Report on the Opportunities for Wind Power as a source of Renewable Energy in Sughd province, Northern Tajikistan

Introduction

The report has been compiled by etc4CA – a commercial venture started in 2010 to equip people in Central Asia to do business better. Renewable energy provision is one of etc4CA's projects to establish local catalysts for business. We believe that energy is essential for a community's economic viability and this project has been initiated in the hope that it goes some way towards addressing the complex energy issues of the region.

This report results from reconnaissance performed in May 2011 across a range of locations in the Sughd province of Northern Tajikistan. Its purpose is to identify opportunities for wind power as an alternative source of renewable energy to address the energy issues affecting communities that live in these regions. Due to the geographic size of the region and the time available to make the assessment, some assumptions have been made to exclude areas where there is little likelihood of wind.

Whilst there is significant provision for hydropower in this province, there is also significant energy poverty, particularly in the more remote villages. Blackouts are also regular, even in the main centres of population. etc4CA fully recognises and commends the ongoing endeavours of the Tajik government and other agencies in there actions to address generation and network infrastructure issues and improve the energy situation in this province.

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Executive Summary

There are three imperatives for Tajikistan to consider wind power as a source of renewable energy:

- Energy poverty is clearly an issue in Northern Tajikistan, despite the availability of hydropower plants for electricity generation.
- With the continued escalation of water management challenges of Central Asia, it would be expedient for Tajikistan to investigate more options to diversify its energy generation sources.
- Glacial shrinkage across the Tien Shan has now been demonstrated[1] over a protracted period and there is a strategic requirement to understand the potential for alternative energy sources if glacial run-off were to reduce, as is likely, in the longer term.

This report reveals that the Ferghana valley of Northern Tajikistan could provide significant opportunities for wind power as a strategic source of renewable energy. Specifically, the Oqbel range on the north shore of the Qayroqqum reservoir has the potential for significant energy generation. Other tactical opportunities appear to exist in several local communities in the region. With existing network capacity this site could easily feed generation into the regional grid network.

It is recommended that a pilot project implements wind turbines in a small number of villages in the area north of the Qayroqqum reservoir be initiated, initially feeding the generated electricity into a local community initiative (i.e. not into the grid). This pilot will demonstrate the availability of wind as a local energy source and will also provide the opportunity to evaluate the performance of wind turbine technologies when exposed to the local climatic conditions.

This report recommends that a Project Initiation Document (PID) be developed to identify an approach to validating wind power potential in the Ferghana valley. It is expected that there will be significant donor and investment interest expressed in support of such a programme, if Tajik governmental agencies are willing to actively support such an investment and share in the solutions.

This PID will be published before the end of 2011 and it is expected that the project should commence with a pilot installation in spring 2013.

Scope

Sughd is the northern province of Tajikistan and consists of an area of some 25,400 square kilometres with a population of 2,132,100 (2008 estimate). The southern part of the province is the east-west valley of the upper Zarafshan River. North, over the Turkestan Range, is the Ferghana Valley. The province has 30% of Tajikistan's population and one-third of its arable land. It produces two thirds of Tajikistan's GDP.

For the purposes of this report, 'renewable energy provision' has been defined in just three categories of solution: solar; hydro-electric; and, wind.

The scope of this report does not extend to consider issues regarding the implications of its findings such as solution technologies, sourcing, installation, configuration and servicing/maintenance. These subjects will be covered in a Project Initiation Document that is referred to later in the conclusions of this report.

Geographically, the findings were all focused upon the Ferghana Valley. No evidence has, as yet been investigated for the Zarafshan Valley and this valley should be considered out of scope of this report.

Method

3Tier wind maps have been referenced to initially identify those areas in Tajikistan that might have sufficient wind potential (i.e. greater than 3-4m/s average wind speeds).

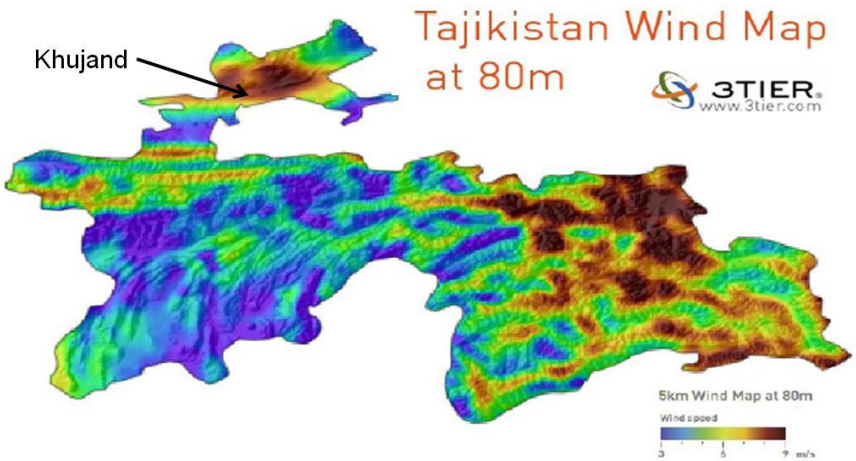
Due to the limited duration of the reconnaissance, evaluations have, in some cases, relied upon anecdotal evidence, combined with experiential information. As part of this reconnaissance, monitoring equipment (anemometer and compass) has been left with a number of individuals to collect data over the next year. Historic meteorological information has been obtained for a period from October 2010 to April 2011 and is documented in Appendix A.

The reconnaissance was performed over a one week period in April 2011.

Findings

The main population centres of Northern Tajikistan in the Ferghana Valley are all on a grid network and electricity is provided by Kairakkhum Hydro-Power Plant (HPP), near Khujand (at the egress of the Syr Darya river from the Qayroqqum reservoir) with a capacity of 126MW. A smaller plant elsewhere in Sughd province, "Histevars" SHPP, also generates to a capacity of 630 KW. However, a number of outlying villages in this region are without electricity and the geopolitical boundaries of the Ferghana valley also make networking of enclaves particularly problematic. Network energy shortages are also common due to the age of the existing generating capacity and increasing peak demands as the population in the region grows.

The 3Tier wind map for Tajikistan can be studied in comparison to the topography and it can be seen that the Ferghana Valley demonstrates wind speeds of 7-9m/s. In particular, the northern shore of the Qayroqqum reservoir and Oqbel range seem ideal locations for good wind generating potential.



NASA data for wind speeds in the Ferghana Valley region are as follows:

Monthly Averaged Wind Speed At 10 m Above The Surface Of The Earth For Terrain Similar To Airports (m/s)

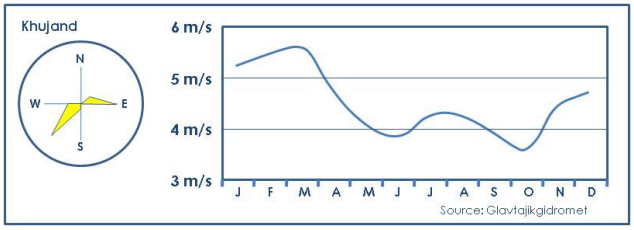
Lat 40.16 Lon 69.44	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average
10-year Average	4.59	4.46	4.09	3.89	3.67	4.18	4.62	4.72	4.50	4.17	4.30	4.32	4.29

Wind monitoring in Chashma (a village just outside Khujand) over the period October 2010 to April 2011 provided the following, in summary:

	Average wind speed for the month (m/s)	% windy days (>5m/s)	Predominant Direction
October	3.0	26%	SE to NE
January	5.6	57%	SW and NE
February	7.2	75%	W, SW and NE
March	6.4	68%	W and NE
April	3.6	24%	Variable

Detail from this monitoring exercise can be reviewed in Appendix A.

Soviet era wind monitoring data was recorded extensively but is not available at the detailed level. A summary chart (see below) produced for a report "Socio-Economic Assessment of the Production and Consumption of Renewable Energy Sources in the Republic of Tajikistan" reveals average monthly wind speeds between 3.5m/s and 5.7m/s. The source data is not available.



Anecdotal evidence all also suggests that the Khujand area is 'windy'.

Conclusion

Hydro-electric power will remain the dominant source of generating capacity in Northern Tajikistan. However, water management issues in the Ferghana Valley are so severe that there is a potential for future conflict. It is strategically important for Tajikistan to demonstrate its willingness to seek energy from other renewable energy resources. Furthermore, the Syr Darya river relies upon glacial melt-water from the Tien Shan mountain and Pamir mountain ranges and glacial shrinkage has been proven, affecting these resources. It is foreseeable that the water availability will significantly reduce in the next three decades. Hydro renewable energy resources are under threat.

Wind power, on the other hand, is an under-utilised and untried resource in this region. There is significant evidence for wind both empirically and anecdotally to the north of the Qayroqqum reservoir and there is an existing grid network infrastructure in the local area to distribute any power generation. The needs and the opportunity for piloting of wind generation in this area are both clear and timely.

Appendix A

Wind monitoring data in Chashma over the period October 2010 to April 2011.

Date	Time	Speed m/s	Temp C	Direction		Date	Time	Speed m/s	Temp C	Direction
05.10.10	12-00	0.7	32.7	NE		07.02.11	12-45	8.1	7.3	W
06.10.10	15-00	2.3	28.2	SE		08.02.11	12-27	5.2	8.3	NE
07.10.10	13-00	11.6	28.2	SE		09.02.11	13-18	7.1	1.4	SW
08.10.10	11-00	5.2	25.6	SE		10.02.11	13-00	13.4	7.5	NE
09.10.10	9-00	0.7	23.0	NE		11.02.11	12-00	5.1	9.5	NE
10.10.10	12-00	0.6	22.1	SE		12.02.11	12-00	4.3	8.4	NE
11.10.10	12-00	6.2	22.2	NE		13.02.11	15-12	1.1	4.6	N
12.10.10	10-00	7.0	21.0	SE		14.02.11	14-20	9.0	8.3	W
13.10.10	12-00	1.0	22.2	NE		15.02.11	13-15	7.6	8.2	NE
14.10.10	09-00	6.0	23.0	NE		16.02.11	14-00	9.2	10.2	NE
15.10.10	10-00	2.9	22.4	NE		17.02.11	12-10	9.3	12.1	W
16.10.10	09-00	0.2	23.0	SE		18.02.11	15-20	9.4	1.5	SW
17.10.10	11-00	0.8	22.0	SE		19.02.11	12-00	9.1	-1.0	SW
18.10.10	16-00	0.6	26.5	NE		20.02.11	12-50	8.1	5.0	NE
19.10.10	14-30	3.6	28.7	SE		21.02.11	16-00	10.2	6.5	NE
20.10.10	13-00	6.6	26.9	SE		22.02.11	11-00	3.3	5.5	NE
21.10.10	14-00	7.0	18.2	SW		23.02.11	15-40	12.0	-3.5	SW
22.10.10	10-00	0.7	20.2	NE		24.02.11	13-25	6.4	-5.4	W
23.10.10	12-00	1.0	21.2	SW		25.02.11	18-00	7.4	-3.3	SW
24.10.10	13-40	3.7	20.1	SE		26.02.11	14-00	8.5	-1.4	SW
25.10.10	10-00	2.2	18.0	NE		27.02.11	13-20	8.1	1.0	SW
26.10.10	10-00	0.2	18.5	SE		28.02.11	16-23	2.2	1.3	W
27.10.10	11-00	2.0	20.0	SE		03.03.11	12-00	2.2	7.1	NE
28.10.10	13-00	0.7	18.5	NE		04.03.11	12-30	8.1	5.2	W
29.10.10	10-00	2.3	18.0	SE		05.03.11	12-45	2.5	8.2	W
30.10.10	10-00	1.7	17.7	NE		06.03.11	15-30	6.0	10.2	W
31.10.10	13-00	2.7	18.2	SE		08.03.11	03-45	5.5	17.1	SE
01.11.10	13-40	3.0	17.0	NE		09.03.11	02-30	2.0	16.6	NW
02.11.10	11-30	2.0	16.9	SE		10.03.11	12-30	9.0	16.4	SE
03.11.10	10-30	1.5	16.7	SE		11.03.11	13-40	6.4	13.7	W
01.01.11	12:00	11.1	2.2	E		12.03.11	15-00	4.3	17.2	SE
02.01.11	12:00	7.2	5.2	NE		13.03.11	16-00	5.5	21.0	NE
03.01.11	12:00	2.2	3.4	NE		14.03.11	16-00	2.7	22.6	SE
04.01.11	12:00	8.0	2.0	SW		15.03.11	14-00	8.4	20.3	NE
05.01.11	12:00	4.4	5.4	NE		16.03.11	13-00	9.3	25.4	W
06.01.11	12:00	4.5	3.6	NE		17.03.11	15-35	11.0	3.6	W
07.01.11	12:00	5.7	-2.3	SW		18.03.11	12-20	14.2	8.7	NE
08.01.11	12:00	3.7	0.0	NE		19.03.11	11-00	7.1	4.6	SW
09.01.11	12:00	1.8	-2.6	NE		20.03.11	14-00	9.4	10.6	NE
10.01.11	12:00	3.2	1.1	NE		21.03.11	12-50	6.5	14.5	SW
11.01.11	12:00	2.3	0.0	SW		22.03.11	13-10	6.4	19.4	W
12.01.11	12:00	2.6	-1.2	SW		23.03.11	12-15	9.3	20.7	W
13.01.11	12:00	2.6	-1.4	SW		24.03.11	17-00	11.2	22.8	NE
17.01.11	12:00	5.6	2.5	SW		25.03.11	11-45	0.7	12.8	N
18.01.11	12:00	5.4	3.1	SW		26.03.11	14-20	3.1	17.6	SW
19.01.11	12:00	8.3	6.6	E		27.03.11	12-00	5.2	10.4	SW
20.01.11	12:00	5.6	3.0	NE		28.03.11	13-30	3.3	16.3	NE
21.01.11	12:00	4.3	7.6	SW		29.03.11	14-45	4.5	19.5	SW
22.01.11	12:00	2.2	5.2	SW		30.03.11	15-00	8.6	19.7	W
23.01.11	12:00	7.9	1.5	SW		31.03.11	15-00	6.1	20.2	W
24.01.11	12:00	2.1	1.6	W		01.04.11	13-30	2.4	12.5	NE
25.01.11	12:00	10.1	5.5	NE		04.04.11	12-00	3.5	10.5	SW
26.01.11	12:00	9.5	7.2	W		05.04.11	14-40	8.3	16.4	NE
27.01.11	12:00	9.5	7.3	W		06.04.11	12-30	2.3	17.1	NE
28.01.11	12:00	5.3	8.5	NE		07.04.11	14-10	1.7	16.3	E
29.01.11	12:00	7.3	11.0	NE		08.04.11	12-00	0.5	22.6	S
30.01.11	12:00	7.4	11.6	NE		09.04.11	16-00	1.5	22.2	SE
31.01.11	12:00	7.0	12.1	E		10.04.11	17-00	1.5	22.1	SE
01.02.11	12-30	6.2	11.3	NE		11.04.11	17-00	0.5	21.3	SE
02.02.11	13-00	4.2	10.1	NE		12.04.11	16-27	1.2	21.0	SW
03.02.11	12-00	11.3	10.2	NE		13.04.11	14-00	8.1	27.1	NW
04.02.11	12-40	8.1	5.1	SE		14.04.11	16-00	1.5	21.2	W
05.02.11	14-10	2.3	3.3	SE		15.04.11	16-00	3.1	21.7	NW
06.02.11	11-30	4.4	4.2	SE		16.04.11	17-38	1.8	22.3	N