

# The integration of GIS and GPS technology in the EDB

Vladimir Stojičić, EDB, Serbia



## EDB's network

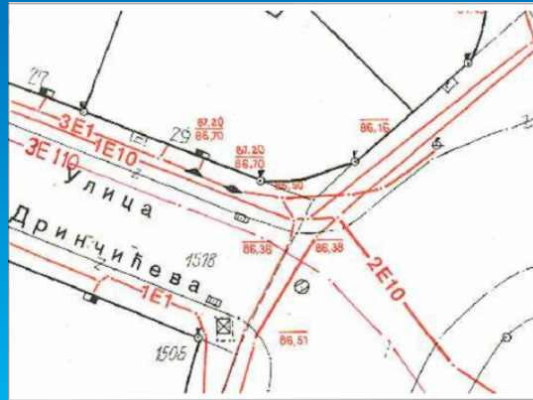
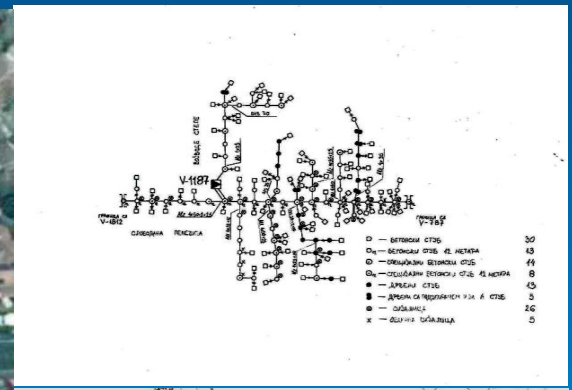
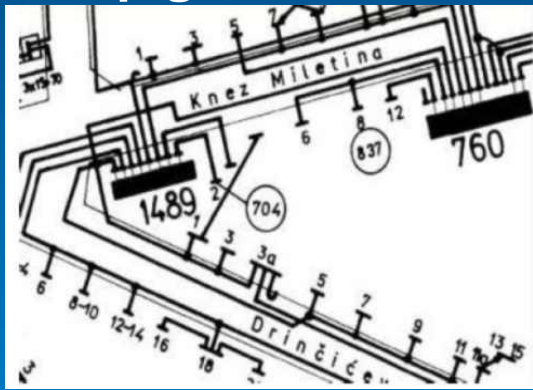
- EDB's network is comprised of 6,500km of underground power lines and spans 9,500 km of overhead lines
- Service points 830.000
- Underground lines 6.500 km
- Overhead lines 9.500 km
- Transformer substations
  - HV/MV 100
  - MV/LV 7000
- Total employed 1800



# Scanning, digitizing, rasterization, vectorization

## Existing graphic documentation

- The organization's mapping system included a mix of paper-based survey and cable plans, CAD files that were somewhat incomplete, and an array of aerial photos.
- Map guide - The exact positions of trench axes.



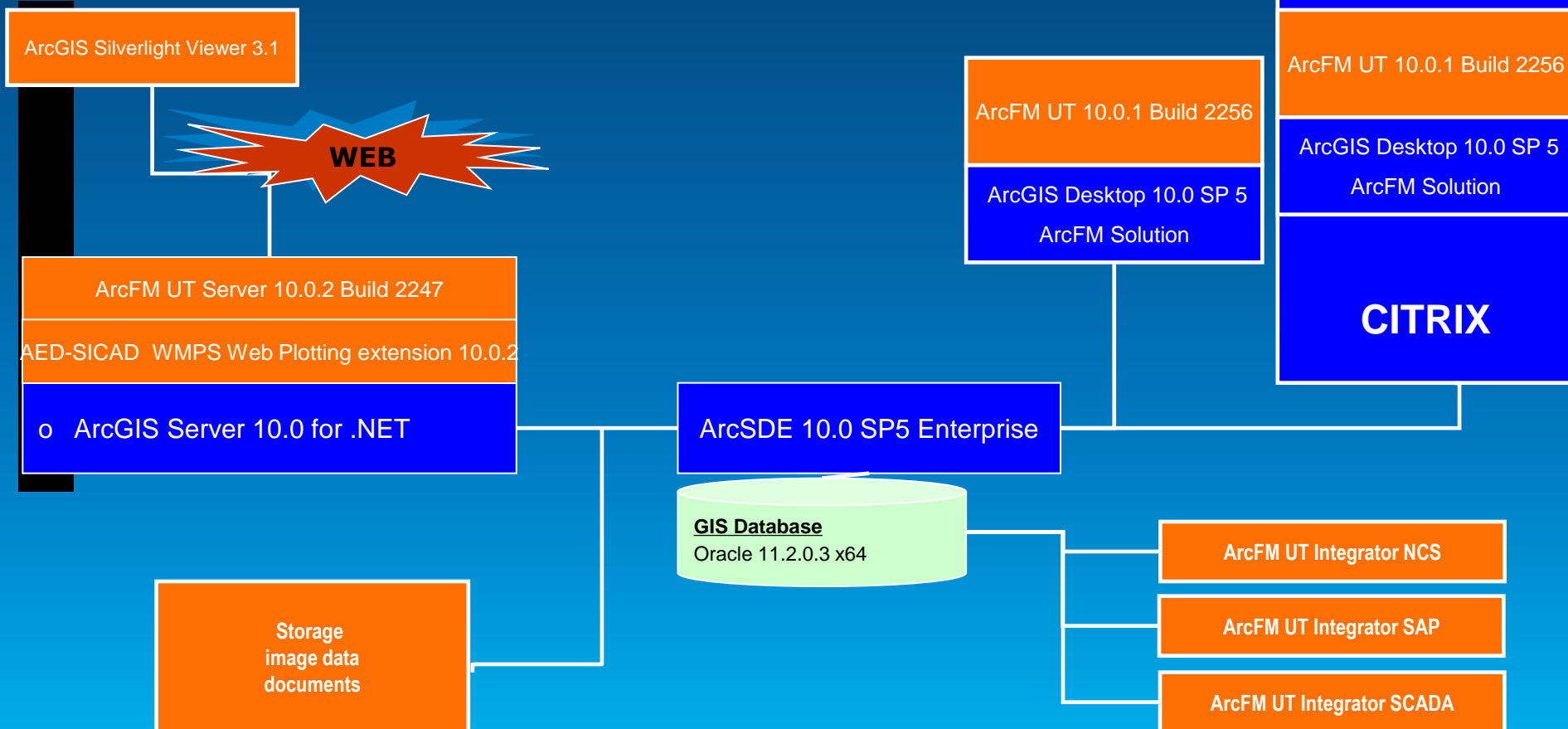
## **GPS data collection HV,MV,LV network - losses**

- **the precise documentation of the overhead network does not exist .**
- **A large percentage of the network does not exist in electronic form as a CAD file or part of the geodatabase.**
- **Graphic documentation is not part of the system that would be available to all structures of the company. Many parts companies maintain documentation for their needs.**

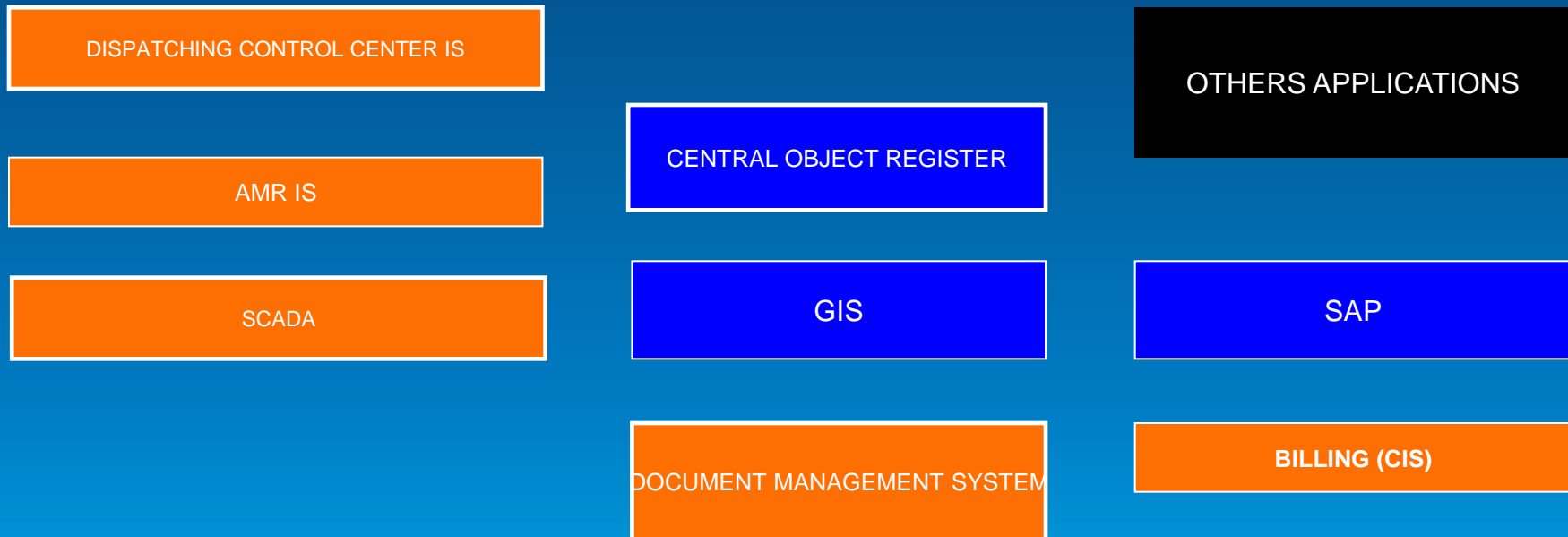
## **GPS data collection HV,MV,LV network - losses**

- **the data collection with GPS devices is the most efficient way to gather information about the network components in the field.**
- **GIS EDB is an advanced system for the collection, maintenance and use of spatial, technical and other data on the electricity network.**
- **Simply, it is a digital technical documentation of the entire electric power (EE) network EDB, implemented in a single GIS database.**
- **GPS record as the fastest, most efficient and most accurate data capture.**
- **Instead geodesic we get a complete GPS data with topological characteristics of EE network.**
- **New technologies and processes are not in the job description, so we form a project team**

# GIS System architecture

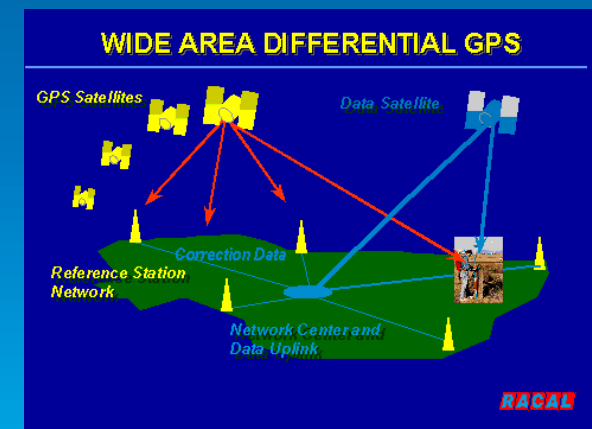


# EDB System architecture



# GPS equipment

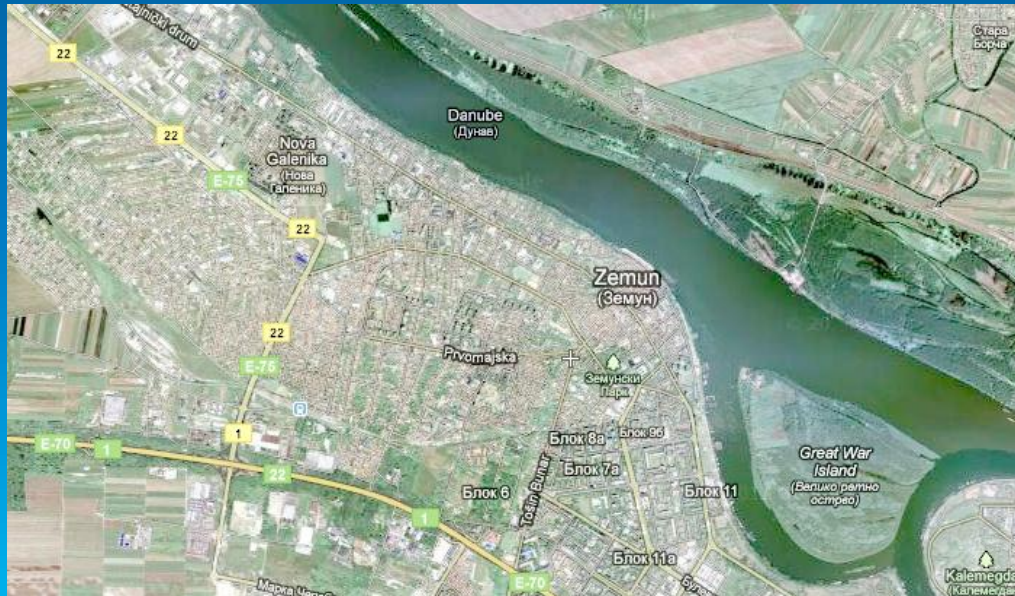
- GPS handheld devices
  - Tablets
  - laser rangefinder
  - Camera
- Reference GPS station
- Trimble GPS software





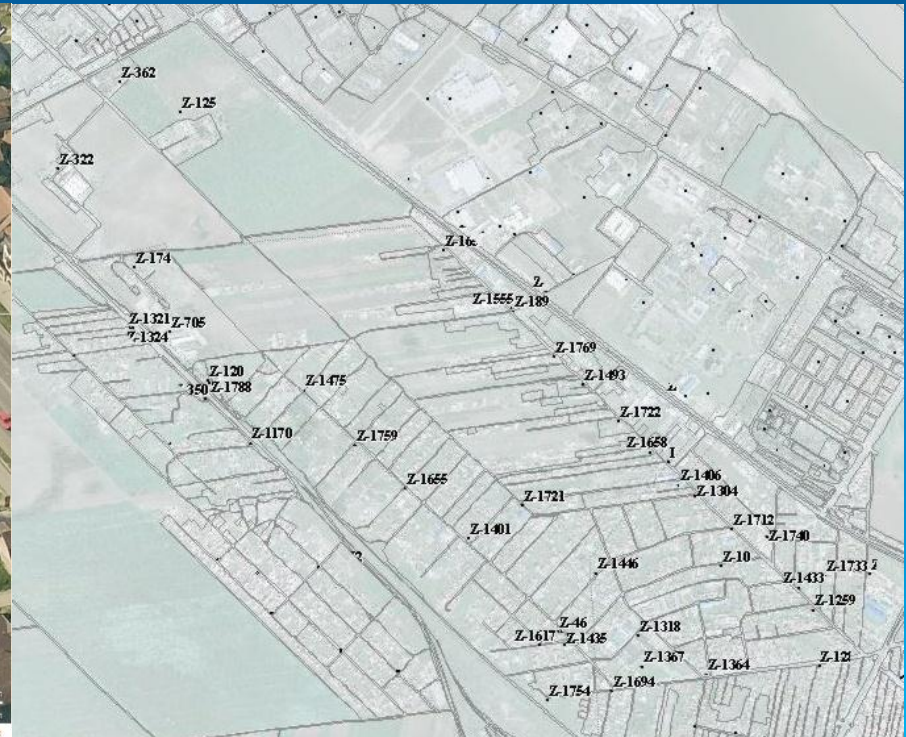
# FIELD TEAM

- Capture network requires knowledge of the network (recognizing types of attributes of objects, identifying the connection network, borders, components, draw sketches, knowledge of the GPS device, a camera and a laser rangefinder.
- two-member field teams + meters reader
- Demanding training



# PREPARING FOR GPS DATA Acquisition

- Preparation of raster and vector documents (aerial photo and scanned maps)
- Defining the data dictionary for the network elements (type, height, material, function ...)



# GPS data acquisition - procedure

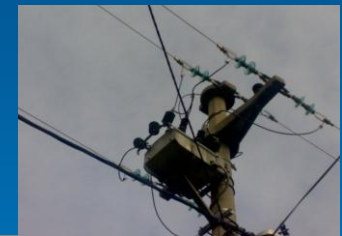
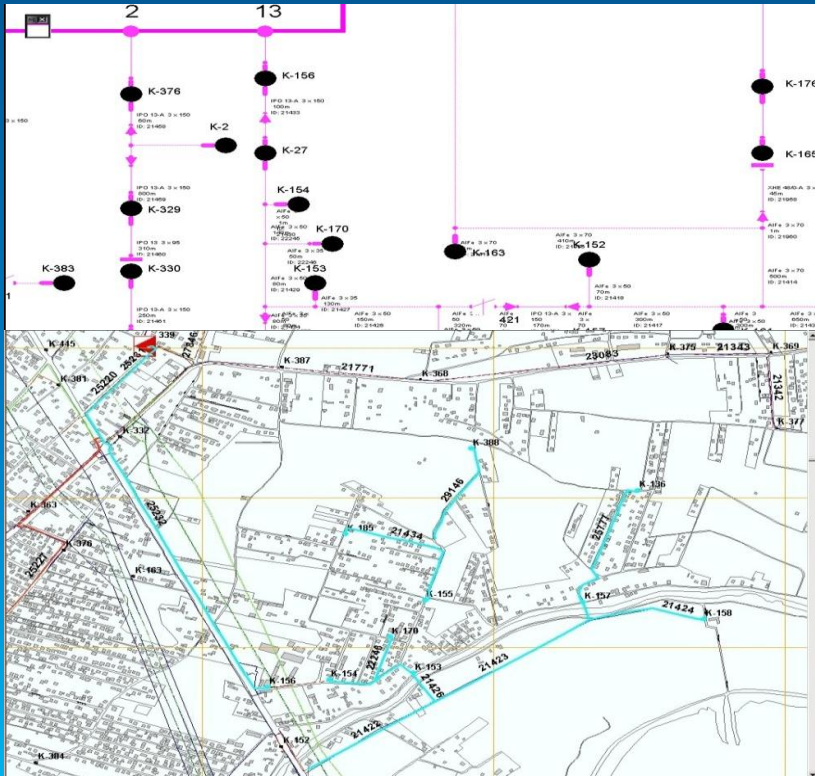
- Record the coordinates of the object. Input shift using a laser rangefinder for inaccessible objects.
- Recording facilities: poles, service points, substations, distribution boxes...
- The object of interest is photographed. Photos name should match with the number of the object.
- The data collected by GPS are corrected by reference EDB station which was placed at EDB location.
- Processing data in the GPS software in the office.
- Checking the validity of the data and the accuracy of the entered attributes.



Update	Options	Log
1 Stub	<input type="checkbox"/> OK	<input type="button" value="Cancel"/>
ID_stuba:	1	
Broj_stuba:	12	
Lokacija:	[dada]	
Tip_stuba:	betonski	
Uloga:	linijsko zatezno	
Visina:	12	
Sila_vrh:	220	
Vlasnistvo:	Pogon 1	
Uzemljenje:	prstenasto pojačano	
Ugradnja:	PODUPRT	
Zastita_d:	Ireozit	
Temelj:	DRV.NOGAVICA	
Svetiljka:	NE	
Odvodnik:	silikonski	
Broj_STS:	0	
Kabl_silaz:	[0]	

# GPS data collection – MV network

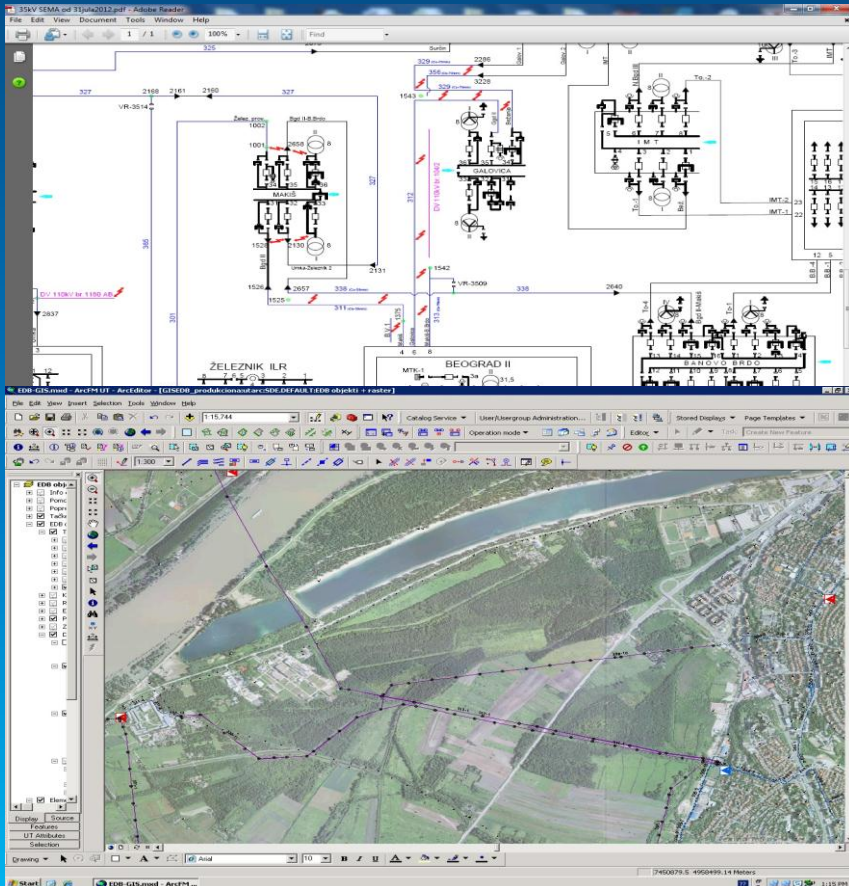
With GPS devices we started to collect data for MV network, with intention to synchronize geographical pattern with up to date synoptic scheme. Results obtained by recording MV network in GIS and possibility of analysis in a GIS-based software, GPS recording has become an inevitable part of other ongoing processes in the company. Collecting data for about 35000 poles on MV network.



# GPS data acquisition – HV network

Therefore, this process included recording of HV networks as well.

Collecting data for about 3500 poles on HV network



# GPS data acquisition – LV network

The need to reduce commercial and technical losses resulted in development of accurate network topology of individual LV substation consumption area and the precise identification of the power supply of each customer. Again, it was concluded that the best way for solving this problem is GPS recording with a list of attributes. At the moment mass collection of data for LV substation consumption area is taking place (which includes 7000 MV / LV substations and 830,000 customers). Collecting data for about 1500 substation consumption area on LV network.



Update	Options	Log
1 Stub	<input type="checkbox"/> OK	Cancel
ID_stuba:	1	
Broj_stuba:	12	
Lokacija:	dada	
Tip_stuba:	betonski	
Uloga:	linijsko zatezno	
Visina:	12	
Sila_vrh:	220	
Vlasnistvo:	Pogon 1	
Uzemljenje:	prstenasto pojacano	
Ugradnja:	PODUPRT	
Zastita_d:	kreožit	
Temelj:	DRV.NOGAVICA	
Svetiljka:	NE	
Odvodnik:	silikonski	
Broj_STS:	0	
Kabl_silaz:	n	



# GPS data collecting methodology (LV network)

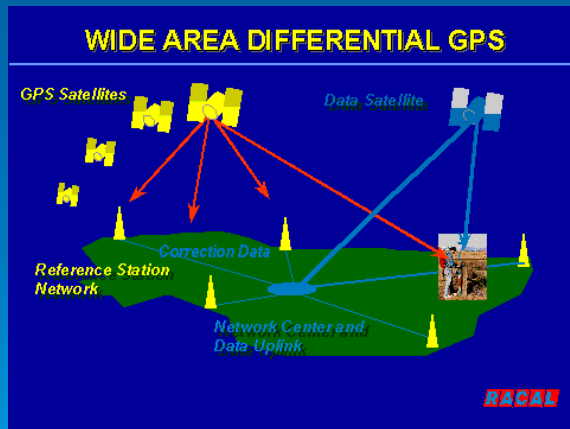
- reducing commercial and technical losses.
- accurate network topology for individual substation transformer consumption area.
- precise identification of the power supply of each customer.
- commercial losses 18%



T	S	Red	Edb Broj	MG	Aktivno	Reaktivno	Sifra	Mesto	Ulica	Broj	Dop	Ulaz	Priključak	Naziv	Tarifa	Napomena
													p52			Skinuto brojilo
8	49	3300	809653311	1	1000000012001		5005	VELIKI BORAK	SIME MARKOVIČA	18			p53	JELIĆ SLAVOLIUB	400	
8	49	3200	834698350	1	1008746681		5005	VELIKI BORAK	SIME MARKOVIČA	16			p54	JELIĆ NEGOVAN	400	
8	49	2900	834698430	1	9202551		5009	VELIKI BORAK	ŠUMADIJSKA	3			p55	JOVIČIĆ MIODRAG	400	
8	55	2400	807991601	1	5197667		5005	VELIKI BORAK	SIME MARKOVIČA	17	A		p56	TRIFUNOVIĆ BRANKO	400	
8	55	2300	834697860	1	8232231		5005	VELIKI BORAK	SIME MARKOVIČA	19			p57	PAVLOVIĆ ŠLOBODAN	400	
8	49	3700	858428150	1	1000000013765		5005	VELIKI BORAK	SIME MARKOVIČA	22			p58	TRIFUNOVIĆ MIODRAG	400	
8	55	2200	834697440	1	8657813		5005	VELIKI BORAK	SIME MARKOVIČA	21			p59	MARKOVIĆ KATA	400	
8	49	3800	834697600	1	8943909		5005	VELIKI BORAK	SIME MARKOVIČA	24			p60	TRIFUNOVIĆ LJ. BOGOLIUB	400	
8	55	2100	841096200	1	2000000013018		5005	VELIKI BORAK	SIME MARKOVIČA	23	A		p61	ILIĆ V. ŽIVAN	400	
													p62			Zaključano
8	55	2110	872159530	1	13862		5005	VELIKI BORAK	SIME MARKOVIČA	25			p63	SAKOVIĆ LJILJANA	400	
8	49	4000	804743321	1	2000000013646		5005	VELIKI BORAK	SIME MARKOVIČA	28			p64	TRIFUNOVIĆ DRAGOSLAV	400	
8	49	5400	852529150	1	5357251		5011	VELIKI BORAK	SKOJEVSKA	10			p65	JOVIČIĆ SINIŠA	400	
8	49	5600	853999311	1	1000000012785		5011	VELIKI BORAK	SKOJEVSKA	1	C		p66	PETROVIĆ BLAGOJE	400	
8	49	4400	834695200	1	12374		5011	VELIKI BORAK	SKOJEVSKA	6			p67	JELIĆ BORISAV	400	
8	49	5700	848726572	1	13764		5011	VELIKI BORAK	SKOJEVSKA	1	A		p68	RADOŠAVLJEVIĆ MIRJANA	400	
8	49	5500	839119430	1	15481		5011	VELIKI BORAK	SKOJEVSKA	1	A		p69	PETROVIĆ VEŠNA	400	
8	49	5100	843573600	1	1000000012684		5011	VELIKI BORAK	SKOJEVSKA	3		1	p70	MARKOVIĆ RADOŠLAV	400	
8	49	900	838012690	1	3570387		5009	VELIKI BORAK	ŠUMADIJSKA	6			p71	MARKOVIĆ R. RADOŠAV	400	
8	49	4600	834694470	1	5896636		5011	VELIKI BORAK	SKOJEVSKA	10			p72	MARKOVIĆ JEZDIMIR	400	
8	49	5150	800090480	1	2729698		5011	VELIKI BORAK	SKOJEVSKA	5			p73	GAROVIĆ MIROSAVA	400	
8	49	4800	852258630	1	1000000012293		5011	VELIKI BORAK	SKOJEVSKA	12			p74	ARKOVIĆ ŠLOBODAN	400	
8	49	4900	843419830	1	90428		5011	VELIKI BORAK	SKOJEVSKA	7			p75	DIMITRIJEVIĆ RUŽICA	400	
8	49	4200	852195850	1	13656		5011	VELIKI BORAK	SKOJEVSKA	2			p76	VLADISAVLJEVIĆ STOJANA	400	
8	49	4400	834695200	1	12374		5011	VELIKI BORAK	SKOJEVSKA	6			p77	JELIĆ BORISAV	400	
8	49	4300	834695380	1	90480		5011	VELIKI BORAK	SKOJEVSKA	4			p78	JELIĆ J. RADISAV	400	
8	49	4100	839103830	1	13746		5011	VELIKI BORAK	SKOJEVSKA	2			p79	VLADISAVLJEVIĆ Č. DRAGAN	400	
8	4	50	3100	99669060	55132		5011	VELIKI BORAK	SKOJEVSKA	8			p80	FILIPOVIĆ MILAN - DOMAĆINSTVO	V	Zaključano - odjavljeno
8	61	550	868445710	1	1000000013668		4994	VELIKI BORAK	TRG PALIH BORACA	4	A		p81	MILOVANOVIĆ ZDRAVKO	400	
			98469260		76237		4994	VELIKI BORAK	TRG PALIH BORACA	8			p82	MARIĆ RADIŠA - DOMAĆINSTVO	V	
8	61	600	860503760	1	1000000013306		4994	VELIKI BORAK	TRG PALIH BORACA	6	A		p83	PETKOVIĆ MILAN	400	
8	61	700	840947301	1	466912		4994	VELIKI BORAK	TRG PALIH BORACA	6	2		p84	PETKOVIĆ D. MILAN	400	
			56620790				4994	VELIKI BORAK	TRG PALIH BORACA	3			p85	PTT SRBIJE IP RJ BEOGRADSKI VEJNAC		

# Reference station EDB

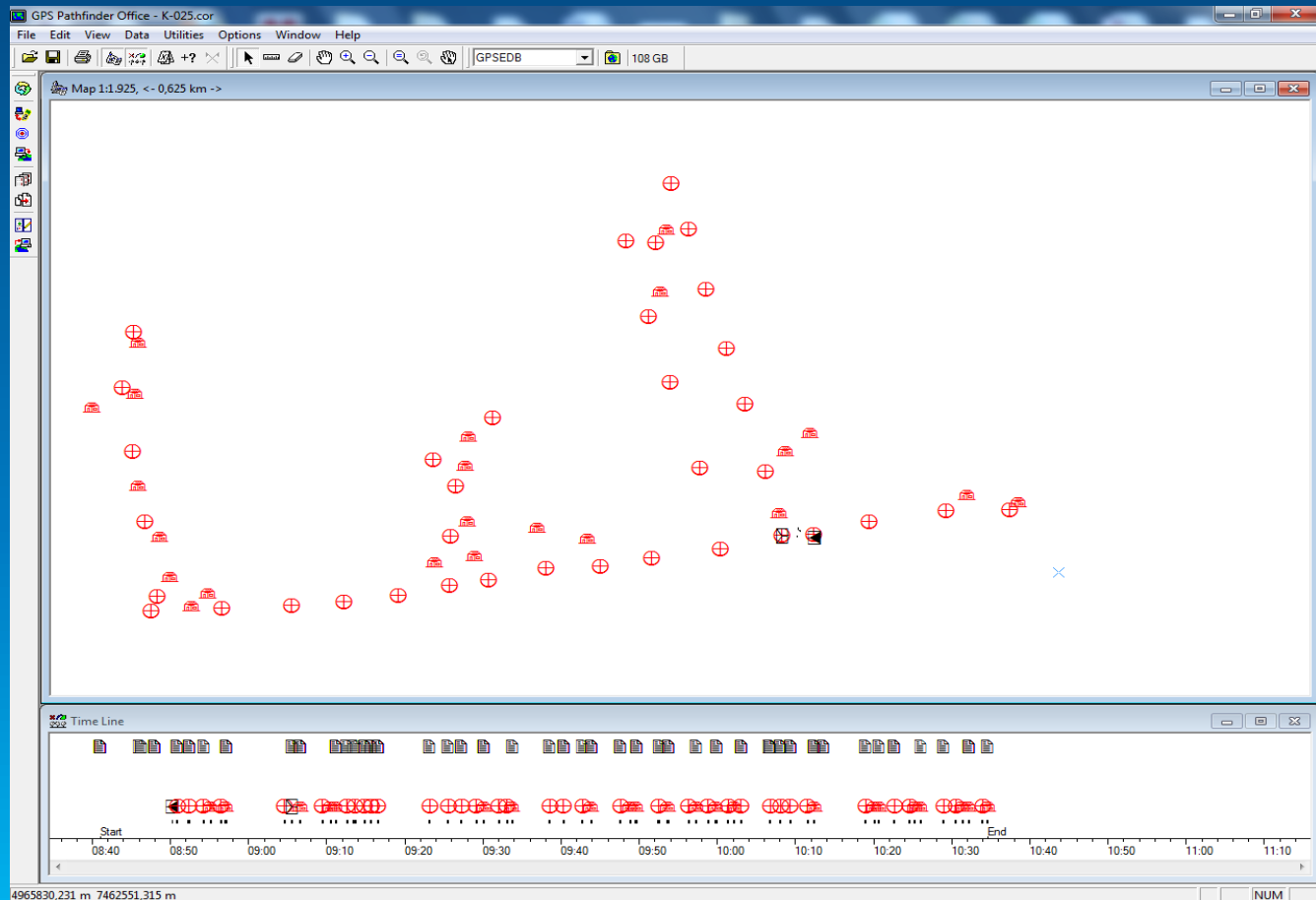
- GPS data correction





# DATA POST-PROCESSING

- Processing data in the GPS software in the office.
- Checking the validity of the data and the accuracy of the entered attributes and coordinates.

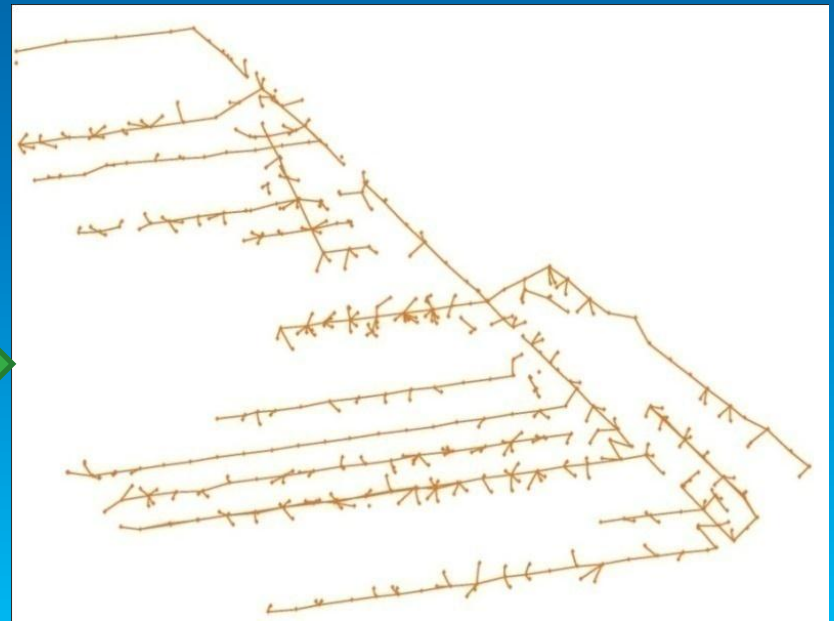
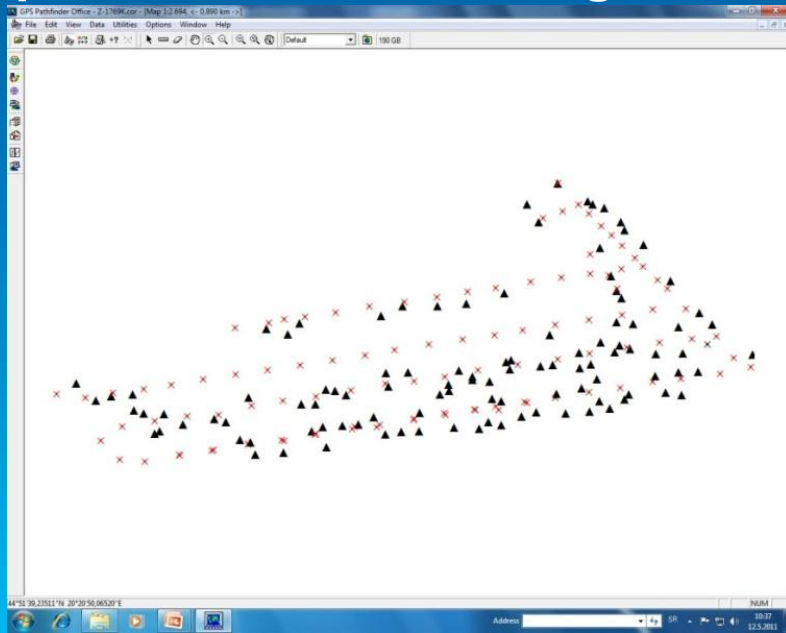


## GPS capturing results

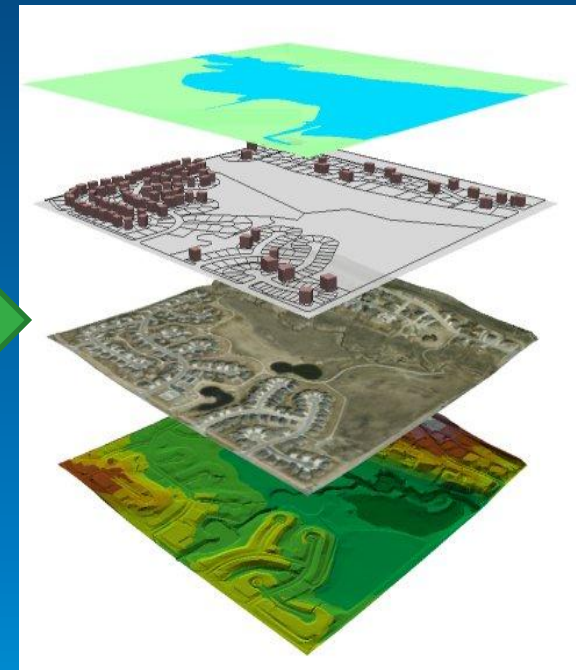
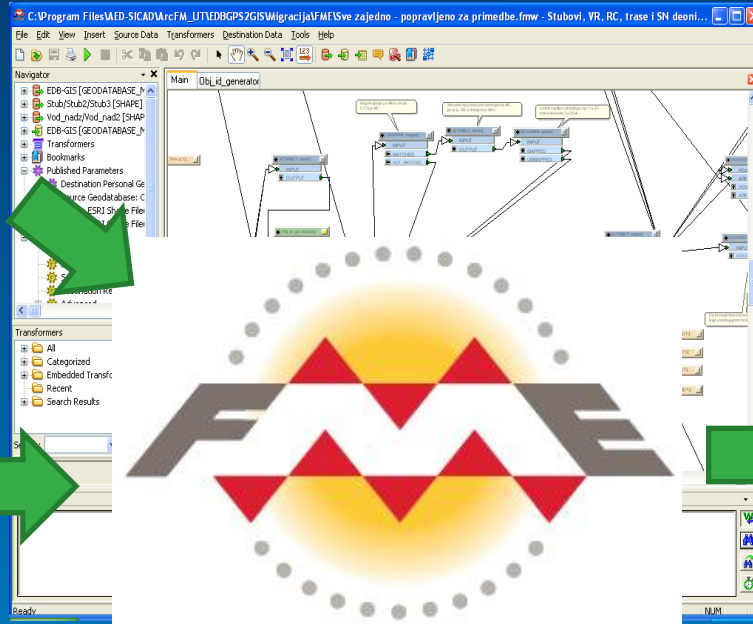
It turned out that one GPS team can record 15 to 20 objects per hour, on average. Complete HV and MV networks were recorded in such manner (about 40,000 of poles), as well as 1,500 substations regions at low voltage levels, with all data transferred to the GIS database.

# GPS data acquisition methodology

- The mass data acquisition and lack of personnel required such application solution that would directly form network graph of the collected data. Methodology for data entry into the GPS device is designed to include only dotted elements - nodes (poles, substations, switching equipment, distribution boxes and service points). Developed software solution automatically forms a graph network based on their topological attributes. This creates a topological reconstruction graph network without the need for time consuming vectorization process of power lines at all voltage levels.



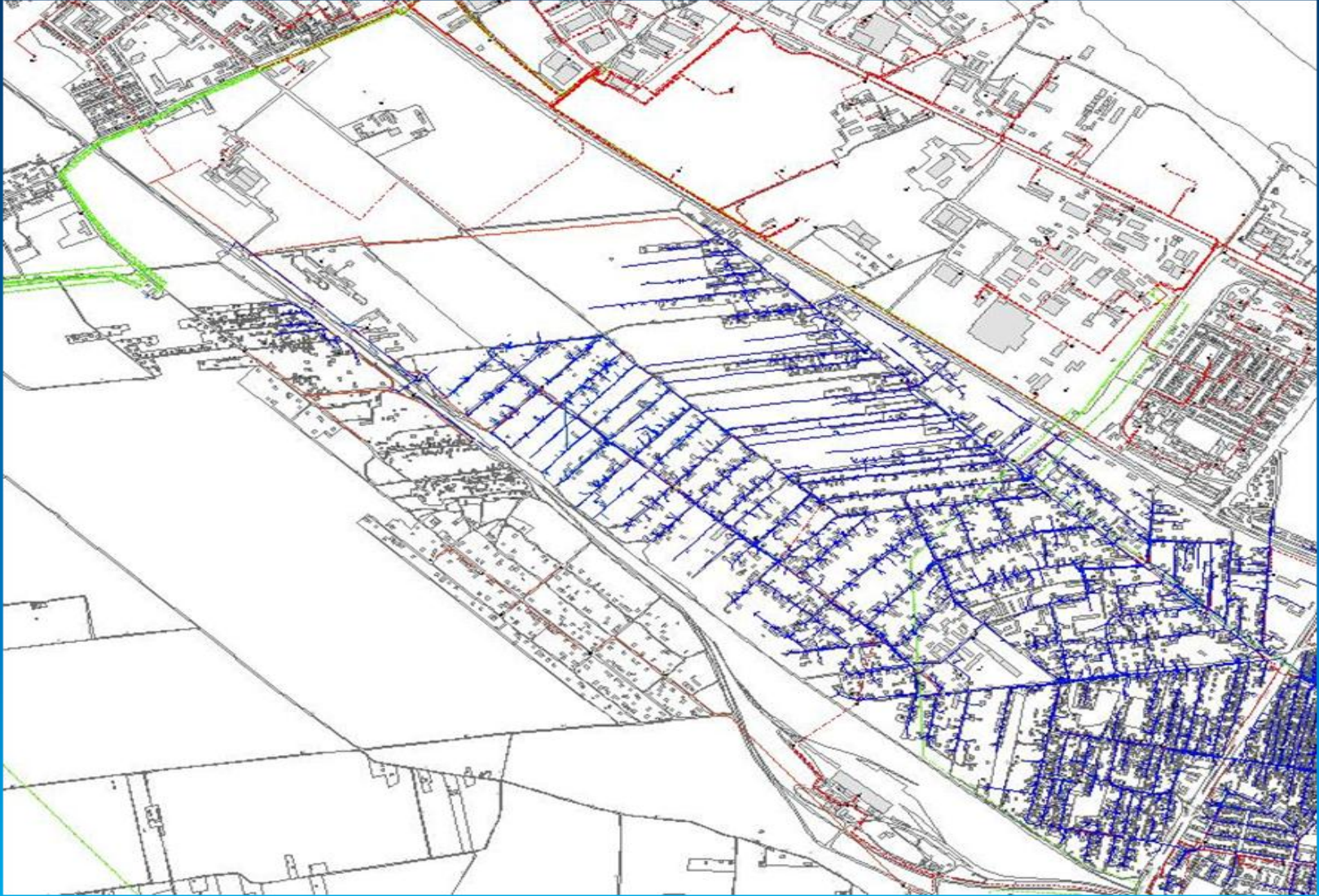
# GPS data migration



CLASS_ID	SRC_TABL	SRC_COI	DEST_TAB	DEST_COI	ATTR_COI	ATTR_ORI	OBJECTID	orig
1602	ut_object_h_year_man	FCL_LV_S	byear	HIST_ED	YE	hist_byear	1	1
8002	ut_object_h_year_man	FCL_E_MV	byear	HIST_ED	YE	hist_byear	2	1
8003	ut_object_h_year_man	FCL_F_HV	byear	HIST_ED	YE	hist_byear	3	1
111001	ut_object_h_year_man	FCL_G_DN	byear	HIST_ED	YE	hist_byear	4	1
111002	ut_object_h_year_man	FCL_G_TN	byear	HIST_ED	YE	hist_byear	5	1
111003	ut_object_h_year_man	FCL_G_TN	byear	HIST_ED	YE	hist_byear	6	1
111007	ut_object_h_year_man	FCL_G_DN	byear	HIST_ED	YE	hist_byear	7	1
111008	ut_object_h_year_man	FCL_G_DN	byear	HIST_ED	YE	hist_byear	8	1
111009	ut_object_h_year_man	FCL_G_DN	byear	HIST_ED	YE	hist_byear	9	1
112001	ut_object_h_year_man	FCL_W_TN	byear	HIST_ED	YE	hist_byear	10	1
112003	ut_object_h_year_man	FCL_W_TN	byear	HIST_ED	YE	hist_byear	11	1
112005	ut_object_h_year_man	FCL_W_DN	byear	HIST_ED	YE	hist_byear	12	1
112007	ut_object_h_year_man	FCL_W_DN	byear	HIST_ED	YE	hist_byear	13	1
112009	ut_object_h_year_man	FCL_W_TN	byear	HIST_ED	YE	hist_byear	14	1
711000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	15	1
712000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	16	1
714000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	17	1
716000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	18	1
717000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	19	1
718000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	20	1
719000	ut_object_h_year_man	FCL_ROUTE	byear	HIST_ED	YE	hist_byear	21	1
731000	ut_object_h_year_man	FCL_H_WW	byear	HIST_ED	YE	hist_byear	22	1

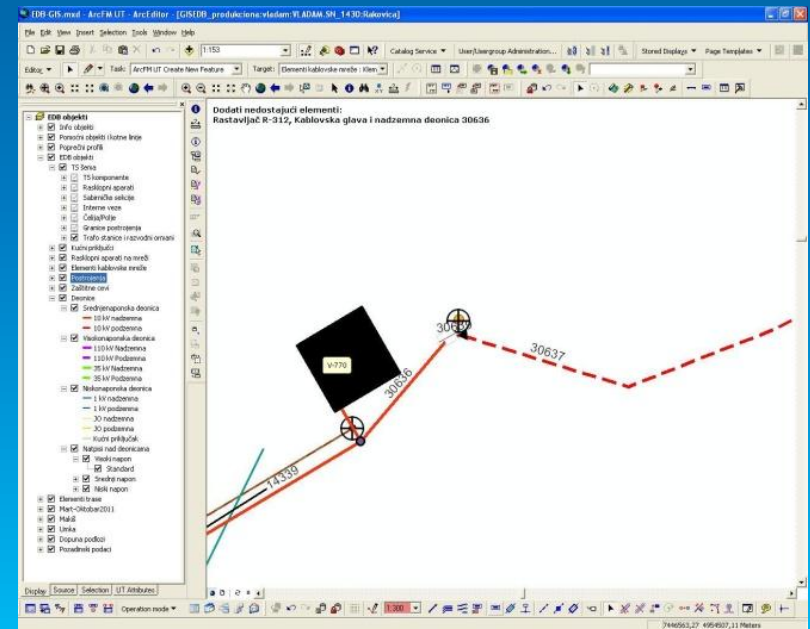
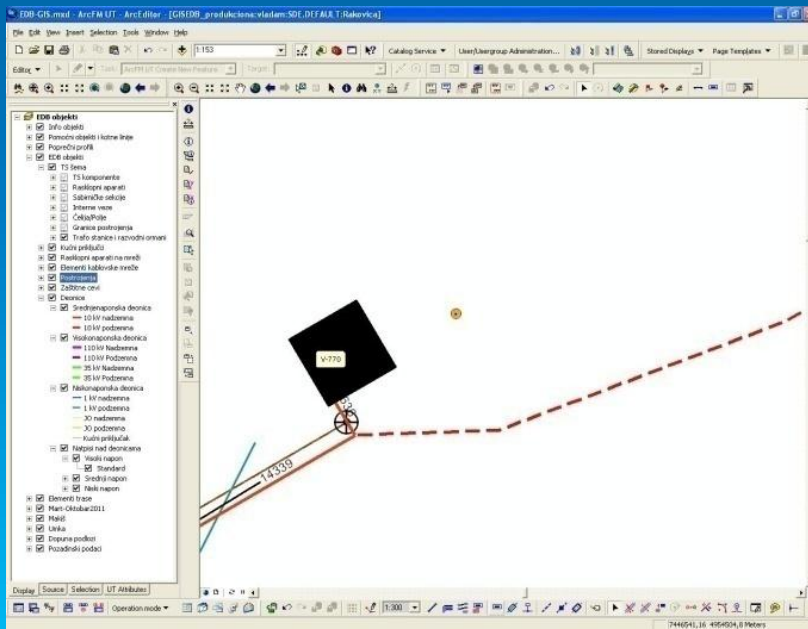
- Migration data in GIS via FME software
- GPS - GIS

# GPS DATA IN GEODATABASE



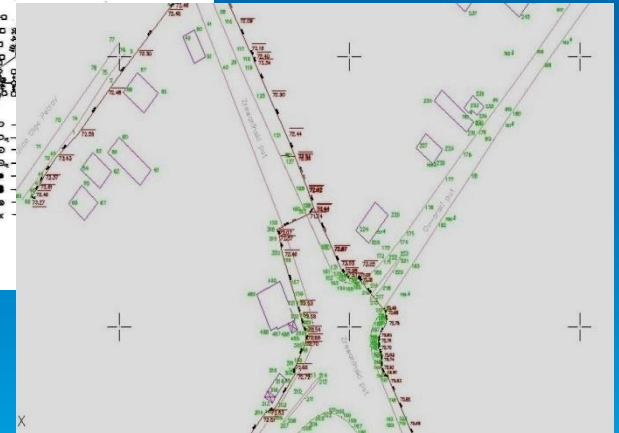
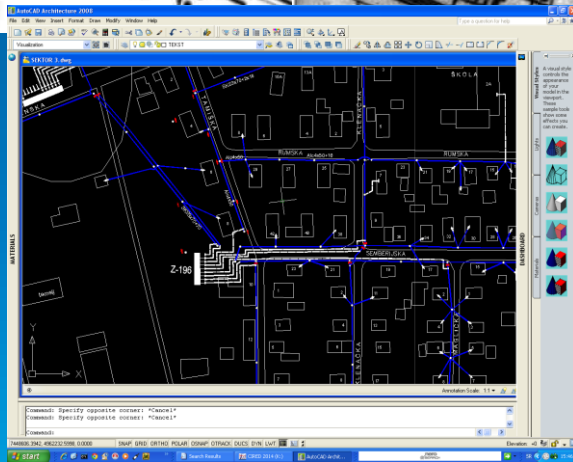
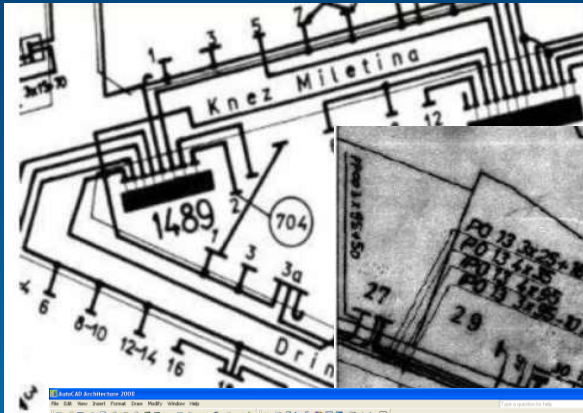
# DATA POST-PROCESSING

- Corrects errors made during GPS collecting and during migration, and verifies the data.
- PRINT LARGE AREA



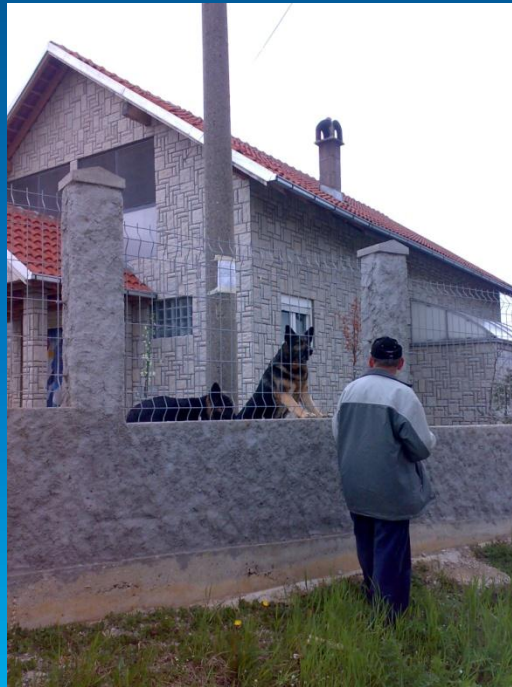
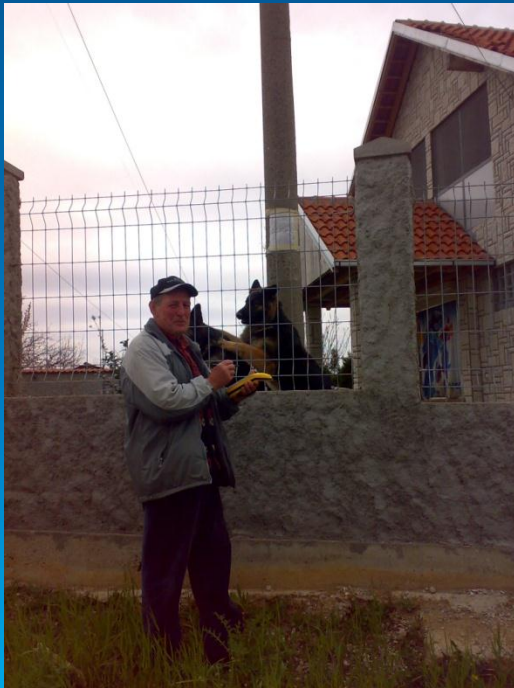
# PROBLEMS - INITIAL CONDITION

- Different initial condition in various types of documents - which is correct?



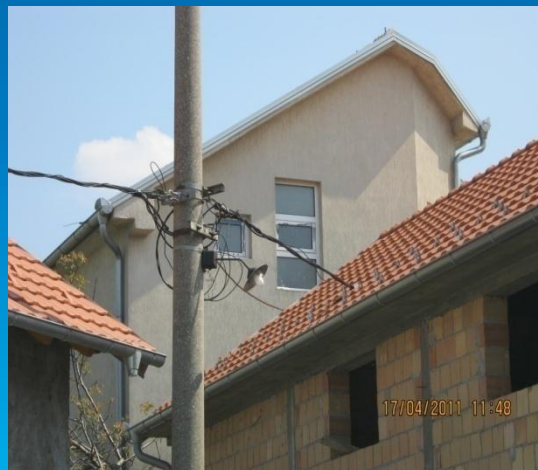
# PROBLEMS IN THE FIELD

- One of the reasons for the use of laser rangefinder
- Disabled the arrival at the measuring point.
- Direct contact with customers
- Locked, dog





# ILLEGAL CONSUMPTION



# ILLEGAL CONSUMPTION



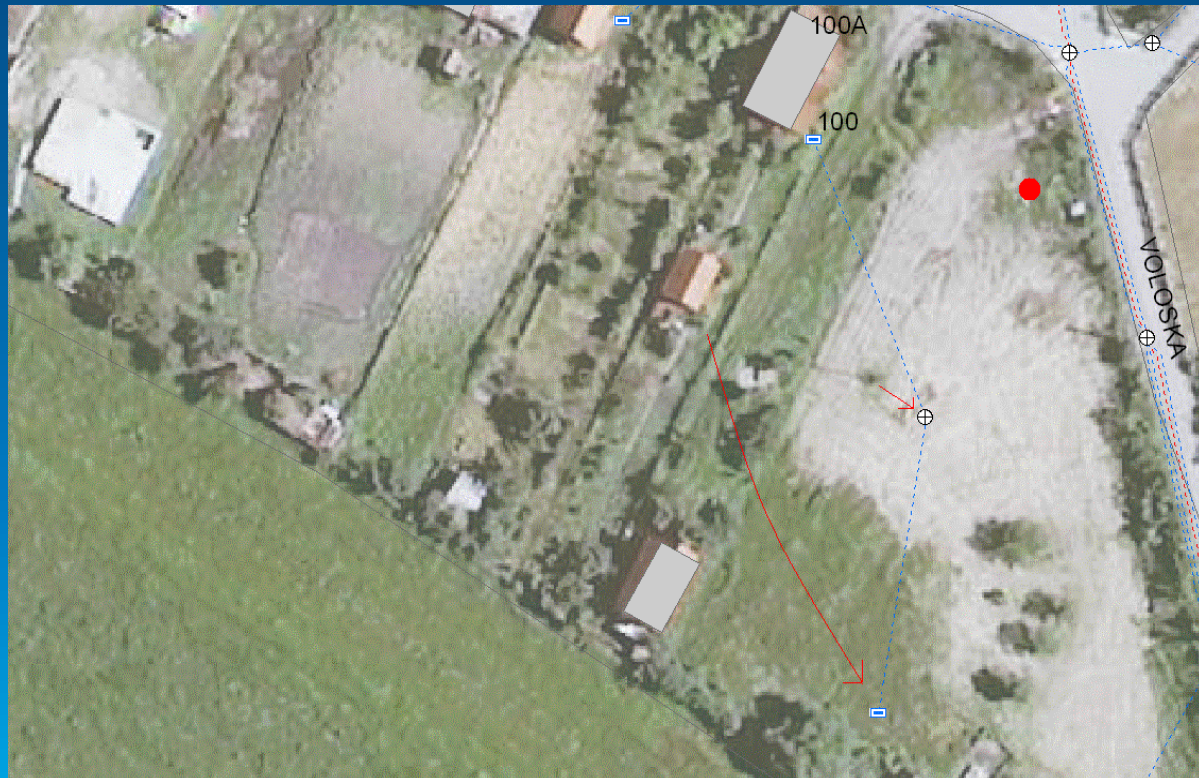
# PROBLEMS IN THE FIELD - ILLIGAL CONSUMPTION

- **New service points that are kept in the system in application stage are already energized**
- **consumers are not in the system**
- **There are not the meter reading.**
- **Border changes affect the topology of substation consumption area, and therefore the measurement results.**



# PROBLEMS – LASER BEAM

in foggy day happens reflection of the laser beam which produces the wrong length. Also local magnetic fields affect the compass located in the laser rangefinder and it happens that the object is wrongly recorded.



# PROBLEMS – PUBLIC LIGHT NETWORK

- Incomplete documentation of public lights.
  - Recording consumption public light region of the transformer requires tracking stocks public lights whose boundaries do not coincide with the boundaries of the regions with the transformer which supplies public lights network.
  - No measurements in public lights distribution boxes.
  - illegal lights on the network (reflectors)
- Unauthorized consumption by connecting directly to the public lights poles.



TS	Brojilo	RO JO	snaga JO W		
V-1091	NE	NE	150	500	10350
B-474	NE	NE	150	500	0
B-1461	u ormanu	DA	150	500	0
B-685	NE	NE	150	500	0
B-694	NE	NE	150	500	0
B-961	NE	NE	150	500	0
V-13	NE	NE	150	500	3150
V-1114	NE	NE	150	500	1500
V-1115	NE	NE	150	500	3000
V-35	NE	NE	150	500	14150
V-296	DA	DA	150	500	2550
Z-1073	neprovereno	DA	150	500	0



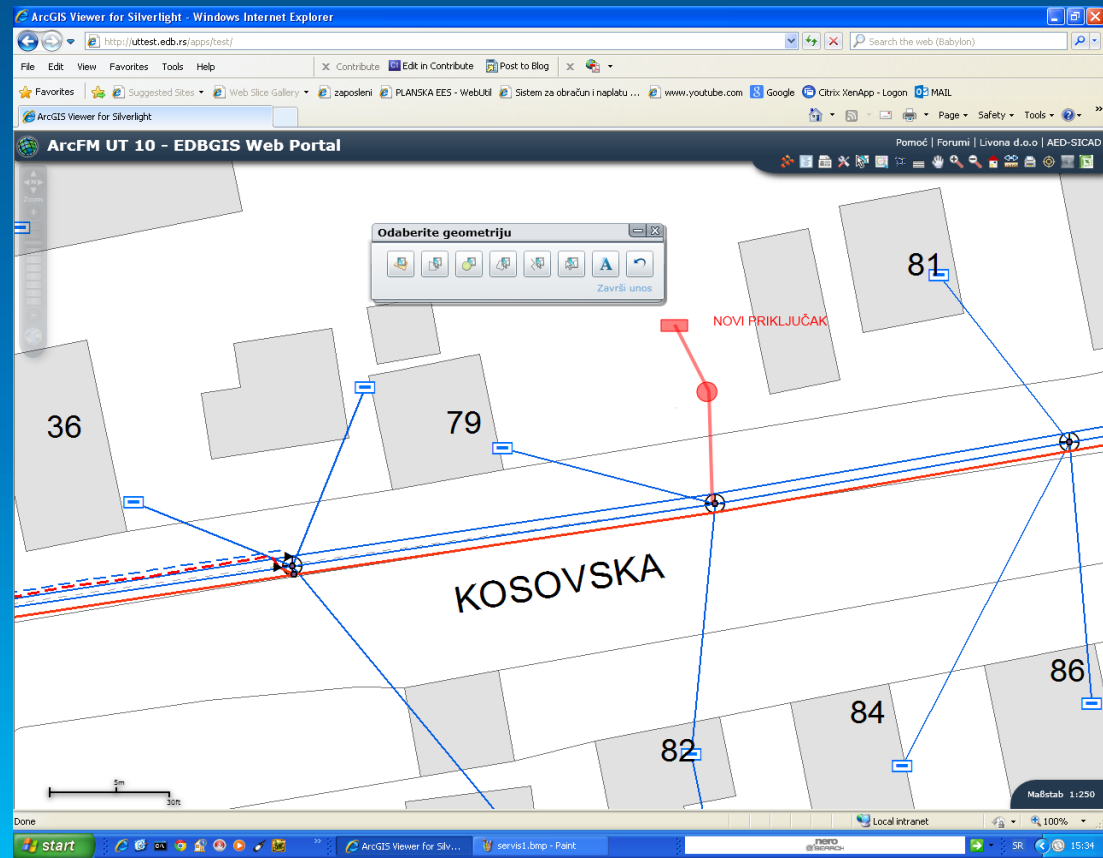
# PROBLEMS – UNMARKED CABLES

- Unmarked cables in the terminal cable boxes
- Unmarked feeders in substations



# PROBLEMS – NETWORK CHANGES

- The changes are not submitted to a whole completely, or not submitted in proper form that would allow fast and accurate updating of data. It is therefore created a procedure of submitting changes centrally so that all changes are coming in GIS team.



# PROBLEMS – NETWORK CHANGES

- GIS WEB form

The screenshot displays the ArcFM UT 10 - EDBGIS Web Portal interface. The main window is titled "ArcGIS Viewer for Silverlight - Windows Internet Explorer" and shows a web browser with the URL <http://uttest.edb.rs/apps/test/>. The portal header includes "ArcFM UT 10 - EDBGIS Web Portal" and navigation links for "Pomoć", "Forumi", "Livona d.o.o", and "AED-SICAD".

The central part of the interface features a "GIS formular" (GIS form) with the following fields:

- Ime i prezime: [text input]
- Telefon: [text input]
- Email: [text input]
- Služba: [text input]
- Opis promene: [text area]
- Opis lokacije: [text area]
- Broj predmeta: [text input]
- Broj saglasnosti: [text input]

Below the form, there are buttons for "Kreiraj prikaz područja", "Pošalji administratoru", and "Otkazi". A "Boja:" section shows a dropdown menu set to "Crvena" and a "Transparencija: 50%" slider.

The right side of the interface shows a map view with a network diagram. A red dot on the map is labeled "NOVI PRIKLJUČAK" (New Connection). The map includes buildings and utility lines, with labels for buildings 36, 81, 84, and 86. A scale bar indicates 5m and 30ft. The map is titled "Područje od interesa" (Area of Interest).

A dropdown menu for "Vrste promena" (Types of changes) is open, listing various network change options:

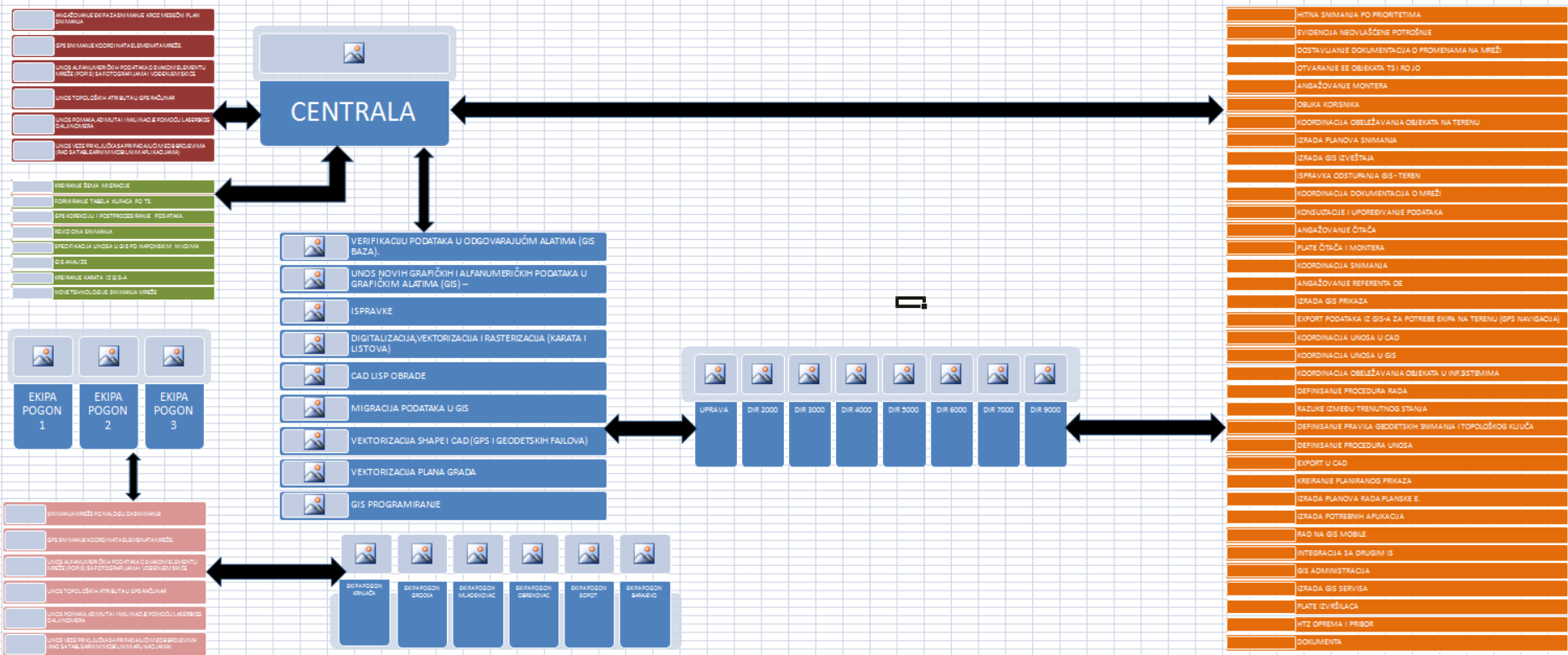
- Novi NN nadzemni vod
- Novi SN nadzemni vod
- Novi VN nadzemni vod
- Zamenjen NN nadzemni vod
- Zamenjen SN nadzemni vod
- Zamenjen VN nadzemni vod
- Novi NN kablovski vod
- Novi SN kablovski vod
- Novi VN kablovski vod
- Zamenjen NN kablovski vod
- Zamenjen SN kablovski vod
- Zamenjen VN kablovski vod
- Nova TS 10/04
- Nova TS X/10
- Novi priključak sa postojeće NN mreže
- Priklučenje preko postojećeg priključka
- Novi priključak preko pomoćnih stubova
- Kablovski silaz sa nadzemne NN mreže... sa kućnim priključkom
- Podzemni priključak (ulaz-izlaz) na postojeći NN vod
- Kućni priključak – kablovski izvod iz TS 10/04
- Kablovski izlaz do prvog stuba... sa kućnim priključkom
- Promena NN granice
- Promena SN granice
- Promena VN granice
- Novi rasklopni aparat (recloser, rastavljač)
- Premešten rasklopni aparat
- Greška u GIS-u

The bottom of the screen shows the Windows taskbar with the "start" button, several open applications, and the system clock showing 15:34 on 08/08/2008.



# PROBLEMS – GIS STRUCTURE

The project team - required GIS sector  
 Coordination of many different departments.  
 Permission for GIS team  
 opening objects



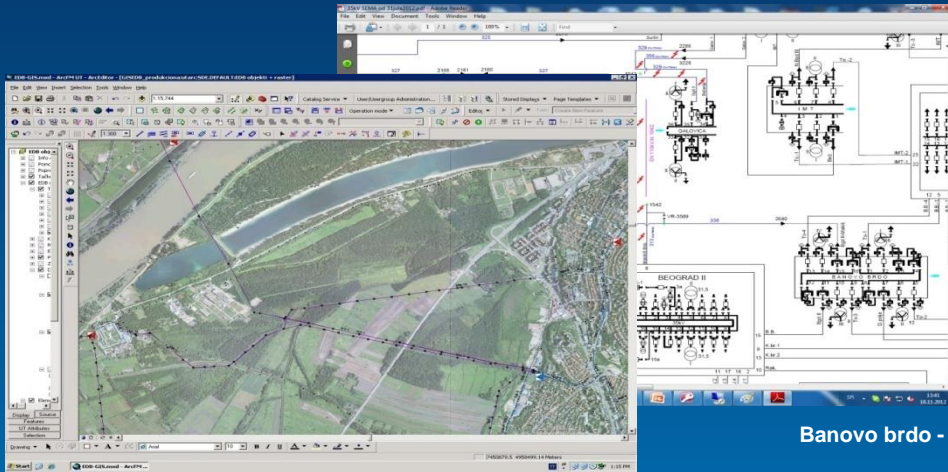
# GIS SERVICES - NAVIGATION TO POI

If we avoid all the problems in the field and office we obtain GIS services and analysis.

- Problem navigating dispatch team to the location of objects of interest
- Poles, switches, reclosers, substations.
- Export from geodatabase, convert and import in GPS navigation device.



# GIS ANALYSIS



Banovo brdo - Makiš

TS	Podzemna (m)	Nadzemna (m)
B-474	354.15	0.00
B-685	277.44	0.00
B-694	951.20	1126.64
B-1461	248.52	0.00
B-961	537.04	21.59
V-13	921.18	1532.32
V-296	754.14	1184.99
V-1091	1697.78	1856.07
V-1114	727.57	679.04
V-1115	765.50	1126.64
V-35	129.44	7332.16
Z-1073	446.95	0.00

TS - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - spojnica  
 spojnica - TS

Naponski nivo	85 stubova 10kV, 490 stubova 1kV
Tip	2 rešetkasta, 2 cevna, 571 okrugli
Materijal	41 drveni, 5 čeličnih, 529 betonskih
Dužina stabla	630/9=43 stuba, 630/12=3, 630/11=1, 400/12=1, 400/11=1, 315/12=14, 315/10=1, 250/9=351, 220/8=6, 2000/9=1, 1600/9=4, 1600/12=4, 1600/11=3, 1000/9=119, 1000/12=2, 1000/11=3
Stanje	17 krivih I 2 oštećena stuba
Druge instalacije	Telekom+kds=50, Telekom=61, kds=172
Svetiljka	0 reflektora I 353 stubova sa jednom svetiljkom I 7 sa dve svetiljke
Odvodnik prednapona	2 silikonska I 6 porcelanskih
Vodjenje	37 dvostruko, 467 jednostruko I 62 mešovito I 9 trostruko
Broj priključaka	5 stubova sa po 6 priključaka, 13 stubova sa po 5 priključaka, 27 stubova sa po 4 priključaka, 69 stubova sa po 3 priključaka, 108 sa po 2, 173 sa 1 i 178 bez priključaka
Osigurači	147 stubova sa osiguračima
IMM	0 izmeštenih mesta merenja
Zajednički stub	42 zajedničkih stubova pod granicama

# GIS ANALYSIS

- Substation Internal schema



# GIS ANALYSIS

- precise identification of the power supply of each customer.

The screenshot displays the EDB GIS WEB Portal interface within a Windows Internet Explorer browser. The browser's address bar shows the URL <http://uttest.edb.rs/edbgis/>. The portal's navigation menu includes 'Opsti prikaz', 'Operativna Energetika', 'OE-CAD', and 'Tehnicka Dokumentacija'. The main content area is titled 'ArcFM UT 10 - EDBGIS Web Portal' and features a satellite map of a residential neighborhood. A network trace is overlaid on the map, consisting of blue lines that connect various buildings to a central power source. The buildings are labeled with addresses such as '44E', '44F', '44G', '44X', '44Y', '44Z', '44A', '44B', '44C', '44D', '44E', '44F', '44G', '44H', '44I', '44J', '44K', '44L', '44M', '44N', '44O', '44P', '44Q', '44R', '44S', '44T', '44U', '44V', '44W', '44X', '44Y', '44Z'. The network trace starts from a central point and branches out to each building, indicating the power supply path. The map also shows a street named 'DULETA OTOVNICA' and another street named 'BANKA RAHMARIJA'. The scale of the map is 1:1000. On the left side of the map, there is a 'Network Trace' panel with the following settings: 'Map Services' set to 'EDBGIS', 'Mark Search Options' checked, 'Options' checked, and 'Place Trace Flag' checked. The 'Flag Type' is set to 'Start (1 item)' and the 'Flag' is 'i8 1 Fiktivno rastavno mesto'. Below the 'Network Trace' panel, there is a list of items: 'Type: Fiktivno rastavno mesto (1 Item)' with 'i8 1', 'Type: Nadzemno priključno mesto (13 Items)' with a list of addresses and their corresponding power supply points, and 'Type: 1 kv podzemna (1 Item)' with 's8-17 B-1849-17-ts-s8 Topološka veza'. The bottom of the screenshot shows the Windows taskbar with the 'start' button and several open applications, including 'EDB GIS WEB P...', 'My Pictures', and 'servis4.bmp - A...'. The system tray shows the date and time as 8:50.



# GIS – Dispatching Control Center IS



Dijega Rivere 8

# GIS – BILLING(CIS)

**Create: BROJILO**

Address: [Empty]  
Zip: 11000 Community: ZEMUN / BEOGRAD-ZEMUN  
Street: DIJEGA RIVERE House No: [Empty]  
Location: [Empty]  
Key: EDB broj: 30619821

Assonments: Osnovni podatci | State/History: Companies/Persons | Registry: Documents

Tip: EI NES  
Naznacena struja: 10-40 A Datum prikljucenja: 14.03.2003  
Naznaceni napon: 380 V Važan (dathe): ne

u pogonu 1105111209091071857942

**Potrošač**

ED Broj: 30619821 0 Potrošač: LUKAČ VELJKO  
JMBG: 3003963111940 Čtački hod: 3 15 12 11000

**Sahni adrese podatke**

Adresa potrošača Adresa memo mesta Adresa fakturisanja

Opština: ZEMUN Mesto: ZEMUN  
Ulica: 5048 - DIJEGA RIVERE Kuć. br: 8 Ulaz: Sprat: Stan:  
Pošta: 11080 BEOGRAD 80 Adresni kod: 11283 006 200961  
Mobilni telefon: Email:

Matični Ugovori Tgrite EES Odobrena snaga Oskobađanja Popusti Oponege Tjžbe Ocjebrenja

**Merno mesto**

Status: Pregledano i prihvaćeno Plomba: 0  
Kategorija čtanja: 6 - 2 min 50 sek Vrsta memo ormara:  
Šifra priključka: 3000016714 Status priključka: Uneti samo podaci o napajanju Broj faza:  
Reg. broj TS: Z-1475 Naziv TS: ALTINA, SVETOMIRA... Transformacija: 10/0.4 Transformator: T1 Izvod: 3  
Vrsta priključka: Tip gl. voda: Prepek gl. voda: Struja gl. osig.

**Potrošač**

Vrsta prijave: Aktivna prijava Aktiva tarifa: 5 - Domaćinstvo DT  
Broj pasoa: Broj priključka: Broj tek. računa: Nema račun Datum zahvaranja:  
Kategorija: 1 - Domaćinstvo  
Način plaćanja: Plaća akontaciju  
Sud: 1 - Prvi osnovni sud u E

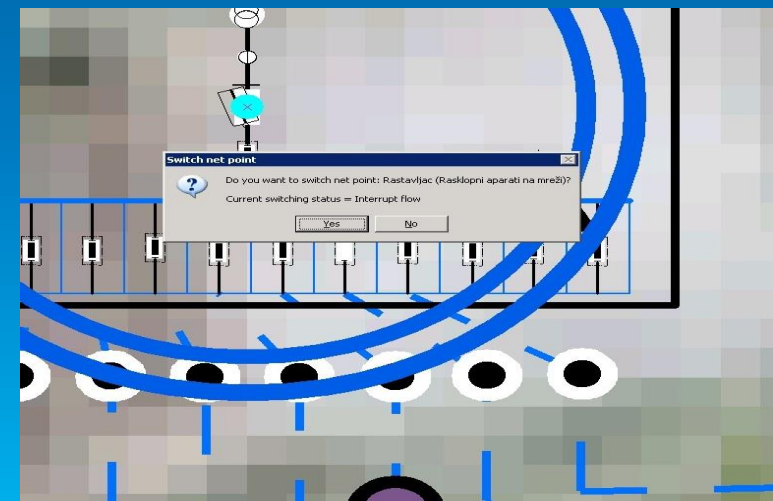
**Zaduženje**

JUSTINA POP



# GIS ANALYSES

- - internal schema substation
- - change status elements

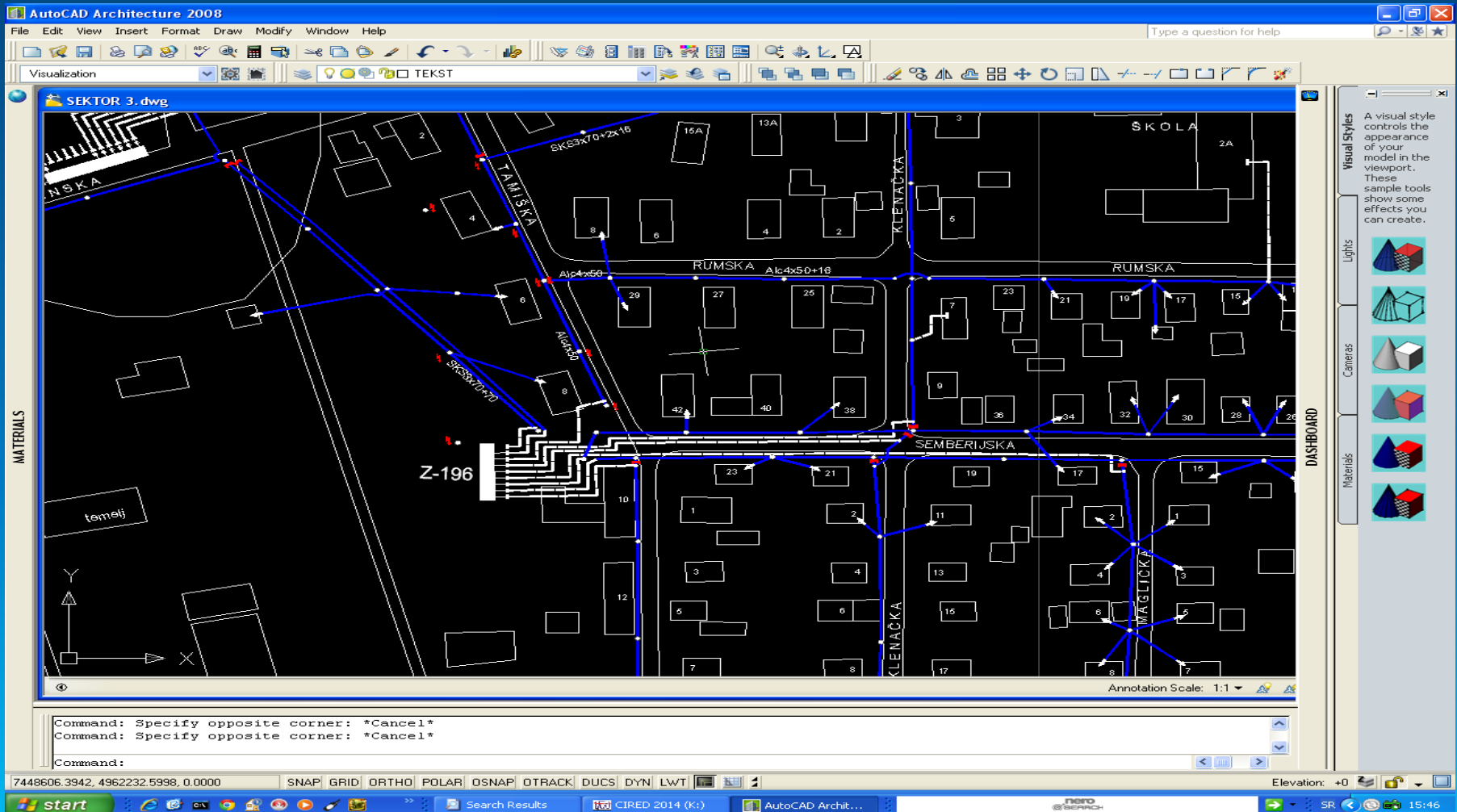


# EXPORT FROM GIS

Export GIS – CAD for planning network department

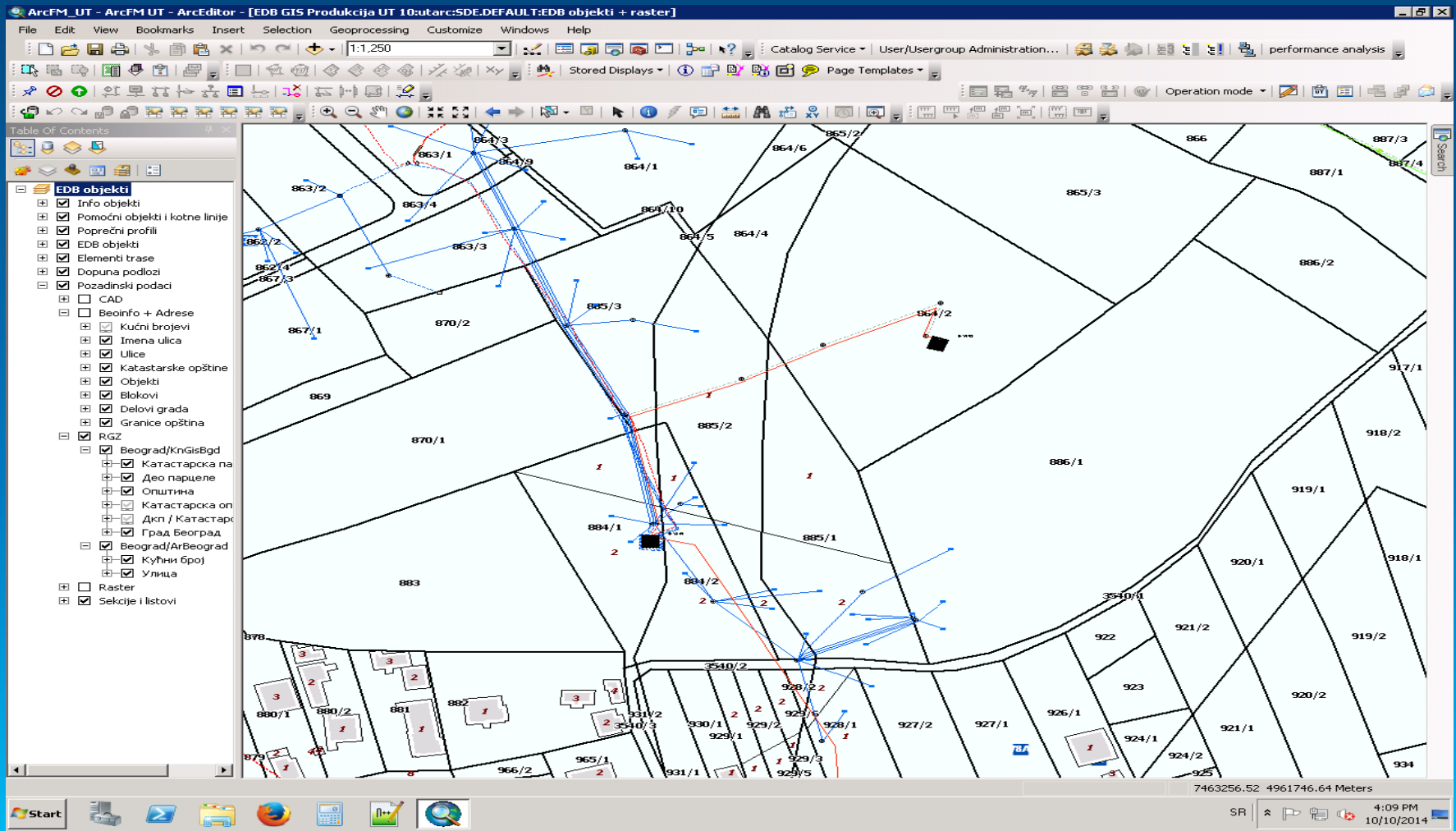
Export for navigation

Export for asset management



# CADASTRE REST SERVICE

incomplete  
address register  
cadastral parcels register



7463256.52 4961746.64 Meters

# GIS ANALYSES

- Distribution of customers by categories, method of heating, type of connection
- Distribution of illegal networks, illegal consumption
- Failures, audits, repairs, items
- Locked, dangerous dog, denied access to measuring point
- Dialysis, an artificial lung, schools, hospitals



# GIS – BILLING (CIS) AMR - COMERCIAL LOSSES

## Losses analyses – Customers list by substation from GIS relocated meters position

POTROŠNJA PO TS 10/04

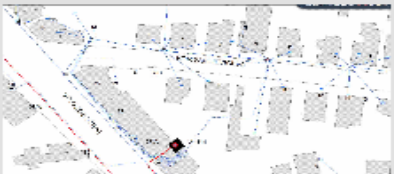
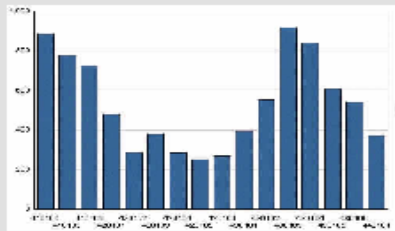
### AMR - GUBICI PO IZABRANOJ TS 10/0.4

Naziv:  Broj brojila:  Konstanta:  Snaga TS:

Snaga JO:  Procena energije JO:  Način grejanja:  Nadzemna mreža(m):  Kablovska mreža(m):

*dupli klik - spisak kupaca*

Napomena:

PDF XLS

### MERENJA AMR TS 10/0.4

Date of reading	Stanje VT	Stanje MT	Stanje VTR	Stanje MTR
11.07.2014	11718	7189	2021	761
10.07.2014	11712	7186	2019	761
09.07.2014	11704	7184	2017	760
08.07.2014	11697	7181	2015	759
07.07.2014	11689	7178	2013	758
06.07.2014	11683	7176	2011	758
05.07.2014	11676	7174	2010	757
04.07.2014	11669	7171	2008	756

### mesečna SNAGA AMR TS 10/0.4

Datum max	vta	O1.mes	mta	O1.mes	Maxpt1	Maxpt2
01.08.2014	11855,64	7237,477	,636	,464		
01.07.2014	11649,07	7163,346	,728	,504		
01.06.2014	11430,25	7081,428	,76	,752		
01.05.2014	11190,21	6982,893	,892	1,172		
01.04.2014	10929,88	6847,544	1,084	1,508		

GIS PRIKAZ TERITORIJE

### POTROŠNJA DOMAĆINSTVA

Obračun	Citanje	Od Citanje	Do Dana	Neo	Očit	kom	Kwh
440103	02.06.14	02.07.14	30	14		228	64481
440102	02.05.14	02.06.14	31	6		228	76618
440101	02.04.14	02.05.14	30	14		228	92970
430106	02.03.14	02.04.14	31	13		228	126900
430105	02.02.14	02.03.14	28	13		228	142252
430104	03.01.14	03.02.14	31	14		228	185018
430103	02.12.13	02.01.14	31		13	229	201232
430102	01.11.13	01.12.13	30		10	229	133289
430101	01.10.13	01.11.13	31		5	229	91956
420106	04.09.13	04.10.13	30		13	229	68194
420105	05.08.13	05.09.13	31		12	229	64928
420104	04.07.13	04.08.13	31		14	228	64188

### POTROŠNJA VIRMANI

Obračun	Citanje	Od Citanje	Do Dana	Neo	Očit	Kom	Kwh
2220000	02.06.14	02.07.14	30		6	20	13225
2210000	02.05.14	02.06.14	31		5	20	13994
2200000	02.04.14	02.05.14	30		6	20	13975
2190000	01.03.14	01.04.14	31		3	20	23057
2180000	02.02.14	02.03.14	28	1	3	22	31508
2170000	03.01.14	03.02.14	31		2	22	39826
2160000	02.12.13	02.01.14	31		5	21	32157
2150000	01.11.13	01.12.13	30		4	21	16094
2140000	01.10.13	01.11.13	31		6	21	15436
2130000	02.09.13	02.10.13	30		6	21	13775
2120000	01.08.13	01.09.13	31		6	21	14109
2110000	25.06.13	26.07.13	31	1	6	21	13718

### IZRAČUNATI GUBICI AMR - (D+V)

Citanje	Od Citanje	Do	AMR Kwh	D+V Kwh	Razlika Kwh	%
02.06.14	02.07.14		89862	77706	12156	13.53
02.05.14	02.06.14		97134	90612	6522	6.71
02.04.14	02.05.14		122660	106945	15715	12.81
02.03.14	02.04.14		160153	149957	10196	6.37
02.02.14	02.03.14		188071	173760	14311	7.61
03.01.14	03.02.14		244222	224844	19378	7.93
02.12.13	02.01.14		273105	233389	39716	14.54
01.11.13	01.12.13		164988	149383	15605	9.46
01.10.13	01.11.13		118671	107392	11279	9.50
04.09.13	04.10.13		92657	81969	10688	11.54
05.08.13	05.09.13			79037		
04.07.13	04.08.13			77906		

# GIS – GPS BENEFITS

## Mapped networks in one place

- Address system house connections
- Network analysis - determining the directions of power, planned off ...
- better planning
- Easier approval of the location and energy compliance
- recording failures
- SSem 10/04 TS
- Calculations voltage drops
- The exact length of lines and sections
- Photos of network components
- accurately labeling
- alphanumeric up to date
- **ASSETS MANAGEMENT**
- Navigation on the site and the elements
- The exact positions of the poles, substations, reclosers, potheads, disconnectors, lights, advertising, non-energy network
- The exact positions of the telecommunications network
- The exact locations of the illegal network
- Correct network topology
- Audited in new ways and new technologies

**THANK YOU**

**VLADIMIR STOJIČIĆ , M.Sc.E.E. – (dipl.ing.el.)**

**GIS manager**

**GPS Project leader**

**Lead IT specialist**

**The Electric Power Distribution – Belgrade**

**ICT Department**