

Solar Ski Lift PV Carport and other Solar Wings Cable Based Solutions

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Purpose

- Mounting PV Installation on top of existing infrastructures promotes the concept of double-use of land, without of use of extra landscape
- Cables benefits in minimum amount of material used to fastening PV modules on a base structure

Methode

- The PV modules are mounted by the use of cables about 2 to 10 meters above ground
- Either 3 or up to 8 Standard PV modules are mounted on top of a beam
- The beam is mounted in a fixed position or as one or two axis tracking solution, by the use of a steering cable

Results

- One-axis Solar Wings Tracking – Lonza, plant, D Waldshut, 650kW Solar Wings PV plant two meters on top of a waste disposal site;
23.5% gain in irradiance rel. to fixed sensor
AC Yield 1325 kWh/kWp as average in the first 3 years of operation, southern Germany (see Tab. 2)
- One-axis Solar Skilift – Tenna plant, CH 60kWp 9 meter on top of a skilift annual PV production 3 times electricity demand
- Two-axis Solar Wings Tracking – Flumroc, CH 90kWp 9 meter above industrial outdoor storage fac.
- Cable based PV Carports / development process

Outlook

- Monitoring of the existing cable based solutions will be performed
- Further on development to optimized light weight constructions will go on.

References

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F. Baumgartner et. al; EUPVSEC 2008, 2009, 2010

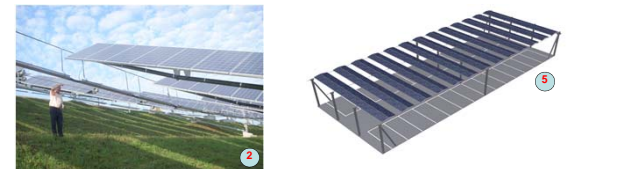
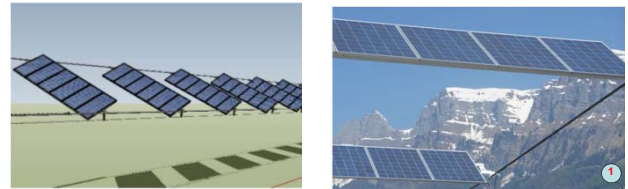


Table 1 Main characteristics of Solar Wings Cable based PV plants

Type – mounted above ...	Height s above ground (meters)	total lengths cables (meters)	Location	Operat ion since	Nomin al Power [kWp]	Mechan ical Trackin g
Industrial parking area ①	4	20	Flums, Switzerland	May 2008	2	1 axis
Waste disposa site ②	2	300	Waldshut, Germany	Dec 2008	654.3	1 axis
Industrial outdoor storage facility ③	9	200	Flums, Switzerland		90	2 axis
Skilift ④	9	320	Tenna, Switzerland	Dec 2011	60.3	1 axis
Carport ⑤	4	40	Germany	Planned 2013	420	no tracking safe position



Table 2 Performance of Solar Wings 654kW cable based PV plant in Waldshut, data measured by Fraunhofer ISE (the combined measurement uncertainty values are estimated to be +/-3% at k=2)

	Monthly Solar Input not tracked at 22° south [kWh/m ²]				Tracked AC yield tracked Generator [Wh/Wp]				Tracking gain sensor		PR
	2009	2010	2011	Mean	2009	2010	2011	Mean	Mean	Mean	
Jan	27.9	22.7	28.7	26.4	29.2	27.2	29.8	28.7	13%	0.96	
Feb	54.3	41	51.4	48.9	54.4	47.0	56.5	52.6	14%	0.95	
Mar	80.1	95.9	118.1	98.0	92.8	114.4	135.6	114.3	21%	0.97	
Apr	133.7	134.3	178.8	148.9	153.0	163.1	195.6	170.6	26%	0.92	
May	151.8	113.2	196.2	153.7	167.1	123.3	207.9	166.1	23%	0.89	
Jun	156.3	140.4	160.9	152.5	177.1	159.5	159.9	165.5	23%	0.88	
Jul	151.9	164.5	175.5	164.0	170.0	183.1	179.2	177.4	26%	0.86	
Aug	162.1	128	187.9	159.3	182.4	145.1	189.8	172.4	25%	0.87	
Sep	110.4	115.8	138.7	121.6	132.9	138.8	135.0	135.6	27%	0.88	
Oct	72.5	69.5	76.9	73.0	87.9	85.9	78.4	84.1	25%	0.92	
Nov	29.5	30.4	30.6	30.2	35.2	36.0	33.1	34.8	20%	0.96	
Dec	22.5	21.2	20.4	21.4	26.6	21.5	19.8	22.6	15%	0.92	
YEAR	1153	1077	1364	1198	1308	1245	1421	1325	23.5%	0.90	

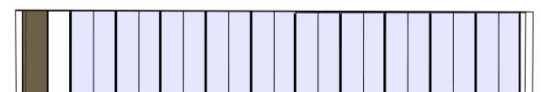


Fig. 5 New light weight PV mounting solution (A. Büchel, F. Baumgartner). In case of strong wind and snow the PV cells are parked in the safe position inside the housing on the left part of the system.