PROCESSING RAW WEATHER DATA INTO WEATHER FILES ACCEPTABLE FOR BUILDING ENERGY PERFORMANCE SIMULATION TOOLS

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Introduction

- All simulation programs need representation of local climate conditions which are relevant for the buildings modeled
  - DBT, RH, WindSpeed, WindDir, ATMPress, Radiation/CC…
- The "typical" weather data are derived from hourly measurements at specific location (national weather stations/building site etc.) for a long period of time
- Special formats:
  - TMY, TMY2, TMY3
  - WYEC, WYEC2
  - TRY
  - AMY
  - IWEC…

Sources of data availability

- BEPST specific
- Tool developers websites
- WMO
- National organizations
- ASHRAE, NREL…
- User support groups

Weather files – general use

- For specific location:
  - For project comparisons or proving building energy performance
    - Long term measurements if available
    - Numerical methods from nearby stations with long term measurements
  - For energy model calibration, online & offline simulations etc.
    - Short term measurements (ongoing)

Raw weather data

- Measured at specific location – national meteorogical organization station network
- Different variables and time interval
- Mainly in UTC (Serbia) – Local Time for simulations
- Solar radiation – measured? Which component?

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	IMS Weather Station data export from MET.																																			
2	Station NIS - RHMZ																																			
3	Exported from Integrated Meteorological System of MicroStep-MIS spol. s r.o.																																			
4	Exported time interval: 12.11.2013 00:00:00 - 30.11.2013 23:59:00 UTC.																																			
5	Exported at 02.12.2013 11:11:33 UTC.																																			
6	Time (UTC)	WindDir 10	Manual	WindSp	Manual	WindSpee	QNH [hPa]	Manual	QFE MET	QFE RWY0	QFE RWY1	QFE RWY2	QFE RWY3	T [degC]	Manual	DP [degC]	Manual	RH [%]	Manual	Prec [mm]	Manual	Prec. Indic	Manual	Tgnd [deg	Manual	SunDur [s]	Manual	GlobalRad	Manual	SnowH [cn	Bar. readir	Bar. altituc	Bar. readir	Virtual ten	Vapour pressure [hPa]	
7	12.11.2013 00:00	0		0		0.8	1020.5		996.1					12.4		9.5		82.5		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
8	12.11.2013 00:01	0		0		0.8	1020.5		996					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
9	12.11.2013 00:02	0		0		0.8	1020.5		996					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
10	12.11.2013 00:03	0		0		0.8	1020.5		996.1					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.6	11.9	
11	12.11.2013 00:04	0		0		0.8	1020.5		996.1					12.3		9.5		83.3		0		0		11.8		0		0			995.9	205.5	995.9	13.6	11.9	
12	12.11.2013 00:05	0		0		0.8	1020.5		996.1					12.2		9.6		84		0		0		11.8		0		0			995.9	205.5	995.9	13.5	11.9	
13	12.11.2013 00:06	0		0		0.8	1020.5		996.1					12.2		9.6		84		0		0		11.8		0		0			996	205.5	996	13.5	11.9	
14	12.11.2013 00:07	0		0		0.8	1020.6		996.1					12.2		9.6		84.2		0		0		11.8		0		0			996	205.5	996	13.5	12	
15	12.11.2013 00:08	0		0		0.8	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
16	12.11.2013 00:09	0		0		0.8	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
17	12.11.2013 00:10	0		0		0.6	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
18	12.11.2013 00:11	0		0		0.9	1020.6		996.1					12.1		9.7		85.3		0		0		11.8		0		0			996	205.5	996	13.4	12	
19	12.11.2013 00:12	0		0		1.4	1020.6		996.1					12.1		9.8		86		0		0		11.8		0		0			996	205.5	996	13.4	12.1	
20	12.11.2013 00:13	0		0		1.4	1020.6		996.2					12.2		9.9		86		0		0		11.8		0		0			996	205.5	996	13.5	12.2	
21	12.11.2013 00:14	0		0		1.4	1020.6		996.1					12.3		10		85.5		0		0		11.8		0		0			996	205.5	996	13.7	12.3	
22	12.11.2013 00:15	0		0		1.4	1020.6		996.2					12.5		10		85		0		0		11.8		0		0			996	205.5	996	13.8	12.3	
23	12.11.2013 00:16	0		0		1.4	1020.6		996.2					12.6		10		84.2		0		0		11.8		0		0			996	205.5	996	13.9	12.3	
24	12.11.2013 00:17	96		0.5		1.4	1020.6		996.1					12.5		9.9		84		0		0		11.8		0		0			996	205.5	996	13.8	12.2	
25	12.11.2013 00:18	93		0.5		1.4	1020.6		996.2					12.5		9.9		84		0		0		11.8		0		0			996	205.5	996	13.8	12.2	
26	12.11.2013 00:19	92		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	
27	12.11.2013 00:20	94		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
28	12.11.2013 00:21	90		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
29	12.11.2013 00:22	92		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
30	12.11.2013 00:23	88		0.6		1.5	1020.7		996.3					12.6		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	
31	12.11.2013 00:24	90		0.7		2.1	1020.7		996.3					12.6		9.9		83.4		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	

EnergyPlus weather file - *.epw

- BEPST – EnergyPlus
- Special file format:
  - Similar in structure to TMY2 and TMY3
  - Easier for processing and visualization (*.csv)

1	Location Titl	Latitude {I	Longitude	TimeZone	Elevation {m}																												
2	LOCATION_N	43.33	21.9	1	202																												
3	Number of D	Title of Design Cond		Design Sta	ColdestM	DB996	DB990	DP996	HR_DP99	DB_DP99	DP990	HR_DP99	DB_DP99	WS004c	DB_WS00	WS010c	DB_WS01	WS_DB99	WD_DB99	Design Sta	HottestM	DBR	DB004	WB_DB00	DB010	WB_DB01	DB020	WB_DB02	WB004	DB_WB00	WB010	DB_WB01	WB020
4				Units	{}	{°C}	{°C}	{°C}	{}	{°C}	{°C}	{}	{°C}	{m/s}	{°C}	{m/s}	{°C}	{m/s}	{deg}	Units	{}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}
5	1	Climate Design Data		Heating	1	-10.9	-8.1	-13.7	1.2	-9.8	-11.2	1.5	-6.8	9.7	-1.9	8.3	-0.5	1.5	320	Cooling	7	13.1	34.3	20.4	32.3	20	30.6	19.5	21.7	31	21	29.7	20.2
6	Number of Ty	Period Na	Period Typ	Period Sta	Period En	<repeat to # periods>																											
7	6	Summer -	Extreme	avg.17	avg.23	Summer -	Typical	jun.29	07.maj	Winter - V	Extreme	dec.22	dec.28	Winter - V	Typical	12.avg	dec.14	Autumn -	Typical	okt.20	okt.26	Spring - W	Typical	04.dec	apr.18								
8	Number of G	Ground Te	Soil Cond	Soil Densi	Soil Speci	Jan {C}	Feb{C}	Mar {C}	Apr {C}	May {C}	Jun {C}	Jul {C}	Aug {C}	Sep {C}	Oct {C}	Nov {C}	Dec {C}	<repeat to Number of temperature depths>															
9	1	1				8.7	6.5	5.7	6.5	8.7	11.8	14.9	17.1	17.9	17.1	14.9	11.8																
10	Leap Year Ob	Daylight S	Daylight S	Number o	Holiday N	Holiday D	<repeat for # Holidays>																										
11	No	0	0	0																													
12	Comment Line #1																																
13	METEONORM Version 6.0																																
14	Comment Line #2																																
15																																	
16	Number of D	Number o	DP Name/	DP Start D	DP Start D	DP End D	<repeat to # Data Periods>																										
17	1	1	Data	Sunday	01.jan	dec.31																											
18	Date	HH:MM	Datasour	DryBulb {	DewPoint	RelHum {%	Atmos Pre	ExtHorzRa	ExtDirRad	HorzIRSky	GloHorzRa	DirNormR	DifHorzRa	GloHorzIl	DirNormIl	DifHorzIll	ZenLum {C	WindDir {	WindSpd	TotSkyCvr	OpaqSkyC	Visibility	Ceiling Hg	PresWeat	PresWeat	Precip Wt	Aerosol O	SnowDept	Days Last	Albedo {.0	Rain {mm	Rain Quantity {hr}	
19	Date	HH:MM	Datasour	Dry Bulb T	Dew Point	Relative H	Atmosphe	Extraterre	Extraterre	Horizonta	Global Hc	Direct No	Diffuse Hc	Global Hc	Direct No	Diffuse Hc	Zenith Lur	Wind Dire	Wind Spe	Total Sky	Opaque S	Visibility	Ceiling He	Present W	Present W	Precipital	Aerosol O	Snow Dep	Days Sinc	Albedo {.0	Liquid Pre	Liquid Precipitation	
20	01.01.2005	01:00	*?*?*?*?*	6.6	3.5	81	98849	0	0	308	0	0	0	0	0	0	9999	128	0.7	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
21	01.01.2005	02:00	*?*?*?*?*	6.4	3.5	82	98849	0	0	307	0	0	0	0	0	0	9999	162	0.4	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
22	01.01.2005	03:00	*?*?*?*?*	6.2	3.1	80	98849	0	0	305	0	0	0	0	0	0	9999	159	0.2	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
23	01.01.2005	04:00	*?*?*?*?*	6.1	2.9	80	98849	0	0	305	0	0	0	0	0	0	9999	265	0.5	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
24	01.01.2005	05:00	*?*?*?*?*	6.1	2.7	79	98849	0	0	304	0	0	0	0	0	0	9999	173	0.5	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
25	01.01.2005	06:00	*?*?*?*?*	6	2.9	80	98849	0	0	304	0	0	0	0	0	0	9999	162	0.9	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
26	01.01.2005	07:00	*?*?*?*?*	6	2.6	79	98849	0	0	303	0	0	0	0	0	0	9999	186	0.5	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
27	01.01.2005	08:00	*?*?*?*?*	6.4	2.4	75	98849	178	1413	303	11	0	11	14	0	14	9999	192	1.4	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
28	01.01.2005	09:00	*?*?*?*?*	7.9	3	71	98849	273	1413	296	98	121	74	108	97	89	9999	169	0.9	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
29	01.01.2005	10:00	*?*?*?*?*	9.2	3.5	67	98849	428	1413	298	167	103	135	182	76	159	9999	208	3.6	10	9	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
30	01.01.2005	11:00	*?*?*?*?*	10.4	2.8	59	98849	528	1413	294	236	146	181	256	124	210	9999	140	2.2	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
31	01.01.2005	12:00	*?*?*?*?*	11.2	3	57	98849	566	1413	296	246	126	196	268	104	226	9999	181	2	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
32	01.01.2005	13:00	*?*?*?*?*	11.7	3.2	56	98849	539	1413	298	232	156	172	253	139	200	9999	145	2.3	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
33	01.01.2005	14:00	*?*?*?*?*	11.4	2.9	56	98845	450	1413	305	125	13	121	141	12	137	9999	103	2.8	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
34	01.01.2005	15:00	*?*?*?*?*	10.8	2.9	58	98841	304	1413	310	55	0	55	63	0	64	9999	145	1.8	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	
35	01.01.2005	16:00	*?*?*?*?*	9.9	3.2	63	98836	112	1413	310	5	0	5	6	0	6	9999	176	3.6	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
36	01.01.2005	17:00	*?*?*?*?*	9.3	3.3	66	98832	2	1413	310	0	0	0	0	0	0	9999	81	1.8	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
37	01.01.2005	18:00	*?*?*?*?*	8.8	3.2	68	98828	0	0	310	0	0	0	0	0	0	9999	155	2.3	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1	
38	01.01.2005	19:00	*?*?*?*?*	8.4	2.9	68	98824	0	0	308	0	0	0	0	0	0	9999	142	1.4	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1	

EnergyPlus weather file - *.epw

- The main problem is converting from:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	IMS Weather Station data export from MET.																																			
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3	Exported from Integrated Meteorological System of MicroStep-MIS spol. s r.o.																																			
4	Exported time interval: 12.11.2013 00:00:00 - 30.11.2013 23:59:00 UTC.																																			
5	Exported at 02.12.2013 11:11:33 UTC.																																			
6	Time (UTC)	WindDir 10	Manual	WindSp	Manual	WindSpee	QNH [hPa]	Manual	QFE MET	QFE RWY(	QFE RWY1	QFE RWY2	QFE RWY3	T [degC]	Manual	DP [degC]	Manual	RH [%]	Manual	Prec [mm]	Manual	Prec. Indic	Manual	Tgnd [deg	Manual	SunDur [s]	Manual	GlobalRad	Manual	SnowH [cn	Bar. readir	Bar. altituc	Bar. readir	Virtual ten	Vapour pressure [hPa]		
7	12.11.2013 00:00	0		0		0.8	1020.5		996.1					12.4		9.5		82.5		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
8	12.11.2013 00:01	0		0		0.8	1020.5		996					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
9	12.11.2013 00:02	0		0		0.8	1020.5		996					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.7	11.9	
10	12.11.2013 00:03	0		0		0.8	1020.5		996.1					12.4		9.6		83		0		0		11.8		0		0			995.9	205.5	995.9	13.6	11.9	
11	12.11.2013 00:04	0		0		0.8	1020.5		996.1					12.3		9.5		83.3		0		0		11.8		0		0			995.9	205.5	995.9	13.6	11.9	
12	12.11.2013 00:05	0		0		0.8	1020.5		996.1					12.2		9.6		84		0		0		11.8		0		0			995.9	205.5	995.9	13.5	11.9	
13	12.11.2013 00:06	0		0		0.8	1020.5		996.1					12.2		9.6		84		0		0		11.8		0		0			996	205.5	996	13.5	11.9	
14	12.11.2013 00:07	0		0		0.8	1020.6		996.1					12.2		9.6		84.2		0		0		11.8		0		0			996	205.5	996	13.5	12	
15	12.11.2013 00:08	0		0		0.8	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
16	12.11.2013 00:09	0		0		0.8	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
17	12.11.2013 00:10	0		0		0.6	1020.6		996.1					12.1		9.7		85		0		0		11.8		0		0			996	205.5	996	13.4	12	
18	12.11.2013 00:11	0		0		0.9	1020.6		996.1					12.1		9.7		85.3		0		0		11.8		0		0			996	205.5	996	13.4	12	
19	12.11.2013 00:12	0		0		1.4	1020.6		996.1					12.1		9.8		86		0		0		11.8		0		0			996	205.5	996	13.4	12.1	
20	12.11.2013 00:13	0		0		1.4	1020.6		996.2					12.2		9.9		86		0		0		11.8		0		0			996	205.5	996	13.5	12.2	
21	12.11.2013 00:14	0		0		1.4	1020.6		996.1					12.3		10		85.5		0		0		11.8		0		0			996	205.5	996	13.7	12.3	
22	12.11.2013 00:15	0		0		1.4	1020.6		996.2					12.5		10		85		0		0		11.8		0		0			996	205.5	996	13.8	12.3	
23	12.11.2013 00:16	0		0		1.4	1020.6		996.2					12.6		10		84.2		0		0		11.8		0		0			996	205.5	996	13.9	12.3	
24	12.11.2013 00:17	96		0.5		1.4	1020.6		996.1					12.5		9.9		84		0		0		11.8		0		0			996	205.5	996	13.8	12.2	
25	12.11.2013 00:18	93		0.5		1.4	1020.6		996.2					12.5		9.9		84		0		0		11.8		0		0			996	205.5	996	13.8	12.2	
26	12.11.2013 00:19	92		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	
27	12.11.2013 00:20	94		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
28	12.11.2013 00:21	90		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
29	12.11.2013 00:22	92		0.6		1.4	1020.7		996.2					12.5		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.8	12.2	
30	12.11.2013 00:23	88		0.6		1.5	1020.7		996.3					12.6		9.9		84		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	
31	12.11.2013 00:24	90		0.7		2.1	1020.7		996.3					12.6		9.9		83.4		0		0		11.8		0		0			996.1	205.5	996.1	13.9	12.2	

into:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1	Location Titl	Latitude {I	Longitude	TimeZone	Elevation {m}																															
2	LOCATION_N	43.33	21.9	1	202																															
3	Number of D	Title of Design Cond		Design Sta	ColdestM	DB996	DB990	DP996	HR_DP99(	DB_DP99(	DP990	HR_DP99(	DB_DP99(	WS004c	DB_WS00	WS010c	DB_WS01	WS_DB99	WD_DB99	Design Sta	HottestM(	DBR	DB004	WB_DB00	DB010	WB_DB01	DB020	WB_DB02	WB004	DB_WB00	WB010	DB_WB01	WB020			
4				Units	{}	{°C}	{°C}	{°C}	{}	{°C}	{°C}	{}	{°C}	{m/s}	{°C}	{m/s}	{°C}	{m/s}	{deg}	Units	{}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}	{°C}			
5	1	Climate Design Data		Heating	1	-10.9	-8.1	-13.7	1.2	-9.8	-11.2	1.5	-6.8	9.7	-1.9	8.3	-0.5	1.5	320	Cooling	7	13.1	34.3	20.4	32.3	20	30.6	19.5	21.7	31	21	29.7	20.2			
6	Number of T	Period Na	Period Ty	Period Sta	Period En	<repeat to # periods>																														
7	6	Summer -	Extreme	avg.17	avg.23	Summer -	Typical	jun.29	07.maj	Winter - V	Extreme	dec.22	dec.28	Winter - V	Typical	12.avg	dec.14	Autumn -	Typical	okt.20	okt.26	Spring - W	Typical	04.dec	apr.18											
8	Number of G	Ground Te	Soil Cond	Soil Dens	Soil Speci	Jan {C}	Feb{C}	Mar {C}	Apr {C}	May {C}	Jun {C}	Jul {C}	Aug {C}	Sep {C}	Oct {C}	Nov {C}	Dec {C}	<repeat to Number of temperature depths>																		
9	1	1			8.7	6.5	5.7	6.5	8.7	11.8	14.9	17.1	17.9	17.1	14.9	11.8																				
10	Leap Year Ob	Daylight S	Daylight S	Number o	Holiday N	Holiday D	<repeat for # Holidays>																													
11	No	0	0	0																																
12	Comment Line #1																																			
13	METEONORM Version 6.0																																			
14	Comment Line #2																																			
15																																				
16	Number of D	Number o	DP Name/	DP Start D	DP Start D	DP End D	<repeat to # Data Periods>																														
17	1	1	Data	Sunday	01.jan	dec.31																															
18	Date	HH:MM	Datasour	DryBulb {(	DewPoint	RelHum {9	Atmos Pre	ExtHorzRa	ExtDirRad	HorzIRSky	GloHorzRa	DirNormR	DifHorzRa	GloHorzIl	DirNormIl	DifHorzIll	ZenLum {C	WindDir {	WindSpd	TotSkyCvr	OpaqSkyC	Visibility	Ceiling Hg	PresWeat	PresWeat	Precip Wt	Aerosol O	SnowDept	Days Last	Albedo {.(	Rain {mm	Rain Quantity {hr}			
19	Date	HH:MM	Datasour	Dry Bulb T	Dew Point	Relative H	Atmosphe	Extraterre	Extraterre	Horizonta	Global Hc	Direct Nor	Diffuse Hc	Global Hc	Direct Nor	Diffuse Hc	Zenith Lur	Wind Dire	Wind Spe	Total Sky	Opaque S	Visibility	Ceiling He	Present W	Present W	Precipital	Aerosol O	Snow Dep	Days Sinc	Albedo {.(	Liquid Pre	Liquid Precipitation			
20	01.01.2005	01:00	*?*?*?*?	6.6	3.5	81	98849	0	0	308	0	0	0	0	0	0	9999	128	0.7	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1			
21	01.01.2005	02:00	*?*?*?*?	6.4	3.5	82	98849	0	0	307	0	0	0	0	0	0	9999	162	0.4	9	8	777.7	77777	9	'9999999	12	0	0	88	0.1	0	1			
22	01.01.2005	03:00	*?*?*?*?	6.2	3.1	80	98849	0	0	305	0	0	0	0	0	0	9999	159	0.2	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1			
23	01.01.2005	04:00	*?*?*?*?	6.1	2.9	80	98849	0	0	305	0	0	0	0	0	0	9999	265	0.5	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1			
24	01.01.2005	05:00	*?*?*?*?	6.1	2.7	79	98849	0	0	304	0	0	0	0	0	0	9999	173	0.5	9	8	777.7	77777	9	'9999999	11	0	0	88	0.1	0	1			

EnergyPlus weather file - *.epw

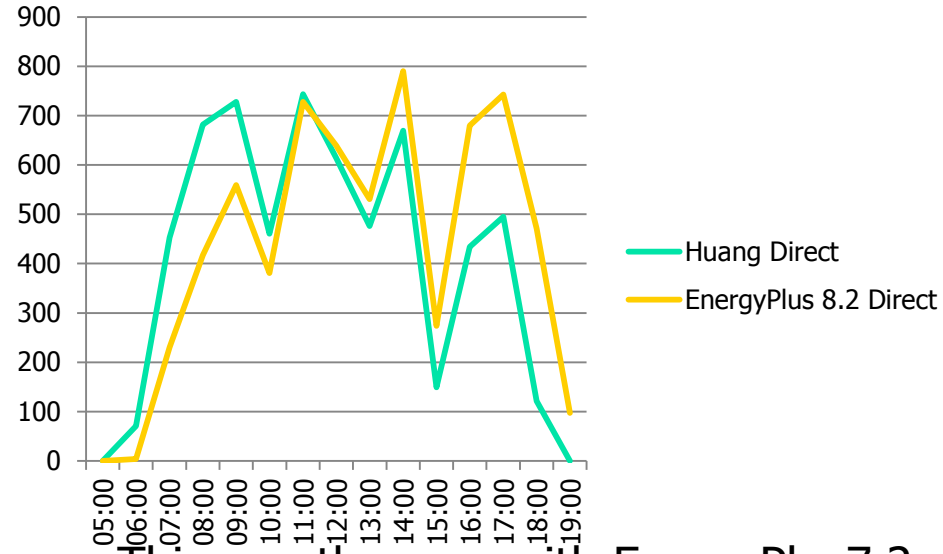
- This is achieved with the use of Weather converter (included in EnergyPlus installation)
- Difficulties observed:
  - A lot of measured data at one minute resolution – selection of the most appropriate data to process
    - Instantaneous readings or averages?
  - Time conversion: from UTC to Standard Local Time
  - Global radiation measured, but EnergyPlus uses Direct Normal and Diffuse Horizontal in heat balance algorithms

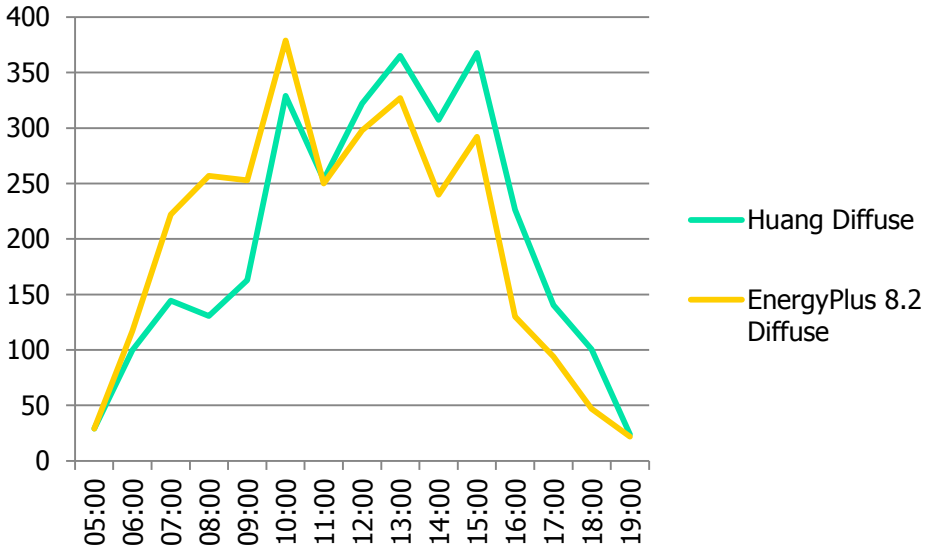
Creating custom *.epw for City of Niš

- #WMO133880
- Averaging data for every 60 minutes (i.e. readings from 15:00 to 15:59 are averaged and stored as data at 16:00)
- Time conversion: from UTC to Standard Local Time (UTC+1 for Niš)
  - Solved in data preparation phase by ofsetting readings for one row
- Global radiation measured
  - Solved by implementing "Perez split"
    - Incorporated in weather converter but with some issues

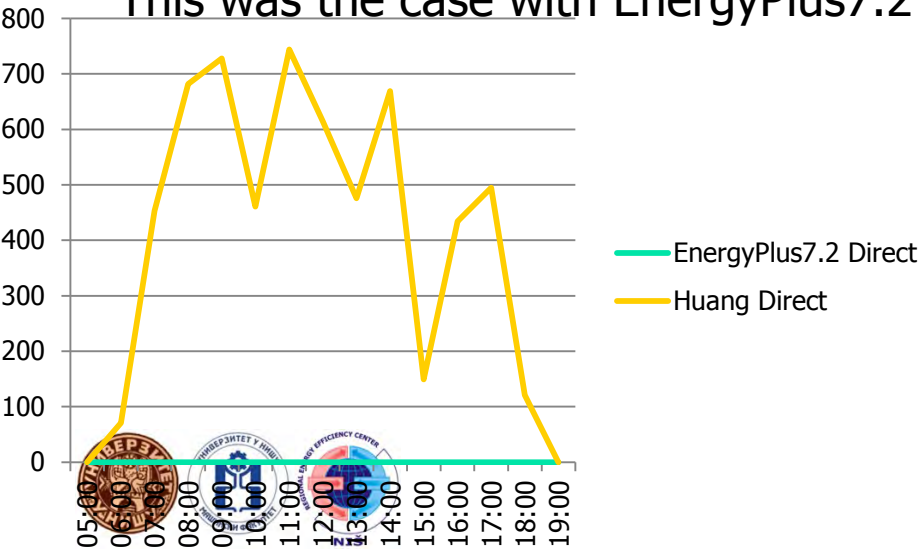
Creating custom *.epw

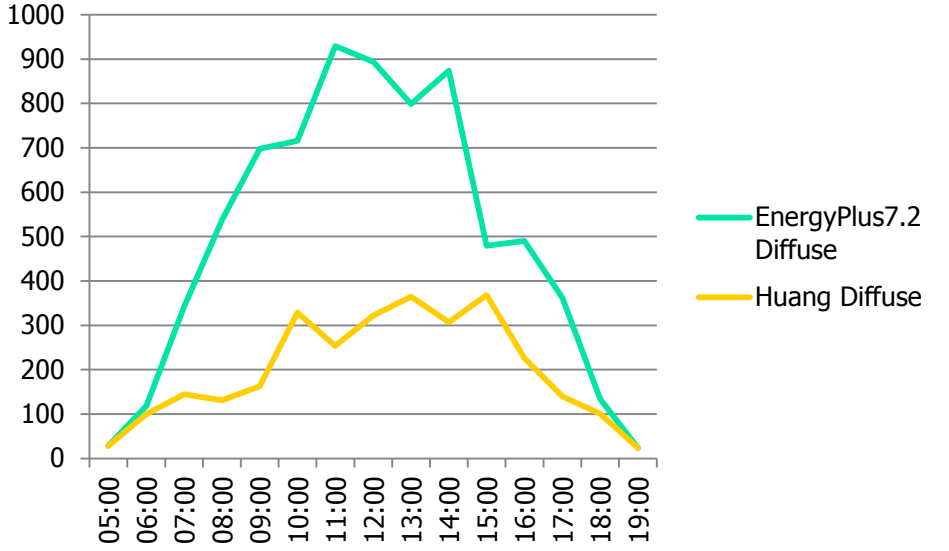
- Not huge difference with EnergyPlus 8.2!





This was the case with EnergyPlus7.2





```
&location
City='Nis'
Country='SRB'
InLat=43.31
InLong=21.89
InTime=1
InElev=202
/

&miscdata
Comments1='This data was prepared by Marko Ignjatovic, based on data provided by Official Meteorogical Opservatory of Nis
Sourcedata='global horizontal radiation measured in the period 15.10.2013-31.08.2014.'
/

&wthdata
InputFileType='Custom'
InFormat='Delimited'
NumInHour=1
DataElements=Day,Month,Year,HH:MM,drybulb,relhum,atmos_pressure,glohorrad,winddir,windspd,dirnorrad,difhorrad
DataUnits='x','x','x','hh:mm','oC','%','Pa','Wh/m2','deg','m/s','Wh/m2','Wh/m2'
DataConversionFactors=1,1,1,1,1,1,1,1,1,1,1,1
DelimiterChar=','
DecimalSymbolChar='.'
/

&datacontrol
NumRecordsToSkip=1
MaxNumRecordsToRead=8760
/
```

This split is performed with the source code provided by Joe Huang

Global Hor	Wind Direc	Wind Spee	DirectRadi	DiffuseRadiation
0	68.12	0.76	0	0
0	51.77	0.55	0	0
0.2	26.95	0.28	0	0.2
29.1	27.37	0.26	0	29.1
118.5	30.17	0.28	70.6	99.8
341.9	80.12	0.39	453	144.5
536.9	256.22	1.04	681.6	130.7
697.6	273.35	1.2	728.3	162.9
716.2	255.75	1.59	460.5	329
929.1	303.17	2.32	743.6	253.5
894.3	305.36	2.27	613.7	322

1	1	Data	Sunday	okt.15	okt.14														
Date	HH:MM	Datasourc	DryBulb {C	DewPoint	RelHum {%	Atmos Pre	ExtHorzRa	ExtDirRad	HorzIRSky	GloHorzRa	DirNormRa	DifHorzRa	GloHorzIll	DirNormIll	DifHorzIllu	ZenLum {C	WindDir {d	WindSpd {i	T
Date	HH:MM	Datasourc	Dry Bulb T	Dew Point	Relative H	Atmosphe	Extraterre	Extraterre	Horizonta	Global Hor	Direct Nor	Diffuse Ho	Global Hor	Direct Nor	Diffuse Ho	Zenith Lum	Wind Direc	Wind Spee	T
11.06.2014	01:00	?9?9?9?9E	19	16.2	84	99401	9999	9999	363	0	0	0	999900	999900	999900	99990	80	0.9	
11.06.2014	02:00	?9?9?9?9E	18.2	16.1	88	99375	9999	9999	360	0	0	0	999900	999900	999900	99990	68	0.8	
11.06.2014	03:00	?9?9?9?9E	17.7	15.8	89	99353	9999	9999	357	0	0	0	999900	999900	999900	99990	51	0.6	
11.06.2014	04:00	?9?9?9?9E	16.9	15.7	92	99372	9999	9999	353	0	0	0	999900	999900	999900	99990	26	0.3	
11.06.2014	05:00	?9?9?9?9E	17.4	15.9	91	99405	9999	9999	355	29	0	29	999900	999900	999900	99990	27	0.3	
11.06.2014	06:00	?9?9?9?9E	18.6	15.9	84	99417	9999	9999	361	119	71	100	999900	999900	999900	99990	30	0.3	
11.06.2014	07:00	?9?9?9?9E	20.7	16	74	99429	9999	9999	372	342	453	145	999900	999900	999900	99990	80	0.4	
11.06.2014	08:00	?9?9?9?9E	22.5	16.6	69	99425	9999	9999	382	537	682	131	999900	999900	999900	99990	256	1	
11.06.2014	09:00	?9?9?9?9E	24.4	16.8	62	99399	9999	9999	392	698	728	163	999900	999900	999900	99990	273	1.2	
11.06.2014	10:00	?9?9?9?9E	26.4	17.6	58	99369	9999	9999	404	716	461	329	999900	999900	999900	99990	255	1.6	
11.06.2014	11:00	?9?9?9?9E	28.5	17.6	52	99347	9999	9999	415	929	744	254	999900	999900	999900	99990	303	2.3	
11.06.2014	12:00	?9?9?9?9E	29.2	16	45	99295	9999	9999	417	894	614	322	999900	999900	999900	99990	305	2.3	
11.06.2014	13:00	?9?9?9?9E	30.2	17.1	46	99256	9999	9999	424	799	476	365	999900	999900	999900	99990	316	2.5	
11.06.2014	14:00	?9?9?9?9E	30.9	16.5	42	99193	9999	9999	427	874	669	307	999900	999900	999900	99990	305	3	
11.06.2014	15:00	?9?9?9?9E	30.2	16.9	45	99173	9999	9999	424	479	149	368	999900	999900	999900	99990	321	2.5	
11.06.2014	16:00	?9?9?9?9E	30.6	16	41	99137	9999	9999	425	490	434	226	999900	999900	999900	99990	311	2.7	
11.06.2014	17:00	?9?9?9?9E	30.4	14.8	39	99125	9999	9999	422	362	495	140	999900	999900	999900	99990	299	2.9	

{d	WindSpd {i	T
ec	Wind Spee	T
30	0.9	
58	0.8	
51	0.6	
26	0.3	
27	0.3	
30	0.3	
30	0.4	
56	1	
73	1.2	
55	1.6	
03	2.3	
05	2.3	
16	2.5	

Conclusion

- Check for availability of data for specific location
  - Standard weather file formats
  - Measurements from local meteorogical station (preferably for several years)
  - Perform on-site measurements (useful only for calibration and online simulations) in order to provide data for weather files
- Select data which can be used within BEPST of choice
- Check if Solar radiation is measured and what components
  - One can obtain Global Radiation from Cloud Cover!
- Perform necessary data pre-processing before creating weather files
- Always check the environmental outputs from BEPST!

Acknowledgments

- Special gratitude to Republic Hydrometeorological Service of Serbia, Observatory in Niš and director Zoran Vasiljević
- Special thanks to Mr Joe Huang from White Box Technologies for providing source code for Direct/Diffuse split

Thank you for Your attention!

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