



Experience with District Heating Rehabilitation in the Republic of Armenia

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UNDP/GEF Project “Armenia – Improving the Efficiency of Urban Heat and Hot Water Supply”

Government Policy of the Republic of Armenia in Heat Supply

Government policy in heat supply – Resolution of the Government of the RA of 2002 “On Heat Supply Reform in the Localities of the RA”

Government policy objective – provide affordable and high quality heat to the general public by reforming the sector on the principles of :

- energy efficiency
- energy saving
- negative environmental impact reduction

Mechanisms – create legal framework and investment climate conducive to mobilizing private investment; government support and promotion.

Objectives of UNDP/GEF Project “Armenia – Improving the Efficiency of Urban Heat and Hot Water Supply”

Goal – facilitate implementation of government policy in heat supply

Objectives:

- Rehabilitate district heating of multi-storey apartment blocks and enhance the role of condominiums
- Assist potential investors in order to promote investment in heat supply
- Disseminate the experience gained

Government Promotion of Heat Supply Rehabilitation

Yerevan mayor's office is an authorized public authority managing the city's heat supply system assets

In order to mobilize investment in the process of rehabilitation and reconstruction of the heat supply systems, resolutions of the Government of the RA:

- Authorized Yerevan mayor to rent heat supply facilities
- Approved methodology for calculating heat supply facilities rent which allows setting incentive (minor) rent

Cooperation with Mayor's Office

- **Signing the Protocol of Cooperation between the UNDP/GEF Project and Yerevan mayor's office**
- **Proposal by mayor's office to assess DH rehabilitation options for heat generation:**
 - By hot-water boilers (HWBs)
 - Using cogeneration plants (CPs+HWBs)

DH as Means of Implementation of Government Policy in Heat Supply

Master plan of the City of Yerevan for 2005-2020 provides for district heating rehabilitation in five large residential districts of the city.

Why DH

DH facilitates:

- Efficient use of fuel, which is especially important for the RA in absence of own non-renewable natural resources and increasing prices for imported natural gas
- Reduction in emission of hazardous substances and greenhouse gases
- Safety and comfort in apartment blocks
- Housing stock preservation

Selecting Districts for DH Rehabilitation

Districts for DH (heat and hot water supply) rehabilitation are selected based on:

- Their compliance with DH specifications:
 - Heat load density – 50-60 MW/km² (reasonably starting from 30 MW/km²)
 - Maximum heat supply radius – 2-2.5 km (reasonably up to 10 km)
- Population's ability to pay – based on analysis of electricity bills
- Level of provision of gas supply – Avan, 11 percent, Davidashen, none

DH Schemes Using Cogeneration Technologies

Why cogeneration:

Using cogeneration in DH facilities:

- Provision of relatively cheap heat to the population and, thus, addressing the issue of non-payment by the population (due to generation of highly liquid and profitable product – electricity)
- Mobilization of investment, using Kyoto mechanisms
- Reduction of investment risks and creation of favorable investment climate

Description of Selected Heat Supply Districts

Avan – housing area of 1.5 km² in the North-East of the city, 1,250 m above the sea level.

DH in place until 2004.

- **Population – 37,000 people**
- **Number of multi-story residential buildings – 218**
- **Number of apartments – 10,172**
- **Number of buildings performing social functions – 32**

Description of Selected Heat Supply Districts

Davidashen – housing area of 1.5 km² in the North-West of the city, 1,150 m above the sea level.

DH in place until 2004.

- **Population – 31,500 people**
- **Number of multi-story residential buildings – 173**
- **Number of apartments – 8,471**
- **Number of buildings performing social functions – 18**

Approaches to Assessing DH Rehabilitation Options

Rehabilitation of heat supply system from source of supply to final user:

- Installing modern main and supplementary facilities at the generation centers
- Selecting the capacity of CPs – based on the heat load of hot water supply (HWS)
- Replacing completely the mains heat system and distribution network
- Reconstructing and rehabilitating intra-building networks
- Installing heat meters and control devices
- Thermal insulation of entrances

Approaches to Setting Heat and Electricity Tariffs

Main objective – provide affordable heat to the population, taking into account the population's ability to pay (*the World Bank pilot projects suggest that effective demand for heat is estimated at USD0.03/kWh*)

■ Approaches to tariff setting:

1. When cost price of generated energy was calculated, costs for generation of heat and electricity were not distinguished
2. Electricity tariff was fixed
3. Heat tariff was determined based on fixed electricity tariff on the condition of ensuring necessary earnings

Risk Assessment and Accounting

- **Electricity sale at the wholesale market reduces project risks considerably**
- **Calculations take into account the following risks:**
 - **Collection rate – actual proceeds from sale of heat were planned at 80–95 percent of sales**
 - **Heat load of users is assumed to account for 85 percent of estimated load**

Key Technical Parameters of Pilot Projects Using CPs

No	Parameter	Unit	Avan	Davidashen
1	Estimated heat load ■ Heating ■ HWS	MW	67 53 14	64 52 12
2	Installed capacity ■ Hot-water boilers ■ CPs ■ <i>Heating capacity</i> ■ <i>Electric capacity</i>	MW	60 16 13.5	60 14 14
3	Annual average heat generation	GWh	140.4	144
4	Annual average electricity generation	GWh	108.0	112

Calculation Results of Pilot Projects Using CPs

- **Investment:**
 - Avan - USD21.3 mln
 - Davidashen - USD19.4 mln

- **Heat tariff (with electricity tariff equal to estimated single-rate tariff of Razdan HPP):**
 - Avan USD0.029/kWh
 - Davidashen USD0.027/kWh

- **Internal rate of return on investment (*IRRa*) – 12 percent**

- **Project payback period – 8 years**

Benefits from Pilot Project Implementation

- Affordable heat tariff (USD/kWh):

	Using CPs	HWBs
■ Avan	0.029	0.045
■ Davidashen	0.027	0.043

- Fuel (natural gas) saving:

- *Due to cogeneration – approximately 25 mln nm³ per year in each project*
- *Due to 20-percent increase in efficiency of the heat supply system (efficiency of the previous system was 50 percent, according to VSEOM, France) – approximately 7 mln nm³ per year in Avan project*

- Reduction in emission of greenhouse gases and hazardous substances (CO₂ emission reduction by about 46 thousand tons a year, IPCC Methodology, 1996)

- Ensuring comfort in apartments

Government Promotion of Pilot Projects Implementation

- **Resolution of the Government of the RA No. 509 of 13.04.2006 regarding pilot projects for rehabilitation of the heat supply systems using CPs**
 - Ensuring guaranteed purchase of electricity generated by CPs
 - Setting electricity tariff equal to the estimated single-rate tariff of Razdan HPP
- **Decision of the Government of the RA of August 2006 on Transfer by the Mayor's Office of Yerevan to the Cities of Avan and Davidashen for Free and Unlimited Use of Heat Supply Infrastructure Situated in Their Administrative Territories**

Pilot Project Status

- **Transfer by the mayor's office of Yerevan of the heat supply systems property complex to the cities of Avan and Davidashen (*in progress*)**
- **Setting up by the cities of Avan and Davidashen and foreign investors of a joint venture for heat supply (*August 2006*)**

Thank you

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