ICT Support of PV Education and PV Data Web Presentation at FEE CTU in Prague

Martin Molhanec
Czech Technical University in Prague

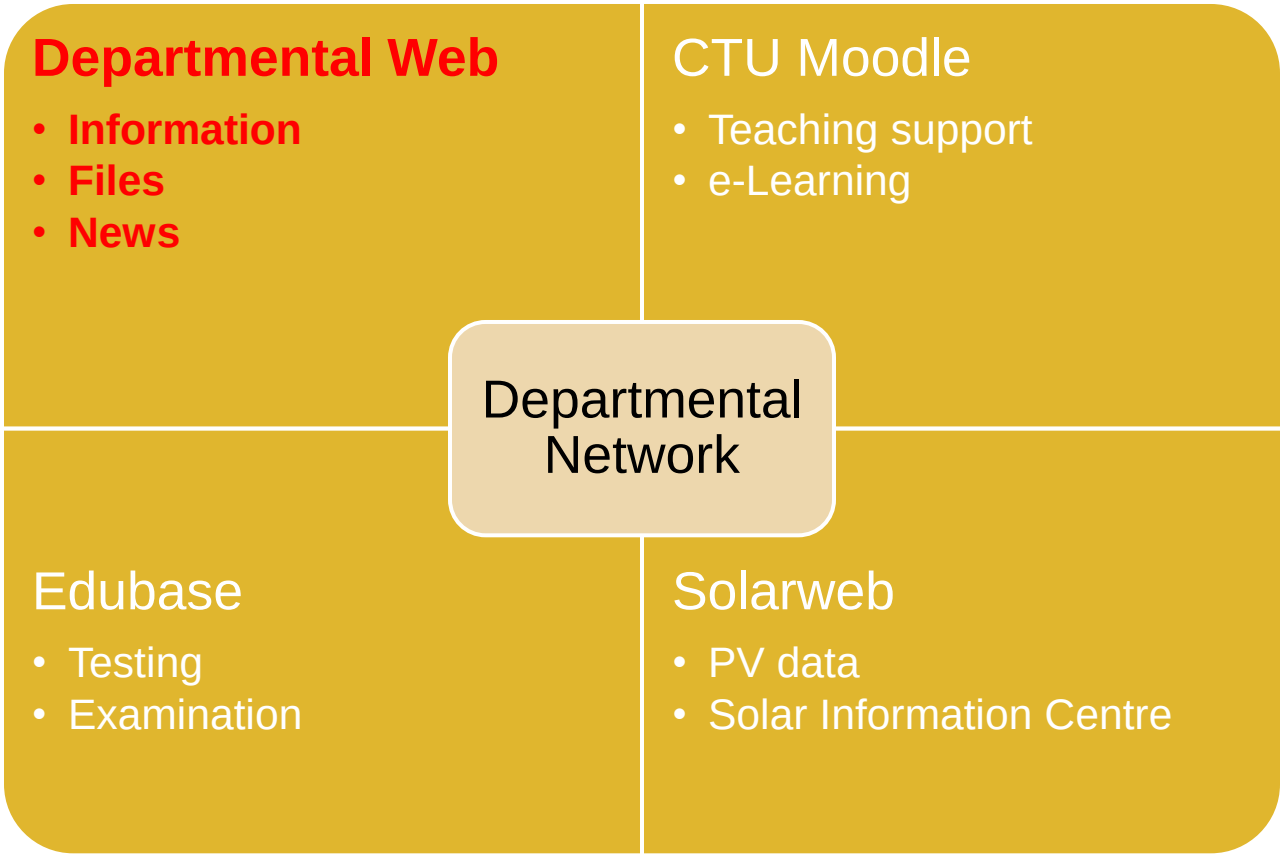
Structure of discourse

- Introduction
  - Structure of departmental network
- Departmental web
- Moodle
- Edubase
- Solarweb
  - Present status
  - Internet Connectivity
  - Detailed description
  - New web site
- Conclusion
  - Future and ideas

Introduction

Basic information about our network

Departmental network



Departmental Web

XWiki platform

Photovoltaic Systems Diagnostics Lab

Právě se nacházíte: ČVUT / Fakulta elektrotechnická / Katedra elektrotechnologie / LDFS / O laboratoři

České vysoké učení technické v Praze
FAKULTA ELEKTROTECHNICKÁ

LDFS Laboratoř Diagnostiky Fotovoltaických Systémů

O LABORATOŘI | SLUŽBY | VĚDA A VÝZKUM | AKREDITACE | KONTAKTY | PRO VÁS

Laboratoř diagnostiky fotovoltaických systémů

Stručně o laboratoři

Laboratoř diagnostiky fotovoltaických systémů, která je součástí Katedry elektrotechnologie FEL ČVUT, byla slavnostně otevřena 5. listopadu 2010 (fotogalerie). Zabývá se zejména měřením fotovoltaických modulů tzv. flash testerem, který umožňuje ověřit mimo jiné jmenovitý výkon modulu. Vedoucím laboratoře je v současné době Ing. Ladislava Černá, která je postgraduální studentkou na katedře technologie. Dalšími zaměstnanci jsou Prof. Ing. Vítězslav Benda, CSc., který zastává funkci Odborného garanta laboratoře a Ing. Pavel Hrzina, PhD., který pracuje jako Manažer kvality laboratoře a zároveň je i jejím Metrologem.

Laboratoř je vybavena profesionálním flash testerem švýcarské firmy PASAN - Sun Simulator IIIc, který splňuje požadavky na zařízení třídy AA (dle IEC 60904-9) pro zkoušení modulů při umělém osvětlení. Kromě flash testů nabízí laboratoř i další služby a měření:

- zkoušky izolační pevnosti modulů na testeru HiPot Sefelec SXS56,
- termografická měření ve spolupráci s firmou Workswell,
- diagnostiku poruch a dle možností jejich opravu,
- diagnostiku fotovoltaických článků, tj. určení parametrů článků, LBIV, LBIC, apod.,
- poradenské služby.

Hlavním cílem laboratoře je získat akreditaci pro svou činnost, která podpoří věrohodnost laboratoře.

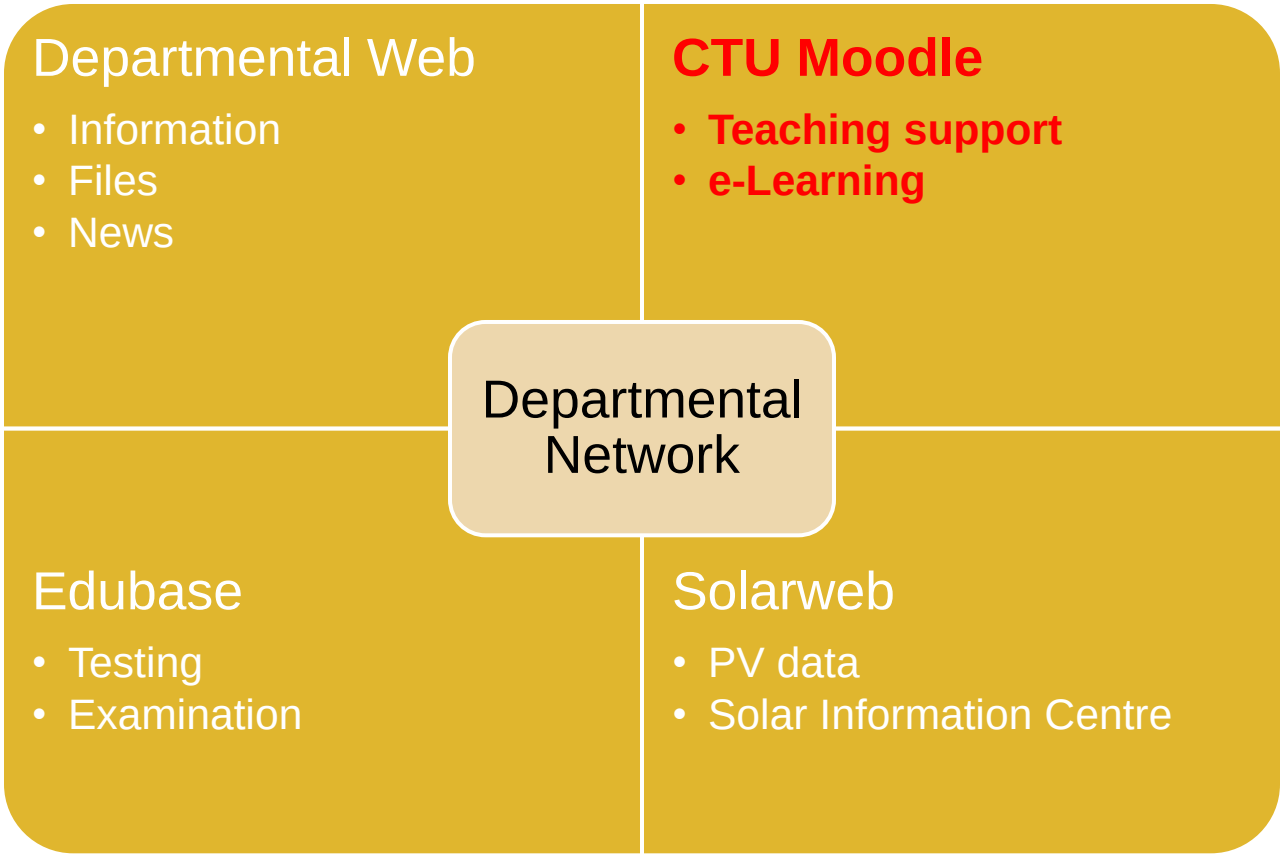
Spolupráce

Laboratoř spolupracuje při řešení úkolů s následujícími organizacemi a firmami:

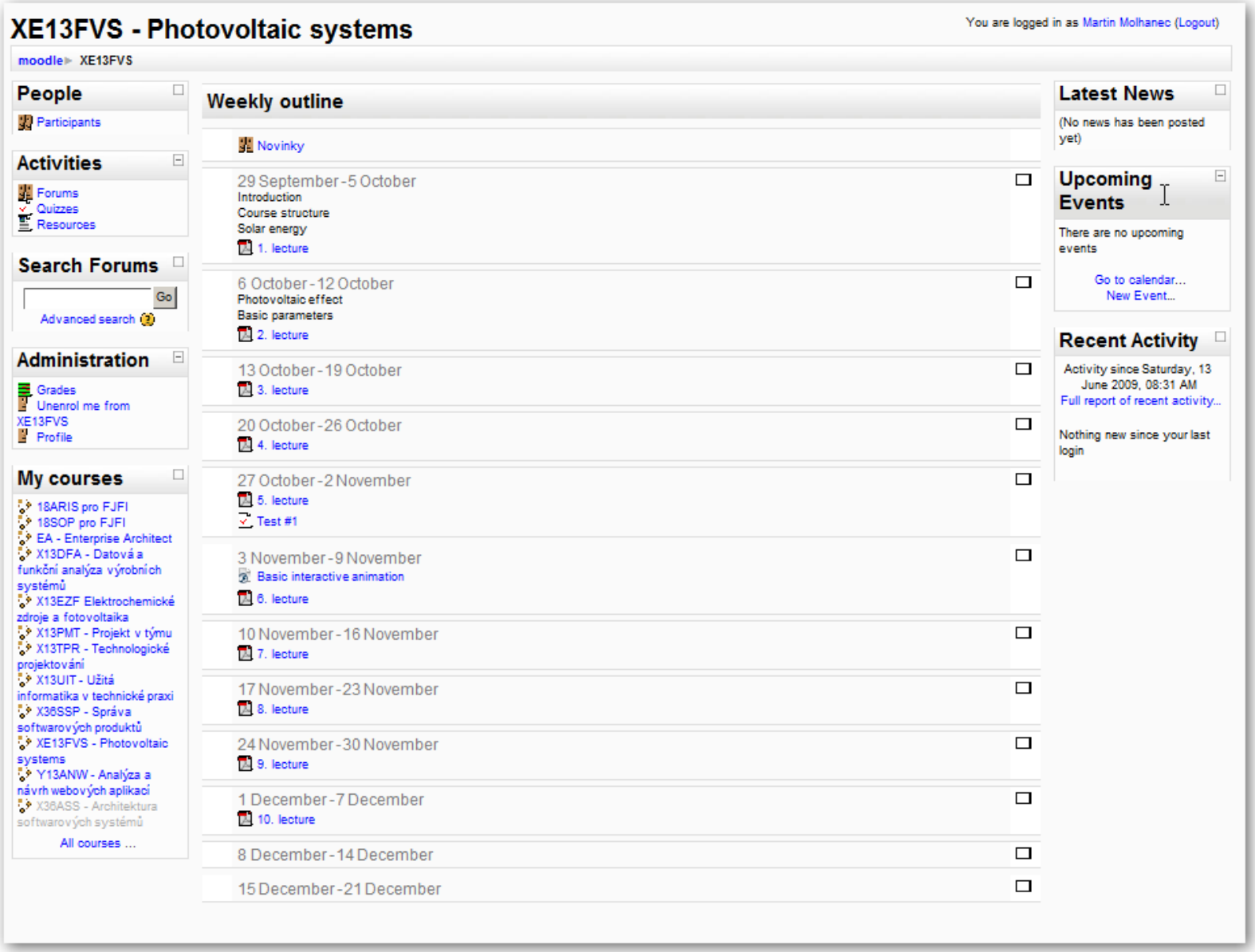
TÜV SÜD Czech Partner

Workswell

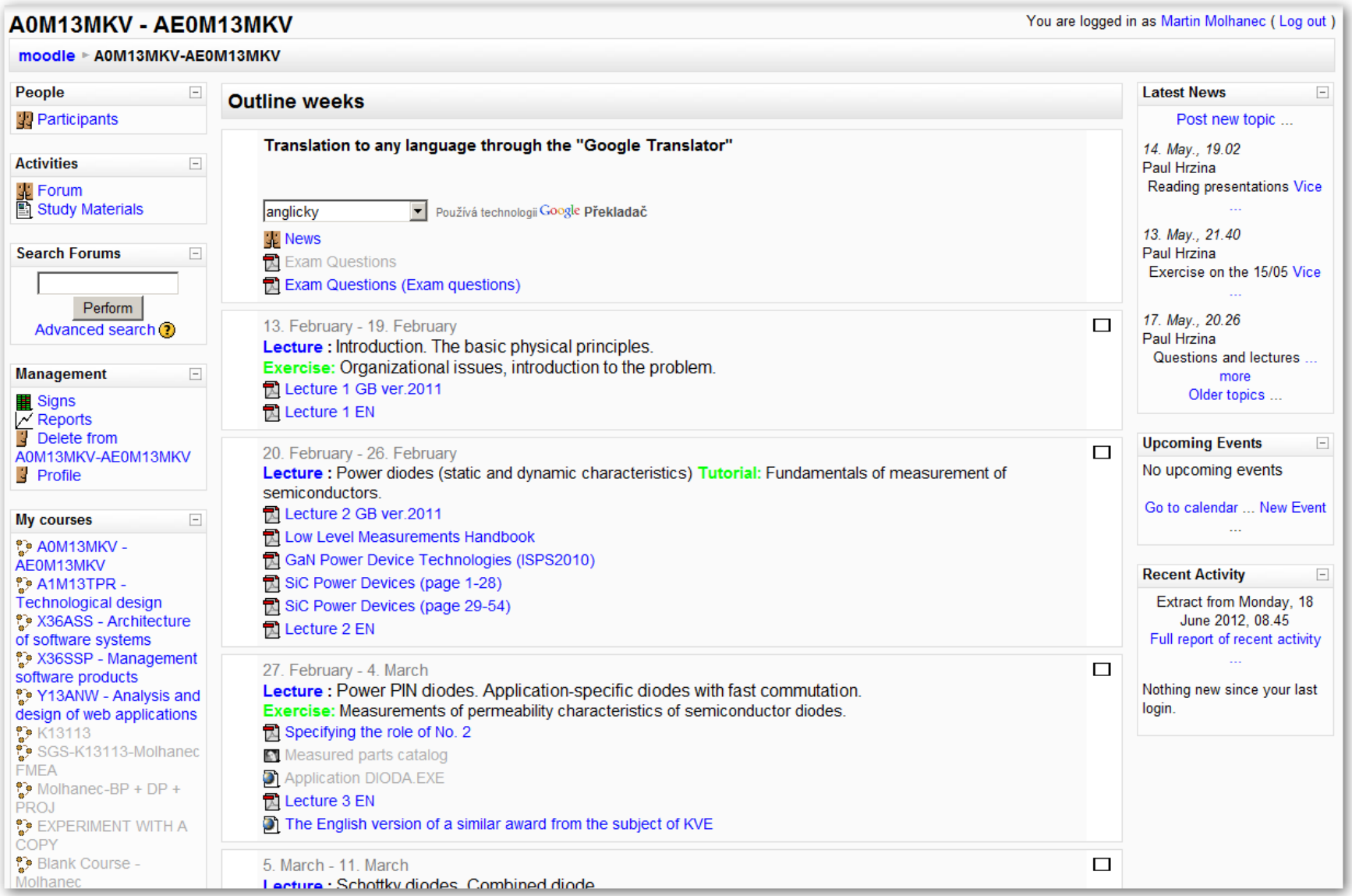
Departmental network



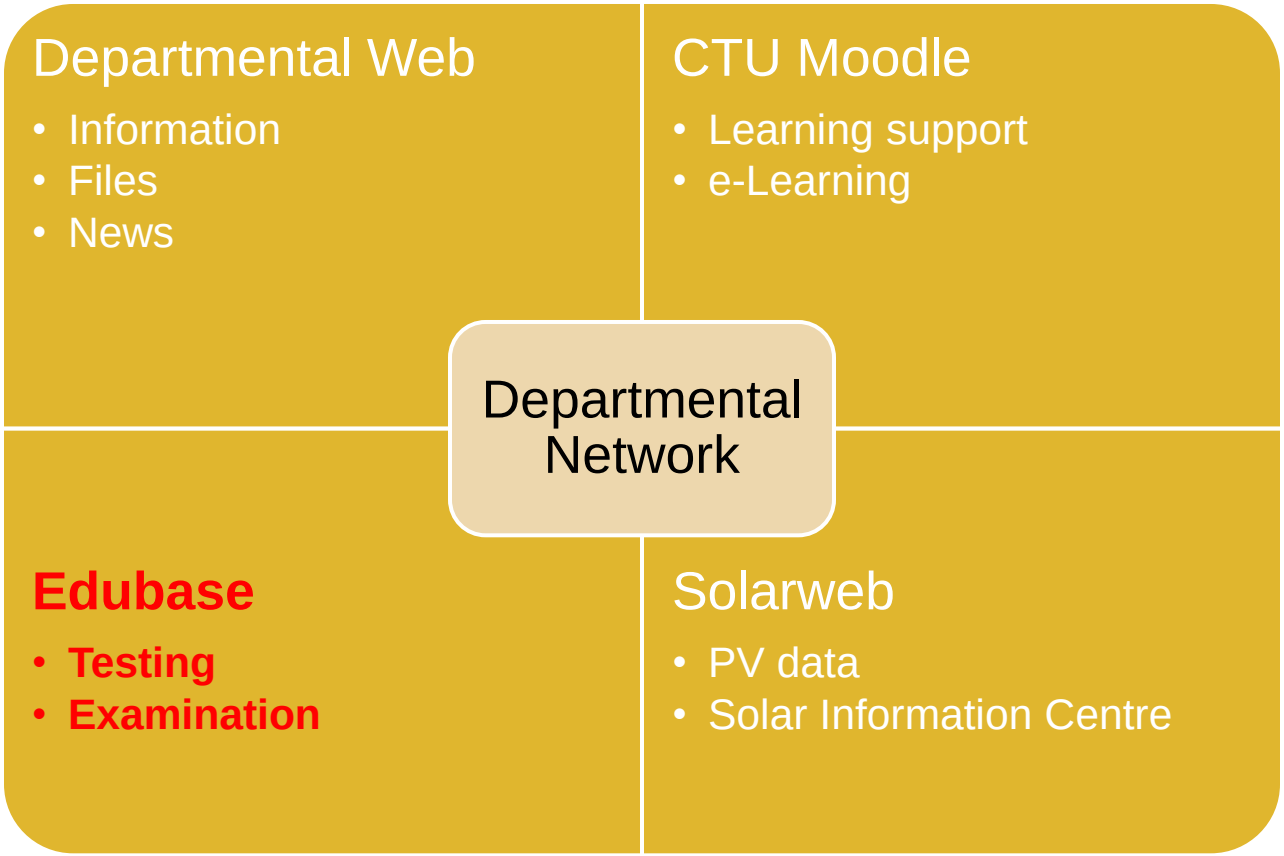
CTU Moodle


XE13FVS - Photovoltaic systems
You are logged in as Martin Molhanec (Logout)
moodle ▸ XE13FVS
People
Participants
Activities
Forums
Quizzes
Resources
Search Forums
Go
Advanced search
Administration
Grades
Unenrol me from XE13FVS
Profile
My courses
18ARIS pro FJFI
18SOP pro FJFI
EA - Enterprise Architect
X13DFA - Datová a funkční analýza výrobních systémů
X13EZF Elektrochemické zdroje a fotovoltaika
X13PMT - Projekt v týmu
X13TPR - Technologické projektování
X13UIT - Užitá informatika v technické praxi
X36SSP - Správa softwarových produktů
XE13FVS - Photovoltaic systems
Y13ANW - Analýza a návrh webových aplikací
X36ASS - Architektura softwarových systémů
All courses ...
Weekly outline
Novinky
29 September - 5 October
Introduction
Course structure
Solar energy
1. lecture
6 October - 12 October
Photovoltaic effect
Basic parameters
2. lecture
13 October - 19 October
3. lecture
20 October - 26 October
4. lecture
27 October - 2 November
5. lecture
Test #1
3 November - 9 November
Basic interactive animation
6. lecture
10 November - 16 November
7. lecture
17 November - 23 November
8. lecture
24 November - 30 November
9. lecture
1 December - 7 December
10. lecture
8 December - 14 December
15 December - 21 December
Latest News
(No news has been posted yet)
Upcoming Events
There are no upcoming events
Go to calendar...
New Event...
Recent Activity
Activity since Saturday, 13 June 2009, 08:31 AM
Full report of recent activity...
Nothing new since your last login

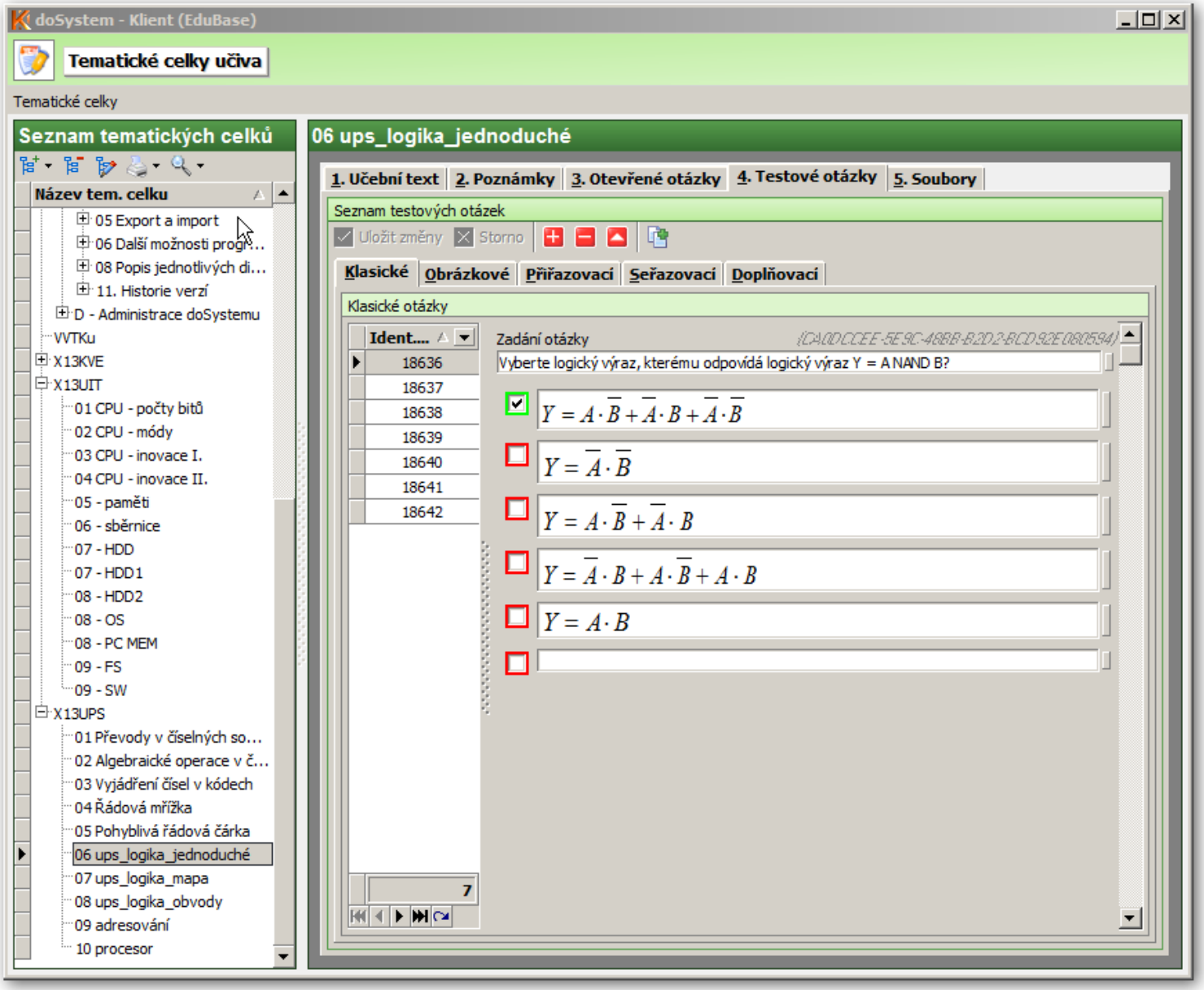
CTU Moodle


A0M13MKV - AE0M13MKV
You are logged in as Martin Molhanec (Log out)
moodle ▸ A0M13MKV-AE0M13MKV
People
Participants
Activities
Forum
Study Materials
Search Forums
Perform
Advanced search
Management
Signs
Reports
Delete from A0M13MKV-AE0M13MKV
Profile
My courses
A0M13MKV - AE0M13MKV
A1M13TPR - Technological design
X36ASS - Architecture of software systems
X36SSP - Management software products
Y13ANW - Analysis and design of web applications
K13113
SGS-K13113-Molhanec FMEA
Molhanec-BP + DP + PROJ
EXPERIMENT WITH A COPY
Blank Course - Molhanec
Outline weeks
Translation to any language through the "Google Translator"
anglicky
Používá technologii Google Překladač
News
Exam Questions
Exam Questions (Exam questions)
13. February - 19. February
Lecture : Introduction. The basic physical principles.
Exercise: Organizational issues, introduction to the problem.
Lecture 1 GB ver.2011
Lecture 1 EN
20. February - 26. February
Lecture : Power diodes (static and dynamic characteristics) Tutorial: Fundamentals of measurement of semiconductors.
Lecture 2 GB ver.2011
Low Level Measurements Handbook
GaN Power Device Technologies (ISPS2010)
SiC Power Devices (page 1-28)
SiC Power Devices (page 29-54)
Lecture 2 EN
27. February - 4. March
Lecture : Power PIN diodes. Application-specific diodes with fast commutation.
Exercise: Measurements of permeability characteristics of semiconductor diodes.
Specifying the role of No. 2
Measured parts catalog
Application DIODA.EXE
Lecture 3 EN
The English version of a similar award from the subject of KVE
5. March - 11. March
Lecture : Schottky diodes. Combined diode
Latest News
Post new topic ...
14. May., 19.02
Paul Hrzina
Reading presentations Vice ...
13. May., 21.40
Paul Hrzina
Exercise on the 15/05 Vice ...
17. May., 20.26
Paul Hrzina
Questions and lectures ... more
Older topics ...
Upcoming Events
No upcoming events
Go to calendar ... New Event ...
Recent Activity
Extract from Monday, 18 June 2012, 08.45
Full report of recent activity ...
Nothing new since your last login.

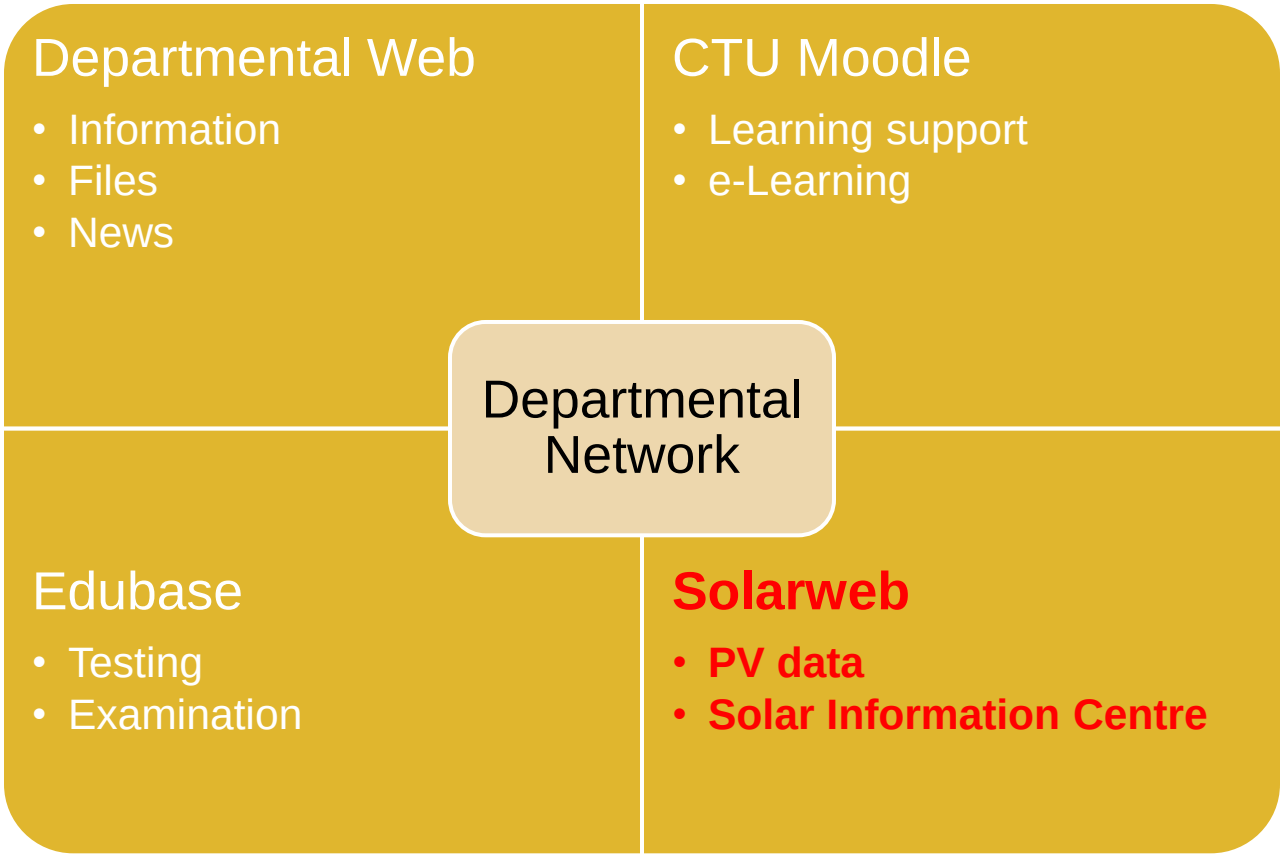
Departmental network



Edubase


doSystem - Klient (EduBase)
Tematické celky učiva
Tematické celky
Seznam tematických celků
Název tem. celku
05 Export a import
06 Další možnosti progr...
08 Popis jednotlivých di...
11. Historie verzí
D - Administrace doSystemu
VVTKu
X13KVE
X13UIT
01 CPU - počty bitů
02 CPU - módy
03 CPU - inovace I.
04 CPU - inovace II.
05 - paměti
06 - sběrnice
07 - HDD
07 - HDD1
08 - HDD2
08 - OS
08 - PC MEM
09 - FS
09 - SW
X13UPS
01 Převody v číselných so...
02 Algebraické operace v č...
03 Vyjádření čísel v kódech
04 Řádová mřížka
05 Pohyblivá řádová čárka
06 ups_logika_jednoduché
07 ups_logika_mapa
08 ups_logika_obvody
09 adresování
10 procesor
06 ups_logika_jednoduché
1. Učební text
2. Poznámky
3. Otevřené otázky
4. Testové otázky
5. Soubory
Seznam testových otázek
Uložit změny
Storno
Klasické
Obrázkové
Přiřazovací
Seřazovací
Doplňovací
Klasické otázky
Ident....
18636
18637
18638
18639
18640
18641
18642
Zadání otázky
Vyberte logický výraz, kterému odpovídá logický výraz Y = A NAND B?
$Y = A \cdot \overline{B} + \overline{A} \cdot B + \overline{A} \cdot \overline{B}$
$Y = \overline{A} \cdot \overline{B}$
$Y = A \cdot \overline{B} + \overline{A} \cdot B$
$Y = \overline{A} \cdot B + A \cdot \overline{B} + A \cdot B$
$Y = A \cdot B$
7

Departmental network



Solarweb as a part of our departmental network

A detailed description

The Present Status of PVDA

- About 9 years old (installed in 2002 year)
- Located on the roof of our faculty
  - See photo on the next slide
- 3 independent system
  - @ 1kW per system
- Each system has 10 PV panels
- The PV system is connected to the standard 230 V, 50 Hz power supply network
- All produced energy is consumed at faculty building

Emplacement of our solar panels on the roof of faculty

Gathered PV Data

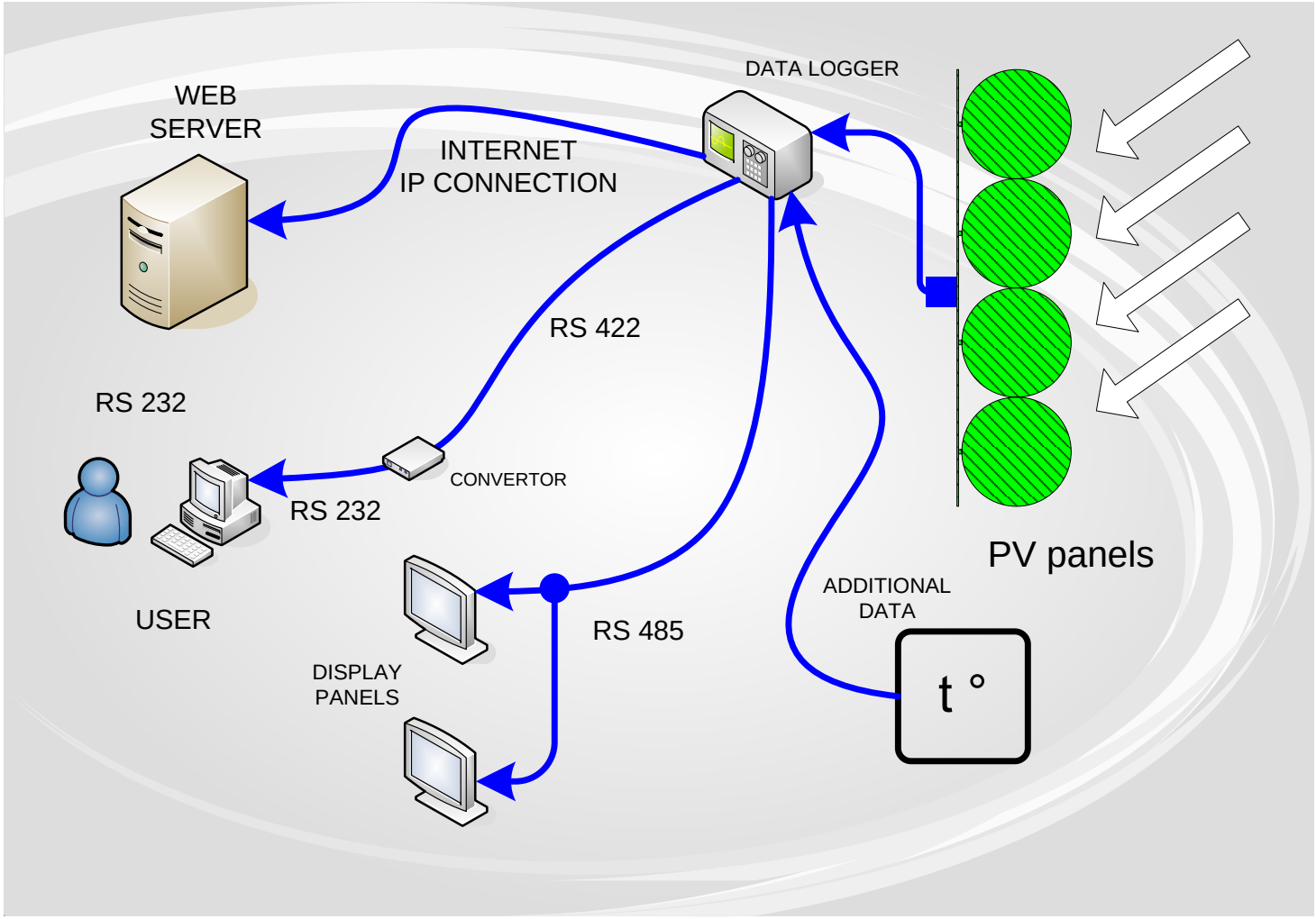
- sum of energy

- direct-current voltage of panel A(inclination 45°)
- direct-current current of panel A(inclination 45°)
- direct-current voltage of panel B(variable inclination)
- direct-current current of panel B(variable inclination)
- direct-current voltage of panel C(inclination 90°)
- direct-current current of panel C(inclination 90°)

- momentary performance supplied to grid (Pac)

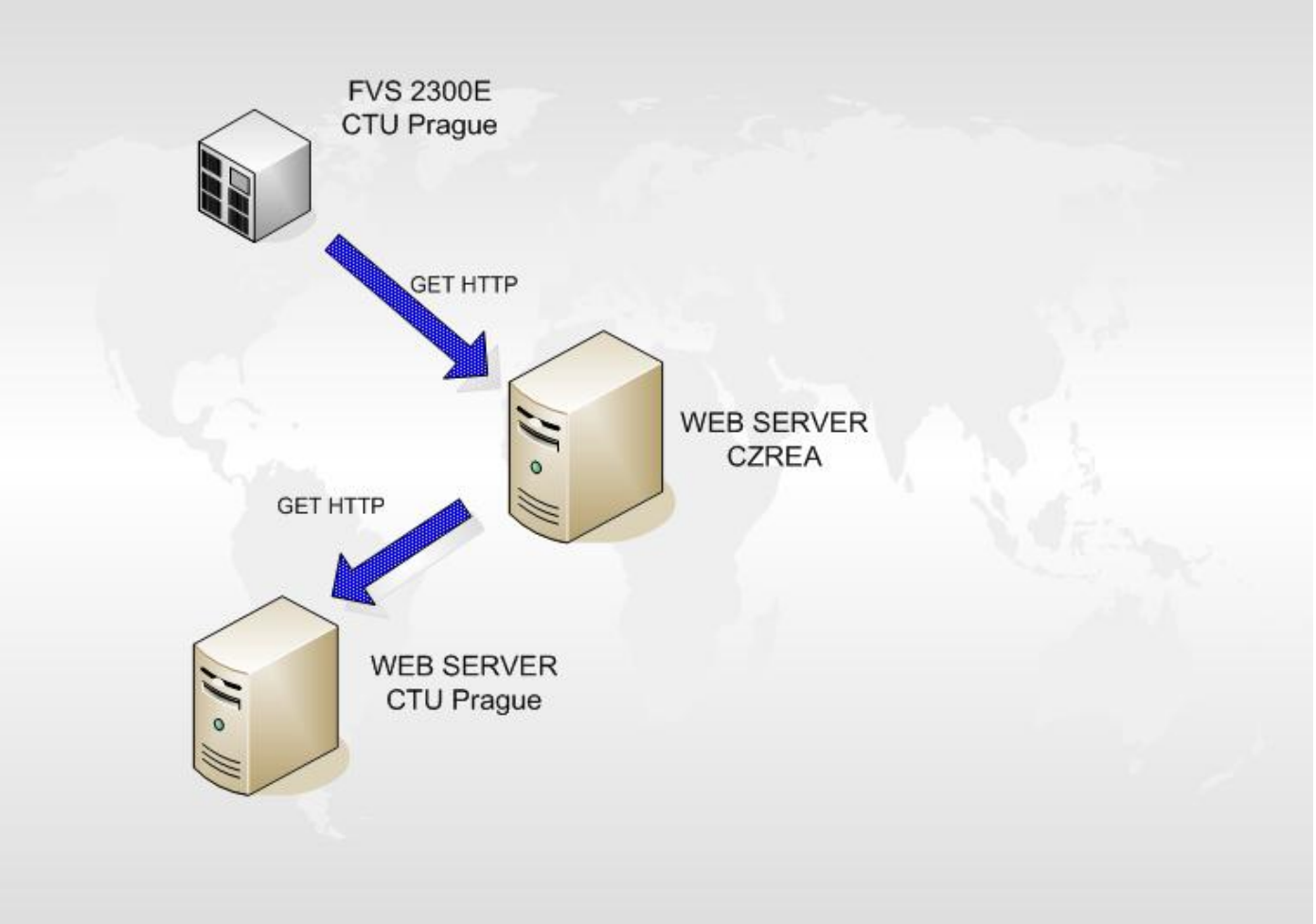
- panel temperature
- intensity of incident sun radiation (Irrad)

Interconnection between parts of our system

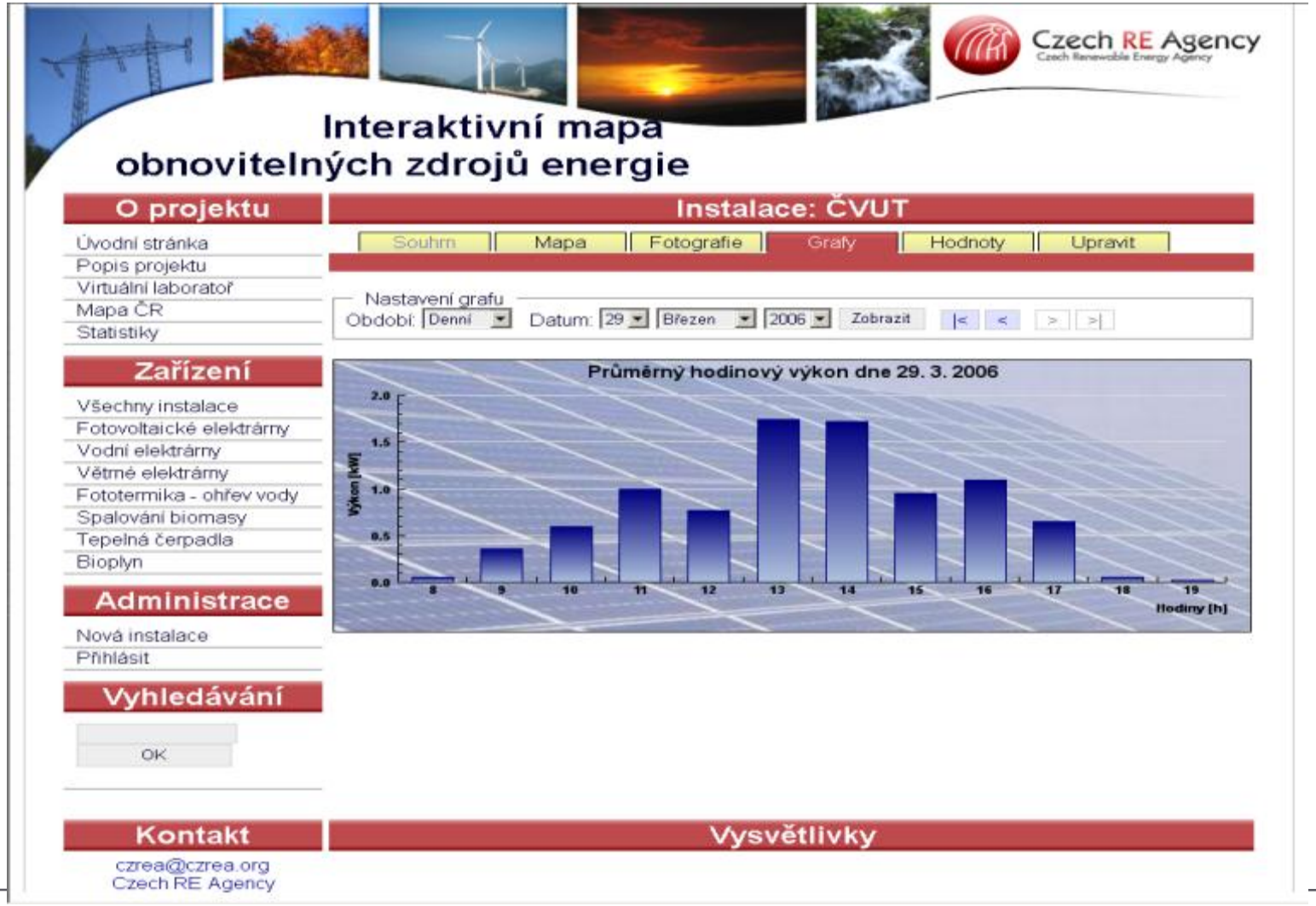


Demonstrational table with solar data in faculty doorway

Scheme of data gathering through Internet connectivity



Our data presented on Czech RE Agency



Advanteges of present time solution

- All data are presented by well-arranged diagrams.
- It is possible to show daily, monthly or yearly data behaviour diagrams.
- The web site system is not only a presentation tool, but also a full-featured content management system (CMS).
- The whole system has a modular structure, suitable for future expansion.
- English and Czech versions exist with a possibility to be outreached by other languages too.

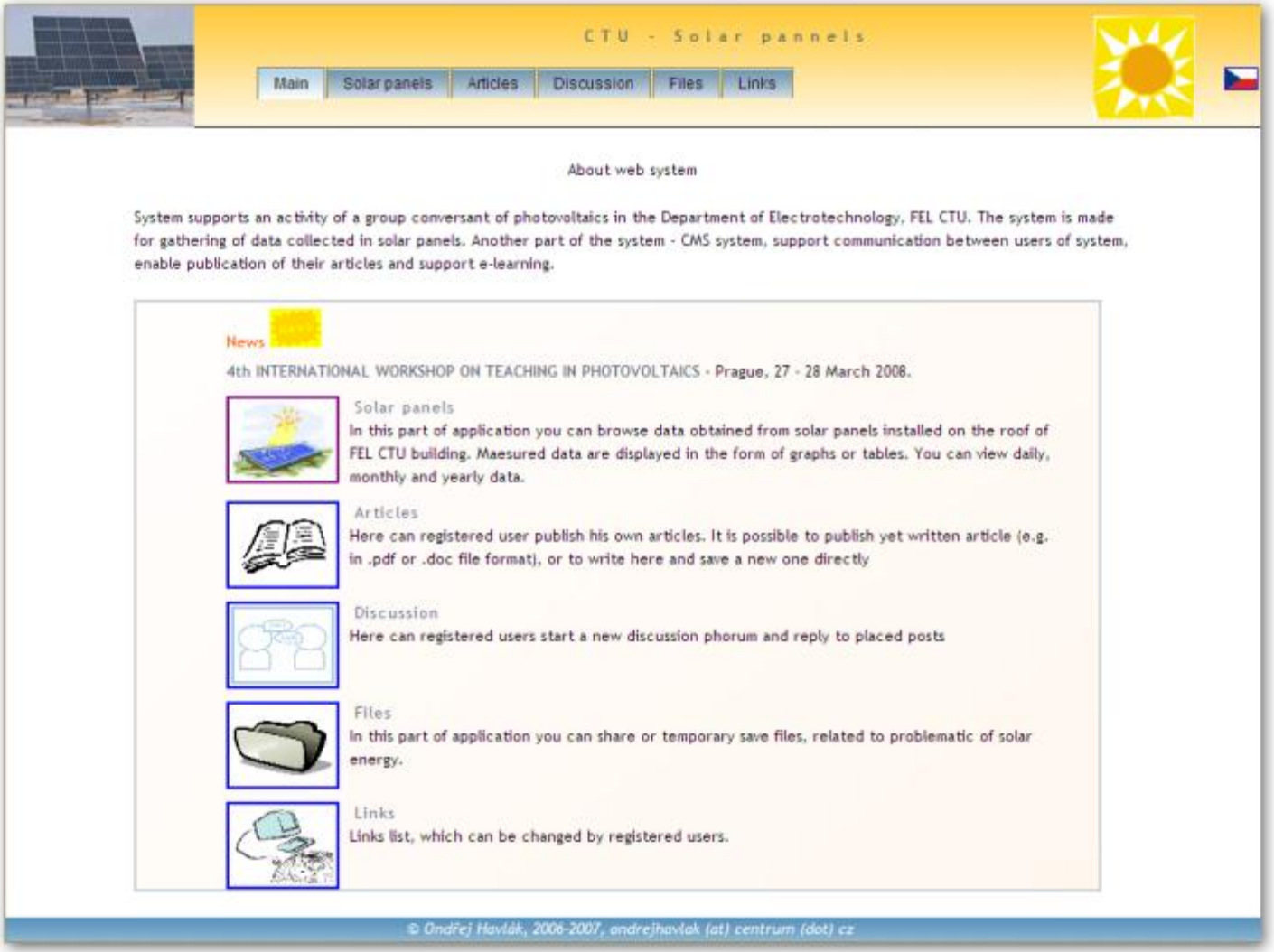
Disadvantages of contemporary solution

- A dependency on the CZREA web server.
  - An unexpected cessation of PV data receiving.
- An impossibility to easily change the address of the target (receiver) web server.
  - We always must call a maintenance service of data-logger producer.
- An impossibility to obtain historical data from the data-logger through the Internet connection.
  - But we can get historical data by another way using a direct connection to the personal computer installed in an office and consequently we can upload this data to the web site

Detailed Description of *Solarweb*

Our Solarweb is located at:
http://technology.feld.cvut.cz/SolarWeb

Home Page of *Solarweb*



5 Main Sections

- Solar panel – is a part targeted for a presentation of gathered PV data.
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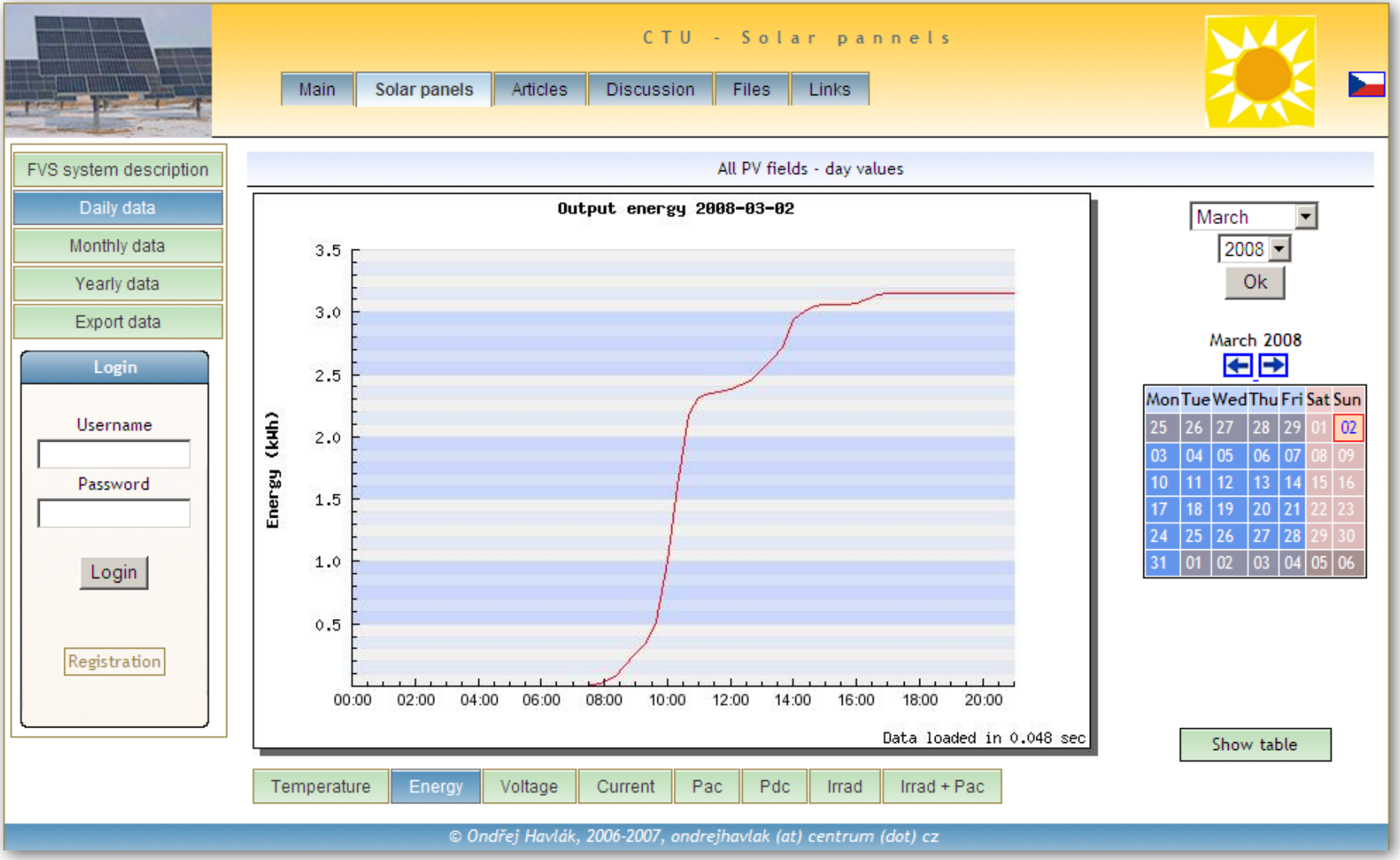
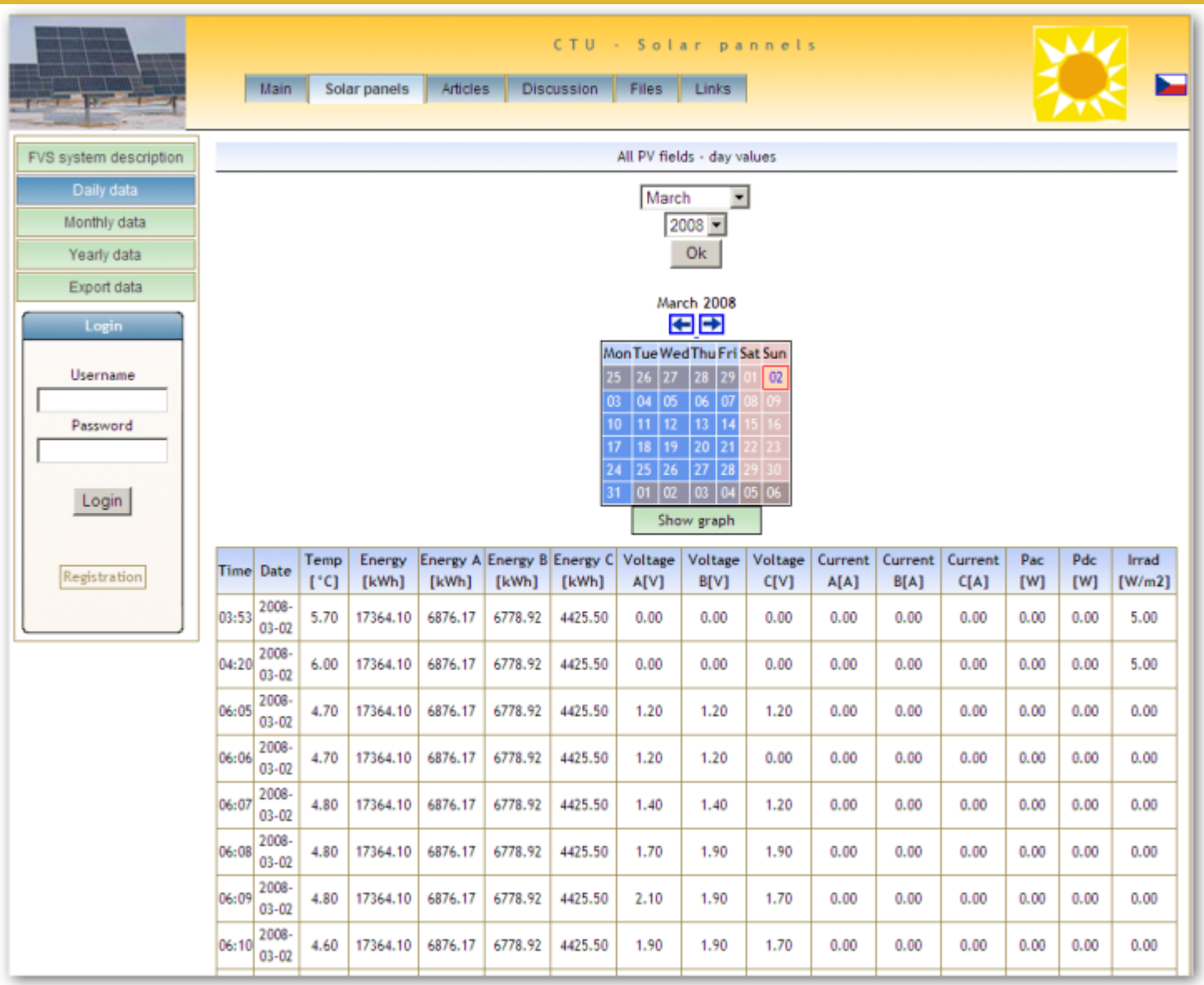
Output Energy Graph

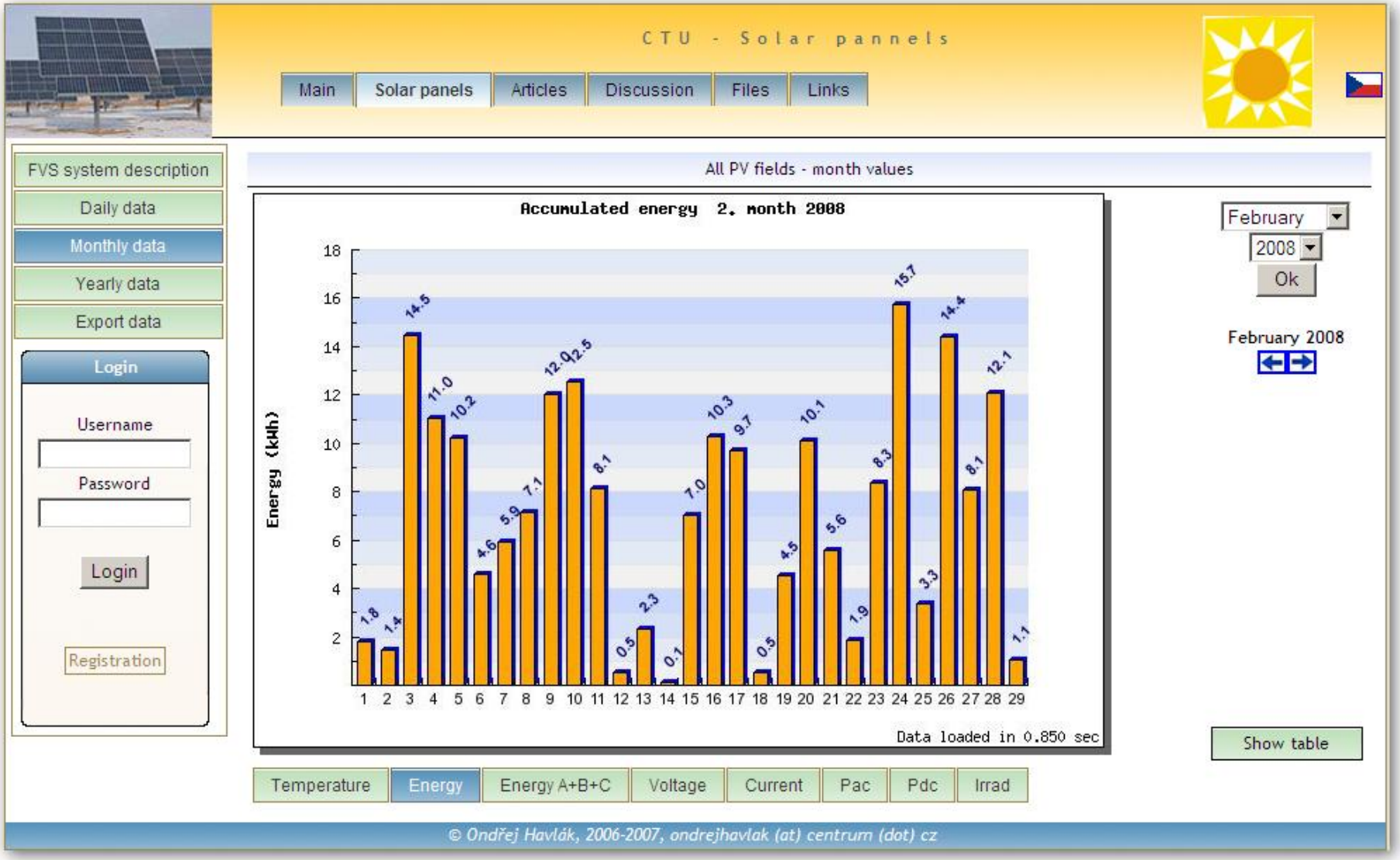


Example of table output format

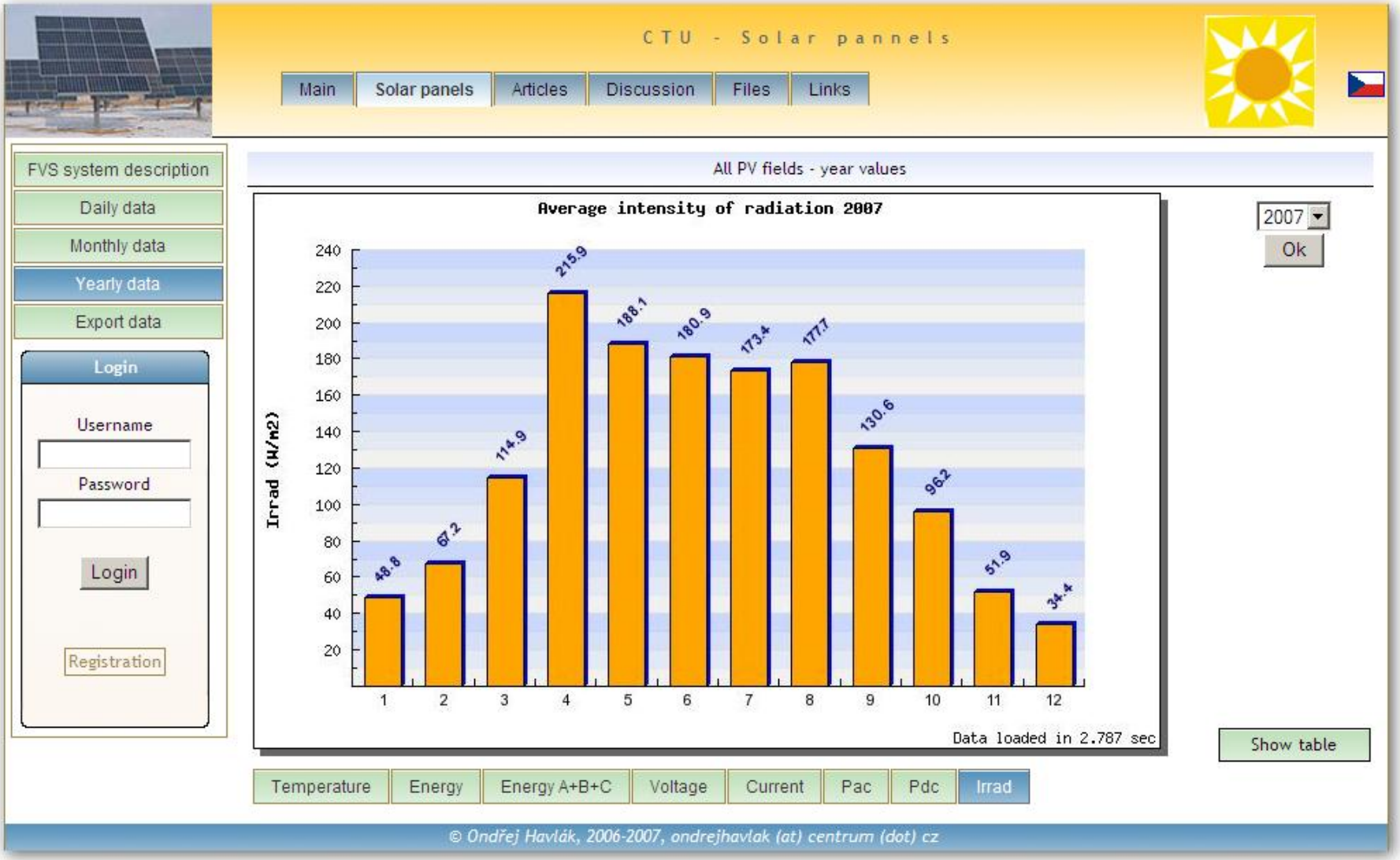


Time	Date	Temp [°C]	Energy [kWh]	Energy A [kWh]	Energy B [kWh]	Energy C [kWh]	Voltage A[V]	Voltage B[V]	Voltage C[V]	Current A[A]	Current B[A]	Current C[A]	Pac [W]	Pdc [W]	Irrad [W/m2]
03:53	2008-03-02	5.70	17364.10	6876.17	6778.92	4425.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
04:20	2008-03-02	6.00	17364.10	6876.17	6778.92	4425.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00
06:05	2008-03-02	4.70	17364.10	6876.17	6778.92	4425.50	1.20	1.20	1.20	0.00	0.00	0.00	0.00	0.00	0.00
06:06	2008-03-02	4.70	17364.10	6876.17	6778.92	4425.50	1.20	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
06:07	2008-03-02	4.80	17364.10	6876.17	6778.92	4425.50	1.40	1.40	1.20	0.00	0.00	0.00	0.00	0.00	0.00
06:08	2008-03-02	4.80	17364.10	6876.17	6778.92	4425.50	1.70	1.90	1.90	0.00	0.00	0.00	0.00	0.00	0.00
06:09	2008-03-02	4.80	17364.10	6876.17	6778.92	4425.50	2.10	1.90	1.70	0.00	0.00	0.00	0.00	0.00	0.00
06:10	2008-03-02	4.60	17364.10	6876.17	6778.92	4425.50	1.90	1.90	1.70	0.00	0.00	0.00	0.00	0.00	0.00

Accumulated Energy Graph



Intensity of Radiation Graph



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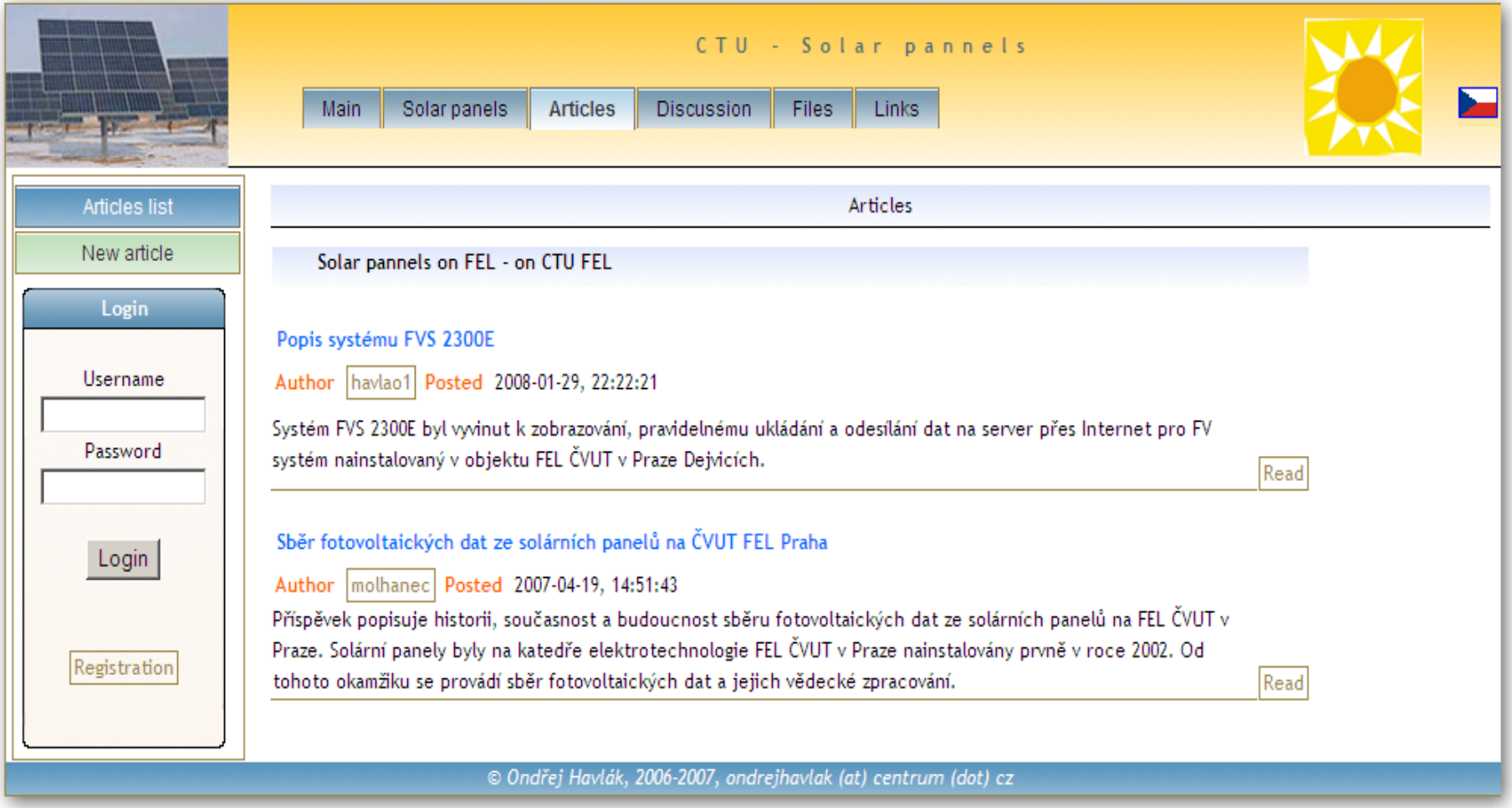
Article Section of *Solarweb*



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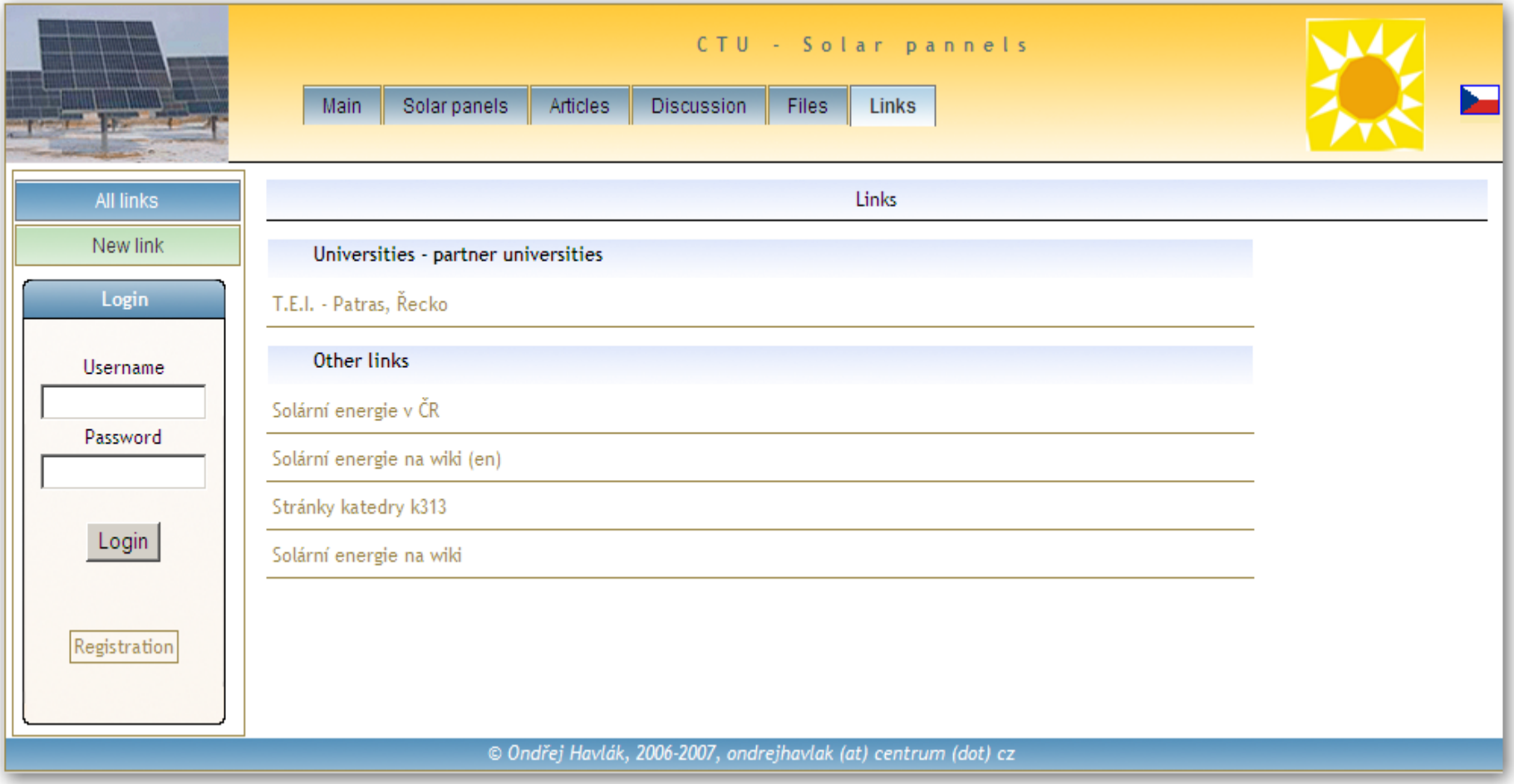
Link Section of *Solarweb*



5 Main Sections
Mention and assessment

- Solar panel
  - The main output of the *Solarweb site*
- Articles
  - Best way of propagation of our *Solar Research Team*
- Discussion
  - Tool for an interaction with professional community
- Files
  - A possibility to share a content
- Links
  - An initial point to another sites concerning solar energy subject matter

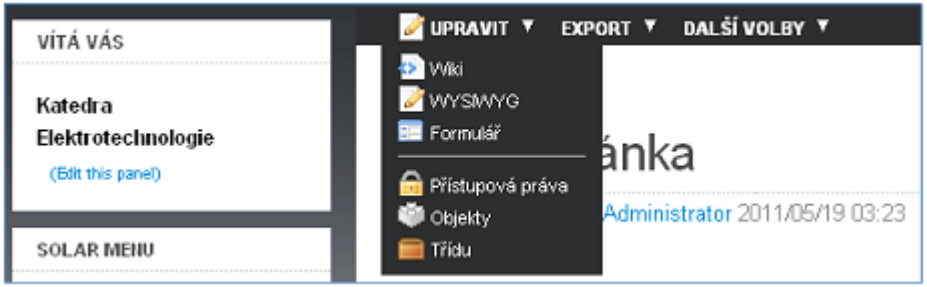
New version of the system

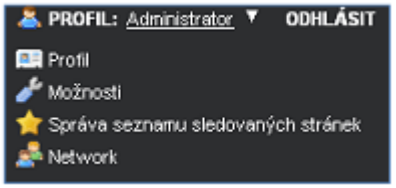
We need a new contemporary modern system

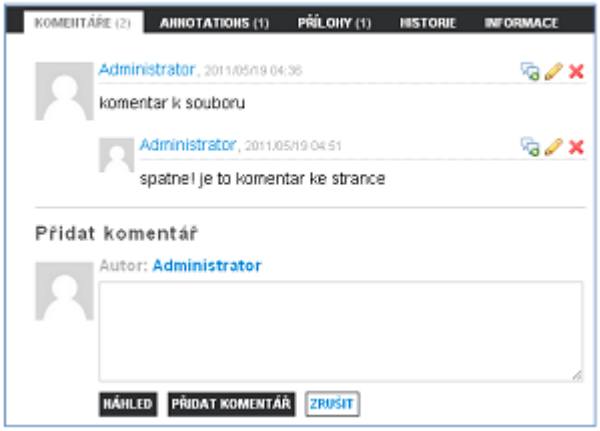
New version of the system

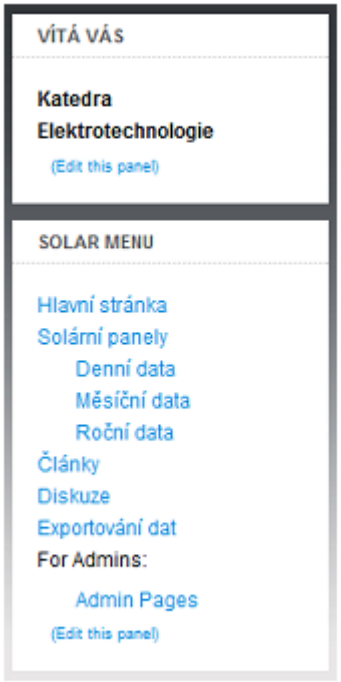
- Output of the bachelor theses lead by me
  - Defended in January, 2012 by Nurlan Abdrassilov - student, Kazachstan
- Based on Xwiki development platform
  - Wiki and CMS system
  - Development platform
- The output of the work is regrettably not very good
  - We suppose a big rework and improvement before upgrading the old system to the new system

Some snapshots of User interface

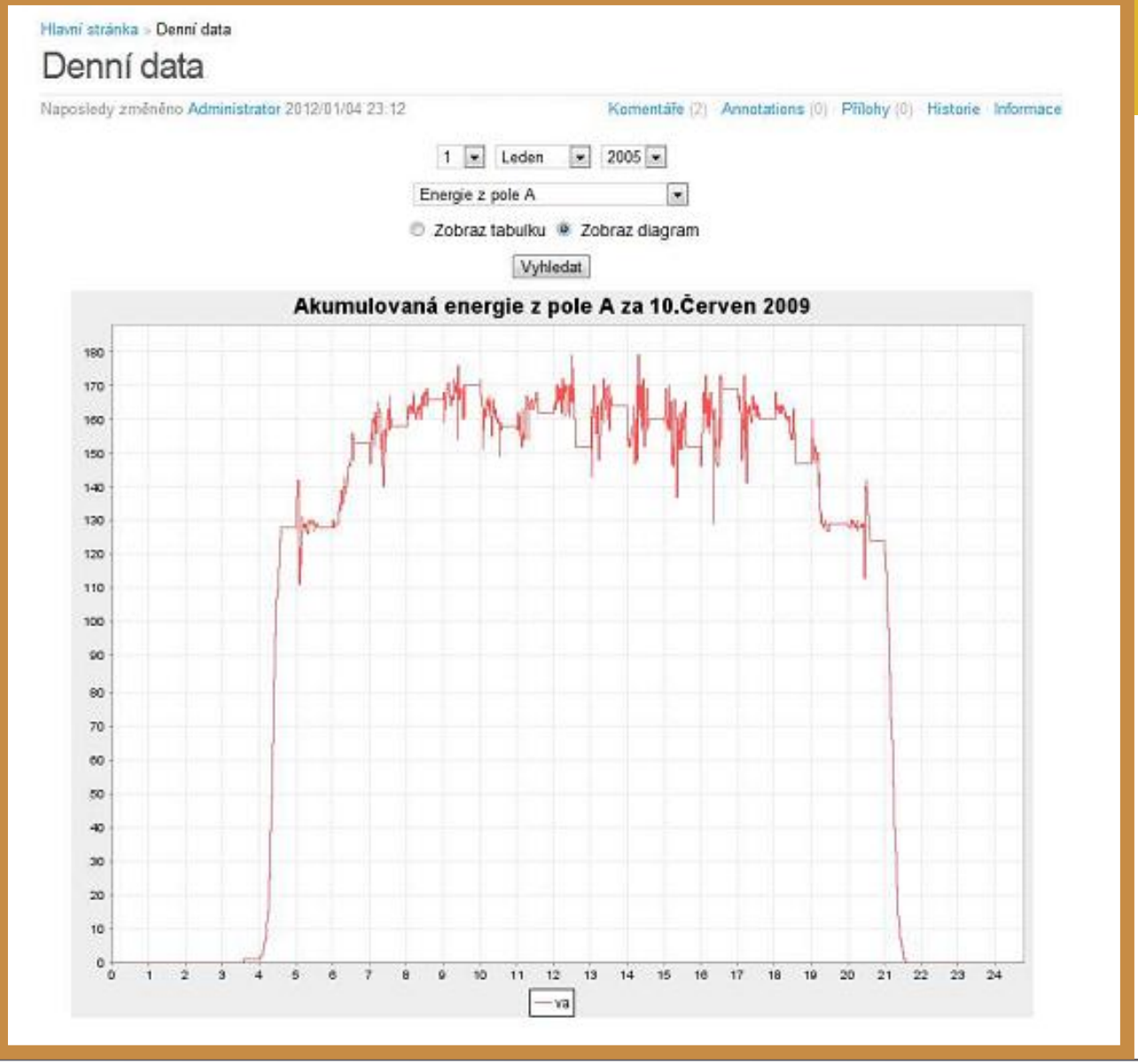




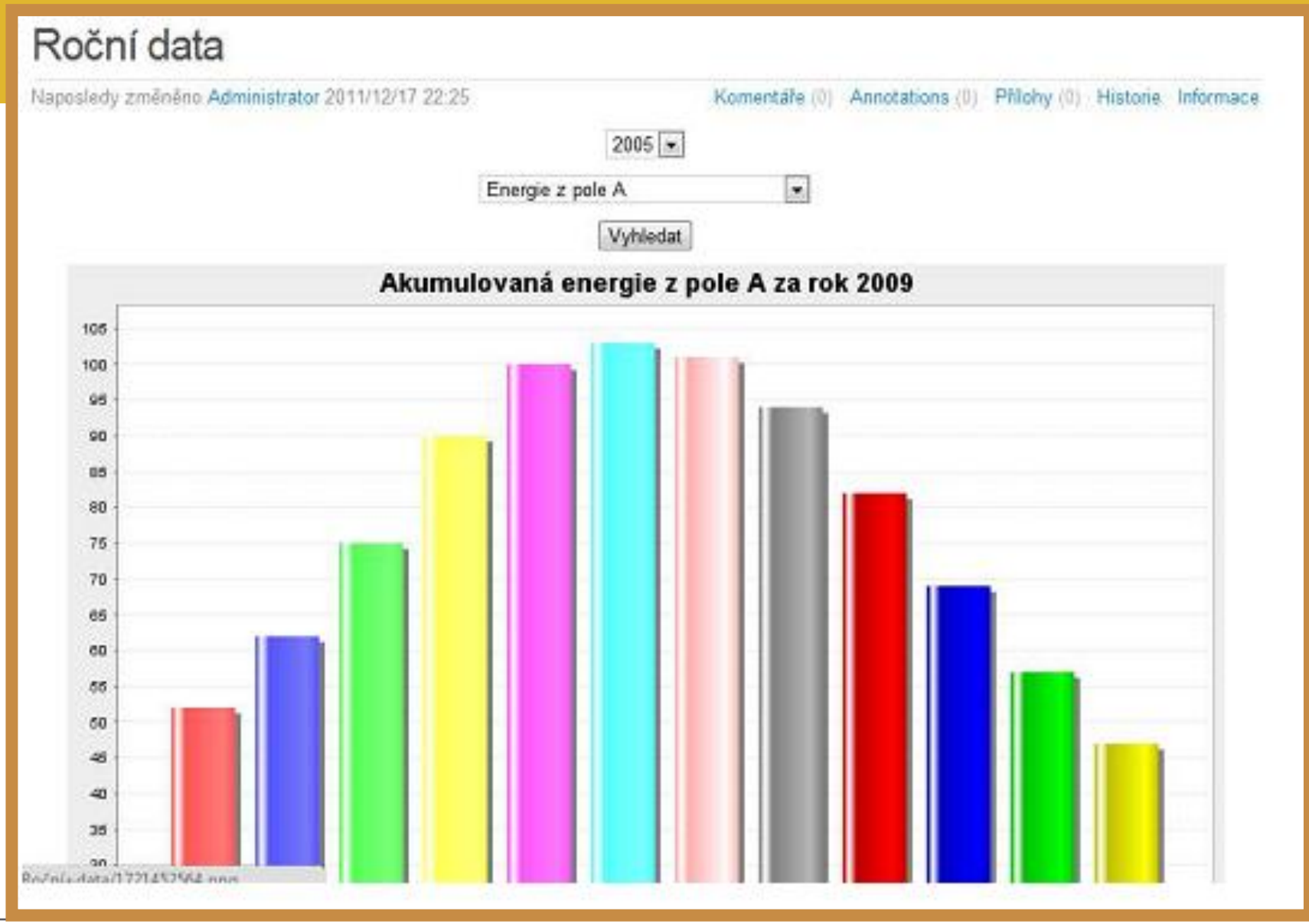




Daily data


Hlavní stránka » Denní data
Denní data
Naposledy změněno Administrator 2012/01/04 23:12
Komentáře (2) Annotations (0) Přílohy (0) Historie Informace
1 Leden 2005
Energie z pole A
Zobraz tabulku Zobraz diagram
Vyhledat
Akumulovaná energie z pole A za 10.Červen 2009
va

Yearly data


Roční data
Naposledy změněno Administrator 2011/12/17 22:25
Komentáře (0) Annotations (0) Přílohy (0) Historie Informace
2005
Energie z pole A
Vyhledat
Akumulovaná energie z pole A za rok 2009

Conclusion

Future and Ideas

- Firstly, we want to fill up our Solarweb site with useful articles and links and actively conduct discussions too.
  - Another idea – create a Facebook feed for our users?
- We need to integrate a processing of our PV data with a meteorological data
  - Probably by using our own measuring equipment?
- We need to upgrade to a new modern and more suitable contemporary web platform.
  - We want to use the same platform as for the departmental web (XWiki).
  - We have some outputs from one bachelor theses lead by me.
- **Our strategic goal is to create a complex information center for photovoltaic education, e-Learning and research.**

Questions?

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Thank You!