SENTECH, INC.

Developing Renewable Energy Projects in Central Asia

Lawrence Markel

Sentech, Inc.

LMarkel@sentech.org

865-483-0359 x104

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Developing Renewable Energy Projects in Central Asia

- Projects
- Financing
- Exports
- Partners
  - Design
  - Implementation
  - Operation
- Return on investment

Projects

But they've got all that oil and gas!

Energy prices are subsidized and low

PV panels are too expensive

Petroleum not used domestically can be exported

Remote or rural areas don't have pipelines – or transmission lines or roads

What is the real cost of not having electricity?

There may be other incentives for renewables

Projects – Niche Markets/Applications

Rural settlements

- Farms
- Irrigation pumps - especially new irrigation techniques
- Houses - lights, communications, value-added to crops (cotton)
- Schools
- Clinics
- Water purification
- Communications
- Crop processing
- Maximizing efficiency of local diesel generators

Isolated points

- Communications towers
- Pipeline sensors/monitors
- Irrigation pumps, moisture sensors in fields

Other incentives

- Carbon credits
- Environmental protection – air/water emissions
- Non-proliferation – creating jobs for CBN scientists

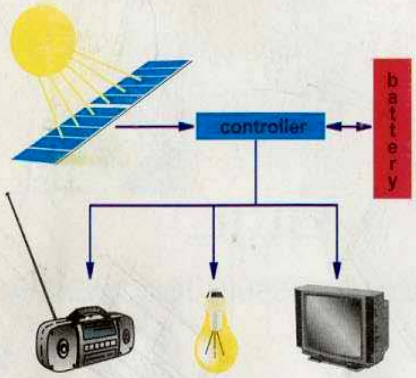
Solar Energy Resources in Uzbekistan

- Annual direct and indirect solar irradiation - 5,5-6,5 MJ/sq.m (clear weather)
- Average duration of sunshine per anum - 2700-2800 hours
- Average duration of sunshine per day - 8-10 hours
- Max. intensity of solar beam - 800-1000 W/sq.m
- Gross potential of solar energy - 50,973 Mill t. fuel equiv.

Potential customers for renewables (solar energy)

- Oil & Gas Industry
- Telecommunication
- Remote villages
- Agriculture (drip irrigation, pumps, greenhouses etc)
- Mobile field groups (geology, military)
- Healthcare service facilities
- Municipal facilities (heating)
- Export to Central Asian and neighboring countries

PV-HOME SYSTEM



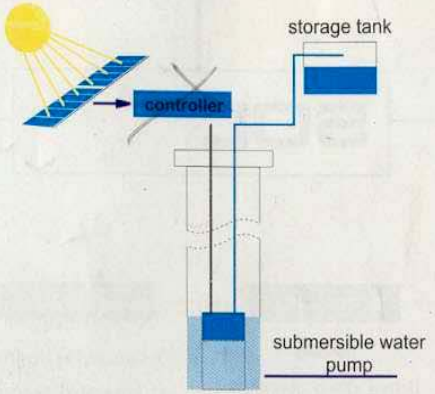
Purpose: Electrification of stand-alone remote houses with small loads

Advantages: Continuous power supply off-grid. Cost effective, autonomous, no pollution or noise

General remark: Systems may be sized up or down to accommodate a variety of needs depending on number of inhabitans

PV-array peak power	100 Watt
Load power:	
3 fluorescent lamps	36 Watt
1 black-white TV	15 Watt
1 radio-tape recorder	5 Watt

PV-WATER PUMPING SYSTEM



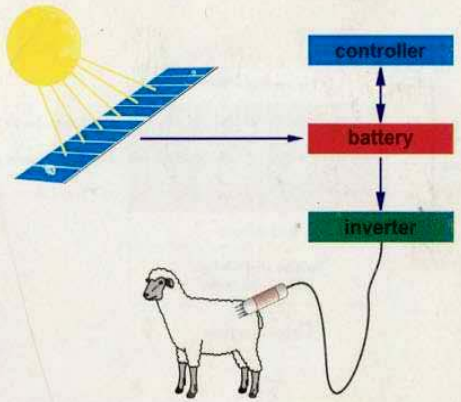
Purpose: To provide water from deep wells in desert areas.

Advantages: Reliable and efficient for stand-alone remote farms and other small isolated communities. Continuous supply of drinking water for inhabitants and livestock

General remark: Water tank is used to store the water.

PV-array peak power	175 Watt
Submersible pump:	
depth of well	6-70 m
load power	40-100 Watt
capacity	0.45-0.3 m^3/hour

PV-SHEEP SHEARING SYSTEM



Purpose: To provide sheep shearing in off-grid shepherd farm

Advantages: Improving shepherd's shearing productivity and the output of wool

General remark: For most part of a year the sheep shearing equipment is not used. The PV-array might be used more effectively by combining the system with PV home and water pumping systems

PV-array peak power	175 Watt
Load power:	
sheep shears	120 Watt

By 2002

6 trial PV demo systems were installed in **Samarkand (3 systems), Bukhara (2)** and **Jizzak (1)** provinces and currently are operating without significant maintenance.

2004-2005

UNDP Project

Clean Energy For Rural Communities of Karakalpakstan

In Uzbekistan there are almost 1500 remote and hard-to-reach rural communities (settlements) that are not connected to national electricity grid and lack good quality drinking water

UNDP Project

Clean Energy For Rural Communities of Karakalpakstan

Installed PV systems produced by FOTON:

15 home PVS (100W)
10 water pumping PVS (200W)
Total capacity of PV: 3.5 kW

The UNDP Project demonstrates the possibility to use PVS (photovoltaic station) to provide electricity and water pumping

Cost calculation for 100W PV system produced by FOTON in US $ 2005

4 **PV modules (Uni-Solar, USA) framed by FOTON:…...850**

Charge controller (FOTON):……..……122

Wiring and accessories (local): ……..…. 20

Battery (local): ……...70

TOTAL: ……**1062** (incl VAT and customs fees)

New regional and local projects developed by TTA

- **Solar energy and new agricultural technologies for sustainable development of remote areas of Uzbekistan and Kazakhstan**
- **Utilization and abatement of torched gases at Oil & Gas deposits of Uzbekistan and Kazakhstan using modern technologies**
- **PV systems for oil and gas industry (*pipeline flow rate meters, cathodic protection, SCADA telecommunication system*)**

TTA projects and activity in the field of solar thermal energy

- Demo project on hot water supply for small medical station at Dumalak village (Fyrogenis, Greece)- 2002
- Training TTA specialists on Core JI/CDM: Key Concepts and Procedures within Caspian Basin Greenhouse Gas Emission Reduction Training Program (CTP) - 2004
- Solar energy for natural gas purification from hydrogen sulfide (under development) - 2005

Urgent issue of sustainable rural development in Uzbekistan

Number of cities/towns: 120

Townships: 114

Villages: 11,844

Population:

- **Rural – 60%;**
- **Share of agriculture in GDP (2004) – 26,8%;**
- **44% of able bodied adults work in agriculture**

Problems of agricultural sector

- Reduced land fertility
- Irrational management of land and water resources
- Unsatisfactory irrigation and drainage system
- Old-fashioned equipment, lack of maintenance
- Lack of up-to-date technologies and difficulties in implementation of new technologies due to limited finances

Flood Irrigation

No-Till and Drip Irrigation

Financing

Project-level economics

Primarily for applications where PV is least expensive option (include equipment & battery maintenance, fuel supply, infrastructure costs)

Climate change

EBRD, Germany, World Bank – Carbon Financing

IFI, Foreign Aid & NGO social projects

Petroleum & pipeline companies – provisions of royalty agreements

IDB (local NGO support), ADB, World Bank – social funds

Foreign assistance, such as Open World, USDA-ARS, US-supported Scientific & Technical Centers in Ukraine/Russia

Carnegie – "school in a box" project

National, Local Government

All Central Asian countries have developed or are developing National Renewable Energy Plans – think "RPS"

"Follow the money" – true cost of lack of electricity includes urban influx, police & security, medical and social support costs, crop spoilage, reduced exports, energy price subsidies, unemployment, discouraging investment

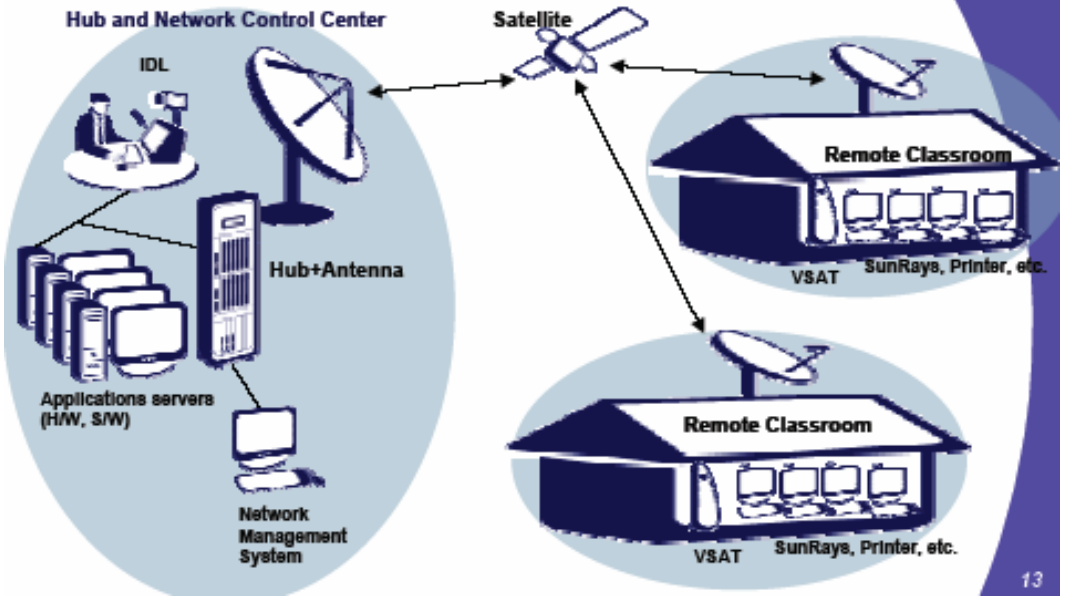
Where subsidies exist, someone – usually the government – is paying. Negotiating for the benefits to be used to finance the projects is more difficult than technical design.

The true financial benefits are significant, but demonstrating this to multiple Ministries is challenging.

Carnegie's proposed "School in a Box" program for Central Asia

"Education Over Satellite Anywhere"
End-To-End Solution For Education In Sub-urban Environment

Concept
Network Topology



Exports

Bundle PV with other functions
- Pipeline and Telecommunications companies
- Agriculture, irrigation
- Health, water, education

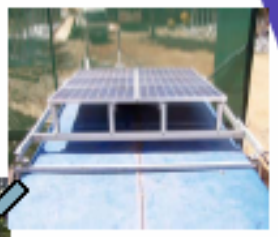
Governments and International Financial Institutions
- Climate change regulations, National renewable energy plans
- Need to make the case that this accomplishes poverty reduction or civil society goals
- Show cost savings in other government expenditures

US Government support – Department of Commerce, Trade Development Agency
- Customs and other regulations
- Market assessments

Biggest hurdle is pilot demonstration to show the value –
TDA, IFI funds can "prime the pump" but it's not easy to get them

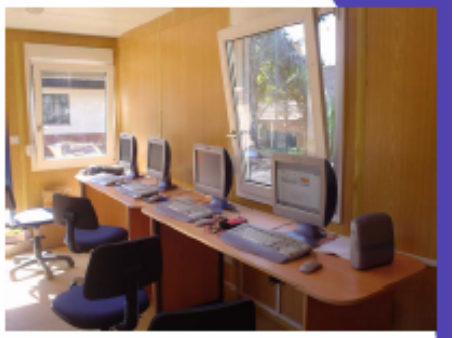
Concept - Cont.
Remote Classroom -Exterior

VSAT Antenna



Solar Panels
(optional)

Concept - Cont.
Remote Classroom -Interior



Partners

US Department of Commerce – Foreign Commercial Service

AMCHAM – Local American Chamber of Commerce partnerships (e.g., in Azerbaijan, half of AMCHAM's members are from other countries) – can facilitate introductions to local companies, familiarize you with regulations, laws, codes & standards, contracting methods, etc.

Local partnerships are essential
- Appropriate technologies
- Understanding local customs
- On-site maintenance, customer service

Eco-Energy Alliance – multi-country technical organization to promote clean energy technologies

Establish local motivation and foster local initiative – make the project self-sustaining

Central Asian Country Coordinators for Eco-Energy Alliance

Dr. Rafika Musaeva, Chairman
Association of Energetics of Tajikistan
Dushanbe, **Republic of Tajikistan**
musaevarafika@rambler.ru

Dr. Kanat Baigarin, Director
Climate Change Coordination Center
Almaty, **Kazakhstan**
kbaigarin@climate.kz

Dr. Alaibek J. Obozov, Director
Center for Renewable Energy
Bishkek, **Kyrgyz Republic**
kun@elcat.kg

Dr. Tolib Sultanov, Director
SOF Energiya Ltd.
Tashkent, **Republic of Uzbekistan**
sultanov_ta@mail.ru, attgknt@mail.ru

Dr. Gulnara Rashidova
Technology Transfer Agency
Republic of Uzbekistan
202-887-5300
gulnararash@rambler.ru

Also:
Nargiz Nasrullayeva-Muduroglu
AMCHAM Azerbaijan
Baku, **Azerbaijan**
amcham@amchamaz.org

Energy Efficiency Project Design

Different parties, different objectives

Customer – residential	More comfort, eliminate moisture problems Improve building appearance and operation Reduce costs Understand what will be done and why Overall pleasant experience, responsive to their needs and concerns Environmental improvement
Customer – industrial	Reduce costs Improve product quality, reduce waste Safe, healthy work environment Reliable equipment and processes Reduce emissions (meet local, national, or European Union requirements)
Energy Services Contractor	Make a profit Retain jobs – employment
District heat utility or other energy utility	Retain or attract customers Reduce operating expenses Motivate customers to pay their utility bills Increase profits Reduce emissions to meet national or European Union requirements
Housing estate	Reduce costs Reduce resident complaints Motivate residents to help with building maintenance Reduce vandalism Induce residents to pay rent on time
City government	Reduce energy costs for city-owned buildings and services (housing, schools, hospitals, etc.) Improve public services Privatize city-owned housing Create employment Eliminate budget deficits (e.g., district heat, housing authority) Improve local environment - reduce harmful emissions
National government	End energy subsidies Create employment Increase GDP Reduce energy/fuel imports Reduce emissions – carbon, water, air, groundwater

Return on Investment

The energy sector is like the body's circulatory system – its health is a necessary prerequisite for healthy, prosperous society.

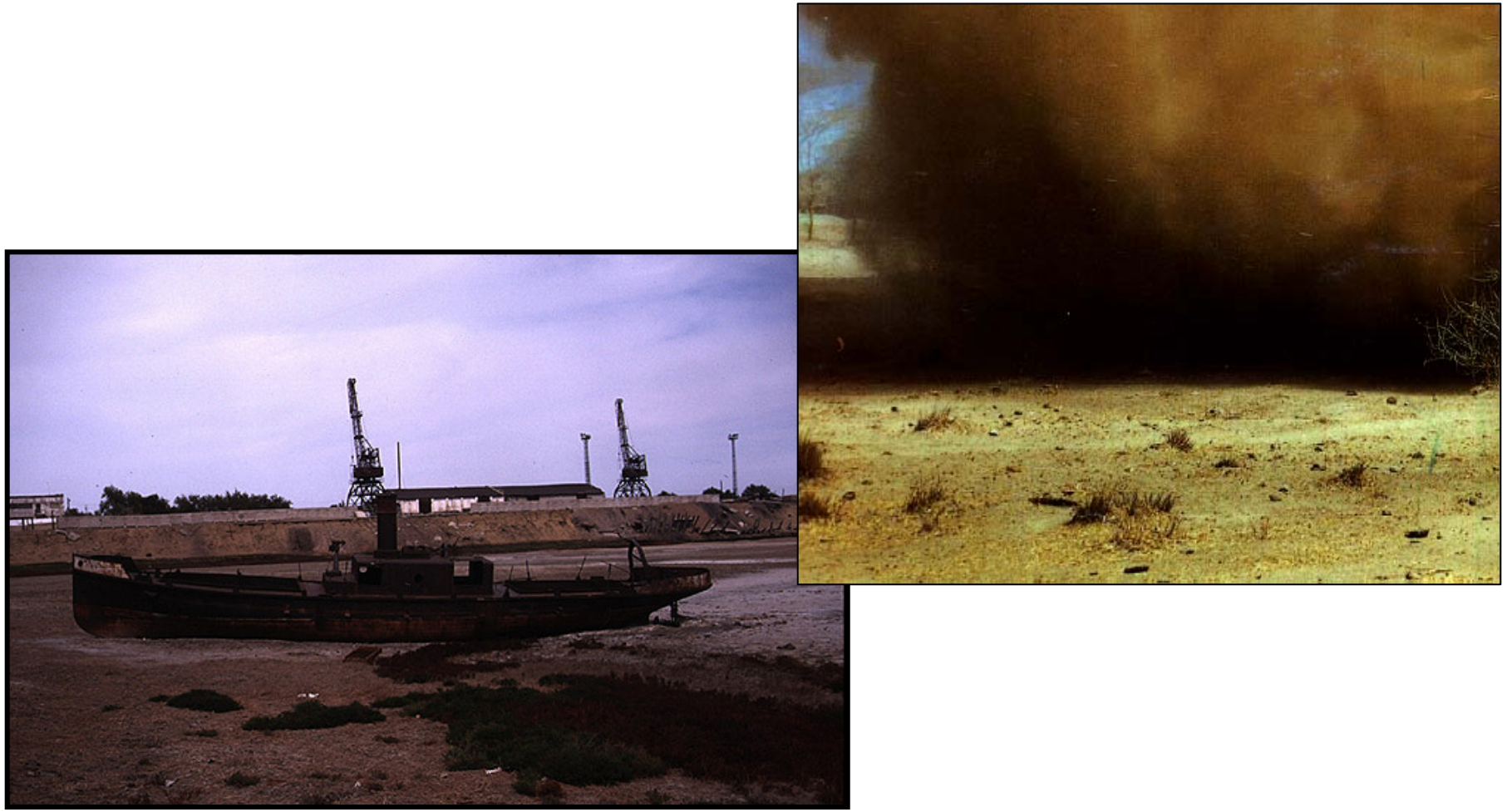
To appreciate the benefits, one must consider all the global and societal implications of the projects.

"It is good for engineers to be reminded now and again that their work, even when motivated by the prosaic needs of running a business, can nevertheless produce splendid results in the public good." – Samuel C. Florman

Return on Investment

- Money
  - Project
  - Government
- Environment
  - Climate change
  - Local – land, water, air
- Economic development and quality of life
  - Jobs
  - Education
  - Communications
  - Healthcare
  - Exports
  - Costs of social displacement
- Security
  - Political stability
  - Civil society
  - Non-proliferation

National Ecological Problems - they are real!
Национальные экологические проблемы
Зоны экологического бедствия



We’re spending billions to treat the disease but can’t find millions for vaccines

“Unless someone like you cares a whole awful lot, nothing is going to get better. It’s not”

– Dr. Suess “The Lorax”