



REPUBLIC OF ARMENIA

**DEVELOPMENT OF THE
RENEWABLE ENERGY TO
INCREASE ENERGY
INDEPENDENCE AND
RELIABILITY**

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Government Objectives in the Energy Sector

Action Plan of the
MENR (2007)

Energy Sector
Development
Strategy (2005)

Energy Security
Concept (2013)

National Program
on Energy Saving
and RE (2007)

Policy direction & specific measures

1. Development of domestic renewable energy:

- New HPPs at Meghri, Loriberd and Shnokh
- New SHPPs
- New WPPs
- Investigate geothermal potential

2. Increased efficiency of existing resources:

- New CCGTs at Yerevan TPP and Hrazdan TPP
- Modernization of T&D networks
- Rehabilitate Vorotan cascade
- Investments in EE measures

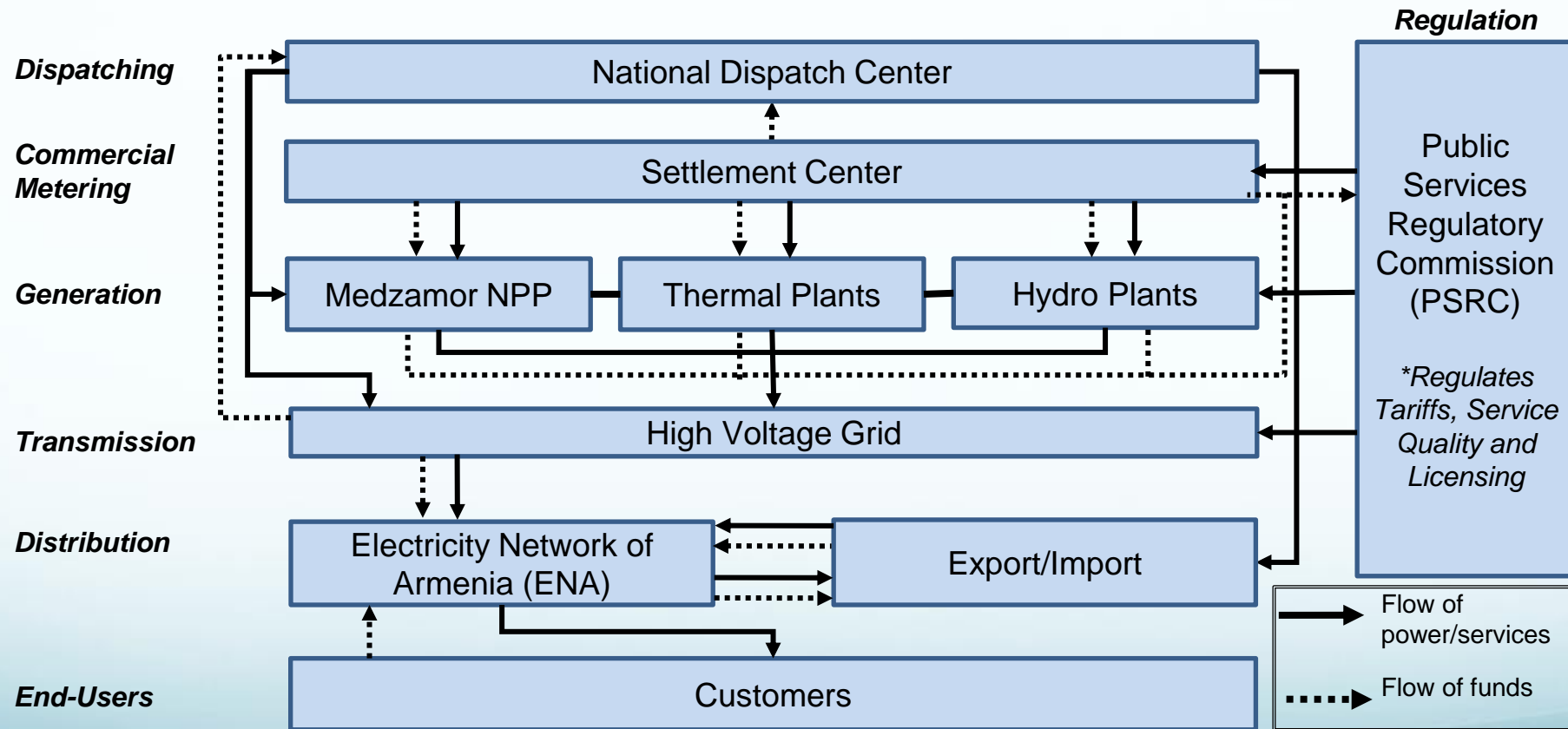
3. Safe operation of ANPP & construction of a new NPP:

- Complete ANPP safety enhancement and maintain safe operation
- ANPP decommissioning plan
- Feasibility study, design works and commissioning of new ANPP unit

4. Diversification of energy supply :

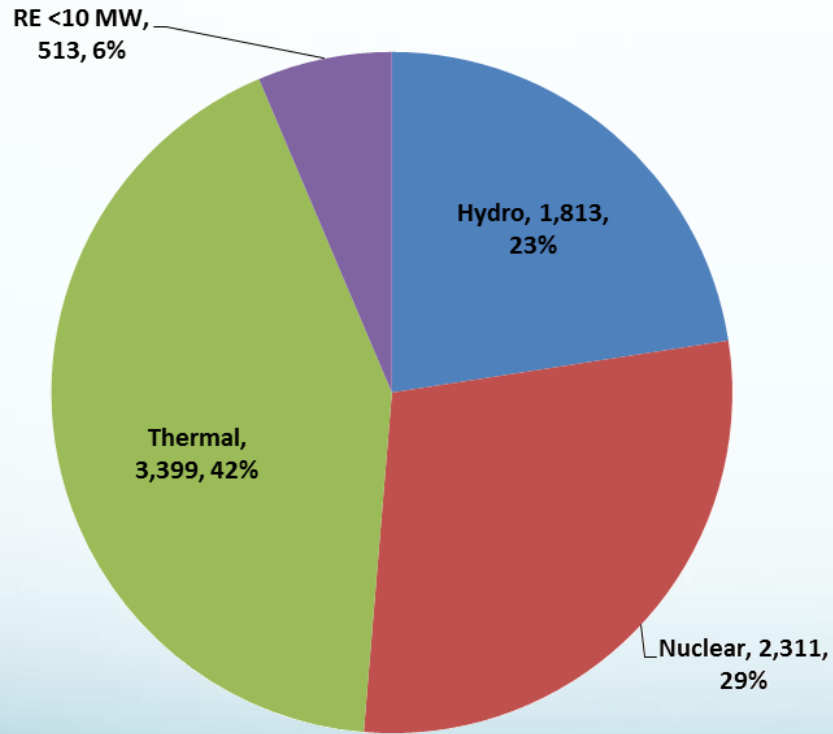
- Diversify gas supply
- Strengthen regional electricity transmission interconnections
- Modernize and expand gas storage

Institutional Framework of the Power Sector

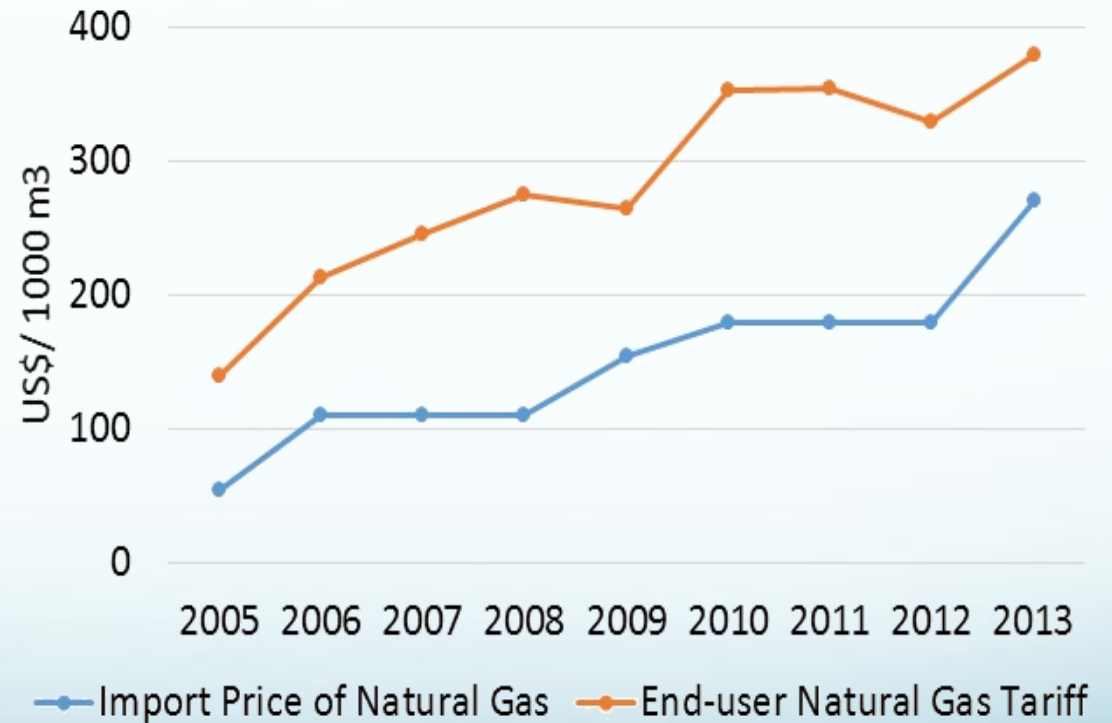


Historical Energy Balance

Electricity Production by Generation Technology (GWh), 2012



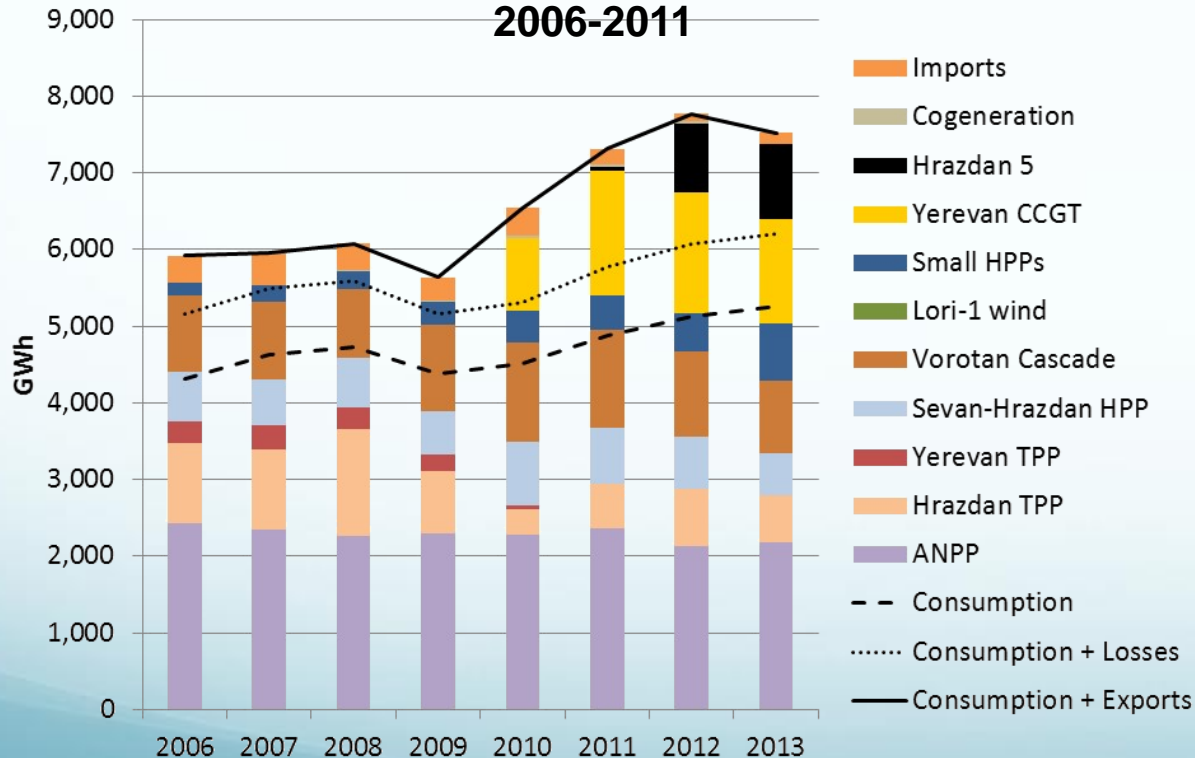
Natural Gas Import Price and Domestic End-User Tariff, 2005-2013



Supply-Demand Gap

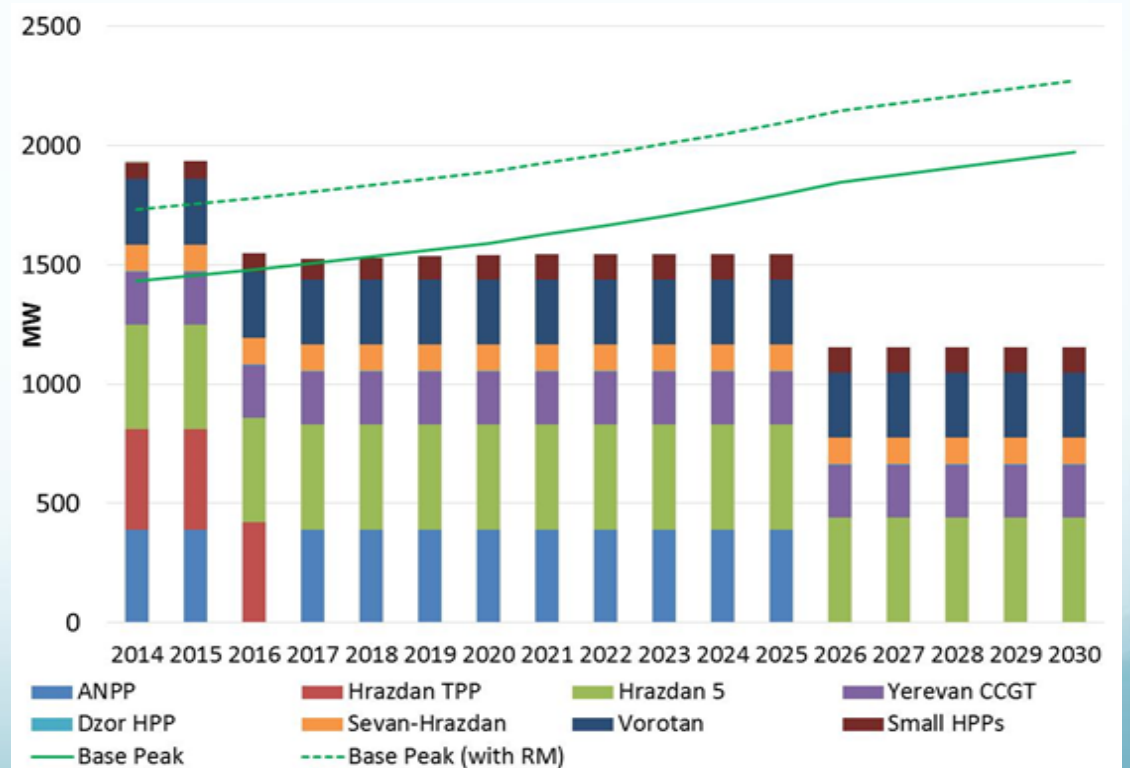
At least 170 MW of new capacity will be needed by 2018 to meet peak demand and maintain an adequate reserve margin. An additional 830 MW of new capacity will be needed starting from 2026 when the existing NPP is retired

Net Generation and Consumption, 2006-2011



Source: Public Services Regulatory Commission

Forecast Gap between Installed Capacity and Winter Peak Demand



Source: World Bank and MENR Projections

RE Resource Potential in Armenia

Technology	Capacity (MW)	Generation (GWh/yr)
Wind	300	650
Utility scale solar PV	830 – 1,200 ^a	1,700 – 2,100 ^a
Concentrating solar power (CSP)	1,200	2,400
Distributed solar PV	1,300	1,800
Geothermal power ^b	at least 150	at least 1,100
Landfill gas	2	20
Small hydropower	100	340
Biogas	5	30
Biomass	30	230
Total (electricity)^c	3,800 – 4,300	7,400 – 8,700
Solar thermal hot water	n/a	260
Geothermal heat pumps	n/a	4,430
Total (heat)		4,690

a Resource potential depends on which solar PV technology is deployed.

b Assumes flash technology is used.

c Solar PV and CSP were evaluated as options for development in the same areas.

SREP Program

- Better security of supply and reliability
- The creation of a utility-scale solar sector and geothermal power sector attractive to private investors.
- Develop the first utility-scale solar PV projects, which through gradual tariff increases will eventually become commercially viable without SREP/MDB support.
- Contribution to reduction of impending supply gap to meet forecast demand
- Improvement to the enabling environment for RE technologies.
- Help customers realize the benefits of switching from electricity and natural gas to geothermal heat pumps and solar thermal heating technologies for heating and cooling.
- Creation of jobs related to the construction/installation, operation & maintenance of RE technologies
- Promotion of local R&D in a technology which has traditionally been a focus of researchers and academicians in Armenia
- Reduced greenhouse gas emissions as compared to the business-as-usual scenario, under which Armenia will likely continue to expand the use of natural gas

Priority Activities: Geothermal Power Exploration and Development

The geothermal power project would include the following activities:

- **Exploratory Drilling at Karkar Geothermal Site** to determine whether or not power could be produced from the resource.
- **Feasibility Study for Karkar site**
- **Transaction Advisory Services**
 - Advisory services will be needed to help structure the PPP (BOT or BOO)
- **Development of Geothermal Power Plant**
 - It is expected that the private sector will make the capital investment required for generation of electricity (the power plant itself).
 - This investment plan assumes a plant with installed capacity of 28.5 MW, based on the average size of geothermal plants elsewhere. The actual size of the plant will depend on the resource potential identified in earlier activities.

Priority Activities: Utility-Scale Solar PV Project Development

- Project preparation, feasibility studies, site measurement and monitoring
- **Transaction advisory**
- **Investment in 40-50 MW projects**



Priority Activities:
Development of Geothermal Heat Pump and Solar Thermal

- Integration into EBRD's Caucasus Energy Efficiency Programme (CEEP)
- Can include geothermal heat pumps or solar thermal
- Programme also includes grant funding for help with energy audits, review investment proposals, support companies in securing funding from PBs and implementation support.
- US \$3 million of SREP funds will help to increase the size of CEEP



THANK YOU

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