ESF II project of the University of West Bohemia in Pilsen
reg. number: CZ.02.2.69/0.0/0.0/18_056/0013239

EUROPEAN UNION
European Structural and Investment Funds
Operational Programme Research,
Development and Education

EMEE - Lecture n. 10

Determination of the exchanged goods quantity in the ES under uncertainty conditions

"What to do "not knowing" what it is? - Create a method, based on the knowledge of system functionality, so you could find it, and verify that it works and gives good results. Then this method, by frequent applications, you can enhance and refine it or create new one.“

e.d.

2

Lecture content

1) **Determining the quantity of goods exchanged under conditions of uncertainty - Typical Load (Daily) Diagram (TLD).**
2) **How do we create TLD?**
3) **How to correct TLD from calculated values to real values?**
4) **The settlement amount actually measured with the contractual.**

3

Typical Load Daily Diagram Method

We know that knowledge of LD for the defined time T of electricity delivering or consumption in Coupling Points (CP) is first step for realization of barter trade in ES:

1. We are able to assemble LD for all consumers or suppliers which know their LD – In ES they are entities with the measure equipment of category A,B and if they have some historical data.
2. The consumers (but also more and more suppliers) with measurement category C (integral measurement) are connecting to ES via coupling points (CP), which is also defined as common (CCP).
3. There is necessary to define their LD and without historical measured data, but without knowing it is impossible.
4. Therefore the method of typical load diagrams (TLD) for defined period T. Period of the exchange process electricity in ES for consumers in CP of category with measurement C is one year in CZ ES.
5. TDD is an alternative procedure for determining the size = estimate of the hourly consumption of a group of eligible customers with type C metering, i.e. it replaces the continuous metering for this group of customers.
6. But we always need statistical data (which we can get from measured values from the past) to be able determine LD. However, the question is how many time series (LD) samples we need with approximately the same load profile value, so that we can say that we have obtained a DZ that corresponds to the real (measured) course with sufficient accuracy.

4

Procedure for the determination of normalised TDD

LD = P_{CP} = f (t), can be considered as a time series. A time series is a sequence of values of a statistical character, in ES there are values of P_{CP}[Wh] (call indicators) arranged in terms of time away from the past to the present. :

- System indicator (P_{CC}) must be materially and spatially defined consistently throughout the period T. The indicator has continuously changes over time and time series indicates the indicators status in certain moments. The status values may not directly depend on the length of the interval between readings (at longer intervals may of course lead to greater change.). Simple counting indicator values of this series does not make sense - we get a value that has no meaning.
- But we always need statistical data (measured LD values from the past).
- However, the question is how many measured samples of LD we have to have for customers with approximately the same load profile (composition of appliances) in order to obtain their LD course with sufficient accuracy,

5

Determination of the number of statistical samples

The question is, how many historical data we need to be able compile time series LD with sufficient accuracy:

- Determination of the samples number is given by the formula of mathematical statistics, in which the required number of samples is determined by the reliability level, degree of change value and the accuracy level.
- In the case of ignorance the distribution law of the sampled values is advisable to choose the values of these criteria which are sufficiently large to ensure adequate accuracy.

Therefore, the selected values must be able to ensure:

- reliability level on 95 %, i.e. for a range of two standard deviations,
- degree value changes on the level of 0.5 and - 0.5, i.e. the maximum probability of occurrence, the accuracy is chosen arbitrarily,
- for the purpose of TDD system was chosen accuracy level of 10%, with respect to the cost measurement.

For such values of the selected criteria is available Yamame simplified formula that is a function only of the size of the precision level as the independent variable and the number of customers in the group.

.

6

Yamaneho formula

The value of the accuracy level depends on the number of samples = number of customers in the groups with approximately same LD:

$$V = \frac{n}{1 + n.e^2}$$

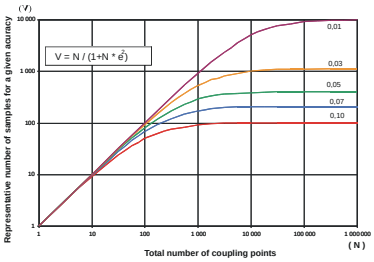
n **– total number of customers in a given TDD,**
e **- accuracy level (value 0,1 = 10 %),**
V **- required number of samples in the group.**

With the chosen level of 10% accuracy occurs the saturation, when the number of elements is on the level of 1000 units and sufficient number is equal to 100 pcs. – see next slide.
In practice TDD it means that the number of measurement samples in all types is the same even the number of elements in the groups are much greater.
The required number of samples have to be increased by 30%, which form a reserve for cases where measurements are for any reason, incomplete or otherwise unusable

7

The dependence of the samples number (V) in the total number of consumers (N) at different levels of accuracy values (e)

The more accuracy with reality we would like to have, more date we need:



If the sufficient accuracy value is 10 %, only 100 data of CP of measure category C we have to have to the disposal LD.

8

Dividing of TDD and Evaluation of statistical TDD samples

Before measuring time series - LD = f (time) - we need to divide customers/suppliers connected to CCP into individual groups according to:

- **consumption/deliver character,**
- **consumption/deliver value of $P_{CCP,Pmax}$),**
- **tariff structure – more component price (LT, MT, HT)**
- **combination privies points.**

- **In CZ, categorization of TDD types for consumers was based on tariff structures from 1. 7. 2001 in ES.**
- **With the respect to tariff structure were 7 types of TDD implemented.**
- **Each class of TDD was monitored the total number of customers and the number of customers at the intervals consumption.**
- **Defined precision of TDD.**
- **Other criteria (failure of samples ...)**
- **The number of measurement samples in each class TDD in ES CZ is 128**
- **Measured consumed values represent the type of electricity load diagrams for each of the selected groups of customers with a comparable nature of electricity consumption.**

9

TLD (TDD) types

Group C = Use electricity for no-residential use - GDP creation.
Group D = Use electricity for residential use:

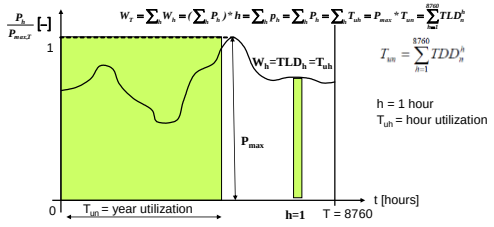
	group	tariff character, duration time	connection to another tariff	customers n.
single tariff	C 01	Jednotarif (pro malou spotřebu)	C1	308 685
TDD č. 1	C 02	Jednotarif (pro střední spotřebu)	C2	253 086
	C 03	Jednotarif (pro vyšší spotřebu)	C3	4 765
double tariff	C 24	Dvoutarif / programové řízení / NT = 8 hodin	---	645
TDD č. 2	C 25	Dvoutarif / operativní řízení / NT = 8 hodin	C1+OL, C2+C4	131 409
	C 26	Dvoutarif / operativní řízení / NT = 8 hodin, vyšší spotřeba	C3+C4	7 864
double tariff	C 34	Dvoutarif / programové řízení / NT = 16 hodin	---	219
	C 35	Dvoutarif / operativní řízení / NT = 16 hodin	---	264
TDD č. 3	C 36	Dvoutarif / operativní řízení / NT = 16 hodin, vyšší spotřeba	---	210
	C 45	Dvoutarif / operativní řízení / NT = 20 hodin	C11	30 812
single tariff	C 46	Dvoutarif / operativní řízení / NT = 20 hodin, vyšší spotřeba	---	493
	C 55	Dvoutarif / tepelné čerpadlo / operativní řízení / NT = 22 hodin	---	142
TDD č. 8	C 60	Jednotarif - speciální sazba pro nemě řené odběry	C12	9 962
	C 62	Jednotarif - speciální sazba pro veřejné osvětlení	C10	32 632
single tariff	D 01	Jednotarif (pro malou spotřebu)	B5	703 596
TDD č. 4	D 02	Jednotarif (pro střední spotřebu)	B	2 578 840
double tariff	D 24	Dvoutarif / programové řízení / NT = 8 hodin		493
TDD č. 5	D 25	Dvoutarif / operativní řízení / NT = 8 hodin	B2H-HIN, N	1 042 186
	D 26	Dvoutarif / operativní řízení / NT = 8 hodin, vyšší spotřeba	BV	72 358
double tariff	D 34	Dvoutarif / programové řízení / NT = 16 hodin	---	1796
TDD č. 6	D 35	Dvoutarif / operativní řízení / NT = 16 hodin	BH	2709
	D 36	Dvoutarif / operativní řízení / NT = 16 hodin, vyšší spotřeba	---	416
double tariff	D 45	Dvoutarif / operativní řízení / NT = 20 hodin	BP	269 429
TDD č. 7	D 46	Dvoutarif / operativní řízení / NT = 20 hodin, vyšší spotřeba	---	1305
	D 55	Dvoutarif / tepelné čerpadlo / operativní řízení / NT = 22 hodin	---	2491
	D 61	Dvoutarif / víkendový režim	---	3300

10

Normalized Load Daily Diagram (Typical) - TDDn

The normalized TDD (index n) of delivery is 8760 relative values of average hourly (h) sampling year (8784 „h“ values in a leap year – duration LD = T), relative to the value of the maximum from annual average hourly values of measurement TDD samples:

Average hourly values, used to determine the TDDn, are converted to normal climatic conditions (in 2005, the thirty-year national average daily temperatures). TDDn values are in the range 0-1 and define the shape of the load profile of the group of end customers under normal climatic conditions. The total sum of the relative values of average hourly values expresses the utilization time of maximal value [hour / year]:

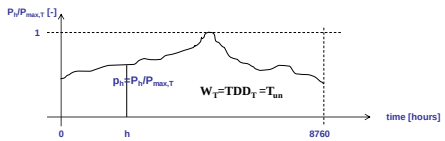


11

TDDn

Determination of the total work in CP with the help of the LD time values:

- **It replace the hourly real value in the CP, which are equipped only with measurement of type C with sufficient accuracy**
- **We can estimate year (T = 8760 h) consumption of the CCP with measurement C = Normalized LD - TDD$_n$**



value of hourly consumption: o_h=W_h= p_h

years consumers consumption: $W_y = O_y * \frac{W_h}{T_{y,utilisat.}} = \frac{p^h}{\sum_{h=1}^{8760} p^h}$

12

Hour consumption of i[th] consumer

Consumer in CCP with „C“ category measurement have to have:

- The LD in the period T of one year (inddex y) O_i^h [Wh] value which can have from:
  - privies (measured) period T
  - information of TDD – new connection
- Then the estimeted (planned) value of LD i-th consumer in h-th hour of the day D in period T is:

$$o_i^h = O_i^y * \frac{p_i^h}{T_{utilis}^y}$$

p_i^h - hour value of t-th type LD of year TDD (8760 values)

$T_{utilsat.}^y = \sum_{h=1}^{8760} p_t^h$ years utilisation time of maximal value P_{max} of TDD

13

Influence of different climatic conditions and position of POM on the course of TDD

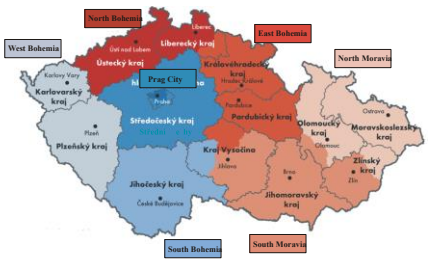
Electricity consumption could be dependent on the location of the POM, taking into account the geographical location as well as the demographic location:

- The territory of the Czech Republic is small in terms of geographical dimensions, so that different natural conditions given by latitude and longitude can significantly reflect in it.
- Areas with a higher altitude, which affects the nature of consumption, occupy a small area and cover a small part of the volume of consumption (each region has its own specific area).
- The nature of settlement, and thus the nature of consumption, is not very different by territory (the greatest weight is in agglomerations).
- TDDs have the same shape in all regions.
- The course of TDD 5 (households with storage water heating or storage heating) differs in individual regions due to the behavior of final customers in these regions.
- There are 7 national and 8 regional type diagrams.
- There are 7 national and 8 regional type diagrams .

14

Dividing TDD8 in CZ on the base of the regions (DS)

- Single categories of TDDn are valued in each CZ regions of territory ES without TDD8, winch is in these regions different :



Distributing systems (consumed CCPs of the consumers in CZ) are situated in the regional regions i.e. in the regions of the privies Regional Energy Enterprises

15

Normalized TDDn – CZ - 2022

- For all categories, the values of consumed power are measured in the individual hours of LD (8760h) and TDDn is compiled:

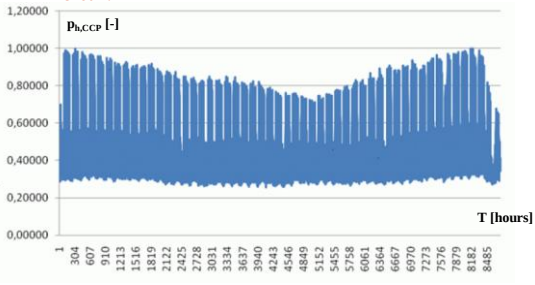
Day	Hour	year serial number	TDD1 CZ C01-C03	TDD2 CZ C24-C36	TDD3 CZ C45-C55	TDD4 CZ D01-D02	TDD5 D24-D26 South Bohem.	TDD5 D24-D26 South Moravia	TDD5 D24-D26 Praha
			p [-]	p [-]	p [-]	p [-]	p [-]	p [-]	p [-]
01.01.2022	1	1	0,40987	0,65165	0,51669	0,44030	0,41770	0,43897	0,46170
01.01.2022	2	2	0,40530	0,68234	0,49035	0,38890	0,34666	0,53347	0,68716
01.01.2022	3	3	0,37864	0,63151	0,51462	0,29874	0,45449	0,57654	0,61762
01.01.2022	4	4	0,35924	0,59874	0,48941	0,26253	0,48886	0,47271	0,60999
01.01.2022	5	5	0,35460	0,54851	0,50255	0,27004	0,45336	0,36451	0,44094
01.01.2022	6	6	0,35133	0,51419	0,53364	0,26746	0,48720	0,33188	0,39899
01.01.2022	7	7	0,36100	0,46259	0,53975	0,27447	0,38659	0,33850	0,31209
01.01.2022	8	8	0,37627	0,41959	0,54244	0,33819	0,32348	0,29652	0,33039
01.01.2022	9	9	0,38212	0,41160	0,54462	0,41631	0,41390	0,32723	0,34682
01.01.2022	10	10	0,41140	0,41800	0,53984	0,51832	0,46254	0,45827	0,35298
01.01.2022	11	11	0,45209	0,41475	0,58378	0,69465	0,39429	0,62127	0,35872
01.01.2022	12	12	0,45192	0,41775	0,57395	0,77541	0,72536	0,64008	0,40072
01.01.2022	13	13	0,46186	0,54940	0,62141	0,71752	0,65207	0,56473	0,65105
01.01.2022	14	14	0,45251	0,63513	0,58466	0,63704	0,89728	0,67843	0,86200
01.01.2022	15	15	0,46082	0,58127	0,58062	0,59317	0,83433	0,85178	0,81583
01.01.2022	16	16	0,47428	0,55683	0,60066	0,63272	0,63337	0,72764	0,54915
01.01.2022	17	17	0,51187	0,52104	0,63076	0,69815	0,49277	0,58759	0,46906
01.01.2022	18	18	0,50106	0,45471	0,59200	0,72334	0,35399	0,49493	0,38447
01.01.2022	19	19	0,49579	0,47325	0,59846	0,73467	0,57170	0,50900	0,38790
01.01.2022	20	20	0,46578	0,48276	0,56076	0,74169	0,63790	0,57215	0,38775
01.01.2022	21	21	0,44514	0,46263	0,59629	0,68220	0,74646	0,47641	0,35812
01.01.2022	22	22	0,42604	0,46294	0,57803	0,60948	0,61215	0,44617	0,34225
01.01.2022	23	23	0,39899	0,50389	0,55872	0,48949	0,70811	0,60061	0,30351

source: Normalizovane_TDD_2022_CZ.xls
https://www.ote-cr.cz/cs/statistika/typove-diagramy-dodavek-elektriny/normalizovane-tdd?date=2022-03-29

16

TDD1 course in CZ ES in period T in CCP

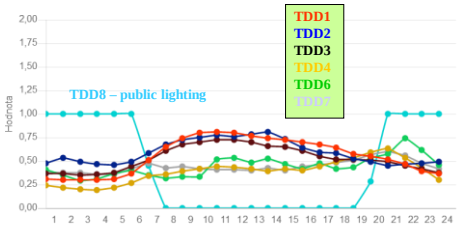
- Graphic normalized load diagram TDD1 course is time row of relative values of the power in CCP in 2009 over the period T of = 8760 h:



17

Graphic courses of TDDn in D= 24h

The colours differ single courses of TDDn (n = 1÷8) except TDD5:

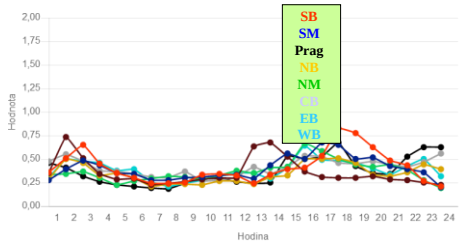


TDD distribution systems (supplying POM to customers in the Czech Republic) are located in the original areas of competence of REZ, i.e. regions.

18

Grafic course TDD5 – CZ in D = 24h

The courses of TDD5 – CZ in single distribution systems of Czech Regions:



19

Procedure of Load Diagram aggregation

LD of P_{CCP} = f (t), can be considered as a time series. A time series is a sequence of values of a statistical character (indicators) arranged in terms of time away from the past to the present.:

- **The aggregation process of times series is based on time indicators – LD values.**
- **Indicator of P_{CCP} value must be materially and spatially defined consistently throughout the period T.**
- **The indicator has continuously changes over time, time series indicates the indicators status in certain moments.**
- **The status values may not directly depend on the length of the interval between readings (at longer intervals may of course lead to greater change.).**
- **Values indicator of this series does not make sense if the time row is inhomogeneous, with the missing values .**

20

How TDDn can differ from real application day

We tray to to know how the statistical LD is deffer from reality its aplication in day D:

Time series can be divided into three parts:

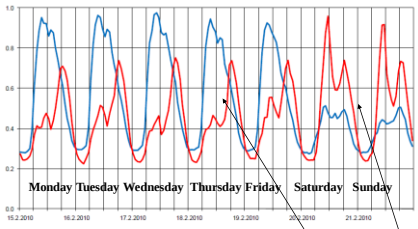
- ***Trend (T)*** **- main direction of development of a long-term trend (increasing range, decreasing range, etc.)**
- ***Periodic (P)*****,** ***oscillations*** **- periodic fluctuations around the trend, long-aligning periodic series:**
  Fluctuations **- having a specific frequency, period length, amplitude (size deviation). Depending on the length fluctuations are:**
  seasonal **- period of one year, fluctuations within a year in certain months and quarters**
  cyclic **- period longer than one year**
  short **- period shorter than one year, fluctuations in months, in weeks, in days**
- ***Randomly (I) (e-residue - error estimate)*** **– small fluctuations caused by intangibles reasons (this component in the time series is always). The basic assumption is that the random component is a random variable with zero mean value (balancing positive and negative fluctuations).**
- **Then time row can be expressed by its components and in additive model:**

$$y(t) = P^{h}_{CCP}(t) = T_t + P_t + I_t$$

21

TDD course P_{CP} in one week – periodic component

The task is to determine how the vales of LD can change in the day D of their application:



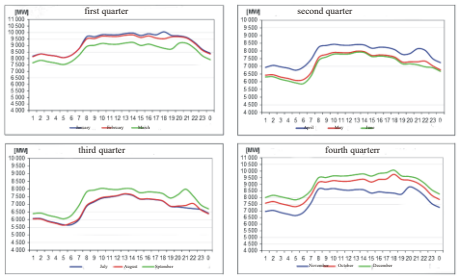
TDD1
TDD4

Short Periodic Components of TDD – working days, weekends

22

Time course of TDD in the year

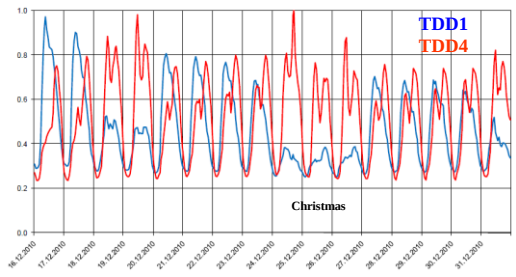
Short periodical components time row of LD – seasons of the year:



23

LD periodical components of the year

Short periodical components time row of LD – December :



24

Expression of time series values using components

A time series composed of individual items can be expressed:

- **Sum of individual components (i) - Additive model:** $y_i = T_i + P_i + e_i$
- **Multiply of components - Multiplicative model :** $y_i = T_i * P_i * e_i$
- **Multiplicative model is possible to trnasform into aditive with logaritmic transformation:** $\log y_i = \log T_i + \log P_i + \log e_i$
- **If we know the course of periodic components of TDD (measured), then the only component that can deviate from the measured value is trend:**
  - **The trend value is most affected by the outdoor temperature, which differs from the temperature at which TDDn was measured.**
  - **The basic relationships between temperature and load, represented by TDD, were determined.**
  - **It has been shown that the relationship between temperature and a given TDD is the same as the relationship between temperature and consumption determined on the basis of this TDD.**
  - **Only its numerical expression changes, in direct proportion to the work done by the diagram (consumption).**

25

Smoothing of time series

- **Trend has a sigmoid course. Time series first moving away from a constant value with increasing speed and then after crossing the inflection point is approaching at low speeds to a constant (**Gompertz curve **has the center of gravity behind the inflection point). For example, time course of the sales volume of consumer goods when the sale first gooes slowly growing interest in the goods and then gradually reached saturation. Similarly to the effect of temperature on load P_E (t). Decreases with rising temperature and decreasing increasing.**
- **Smoothing can be determined by the trend component of time series, i.e. to cleanse it from periodic and random variations. We are looking for a trend indicator as a function depending on the time using regression analysis. In simpler cases, it can be done by the method of least squares. The trend function (mathematical relationship) can be used to predict the settlement for the whole time series**

26

Time series trend smoothing - Gompertz curve

By smoothing it is possible to find out the trend component of the time series, ie to clean it from periodic and random fluctuations:

- **By smoothing, it is possible to determine the trend component of the time series, ie to clean it from periodic and random fluctuations.**
- **We look for the trend as a function of the dependence of the indicator on time using regression analysis.**
- **In simpler cases, this can be done using the least squares method. The trend function (mathematical relationship) can be used to predict the adjustment for the entire time series.**
- **The trend in the exponential model has an S-shaped course.**
- **The time series first moves away from a certain constant with increasing speed and then after exceeding the inflection point it approaches with a decreasing speed to a certain constant, eg the time course of sales of consumer goods, when sales first starts slowly, interest in goods increases and then gradually reaches saturation. It is similar with the effect of temperature**



on the load $P_{CP} = f(t)$, with increasing temperature, consumption decreases and as consumption decreases, so does production.

- **The Gompertz curve has its center of gravity behind the inflection point which respects the inertia of the trend.** $\ln T_t = \ln k + a_1^t \ln a_0$

27

Regression equations for TDD

The basis for this procedure is the explained decomposition of the load course into multiple components (waveforms) with a clearly defined relationship to temperature - the first three terms of the equation:

- **These components are defined by a regression equation, the specific form of which expresses a specific relationship of load to temperature.**
- **The last term is the regression term expressing the effect of the change in temperature compared to normal.**
- **This trend - regression equation, expressed using a modified exponential dependence.**
- **Then the total modified exponential regression equation for the estimated daily course of TDD (using the logistic trend function; S-curve with an inflection point shift of 0.5) has the form:**

$$TDD^{d}_{ESTIMATE} = K + k_d \cdot D + k_p \cdot T_p + k_n \cdot \left(\frac{1}{1+\exp\left(-k_b \cdot \left(k_0 - T_{sk}\right)\right)} - 0.5 \right)$$

28

Regression equation values for TDD

It is true that national actual and normal temperatures are used in the conversion of national TDDs and regional actual and normal temperatures are used in the conversion of regional TDDs in the TDD5 class. Significance of individual coefficients of the equation:

TDD^{d}_{odu}	**daily average value of the estimated (theoretical) course of TDD,**
K	**constant component independent of temperature,**
k_d	**trend regression coefficient,**
D	**order of day of the year,**
k_p	**normal temperature regression coefficient,**
T_p	**daily average value of normal temperature,**
T_{sk}	**daily average value of the actual temperature,**
k_n	**regression coefficient indicating the amplitude of the nonlinear component,**
k_0	**regression coefficient indicating the temperature at the inflection point of the nonlinear functional dependence,**
k_b	**regression coefficient indicating the saturation rate of the nonlinear component.**

29

Temperature smoothing

All normal and actual temperature curves are smoothed exponentially:

- **The conversion is performed for each hour and each TDD class.**
- **One normal value and one actual smoothed temperature value are used for all hours of the day.**
- **For practical use (for sufficient accuracy), it was sufficient to include the first ten members of the exponential smoothing in the above formula (the last temperature is therefore used from i =1-9).**
- **The weight of the influence of temperatures in the previous days is decreasing.**
- **It is smoothed according to the following formula (smoothing respects the delay of the changed temperature).**

$$T_{smoor,i} = \frac{1}{2}\cdot T_i + \frac{1}{4}\cdot T_{i-1} + \frac{1}{8}\cdot T_{i-2} + \frac{1}{16}\cdot T_{i-3} + \frac{1}{32}\cdot T_{i-4} + \frac{1}{64}\cdot T_{i-5} + \frac{1}{128}\cdot T_{i-6} + \frac{1}{256}\cdot T_{i-7} + \\ + \frac{1}{512}\cdot T_{i-8} + \frac{1}{1024}\cdot T_{i-9}$$

30

Relationship between normal and real TDD

Based on the definition of the static method, the smoothing regression equation is used to determine the diagram, both for the normal and for the actual diagram:

- This gives two regression equations for the daily average smoothed temperatures:
  - for normal temperature (computational) Tvp,
  - for the average value of the actual temperature Tsk in the initial measurement period.
- These equations differ only by the smoothed daily temperature in the exponential term.
- The error caused by the mathematical modeling of the effect of temperature thus enters the resulting formula for the actual TDD only in the form of the difference of the nonlinear members of the regression equation.
- Then, for each day d, a regression coefficient can be defined given by the ratio of the normalized and the actual TDZ:

$$K^{d}_{T-NORM} = \frac{TDD^{d}_{T-NORM}}{TDD^{d}_{T-REAL-DEFOLT}}$$

- If we multiply all the hourly values of TDD compiled from the measurement in the initial period by this coefficient every day, then we get the hourly course of TDD converted to normal temperatures:

$$TDD^{h}_{T-NORM} = K^{d}_{T-NORM} \cdot TDD^{h}_{T\ SK\ DEFOLT}$$

31

Waether influence (temperature) on TDD

The temperature conversion takes place according to the following formula where HD is the number of hours on a given day:

- **The number of hours in each day of the year can vary - change in summer winter time.**

$$k = \frac{\frac{\sum_{h=1}^{H_D} TDD^{h}_{nt}}{H_D} + k_{n_t,D} \cdot \left[\frac{1}{1+\exp\left(-k_{b_t,D}\cdot\left(k_{0_t,D} - T_{vsk_D}\right)\right)} - \frac{1}{1+\exp\left(-k_{b_t,D}\cdot\left(k_{0_t,D} - T_{vp}\right)\right)}\right]}{\frac{\sum_{h=1}^{H_D} TDD^{h}_{nt}}{H_D}}$$

- **TDD recalculated = k . TDD normed**

32

Regression coefficients for conversion

Coefficients for conversion of nationally valid TDDn

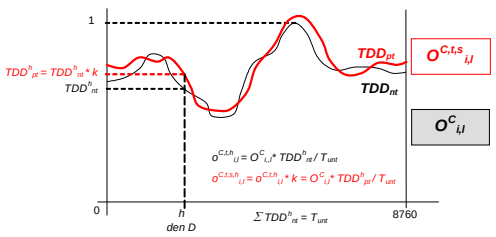
		TDD2	TDD3	TDD6	TDD7
Pracovní dny	k_{n_tP}	0.13984	0.35727	0.44138	0.57447
	k_{b_tP}	0.31785	0.27547	0.20091	0.20789
	k_{0_tP}	1.68502	2.20507	3.46311	2.80810
Soboty	k_{n_tS}	0.13418	0.37579	0.47672	0.60096
	k_{b_tS}	0.31134	0.27093	0.18543	0.20092
	k_{0_tS}	1.42098	1.36993	3.54568	3.15606
Neděle	k_{n_tN}	0.14042	0.35736	0.49830	0.64812
	k_{b_tN}	0.36442	0.28605	0.17605	0.18001
	k_{0_tN}	2.15124	1.50823	2.83578	1.81956

- **TDD5 coefficients are separate for each CZ region.**
- **The coefficients TDD1 and TDD2 are not determined - the effect of temperature on LD values has not been proven.**
- **The coefficient for TDD8 is also not calculated, it is a diagram of public lighting and the effect of temperature does not apply there.**

33

The course of recalculated normalise TDD

Conversion of consumption to actual climatic conditions on day D



34

The possibility to TDD use for LD determination to real conditions

- **We can use one time measured LD or to measure it permanently:**

- **Static TDD method is based on determining normalised TDD for designated groups of final customers with measurement type C and their conversion into actual weather conditions on the day D.**
- **Dynamic TDD method is also based on the normalized TDD, but they are not converted to actual weather conditions on the day D (used for static methods). These are based on measurements of samples on day D and data transmission, on the basis of which consists of standard 24 values of TDD of individual groups of final customers on day D.**

35

Conclusion

- **Knowledge of the course of the LD for the monitored period of evaluation of the exchange process in the ES is essential.**
- **To evaluate CP measurements equipped with category C measuring devices, the shift process time is used T = 1 year.**
- **If the CP already has a measured annual consumption, this annual consumption is taken as the basis for calculating the planned hourly consumption value of this customer, i.e. this consumption is divided by the annual use time of the maximum and multiplies the relative value of consumption (normal temperature corrected).**
- **If it is a new customer, then its annual consumption value is determined according to a standardized diagram.**
- **If the CP moves to another supplier, a deduction must be made on that day and a settlement must be made on that day. This is followed by the usual method of determining DZ for the next days.**

36