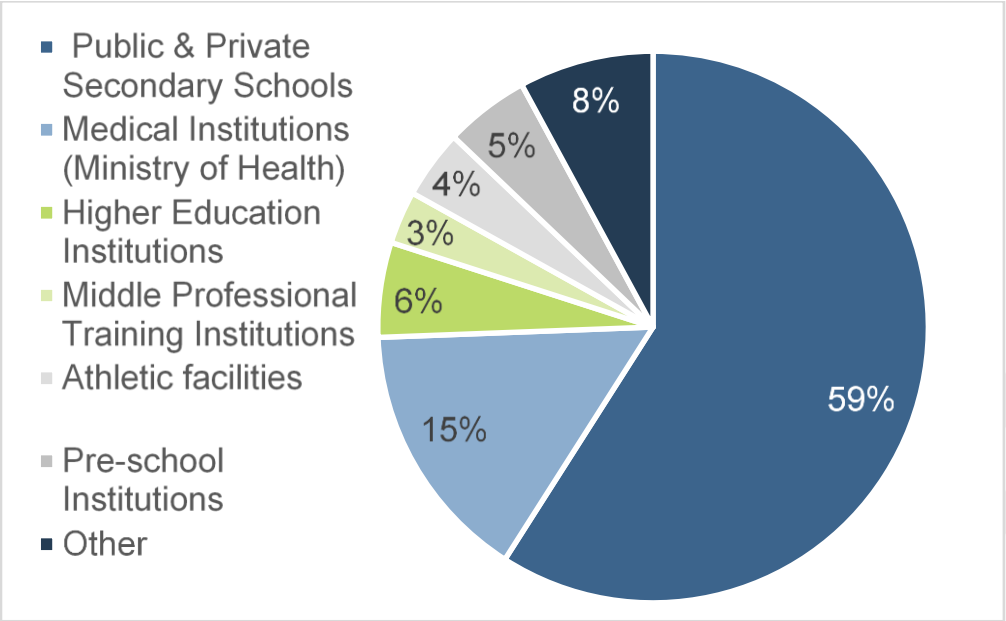


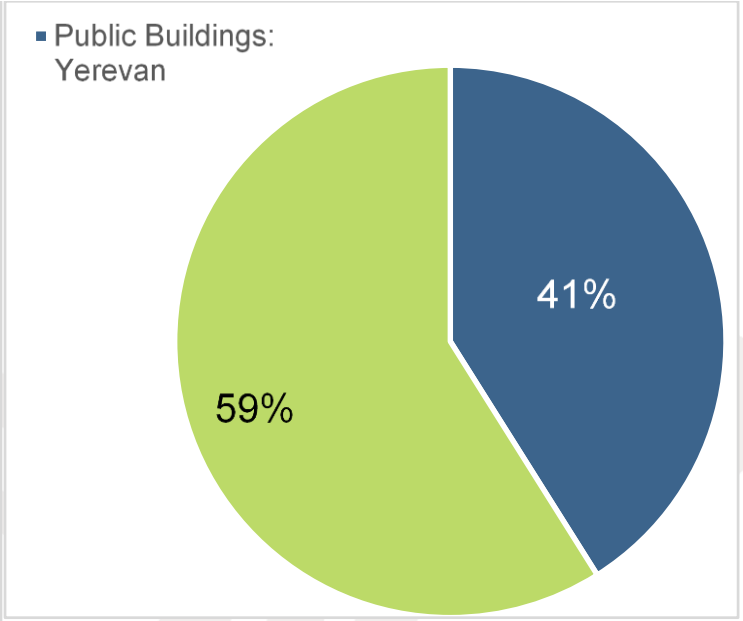
Energy tariffs and Energy Consumption in Residential Sector, 2010-2015





Public Buildings and Services





Energy Saving Potential in Public Buildings

Total Area of public buildings in Armenia (m2)	13,787,397
Total energy consumption in Public Buildings (MWh/year)*	1,764,787
Annual Energy Saving Potential (MWh/year)*	896,181
* - based on R2E2 experience with 56 projects.	
Average energy consumption prior to EE in public buildings	128 kWh.m/yr
Average energy consumption after EE	63 kWh.m/yr
Average energy saving rate	51%
Investment need (AMD) at average of AMD 8400/m2 for typical ESMs	115,814,134,238
Investment need (USD) - exchange rate 473	$244,850,178
Total Financing currently available (GEF and KfW)	$ 27,270,296

Supporting Covenant of Mayors in Armenia

Signatories	Population	Commitments	Status
Akhtala, AM	2,753	2030 ADAPT	
Alaverdi, AM	16,400	2030 ADAPT	
Aparan, AM	6,500	2020	
Artik, AM	19,500	2020	
Gavar, AM	19,900	2030 ADAPT	
Goris, AM	21,555	2030 ADAPT	
Hrazdan, AM	42,000	2020	
Ijevan, AM	20,800	2030 ADAPT	
Kapan, AM	42,900	2030 ADAPT	
Masis, AM	21,376	2030 ADAPT	
Paraqar, AM	9,140	2030 ADAPT	
Spitak, AM	18,237	2020	
Tashir, AM	8,700	2020 2030 ADAPT	
Tsakhkadzor, AM	1,700	2020	
Vanadzor, AM	86,199	2020	
Vayk, AM	5,900	2020	
Yerevan, AM	1,077,400	2020	

The Covenant Step by Step

STEP 1: Signature of the Covenant of Mayors

- Creation of adequate administrative structures
- Baseline Emission Inventory & SEAP development

STEP 2 : Sustainable Energy Action Plan submission

- Implementation of your Sustainable Energy Action Plan
- Monitoring progress

STEP 3 : Regular submission of implementation reports

-20% CO_2 by 2020

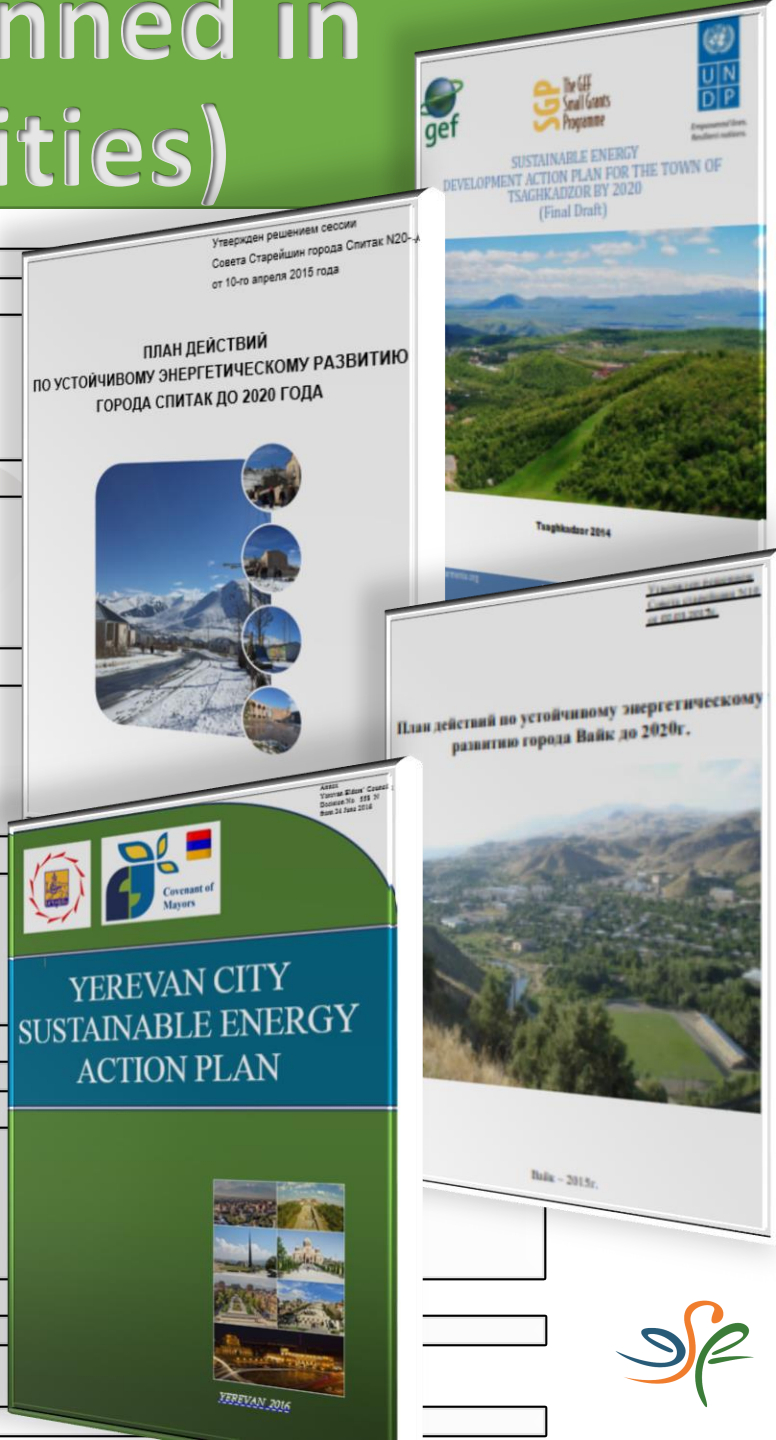
30% by 2030 + adaptation

Covenant of Mayors
Committed to local sustainable energy

We are supporting the Covenant of Mayors!

Sustainable Energy Investments Planned in SEAPs of Armenian Signatories (8 cities)

- **Introducing municipal energy management system in public institutions**
- **Capital repair and thermal modernization of municipal buildings**
  - Insulation, window & door replacement, efficient lighting in kindergartens, culture schools, administrative buildings, etc.
- **Energy efficiency retrofits of multi-apartment residential buildings**
  - Insulation, Efficient doors and windows
  - Improved lighting
- **Energy efficiency upgrades in public lighting system**
  - Public spaces / courtyards
  - Municipal street-lighting
- **Efficiency Municipal transport**
  - Road network optimization, upgrading of car fleet, rerouting
  - Development of bike lanes and pedestrian commute
- **Renewable Energy Development**
- **Increased public awareness on sustainable energy and energy efficiency**
  - Trainings and capacity building, Energy days, Earth Hour
  - Energy Certification of buildings
- **Rehabilitation of green spaces**
- **Municipal solid waste management & Methane utilization**



Positive Steps & Successes to Date and Remaining Issues

Policy reform initiated (ES&RE Law, ES&RE Program, EPBD, 1st & 2nd NEEAP, etc.)

More drafting needed, Enforcement lags, institutional capacity insufficient

Standard & norms being updated to meet international best practices

Only small part, done with donor-funding, | **Enforcement lags**

Several studies assessed the potential for energy saving at 30-40% of overall national use

Potential largely remained untapped

Donor-funded pilot projects demonstrated a sufficient set of technical solutions for EE

Not always found administrative models & financing mechanisms for replication

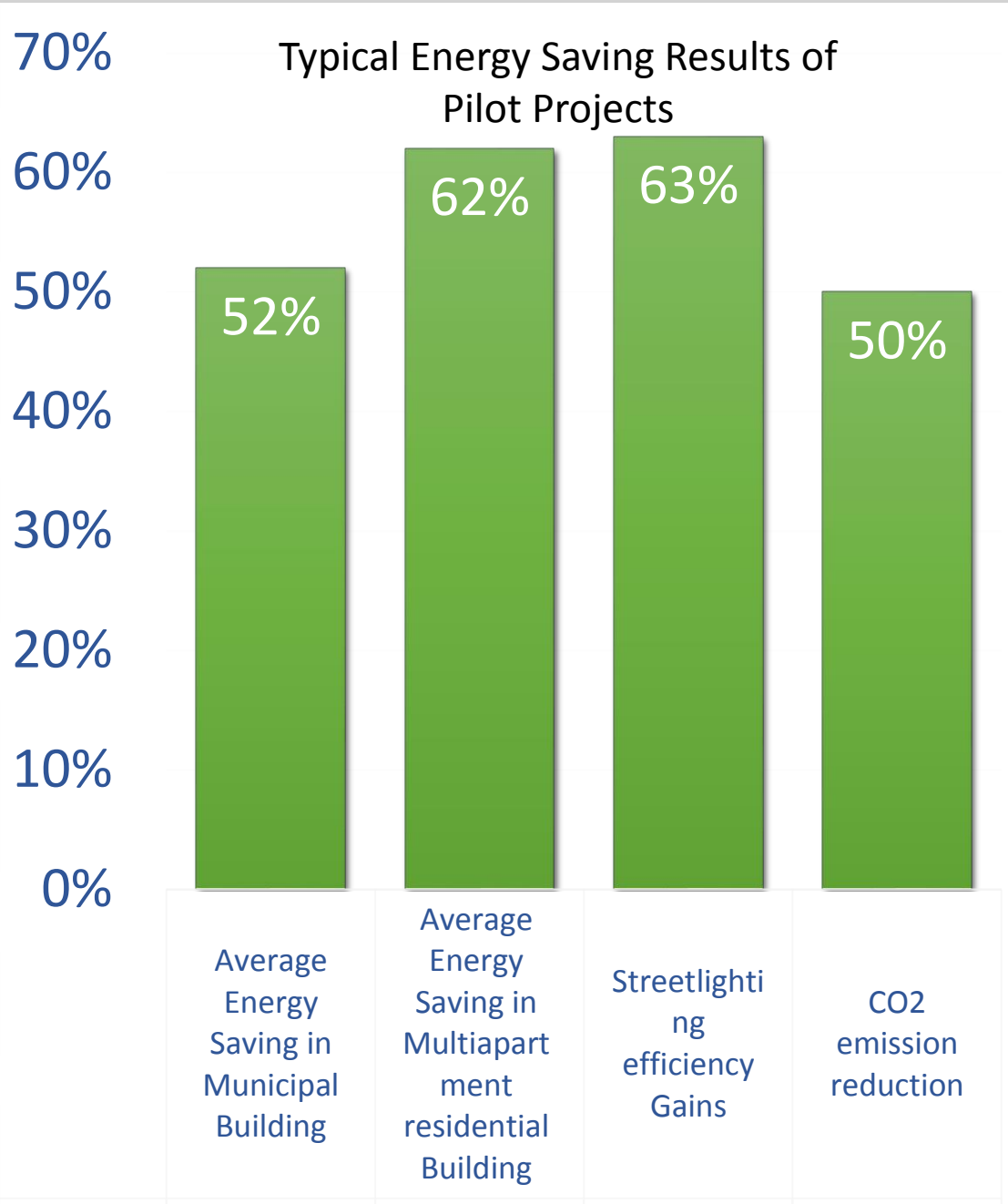
Credit lines functional for corporate, SME, households and municipal EE

Grant-funding for potentially bankable investments, duplication in some cases | **Multi-apartment housing EE underserved**

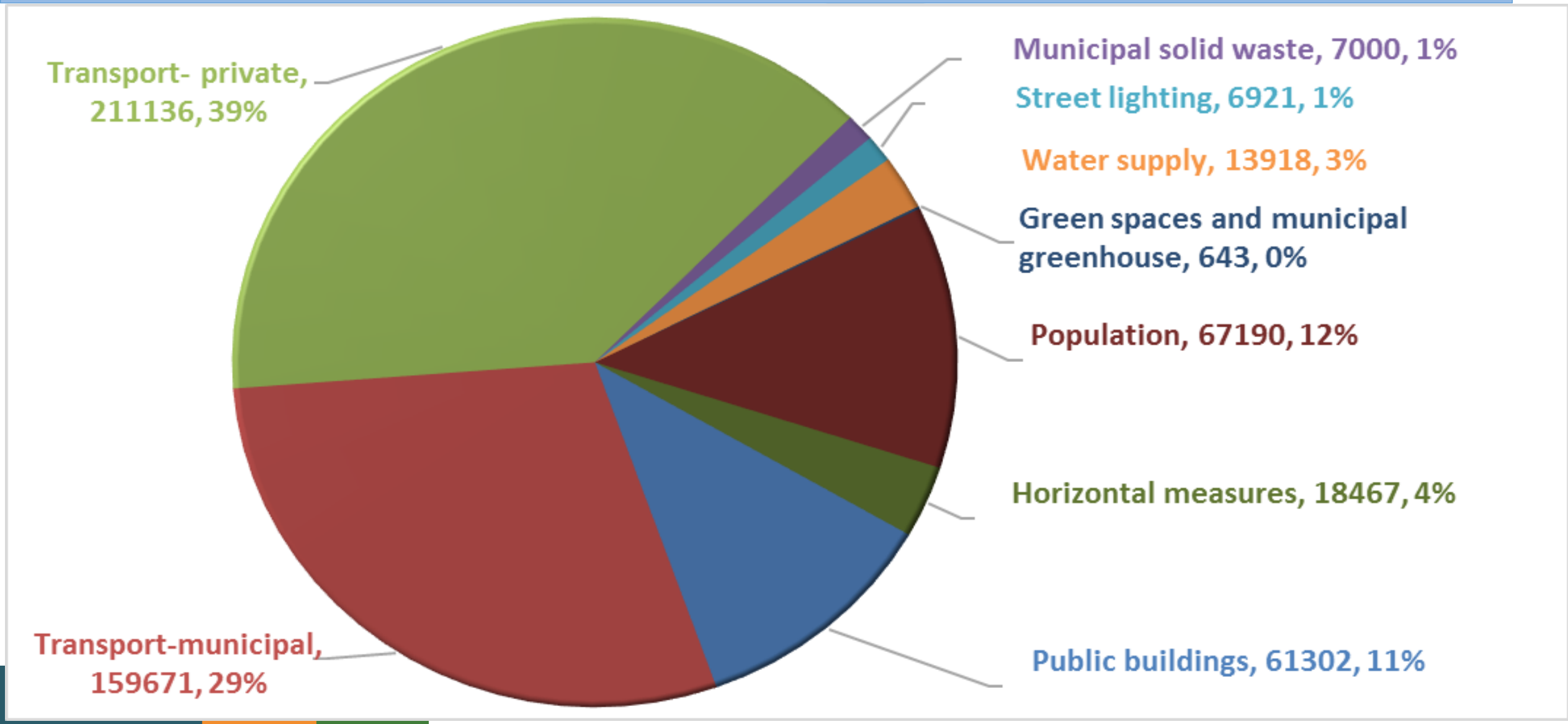
Local authorities slowly taking the lead (CoM/SEAPs)

Municipalities lack skills and resources for energy planning and project development

The public awareness and outreach not adequate



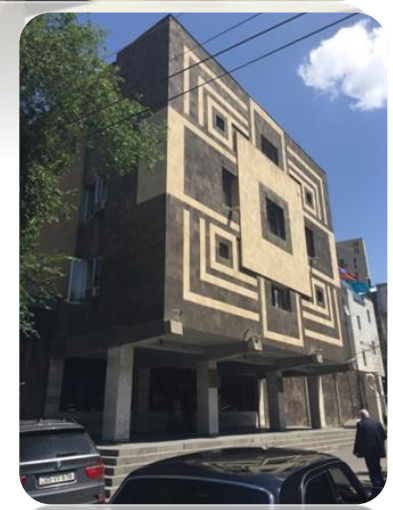
How Much Energy can a City Save: Yerevan Case Potential for Energy Saving by sectors (MWh & %)



Yerevan Energy Efficiency Project

- The project aims to support the Municipality of Yerevan (MoY) in implementing a rehabilitation programme involving Energy Efficiency (EE) and renewable energy (RE).
- The project targets **147 public buildings** (330.000m^2) depending on the availability of grants to support the project
- **Municipality of Yerevan with the assistance of the Municipal Project Support Facility (MPSF) TA consultant selected:**

147 kindergartens



An innovative and transformational project

Project cost EUR 15-20m

EIB Loan – EUR 7m	E5P grant – EUR 10m *in two tranches (5+5m EUR)*	Municipality's funds – EUR 2m	MPSF grant EUR 250.000 + GCF by UNDP EUR 1m

Thermal refurbishment and other EE/RE components:

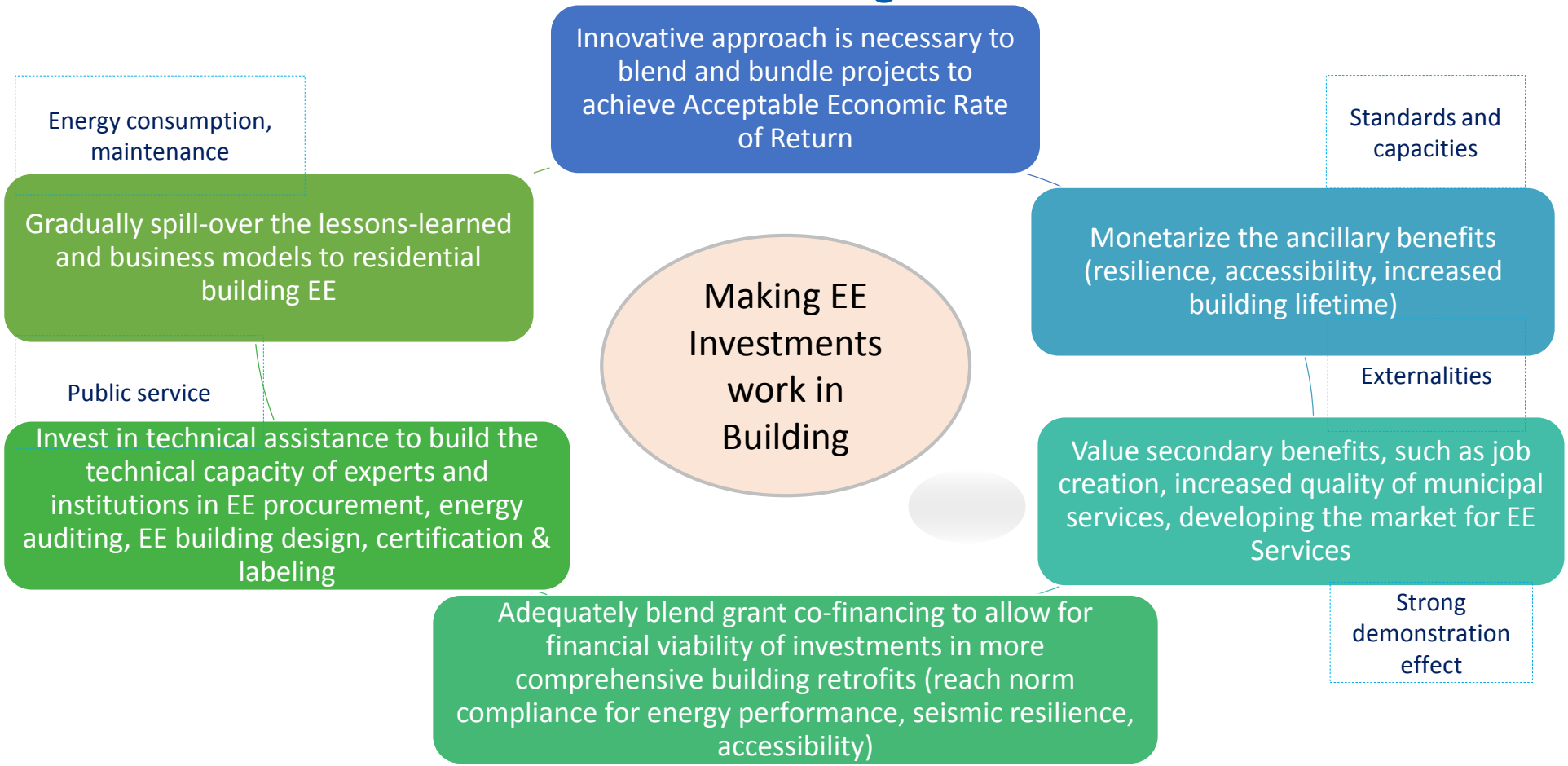
- building envelope
- heating, ventilation, and air conditioning (HVAC) systems, including boiler replacement
- renewable energy sources and energy management systems including solar heat and/or solar power generation
- geothermal heat generation, heat pumps, small cogeneration
- overall technical condition of buildings
- lighting systems
- **Seismic resilience and accessibility components**

Technical Assistance for implementation and for scaling up to next phase

Buildings	**147 buildings / 330,000 m²**
Energy saving	**27,782 MWh/year**
CO_2 saving	**5,502 t/year**
Costs saving	**1,094,604 EUR/year**
CO_2 reduction ratio	**903 t of CO_2 per m EUR invested**

Compared to base line:
deep renovations savings expected at about 60%.
Overall with horizontal measures electricity savings expected at 70% (due to PV)
thermal energy savings at 30%

Key Remedies to Overcome Barriers for EE Investments in Armenia's Building Sector

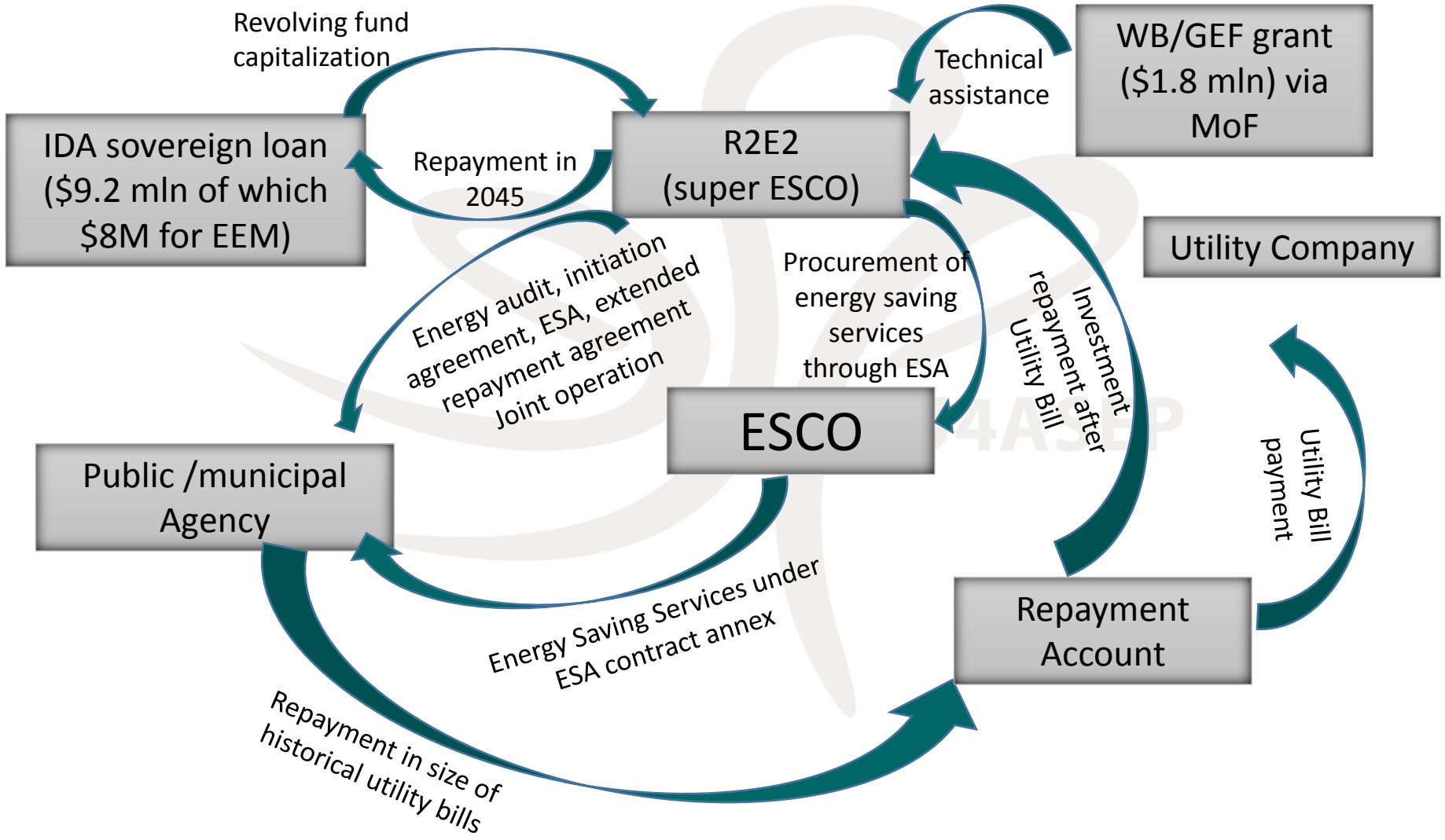


Substantial benefits for the population, for MoY, Impact on growth, energy security, GHG emissions

EE Project for Public Buildings in Armenia: Renewable Resources and Energy Efficiency Fund (R2E2)

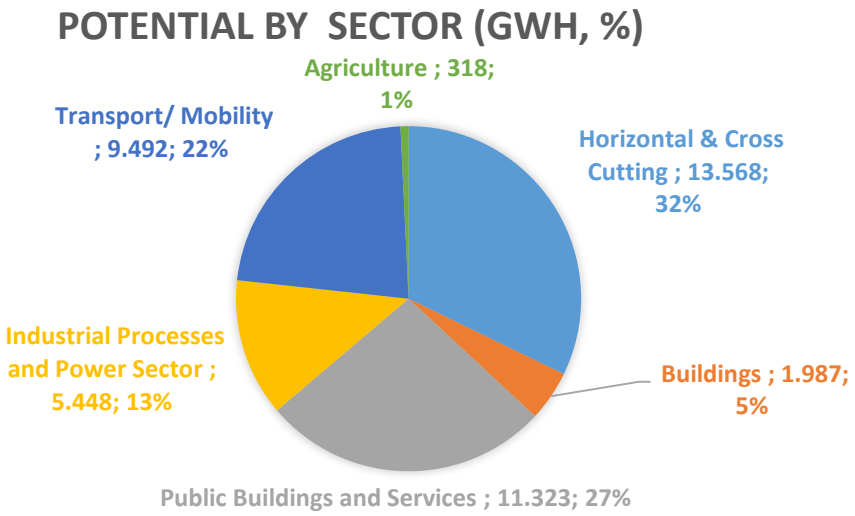
- Objective: Reduce energy consumption in public buildings
- Funding: $9.8mln
- Beneficiaries: Public and municipal agencies
- Typical EE measures: Insulation of walls and roofs, replacement windows, replace street lighting system
- Average 7200 AMD/m2 (min 5300 & max 9000 AMD/m2)
- Simple payback: 7.1-7.2 years
- Energy saving: 54.4%:
- Heating (kWh/m2/year) : Before ESM - 120 ► after - 55
- CO_2 Emissions reduction : Before ESM - 471.8 t/year ► after - 218.2 t/year (-53.7%)

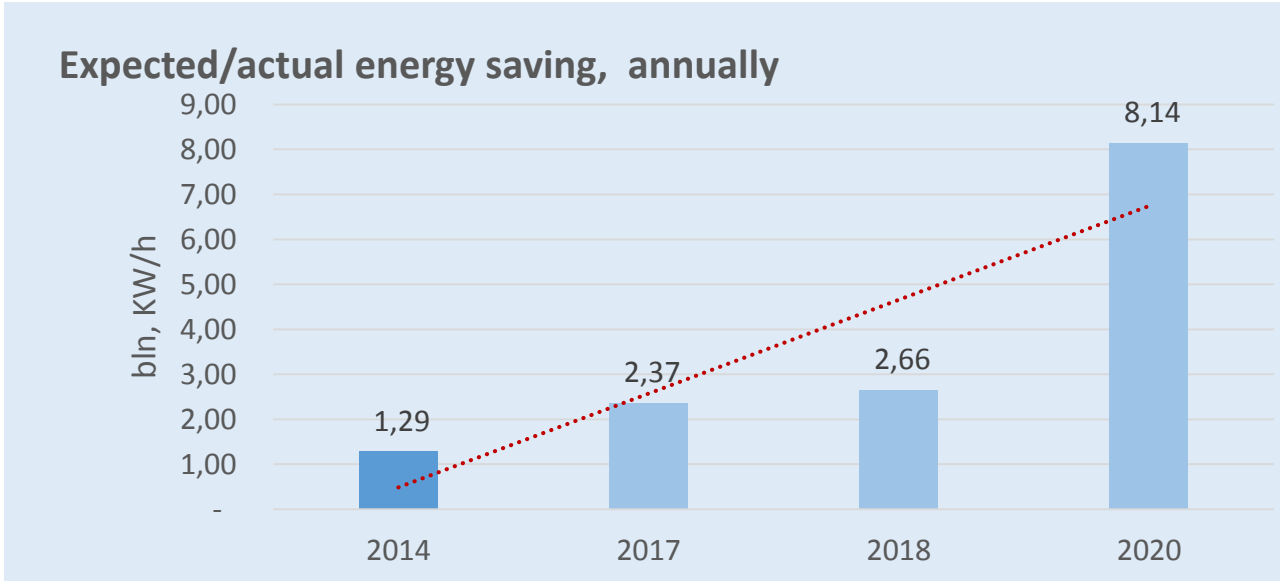
Functional Scheme for Public Building EE Finance in Armenia: the R2E2 & ESAs

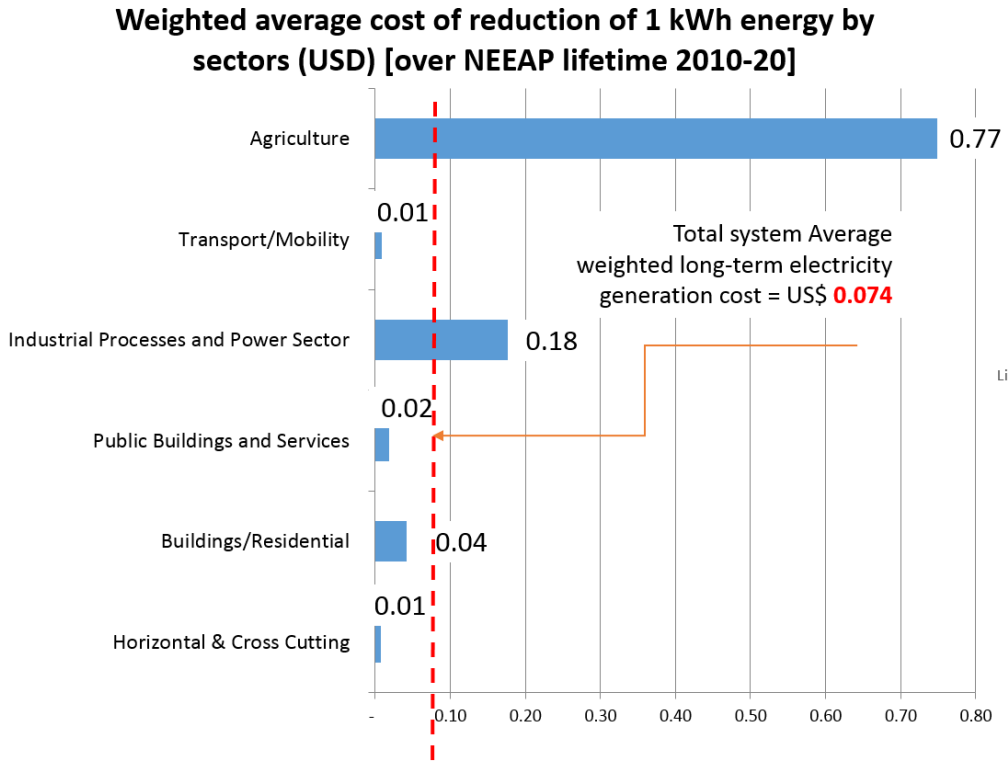


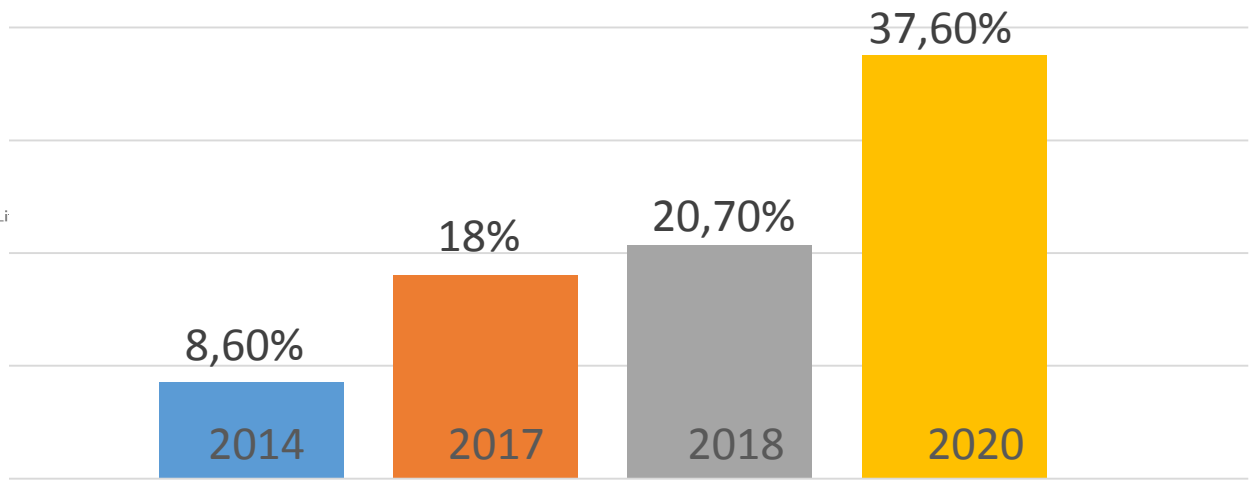
Energy Efficiency

among top 4 energy sector priorities of the country, legal framework in place, a dozen credit lines, $340 million underserved









National Energy Saving Targets

Food for thought

If Armenia fully realizes its potential for energy saving, the available energy supply will increase by 50-70% (hence import can be reduced)

The economic benefit of energy saving is equivalent to 5% of GDP, or about 80% of budget deficit

$1m^3$ of imported natural gas costs about twice more than investing in conservation of $1m^3$ of natural gas

Building 1kW new capacity costs 5 times more than the cost of 1kW energy saved

Roughly 40% of Armenia's energy saving potential is in the buildings sector

Saving energy in building design phase is a low-cost/no cost opportunity with over 50% saving potential

Next Steps for Us:

Expand the self-sustaining financing schemes across other public buildings and urban, multi-apartment buildings

- Sub-sovereign borrowing, Revolving funds, PPP & LFIs, Super ESCO

Directing public renewable energy revenues towards revolving funds for energy efficiency

- Minigrids, energy cooperatives, virtual net metering, etc

Utilizing carbon financing for EE

- Seek GCF financing for Rural EE to combat deforestation

Support implementation of EU-Armenia Comprehensive and Enhanced Partnership Agreement (CEPA)

- Promotion of EE, RES, diversification, and energy security
- Facilitate enforcement of Technical Regulation on Building Energy Efficiency (EPBD transposition), energy auditing calculation tool & procedures
- Develop a concept for NZEB and eco-labeling
- Develop Energy Efficient public procurement rules and model contracts
- Energy Market Liberalization for promotion of EE-integrated renewables, Regional Energy Market Integration, etc

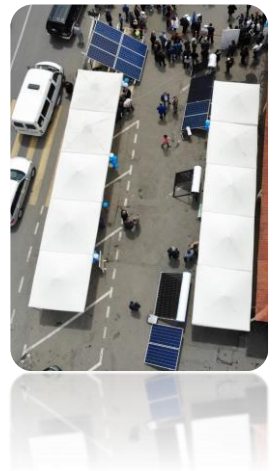
Empower women in Energy dialogue

Etc

ENERGY SAVING FOUNDATION

FOUNDATION TO SAVE ENERGY

THANK YOU!



INFO@ESFARMENIA.ORG

ESFARMENIA.ORG

15 years in delivering better policies, better programs, better lifestyles with smaller footprint