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ELNOS
GROUP

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100 METERS ABOVE THE LAND
GIANTS OF LAKE MÄLAREN



365 MW
INSTALIRANOG KAPACITETA
OBNOVLJIVE ENERGIJE
365 MW INSTALLED CAPACITY
OF RENEWABLE ENERGY

DV 400 kV Hamra-Åker, Švedska

Podizanje dalekovodnih stubova visokih 86 i 100 m

TL 400 kV Hamra-Åker, Sweden

Erecting transmission line towers 86 and 100 m high



Riječ urednika

Editors letter

Dragi prijatelji, poštovani partneri,

U eri globalnih megatrendova znatno su se ubrzale promjene u društvu, tehnologiji i energetici. Razvoj modernog doba neraskidivo je vezan za energetiku, čija su budućnost obnovljivi izvori energije. Iako posljednjih godina globalni kapacitet zelene energije snažno raste, predviđa se da će potražnja za njom u naredne tri decenije porasti za 35 odsto. Put ka energiji budućnosti je dug i brojni novi izazovi sve veće složenosti su tek pred nama. Za uspjeh na ovom putu neophodni su posvećenost napretku i praćenje inovacija, a dragocjena su sva prethodna iskustva.

Mi u Elnos Grupi, predanim stvaralačkim radom živimo ove vrijednosti i dijelimo ih sa vama kroz priče o projektima koji mijenjaju energetsku sliku Evrope, od rekorda ostvarenog učešćem u 365 MW instaliranog kapaciteta iz OIE, preko HVDC sistema koji su remek-djela moderne tehnologije, do drugih brojnih poduhvata. Naša najnovija iskustva značajan su link ka uspostavljanju modernih elektroenergetskih sistema, kojim će se smanjiti emisije štetnih materija i obezbijediti sigurnost snabdijevanja električnom energijom. I to je ono na šta smo, uz naše zaposlene, posebno ponosni.

Pozivamo vas da otkrijte interesantne priče o našoj Grupi i našim zaposlenima. Nadamo se da će vas inspirisati posebnom, Elnosovskom, ljudskom i poslovnom alhemijom.

Dear friends and partners,

In the era of global megatrends, social and technological changes, as well as changes in domain of energy, are occurring faster than ever. Development of modern age is most closely connected with energetics, future of which lies in renewable energy sources. Although global green energy capacity is experiencing serious growth in recent years, it is forecasted that demand for this type of energy will continue to grow and will experience an increase by 35 percent in following two decades. A journey to energy of the future is a long one and numerous ever more complex tasks stand before us. In order to succeed, it is necessary to remain dedicated to progress and focused on innovation, having a due regard to all previous experiences.

We in Elnos Group, live these values through our devoted creative efforts and share them with you in our stories about projects that are changing energy map of Europe, from record attained by participating in installation of 356 MW of capacity all from renewable energy sources to HVDC systems which are a master piece of modern technology and numerous other undertakings. Our most recent experiences are an important link to establishing modern electric power systems which will help reduce pollutant emissions and provide a stable and reliable power supply. This is what we are, along with our employees, most deeply proud of.

We invite you to discover interesting stories about our Group and our employees. We hope these will inspire you, with their true, Elnos-wise, human and business alchemy.

Uživajte čitajući,

Enjoy reading,

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Menadžer za korporativne komunikacije
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NOVI PODUHVAT NA ISLANDU
100 METARA ISPOD
VULKANSKOG TLA

NEW ENDEAVOUR ON ISLAND
100 METERS BELOW
VOLCANIC SOIL

Ovo je priča o hrabrosti i izazovima moderne energetike spojenim u jedinstvenom podvigu izgradnje hidroelektrane Búrfell 2, odvažnom projektu ispisanim duboko ispod površine zemlje.

A story about courage and challenges of modern energetics combined in a unique endeavour to construct hydro power plant Búrfell 2, a bold project engraved deep below surface of earth.



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PRIČA O JUBILEJU
NAŠA PRVA DECENIJA
U CRNOJ GORI

ANNIVERSARY STORY
OUR FIRST DECADE IN
MONTENEGRO

Elnos inženjering ove godine slavi svoj deseti rođendan. Ponasni smo na činjenicu što je naša članica sa centralom u Podgorici danas jedna od vodećih elektroenergetskih kompanija na ovom tržištu.

Elnos Engineering celebrates its tenth birthday this year. We are proud that our member established in Podgorica became one of leading electrical engineering companies in the market.

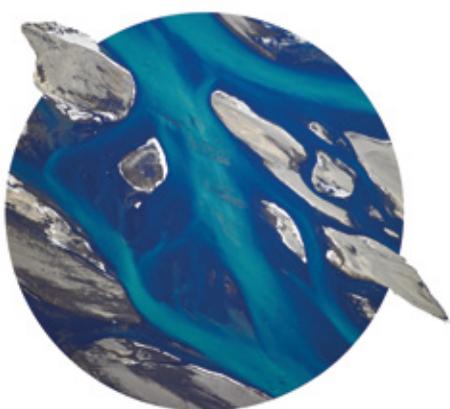
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ŽENE U ELNOS GRUPI
PRIČE SA
GRADILIŠTA

WOMEN IN ELNOS GROUP
CONSTRUCTION SITE
STORIES

One su žene koje su iz ljubavi prema nauci, tehnički i izazovima odlučile da profesionalan poziv vežu za rad na terenu i postanu „dame sa šljemetom“. Upoznajte ih.

These are the women that, out of their love of science, technics and challenges, decided to choose a career linked to a construction site and become “ladies in helmets”. Meet them.



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NOVE TEHNOLOGIJE IZGRADNJA ENERGETSKE MREŽE NOVE GENERACIJE

NEW TECHNOLOGIES BUILDING THE ENERGY NETWORKS OF A NEW GENERATION

Bili smo dio projekta izgradnje HVDC interkonekcije između Crne Gore i Italije. Gradeći konvertorsku stanicu u Lastvi Grbaljskoj, suočili smo se sa izazovima nove energetske budućnosti.

We were part of the construction project HVDC interconnection between Italy and Montenegro. By building the converter station in Lastva Grbaljska, we faced the challenges of the new energy future.



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ŠIROM ŠVEDSKE TRAFOSTANICE ZA MODERNIJI I STABILNIJI SISTEM

ALL OVER SWEDEN SUBSTATIONS FOR MODERN AND MORE STABLE SYSTEM

Nizom projekata izgradnje i rekonstrukcije trafostanica, ekipi Elnos Grupe nastavljaju potvrđivati ekspertizu u realizaciji najzahtjevnijih projekata širom Švedske.

A series of substation construction and reconstruction projects performed by Elnos Group teams continues confirming our expertise in realization of most demanding projects across Sweden.



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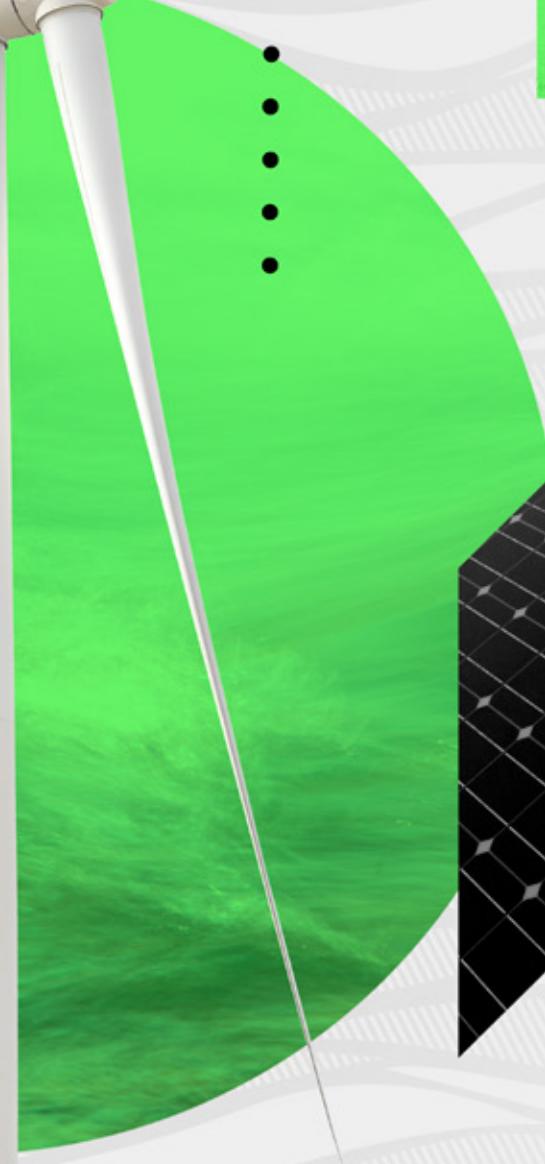
POGLED U BUDUĆNOST STUDENTI POSJETILI GRADILIŠTE VP ČIBUK 1

A LOOK INTO THE FUTURE STUDENTS VISITED SITE OF WIND FARM ČIBUK 1

Vidjeti projekat izgradnje najvećeg vjetroparka na Balkanu je za buduće inženjere značajan korak ka zadacima koji ih čekaju. Bilo nam je zadovoljstvo podijeliti znanje i iskustvo sa njima.

Witnessing construction of largest wind farm in Balkans is a significant step for future engineers towards the tasks that await them. It was a pleasure to share our knowledge and experience.





JEDAN ZELENI MW ZA SVAKI DAN U GODINI

ONE GREEN MW FOR EACH
DAY IN A YEAR

SR "Energija, to je ključni problem budućnosti – pitanje života ili smrti", kao da nam je savremenik, jednim od najaktuelnijih pitanja današnjice bavio se Nikola Tesla.

Za očuvanje energetske budućnosti na planeti potrebno je dostići još mnogo ciljeva. Ipak, dobra vijest je da je planeta prošlu godinu, uprkos velikim izazovima, završila sa pozitivnim „zelenim“ energetskim bilansom.

Naime, procjenjuje se da je ukupan globalni kapacitet zelene energije na kraju 2018. iznosi oko 2.378 GW, što je za 181 GW ili 8 odsto više, u odnosu na godinu dana ranije.

Prateći zahtjeve energetski održive budućnosti, rad Elnos Grupe je usmjeren na povećanje obnovljivih energetskih kapaciteta. Zadovoljni smo što možemo istaći da smo u godini iza nas, kroz projekte čiji smo bili dio, učestvovali u stvaranju novih 365 MW zelene energije.

Simboličnih po 1 MW za svaki dan u godini je naš doprinos u tranziciji ka nastanku Zemlje čija pluća će moći duboko da dišu.

Ostajemo na zadatku stvaranja energetski održivih uslova na planeti.

EN "Energy, key problem of the future – a matter of life and death", as he was our contemporary, Nikola Tesla dealt with one of the most current issues of today as well.

In order to preserve energy future on planet, there are many goals to reach. However, it is good news that planet, despite great challenges, ended last year with positive "green" energy balance.

Namely, it is estimated that total global capacity of green energy at the end of 2018 amounted to about 2,378 GW, which is 181 GW or 8 per cent more compared to previous year.

Following in requests by energetically sustainable future, work of the Elnos Group has been focused on increase of renewable energy capacities. We are pleased to be in a position to state that, in the year behind us, we participated in projects which resulted in creation of new 365 MW of green energy.

Symbolically, 1 MW for each day of the year is our contribution in transition toward to the Earth, whose lungs shall be able to breathe deeply.

We are still tasked with creation of energy sustainable conditions on the planet.





100 METARA ISPOD VULKANSKOG TLA

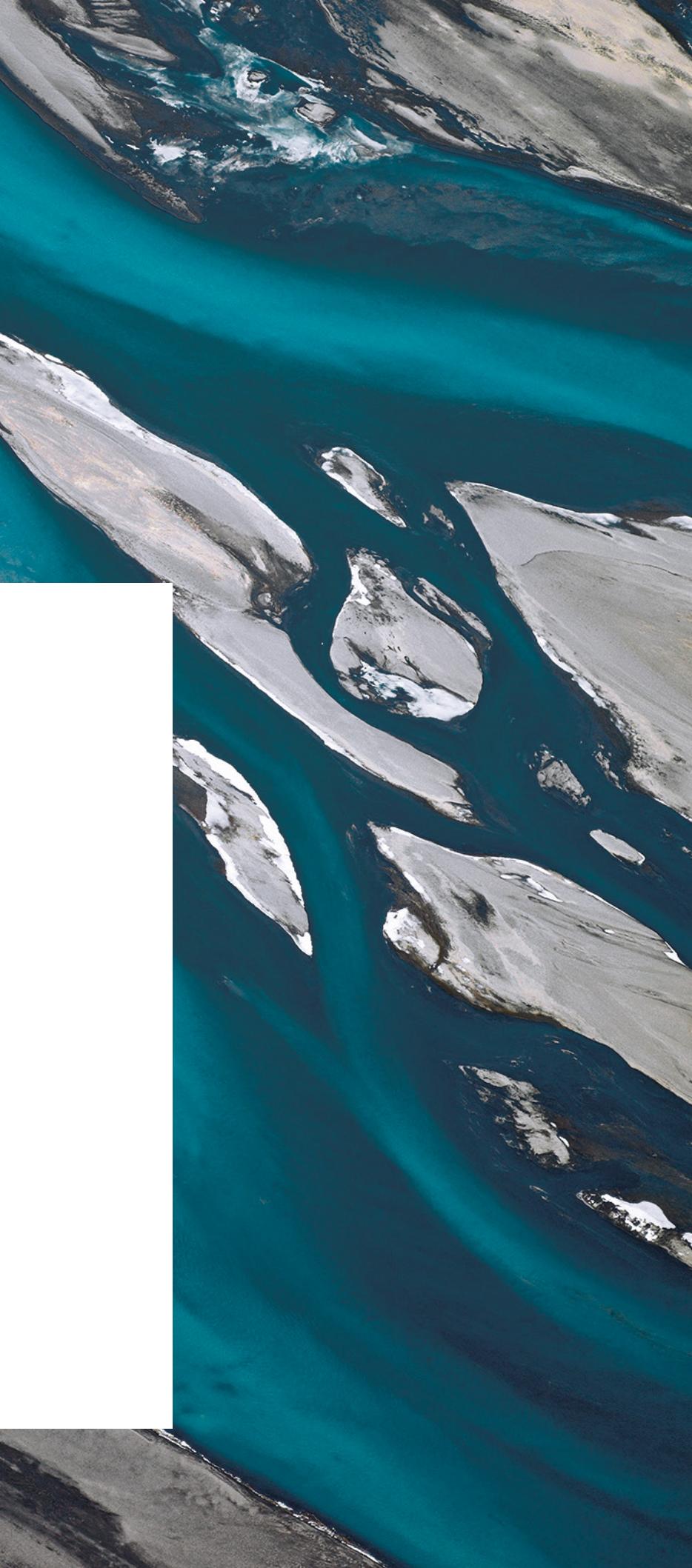
100 METERS UNDER VOLCANIC GROUND

DESETINE METARA ISPOD SLOJEVA

VULKANSKOG TLA, na lokalitetu islandske planine Búrfell, naši timovi su bili dio jednog od najznačajnijih projekata novije energetske istorije najsjevernije evropske zemlje – izgradnji hidroelektrane Búrfell 2. Smješteni u radničko naselje kojem je najbliži oblik civilizacije 60 kilometara udaljen gradić Selfoss, ekipe Elnosa su se našle pred jednim sasvim novim izazovom, izgradnjom elektrane 100 metara ispod zemlje. Došao je trenutak da iskustvo stečeno radom na tlu sada testiramo ispod njega

TENS METERS UNDER LAYERS OF

VOLCANIC GROUND on the site of Icelandic mountain Búrfell, our teams were a part of one of the most significant projects in recent energetic history the northernmost European country – construction of Hydro Power Plant Búrfell 2. Accommodated in working neighborhood, where closest form of the civilization is 60 kilometers away – Selfoss town, Elnos teams were faced to a completely new challenge – construction of power plant 100 meters under the ground. It is a high time that our experience acquired on the ground is to be tested underground



PRIČA O DVA BÚRFELLA

Ispod bazaltnih vrhova planine Búrfell protiče najduža islandska rijeka Þjórsá (230 km) čiji hidropotencijal kotira kao drugi po snazi u ovoj zemlji. Proizvodnja što većeg broja kilitav časova električne energije iz ove ledničke rijeke bila je jedna od najznačajnijih privrednih inicijativa pred kojom se Island našao sredinom 20. vijeka.

Ideja o izgradnji hidroelektrane na rijeci Þjórsá realizovana je 1962. godine, kada je u rad puštena najveća hidroelektrana Islanda. Ona je dobila isti naziv kao planina iznad nje – Búrfell.

Sa instaliranim snagom od 270 MW i godišnjom proizvodnjom od 2300 GWh, sve do 2007. godine hidroelektrana Búrfell je ostala najgrandiozniji hidroenergetski objekat ove zemlje.

Sliv rijeke Þjórsá se vremenom mijenjao, zbog čega je čak 410 GWh njenog potencijala ostalo neiskorišteno. Ovo je bio jedan od ključnih razloga za početak realizacije nove energetske misije – izgradnje hidroelektrane Búrfell 2.

Ovaj poduhvat je podrazumijevao proširenje hidroenergetskog kompleksa u krugu stare, istoimene hidroelektrane kako bi se proizvodnja električne energije povećala za 300 GWh godišnje.

Zadatak ekipa Elnos Grupe je bio da u okviru ugovora sa kompanijom „Andritz Hydro“, izvede kompletne radove instalacije glavnih elektroenergetskih postrojenja neophodnih za priključenje nove hidroelektrane na mrežu. Naše epipe su znale da zadatak na Islandu mora imati pečat atipičnosti. Tako je bilo i ovaj put, jer su prioriteti zaštite ljepote podneblja i što većeg korištenja akumulacije rijeke Þjórsá lokaciju izgradnje HE Búrfell 2 pozicionirali 100 metara ispod vulanskog tla.



Put na posao - spuštanje niz 200 metara dug tunel Commuting - descending through 200 meters long tunnel



Projekat najvišeg nivoa složenosti
Highest complexity project



RAD 'U PEĆINI'

„Ulazak 'u brdo', spuštanje niz tunel duži od 200 metara je poput ulaska u rudarsko okno u kojem vas dočeka ogromno postrojenje, radnici, mašine, oprema koju trebate montirati“, kratak je opis početka radnog dana većine naših zaposlenih na projektu Búrfell 2, prema riječima Danijela Milakovića, poslovođe na projektu.

Pripremni radovi su se odvijali napolju, na temperaturi koja je sezala do minus 15, vjetru koji duva bez predaha, dižući vulkansku prašinu koja je istinska napast. Drugi dio radova odvijao se ispod zemlje, kao u pećini, na mjestu gdje se lako gubi osjećaj za trajanje dana.

Rad ispod tla je donio sasvim drugačiji ambijent, u kojem su naše ekipe pokazale izuzetan timski duh i spremnost da se izbore sa nepristupačnim podnebljem, ali i izazovom rokova.

„Iskustvo koje su ekipe Elnosa stekle u 'zemljivatre i leda' mnogo je više od realizacije projekata montaže nekog običnog postrojenja. Ovo je projekat koji se ne zaboravlja“, rekao je Milaković.

PODVIG ZA PAMĆENJE

U prvoj fazi radova ekipe Elnosa su izradile trase za energetske i komandno-signalne kablove u svim dijelovima elektrane i izvršile montažu

čeličnih konstrukcija u vertikalnom tunelu. U pitanju su konstrukcije koje služe kao nosači za aluminijumske vazduhom izolovane sabirnice koje povezuju generatorski prekidač sa monofaznim energetskim 'step-up' transformatorima. Ovo je etapa radova u okviru koje smo ugradili 3,5 kilometra kablovskih trasa, od čega je 1,2 kilometra njih ugrađeno u dugom vertikalnom tunelu.

Zbog kratkih rokova, naši radnici su u okviru ove faze radili i noću, da bi poslove okončali na vrijeme.

U okviru naredne faze naše ekipe su montirale sistem sopstvene potrošnje elektrane (400 VAC sistem sastavljen iz četiri transformatora sopstvene potrošnje, ormara AC razvoda i pripadajućeg šinskog razvoda i 110 VDC sistem sastavljen iz ormara DC razvoda, baterijskih, ispravljačkih i invertorskih sistema). Paralelno sa ovom fazom montirano je 40 ormara upravljanja i zaštite na više lokacija i etaža hidroelektrane.

Uslijedilo je polaganje i povezivanje energetskih SN i NN kablova, kao i komandno-signalnih kablova u čitavoj hidroelektrani a što je, zbog veoma zahtjevnih kablovskih trasa, bila izuzetno teška faza projekta.

Ipak, najveći izazov je bila montaža aluminijskih vazduhom izolovanih sabirnica. Uz nadljudske napore, spuštajući segmente sabirnica duge 20 metara kroz vertikalni tunel visine 115 metara i prečnika 4,5 metra, uprkos vjetru koji je konstantno duvao, naše ekipe su napravile istinski podvig u svojoj struci.

Važno je istaći da smo uspješno izvršili i montažu generatorskog prekidača, nominalne struje 6300 A i težine oko pet tona, transformatora pobude i na kraju izvršili podršku u aktivnostima na ispitivanjima ugrađenih elektroenergetskih postrojenja.

„U novu hidroelektranu je ugrađena Francis-ova turbina koja u sprezi sa generatorom daje izlaznu snagu od 100 MW. Izlazni napon generatora je 13,8 kV, dok je očekivani pad 110 metara i instalirani protok 92 m³/s“, precizirao je Slaven Pavlović, inženjer na projektu.

Sumarno posmatrano, hidroelektrana Búrfell 2 je donijela novi nivo stabilnosti i pouzdanosti za kompletan elektroenergetski sistem Islanda.

Marko Mijić, projekt menadžer Elnos Grupe je istakao da je ovaj poduhvat veoma značajan za Elnos Grupu, jer je potvrda kapaciteta kompanije za realizaciju projekata ovog nivoa tehničke i logističke složenosti.

„Projekat predstavlja značajan tehnički izazov na planu montaže specifične tehničke

opreme prilagođene uslovima na ovoj hidroelektrani, dnevne koordinacije sa izvođačima mašinske i građevinske faze zbog korekcija izvođačke projektne dokumentacije i intenzivnih optimizacija dinamičkih planova, kako bi se obezbijedio minimalan rok izvođenja radova", istakao je Mijić.

EN STORY ABOUT TWO BÚRFELLS

Longest Icelandic Þjórsá River (230 km) runs under basalt peaks of Búrfell mountain and its hydro-capacity is ranked as the second in capacity in this country. Production of as many kilowatt hours of electrical power from this glacial river was one of the most important economic initiatives and Iceland faced it in the mid-20th century.

Idea on constructing hydro power plant on the Þjórsá River was realized in 1962, when the biggest Icelandic hydro power plant was commissioned. It got as same name as the mountain above it – Búrfell.

Having installed power of 270 MW and annual production of 2300 GWh, all up until 2007, Hydro Power Plant Búrfell remained the most grandiose hydro power project of this country.

Basin of the Þjórsá River changed during time due to which as much as 410 GWh of its capacity remained unused.

This was one of the key reasons for beginning of realization of the new energy mission – construction of Hydro Power Plant Búrfell 2.

This endeavour implied an expansion of a hydro power complex within an already existing power plant of the same name, in order to increase production of electric energy by 300 GWh per year. Within a contract signed with company "Andritz Hydro", Elnos teams were assigned with a task to perform all installation works on main power facilities necessary to connect the new power plant to the network. Our team knew that a task to be performed on Iceland had to be atypical one. And they were right, because in order to protect the beautiful landscape and to enable highest possible usage of accumulation of Þjórsá river, works on construction of power plant Búrfell 2 were executed 100 m below volcanic soil.

WORK 'IN CAVE'

"Entrance 'in hill', descending down the tunnel more than 200 meters long resembles descending to mining shaft where you find an enormous plant, workers, machinery, equipment you need to mount", this is a short description of the beginning of a working day for most of our employees at the project Búrfell 2, witnessed by Danijel Milaković, Project Foreman.

Preparatory works were performed outside on temperatures up to minus 15, wind blowing non-stop and raising volcanic dust, which really is annoying. The other part was performed under the ground as in cave, in the place where you can easily lose track of time.

Working underground brought a completely different atmosphere, where our teams expressed extremely sport spirit and readiness to fight inaccessible region as well as works performance deadline challenge.

"Experience Elnos teams acquired in 'land of fire and ice' is more than mere project realization for mounting simple plant. This was unforgettable project", stated Milaković.

ACCOMPLISHMENT TO REMEMBER

In the first phase of works, Elnos teams constructed routes for power and command-signal cables in all parts of the power plant, and mounted steel structures in vertical tunnel. These are structures used as bearers for aluminum air-insulated busbars connecting generator switch with single phase power 'step-up' transformers. This is a phase of works when we installed 3.5 kilometers of cable routes, out of which 1.2 kilometers were installed in long vertical tunnel.

Due to short deadlines, our workers also worked during the night in this phase in order to complete works on time.

Within the following phase, our teams mounted system of own consumption (400 VAC system consisting of four transformers of own consumption, of AC distribution cabinets and accessory trunking as well as 110 VDC system consisting of DC distribution cabinets, battery, supply and invertor system). 40 cabinets for control and protection were mounted on several locations and levels of hydro power plant simultaneously with this phase.

Laying and connecting power MV and LV cables followed, as well as command-signal cables in entire hydro power plant, and this, due to very demanding cable routes, was extremely difficult project phase.

However, biggest challenge was mounting aluminum air-insulated busbars. With super-human efforts, lowering busbars segments 20 meters long through vertical tunnel 115 meters high and 4.5 meters in diameter, in spite wind blowing non-stop, our teams had an amazing accomplishment in its profession.

It is important to emphasize that we are successfully accomplished mounting of generator switch of 6300 A nominal current and weighing about five tons, and excitation transformer. At

the end, teams provided support in activities of testing installed electrical power plants.

"Francis turbine was built-in in this hydro power plant and, along with generator, it results in output power of 100 MW. Output generator voltage is 13.8 kV, whereas expected head is 110 meters and installed flow of 92 m³/s", Slaven Pavlović, Project Engineer, stated.

Summarized, Hydro Power Plant Búrfell 2 provided new level of stability and reliability for entire Icelandic electrical power system.

Marko Mijić, Elnos Group Project Manager, said this was a project of great importance for Elnos Group since it was confirmation of company's capacities for project realization of this level of technical and logistic complexity. "Project represents a significant technical challenge in the field of mounting specific technical equipment adjusted to conditions on this hydro power plant, daily coordination with contractors of mechanical and construction phase due to corrections of built-in project documentation and intensive optimizations of time schedule in order to provide minimum work performance deadline", stated Mijić.



IDEA 100 YEARS OLD

Einar Ben, entrepreneur, was a visionary who was the first to represent an idea of tackling Þjórsá River 100 years ago. His idea was to build an electric power plant in the very place where Búrfell 2 was built nowadays.

"We are very glad that Búrfell 2 was built here, 'in the yard' of old power plant, the first power plant that Landsvirkjun had built almost over 50 years ago. Likewise, this is 18th Landsvirkjun's power plant. We were relentless about solution for extension referring to the fact that power plant is to be located underground. Project was designed and performed so that specificity of the region in southern part of Iceland remained almost intact", said Ásbjörg Kristinsdóttir, Project Manager on behalf of Landsvirkjun, the Icelandic national electric power supply company, which is Project Investor.



MHE BOČAC 2 IZVRSNOST NA DJELU

SHPP BOČAC 2
EXCELLENCE IN
PERFORMANCE

BAŠ KAO ŠTO VRHUNSKI KUVARI ne žele da govore o posebnim začinima svojih specijaliteta, vode projekata brižno čuvaju tajne izvođenja velikih poduhvata. Imati dobar know how recept u oblasti savremenog inženjeringu znači posjedovati veoma specifičnu kombinaciju znanja i iskustva koji izvođenje projekta vodi ka nivou izvrsnosti. Projekat koji je jedan od najljepših potvrda know how Elnos Grupe je poduhvat izgradnje male hidroelektrane Bočac 2, koja danas kotira kao jedna od najmodernijih hidroelektrana u regiji.

PROJECT MANAGERS TAKE A GOOD CARE of secrets to perform big endeavors as same as top chefs do not want to talk about special spices of their specialties. When you have a good know-how recipe in the field of modern engineering, this means you have a very specific combination of knowledge and experience, which take project performance to the excellence level. Project of constructing the Small Hydro Power Plant Bočac 2, which is seen as one of the most modern hydro power plants in the region nowadays is one of nicest confirmation of Elnos Group know-how



SR IDEJA I POČETAK RADOVA

Prije pet godina je na srednjem toku rijeke Vrbas, u kanjonu čiji naziv Tijesno jasno govori o geografskim karakteristikama ove lokacije, počela realizacija hidroenergetskog posla decenije, izgradnje male hidroelektrane Bočac 2.

Iako je ideja o izgradnji male hidroelektrane Bočac 2 rođena 1981. godine, odnosno s početkom rada hidroelektrane Bočac 1 (110 MW), na njenu realizaciju se čekalo više od tri decenije.

Mala hidroelektrana Bočac 2 je značila proizvodnju nove čiste obnovljive energije iz Vrbasa, a studije su potvrdile činjenicu da je tek nešto više od petine njegovog potencijala iskorišteno.

Naime, od ukupno iskoristivog hidroenergetskog potencijala slivnog područja Vrbasa danas se za proizvodnju električne energije koristi oko 22,5 odsto kroz hidroelektrane Jajce 1, Jajce 2 i Bočac 1.

Mala hidroelektrana Bočac 2 se danas nalazi sedam kilometara nizvodno od HE Bočac 1 i projektovana je na postojećoj brani kompenzacionog bazena HE Bočac 1. Konačan datum upisan kao rodendan "mlade sestre" Bočca 1 je 4. oktobar 2018. godine, i od tog vremena ona je počela da piše svoj radni dnevnik.

RADOVI ELNOS GRUPE

Za naše timove je učešće u izgradnji male hidroelektrane Bočac 2 bilo jedan od najzahtjevnijih i najatraktivnijih projekata na domaćem terenu. Elnos Grupa je bila vođa konzorcijuma koji je predvodio kompletну elektromehaniku i hidromehaničku fazu radova. Projekat smo realizovali zajedno sa našim konzorcijalnim partnerom kompanijom Andritz Hydro S.A.S, a za investitora Hidroelektrane na Vrbasu a.d. Mrkonjić Grad.

Poduhvat izgradnje male hidroelektrane Bočac 2 je bio izazovan, jer se izvodio u uslovima stalne proizvodnje u HE Bočac 1 i činjenice da je za vrijeme izgradnje bilo neophodno obezbijediti regularan protok saobraćaja na magistralnom putu Banjaluka-Sarajevo.

Njegovu impozantnost je najlakše staviti u prvi plan 'govoreći u brojkama', a one kažu da MHE Bočac 2 posjeduje instaliranu snagu od 10 MVA, projektovanu godišnju proizvodnju od 41,6 GWh, te će proizvoditi električnu energiju



DUŠAN TORBICA

Predsjednik Uprave Elnos Grupe
President of the Board Elnos Group

"MHE Bočac 2 je svakako poseban projekt na kome smo primijenili savremeni projekt menadžment i kontrolu kvaliteta. Ovo je projekt koji ćemo pamtitи po tome što smo unaprijedili svoja znanja i doprinijeli da MHE Bočac 2 bude ucrtana na evropskoj i svjetskoj mapi savremenih postrojenja".

"SHPP Bočac 2 certainly is a special project we applied modern project management and quality assurance on. This is a project we are going to remember by the fact we improved our knowledge and contributed that SHPP Bočac 2 is marked in European and world map of modern plants".



Spuštanje turbinskog agregata težkog 55 t Submerging of 55 t turbine generator

za oko 12.800 domaćinstava. U MHE Bočac 2 je ugrađeno više od 15.000 kubnih metara betona, više od 1.000 tona čelika, a za potrebe njene izgradnje je iskopano više od 40.000 kubnih metara stjenovitog materijala velike čvrstoće.

Naš dio posla je imao svoje faze. „Prva etapa realizacije projekta je podrazumijevala izradu proizvodne dokumentacije. U pitanju je faza koja je obuhvatala intenzivnu koordinaciju sa pojedini projektним biroima različitih proizvođača opreme. Naš cilj je bilo izvršenje harmonizacije kompletne opreme koja se ugrađuje na objektu, nakon čega je uslijedila proizvodnja opreme i praćenje kontrole kvaliteta tokom same proizvodnje uz završna ispitivanja“, rekao je Marko Mijić, projekt menadžer Elnos Grupe.

Nakon harmonizacije uslijedila je isporuka, a zatim i zahtjevne montaže elektro-mašinske i hidromehaničke opreme, čiji je vrhunac bila etapa ugradnje dva turbineska agregata. Ovo je bila faza radova kojoj je prethodio višemjesečni izazovan proces rada naših ekipa.

U aprilu i maju 2018. godine, agregati, od kojih je svaki težak 55 tona i posjeduje instaliranu snagu od 5 MW, uspješno su potopljeni u vodu 21 metar ispod kote pristupnog platoa i ugrađeni u MHE Bočac 2.

Agregati ugrađeni u MHE Bočac 2 su danas među prvim ovog tipa na području bivše Jugoslavije. Zanimljivo je da je aggregate proizvela kompanija Andritz Hydro S.A.S, koja je svoje-vremeno proizvela turbineske agregate za HE Bočac 1.

„U proizvodnom bloku su smještena dva aggregata tipa ECO-Bulb sa turbinama tipa Kaplan

sa dvostrukom regulacijom, težine 2x55 tona, instaliranog protoka 2x55 kubnih metara u sekundi i snage 2x5 megavata. Inženjering je napravljen u Francuskoj i ja vjerujem da će oni praviti dobre rezultate“, objasnio je Kristof Kluze, supervisor za montažu turbina u ime kompanije Andritz Hydro S.A.S.

Uslijedile su faze povezivanja energetskih i kontrolno-upravljačkih kablova i funkcionalnog ispitivanja, probne sinhronizacije aggregata i na kraju puštanje MHE Bočac 2 na elektro-energetsku mrežu.

„Na projektima ovog tipa, gdje je u sam proces proizvodnje opreme i djelimično u proces ugradnje opreme uključen veliki broj renomiranih kompanija, neophodno je primijeniti najviši nivo projektnog menadžmenta kako bi se optimalno koristili raspoloživi potencijali, odnosno da bi se ispravnim planiranjem materijalnih, tehničkih i ljudskih resursa izvršila efikasna realizacija projekta i završetak radova u rekordnom roku“, rekao je Mijić.

MHE Bočac 2 je novi i moderan projekat iz oblasti obnovljivih izvora energije, izgrađena je tako da ispunjava savremena tehnološka dostignuća i evropske i svjetske standarde.

EN IDEA AND WORKS START

Five years ago, in the middle part of the Vrbas River flow, in the canyon called Tijesno (Strait), whose name clearly stands for geographical features of this location, realization of hydro power project of the decade, i.e. construction of Small Hydro Power Plant Bočac 2, started.

Although the idea on constructing Small

Hydro Power Plant Bočac 2 was born back in 1981, when the works on constructing Hydro Power Plant Bočac 1 (110 MW) begin, we had to wait for the beginning of its realization for more than three decades.

Small Hydro Power Plant Bočac 2 was a synonym for new clean renewable energy from Vrbas, and studies confirmed the fact that only a bit over one fifth of rivers capacity had been used.

Namely, nowadays, about 22.5 per cent is used through hydro power plants Jajce 1, Jajce 2 and Bočac 1 for production of electrical energy out of total usable hydro power capacity of water catchment area of the Vrbas River.

Today, Small Hydro Power Plant Bočac 2 is located seven kilometers downstream from HPP Bočac 1 and was designed on the existing dam of the compensation basin of the HPP Bočac 1. Final date registered as birthday of “younger sister” to Bočac 1 is October 4, 2018. This is when it started its work log.

ELNOS GROUP WORKS

As for our teams, participation in construction of the Small Hydro Power Plant Bočac 2 was one of the most demanding and most attractive projects in national market. Elnos Group was the leader of consortium that was in charge of entire electro-mechanical and hydro-mechanical phase of the works. We performed the project along with our partner in consortium, Andritz Hydro S.A.S. Investor was Hidroelektrane na Vrbasu a.d. Mrkonjić Grad (Hydro Power Plants on Vrbas PLC).



Project of constructing Small Hydro Power Plant Bočac 2 was mostly a challenge, since it was performed in conditions of constant production at the HPP Bočac 1 and the fact that there was a need to provide regular traffic flow for motorway Banja Luka-Sarajevo during construction.

Its impressiveness can be described, in the first place, 'through figures', and these state SHPP Bočac 2 has installed power of 10 MVA, designed annual production of 41.6 GWh, and it shall produce electrical energy for about 12,800 households. More than 15,000 cubic meters of concrete, more than 1,000 tons of steel were built in SHPP Bočac 2, more than 40,000 cubic meters of rock material of high strength was dug for its construction.

Our part of work had its phases. "First phase of the project realization included making product documentation. This is a phase that covered intensive coordination with certain design offices of various equipment producers. Aim of this stage was to adjust entire equipment being installed on the facility, and production of the equipment followed as well as monitoring quality assurance during production itself along with final tests", said Marko Mijić, Project Manager in Elnos Group.

After adjustment phase, delivery is followed. After this, demanding assembly of electro-mechanical and hydro-mechanical equipment followed, and their peak was phase of installing two turbine generators. This was a part of works preceded by many months of challenging work process of our teams.

In April and May 2018, generators, 55 tons each with installed power of 5 MW, were suc-

cessfully submerged in water 21 meters under the height of approaching plateau and were installed in the SHPP Bočac 2.

Generators built in SHPP Bočac 2 nowadays are the first of this kind in the region of the former Yugoslavia. It is interesting fact that they were produced by company Andritz Hydro S.A.S, which, at the time, produced turbine generators for HPP Bočac 1 as well.

"Production block contains two ECO-bulb generators with Kaplan turbines with double regulation, weighing 2x55 tons, installed flow 2x55 cubic meters per second and 2x5 megawatt power. Engineering was performed in France and I believe they are going to have good results", explained Kristof Kluze, Supervisor for assembly of turbines on behalf of company Andritz Hydro S.A.S.

Phases of connecting power and control cables and functional testing, probation synchronization of generators as well as commission of the SHPP Bočac 2 to electrical power network followed.

"Projects of this type, where a large number of renowned companies are included in the process of equipment production itself, and partially in the process of equipment installation, it is necessary to apply the highest level of the project management in order to use available capacities optimally, i.e. to perform efficient realization of the project and works completion in record deadline by proper planning of material, technical and human resources", said Mijić.

SHPP Bočac 2 is a new modern project in the field of renewable energy sources. It was built in a way it meets modern technological achievements and European and global standards.

MHE BOČAC 2 ISPUNJAVA SVJETSKE STANDARDE

Projektantske, konsultantske i usluge nadzora u toku izgradnje svih objekata MHE Bočac 2 je obavljao Institut za vodoprivredu „Jaroslav Černi“ iz Beograda.

„MHE Bočac 2 izgrađena je tako da zadovoljava savremena tehnološka dostignuća i ispunjava evropske i svjetske standarde. Specifičnost ove hidroelektrane su generatori sa permanentnim magnetima, što znači bez pobudnih namotaja na rotoru i bez pobudnog sistema“, istakao je Dejan Divac, generalni direktor ovog instituta.

SHPP BOČAC 2 SATISFIES WORLD STANDARDS

Institute for the Development of Water Resources “Jaroslav Černi” from Belgrade provided design, consultancy and supervisory services during construction of all facilities in SHPP Bočac 2.

“SHPP Bočac 2 was built so it meets modern technological standards and satisfies European and global standards. Specific feature of this hydro-power plant are generators with permanent magnets, which means they do not have exciter coils on rotors and no exciter system”, stated Dejan Divac, CEO of this Institute.



Finiš revitalizacije

HE ZVORNIK

FINISH OF REVITALIZATION OF HPP ZVORNIK

GODINA 2019. ĆE BITI POSEBNO

OZNAČENA u istorijskoj lenti vremena hidroelektrane Zvornik, najstarijeg objekta za proizvodnju električne energije na Drini. Na njoj će biti upisano da je upravo ove godine, šest decenija nakon rođenja, HE Zvornik započela svoj novi život

YEAR 2019 SHALL BE ESPECIALLY

MARKED in timeline of Hydro Power Plant Zvornik, the oldest facility for production of electrical power on the Drina River. HPP Zvornik starts its new life this year, six decades after its birth

SR Prije tačno 60 godina, početak rada hidroelektrane Zvornik je obilježio era industrijalizacije bivše Jugoslavije. Danas, nakon što je proizvela desetine miliona kilovat sati električne energije, 'prva hidroelektrana Drine' ulazi u sam finiš velikog postupka revitalizacije.

Sveobuhvatan postupak modernizacije je posljednje četiri godine sastavni dio života HE Zvornik. Njegovim finalnim implementiranjem hidroelektrana će dobiti 28 MW više u odnosu na dosadašnji kapacitet od 96 MW, a njen radni vijek se produžava za najmanje još 30 godina.

Vrhunac našeg dosadašnjeg angažmana predstavlja kraj radova na revitalizaciji agregata A3, koji su zvanično okončani krajem prošle godine. Ovo je bila etapa u kojoj smo potvrdili da smo zahvaljujući stečenoj praksi uspješno pomjerili granice naše ekspeditivnosti.

„Iskustvo koje smo stekli radeći na prva dva aggregata je pomoglo da sve aktivnosti i koordinacija svih učesnika budu bolji i produktivniji. Cjelokupan tim angažovan na ovom projektu je uigraniji, iskusniji i pametniji za dvije godine zajedničkog rada, što je rezultiralo završetkom probnog rada na agregatu A3 i to dvije nedelje prije definisanog roka. Nadam se da smo kroz prva tri aggregata prošli sve izazove i probleme i da će rad na agregatu četiri biti najefikasniji

i najproduktivniji”, rekao je Miloš Pandilović, projekt menadžer Elnos Grupe.

Poseban uspjeh ovog višegodišnjeg poduhvata će biti to što će kompletna elektrana raditi bez stalne posade, što je postignuto implemenzacijom veoma složenog i razgranatog sistema daljinskog upravljanja koji se pohranjuje iz svih podsistema hidroelektrane.

Podsetimo da je Elnos Grupa u okviru ovog kapitalnog projekta na čelu brojne domaće operative angažovane na realizaciji HE Zvornik. Zaduženi smo za projektovanje, nabavku, ugradnju i puštanje u rad elektromontašinske opreme.

Naš posao podrazumijeva kompletну rehabilitaciju četiri agregata i 110 kV transformatorske stanice, projektovanje i izvođenje elektromontašinskog dijela, isporuku i puštanje u rad zaštitno-upravljačkih uređaja i isporuku i puštanje u rad upravljačkog sistema elektrane. Potpisani je i aneks ugovora za harmonizaciju i nositrifikaciju kompletног projekta revitalizacije HE Zvornik, što predstavlja dodatni segment ovog projekta.

Rekonstrukcijom HE Zvornik, snaga svakog od četiri postojeća aggregata se povećava za više od 25 odsto u odnosu na raniju snagu, što u praktičnom smislu znači da hidroelektrana u konačnici dobija još jedan dodatni, peti agregat.

Modernizacija HE Zvornik je projekat koji je zahtijevao angažman svih divizija iz sektora inženjeringu Elnos Grupe, odnosno timova za elektrane, dalekovode i trafostanice, ekipu iz građevinskog sektora, te projektnog biroa.

Ovo je projekat u okviru kojeg smo napravili značajan iskorak u oblasti bezbjednosti i zaštite na radu.

Elektroprivreda Srbije će završetkom revitalizacije HE Zvornik, u oktobru ove godine, dobiti još jednu kompletno obnovljenu hidroelektranu, što će značajno uticati na stabilnost proizvodnje električne energije u zemlji.

EN Exactly 60 years ago, commissioning of Hydro Power Plant Zvornik marked industrialization era of the former Yugoslavia. Today, after having produced of millions kilowatts hours of electrical power, 'the first hydro power plant on Drina' enters finish of a huge revitalization procedure.

Comprehensive modernization procedure has been a constituent part of HPP Zvornik for the last four years. In its final implementation, hydro power plant shall acquire 28 MW more compared to the current capacity amounting to 96 MW, and its life age extends for at least 30 years.

Highlight of its so far work is completion of works on revitalization of A3 generator, which officially completed at the end of the year. This was a stage where we confirmed we successfully had moved borders of our expediency thanks to acquired practice.

"Experience we acquired working on the first two generators helped that all activities and coordination of all participants be better and more productive. Entire team engaged for this project is well-coordinated, more experienced and smarter for two years of joint work, which resulted in ending trial work on generator A3 two weeks before defined deadline. I hope that we went through all challenges and problems with three generators and that work on generator number four is going to be more efficient and more productive", said Miloš Pandilović, Elnos Group Project Manager.

Special success of this many-years' projects is going to be that entire electrical plant is going

to work without full-time crew, which has been achieved through implementation of very complex and outspread system of remote control, which gets information from all subsystems of the hydro power plant.

Let us remind that, within this capital project, Elnos Group is heading numerous national operation teams engaged in the realization of the same. We are in charge of design, purchase, installation and commissioning of electro-mechanical equipment.

Our work includes entire reconstruction of four generators and 110 kV transformer station, design and performance of electro-mechanical part of works, delivery and commissioning protection-control devices as well as delivery and commissioning of control system of the electrical plant. Annex to the Contract for harmonization and nostrification of entire project on revitalization of the HPP Zvornik was signed as well, which is additional segment of this project.

By reconstruction of the HPP Zvornik, power of each of four existing generators is increased for more than 25 per cent compared to earlier power, which, practically, means that hydro power plant gets another, additional, fifth generator at the end.

Modernization of the HPP Zvornik is a project that demanded engagement of all divisions from Engineering Sector of the Elnos Group, i.e. teams for electrical plants, transmission lines and substations, team from Civil Engineering Sector, as well as designers.

This is a project where we made a significant step forward in the field of safety and protection at work.

After completion of revitalizing HPP Zvornik, in October this year, Elektroprivreda Srbije is going to get another fully upgraded hydro power plant, which shall significantly affect electrical power production stability in the country.

Timovi Elnosa na čelu brojne domaće operative

Elnos teams leading numerous national operative teams



MILOŠ PANDILOVIĆ
Projekt menadžer Elnos Grupe
Elnos Group Project Manager

"Pored naših ustaljenih procedura i prakse, u HE Zvornik svakodnevno primjenjujemo i standarde i pravila glavnog ugovarača na ovom projektu, kompanije Voith Hydro iz Austrije, čime smo napravili iskorak i u ovom segmentu rada Elnos Grupe".

"Apart from our standard procedures and practice, we also apply standards and regulations of the Main Contractor of the project, company Voith Hydro from Austria, on daily basis in the HPP Zvornik, which enabled us with making a step forward in this segment of Elnos Group operation as well".

Novo poluvrijeme za 7 MHE ZAPADNE SRBIJE

**NEW HALF-TIME FOR
7 MHPPS OF WESTERN SERBIA**

SAMO ČETIRI GODINE nakon izgradnje prve Tesline elektrane na Nijagarinim vodopadima, Srbija je dobila prvu hidroelektranu izgrađenu po trofaznom sistemu ovog velikog naučnika. Hidroelektrana „Pod gradom“ se nalazi ispod užičke tvrđave, a ove godine slavi 119. rođendan i samo je jedan od elektroenergetskih objekata koji su dio sveobuhvatne revitalizacije MHE Zapadne Srbije

ONLY FOUR YEARS AFTER construction a new Tesla power plant on Niagara Waterfalls, Serbia got the first hydro power plant built according to three-phase system of this famous scientist. Hydro Power Plant “Pod gradom” is located under Užice Fortress, celebrating 119th birthday and is only one of electrical power facilities being a part of comprehensive revitalization of MHPPs of Western Serbia

 Elnos Grupa, kao vodeći član konzorcijuma formiranog sa kompanijom Kössler GmbH & Co KG, u posljednje tri godine revnosno i studiozno realizuje projekat revitalizacije sedam starih mini-hidroelektrana.

Proces modernizacije ovakvih objekata je delikatan, izazovan i podrazumijeva radeve visokog nivoa komplikovanosti. U elektroenergetske objekte, među kojima neki od njih spadaju u kategoriju izuzetno rijetkih primjeraka tehnike na svijetu, ugrađuje se najsvremenija sofisticirana oprema, što je zadatak sa veoma visokim stepenom izazova.

Kompletna postrojenja mini-hidroelektrana će po okončanju postupka modernizacije biti automatizovana, daljinski upravljiva i moći će da rade bez posade.

Zadatak konzorcijuma, u najširem kontekstu, podrazumijeva poslove: proizvodnje, ispitiva-



MHE Pod gradom - jedna od najstarijih očuvanih hidroelektrana na svijetu
MHPP Pod gradom - one of the oldest preserved hydro power plants in the world



nja, isporuke, ugradnje elektromašinske opreme i puštanja mini-hidroelektrana u rad.

Realizacija poduhvata će Elektroprivredi Srbije donijeti veoma značajno povećanje broja vrijednih kWh dobijenih iz obnovljivih izvora energije, povećanje kapaciteta elektrana i stvaranje višeg stepena pouzdanosti rada njihovih pogona.

Projekat revitalizacije čiji su ekipe Elnosa dio, obuhvata sedam mini-hidroelektrana: Seljašnica, Kratovska reka, Turica i Radaljska banja, Moravica, Raška i već pomenuta elektrana Pod gradom.

NOVI SJAJ ČETIRI MINI-HIDROELEKTRANE

Timovi Elnos Grupe su do sada uspješno okončali modernizaciju četiri mini-hidroelektrane. U svakoj od njih realizujemo radove koji predstavljaju poseban i zahtjevan tehnički spoj objedinjenja starih i novih tehnologija.

Poslovi modernizacije starih MHE se često izvode u veoma skučenim prostorima u kojima je nekada teško, pa čak i nemoguće raditi bez



MHE Turica - "rođena" davne 1928. godine
MHPP Turica - "born" long ago in 1928

pomoći mehanizacije. Veliki broj radova se odvija uz pomoć priručnih sredstava, što produžava trajanje radova.

U avgustu 2018., nakon godinu dana predanog rada na terenu, uspješno je okončana rekonstrukcija mini-hidroelektrana Turica i Seljašnica.

„MHE Seljašnica je bila naš prvi projekat. On nam je poslužio kao veliko iskustvo za nastavak rada na projektu, dok je rad na MHE Turica zahtijevao maksimalan angažman projektanata, isporučilaca opreme i izvodača radova. Na kraju su ipak sve faze realizovane uspješno, u skladu sa najsavremenijim metodama i uz najkvalitetniju opremu“, rekao je Nenad Mićić, inženjer Elnos Grupe.

MHE Seljašnica je diverzionalni tip MHE, a sa radom je počela prije 65 godina. Nalazi se kod Prijeopolja i pozicionirana je na istoimenoj rijeci. Prije revitalizacije ova MHE je posjedovala instaliranu snagu od 900 kW, koja je sada povećana na 1040 kW.

MHE Turica je počela sa radom davne 1928. godine i isto kao MHE Pod gradom, nalazi se na rijeci Đetinji. Njena instalirana snaga je revitalizacijom povećana sa 320 kW na 380 kW.

Krajem 2018. i početkom ove godine, naše ekipe su uspješno završile i radove na modernizaciji dvije 'mlade' MHE iz velikog ciklusa revitalizacije mini-hidroelektrana u regiji Zapadne

Srbije. U pitanju su mini-hidroelektrane Radaljska banja i Kratovska reka.

MHE Kratovska reka je diverzionalni tip MHE. Nalazi se kod Pribroja i posjeduje instaliranu snagu od 880 kW, dok je MHE Radaljska banja akumulaciona elektrana, i nalazi se u blizini Malog Zvornika, a posjeduje instaliranu snagu od 244 kW.

„Većina elektrana koje smo modernizovali ili njihova revitalizacija još traje, radile su u sistemu EPS-a više od 90 godina i zaslužile su da se podmlade. Važno je istaći da su one objekti velike vrijednosti, ne zagadjuju okolinu, njihova proizvodnja je znatno jeftinija, a svaki kilovat iz ovih obnovljivih izvora je zlata vrijedan“, istakao je Mićić.

NOVI RADOVI

Do kraja realizacije projekta modernizacije MHE Zapadne Srbije, našim timovima je preostao obiman angažman na još tri stare MHE. U prvoj 'Teslinoj' hidroelektrani, s početka naše priče, sredinom ljeta počinjemo fazu elektromontažnih radova.

Kada je u pitanju MHE Moravica kod Ivanjice, koja datira iz 1911. godine, u njenim pogonima ćemo ovog ljeta realizovati fazu elektromontažnih radova, dok će u oktobru ove godine početi prvi poslovi na MHE Raška kod Novog Pazara.



EN Elnos Group, being a Leader Member of consortium established with company Kössler GmbH & Co KG, devotedly and in detail, has performed a project of revitalizing seven old mini hydro power plants in the last three years.

Modernization process of such facilities is a delicate one, challenging and includes works of high complexity level. Electrical power facilities, where some of them fall into category of extremely rare examples of technology globally, are equipped with state-of-art sophisticated equipment, which is a task at a very high degree challenge.

Once modernization completes, entire plants of mini hydro power plants are going to be automated, remotely controlled and will be able to operate without crew.

Generally, consortium's task includes the following works: production, testing, delivery, installation of electro-mechanical equipment and commissioning of the mini hydro power plants.

Realization of the project shall bring a very significant increase of number of valuable kWh for company Elektroprivreda Srbije (Electrical

Power Supply company) acquired from renewable energy sources, increase of electrical plants' capacity and creation of higher level of reliability in operation of their plants.

Revitalization project, where Elnos teams take part in, encompasses seven mini hydro power plants: Seljašnica, Kratovska reka, Turica and Radaljska banja, Moravica, Raška, and previously mentioned electrical power plant Pod gradom.

NEW GLOW FOR FOUR MINI HYDRO POWER PLANTS

Elnos Group teams have successfully completed modernization of four mini hydro power plants so far. In each of them, we perform works representing a special and demanding technical composition of old and new technologies.

Works on modernizing old MHPPs are often performed in a very small premises, where, sometimes, it is hard to even impossible, to work without machinery help. A large number of works is performed supported by accessory means, which prolongates works performance.

In August 2018, after a year of devoted field

work, reconstruction of mini hydro power plants Turica and Seljašnica was successfully completed.

"MHPP Seljašnica was our first project. It served as a big experience for continuing work on the project, whereas work on MHPP Turica required maximum of designers' engagement, equipment suppliers and contractors. At the end, all phases were successfully performed in line with latest methods and most modern equipment", said Nenad Mićić, Elnos Group Engineer.

MHPP Seljašnica is a diversion type MHPP and it started its operation 65 years ago. It is in vicinity of Prijepolje and located on the river of the same name. Before revitalization, this MHPP had 900 kW of installed power, which has been increased to 1040 kW.

MHPP Turica started its operation as far as in 1928, and, as same as MHPP Pod gradom, it is located on the river Đetinja. Revitalization increased its installed power from 320 kW to 380 kW.

At the end of 2018 and at the beginning of this year, our teams also successfully completed works on modernizing two 'younger' mini hydro power plants from big revitalization cycle of mini hydro power plants in area of the Western Serbia. These are mini hydro power plants Radaljska banja and Kratovska reka.

MHPP Kratovska reka is a diversional type of MHPP. It is in the vicinity of Priboj and has installed power of 880 kW, whereas MHPP Radaljska banja is an accumulation power plant, and is located in the vicinity of Mali Zvornik with installed power of 244 kW.

"Most of plants we modernized, or their revitalization is still ongoing, worked in EPS system for more than 90 years and deserved rejuvenation. It is important to stress that these are facilities of big value, do not pollute environment, their production is significantly cheaper, and each kilowatt of these renewable energy sources is as worth as gold", said Mićić.

NEW WORKS

By the end of realization of the project for modernizing MHPP of Western Serbia, our teams still have huge engagement in another three old MHPP. In the first one, Tesla's hydro power plant, the one from the beginning of our story, we are going to start electrical assembly phase of works in mid-summer.

As for MHPP Moravica in the vicinity of Ivanjica, dating from 1911, this summer, we are going to perform electrical assembly phase of works in its plants, whereas in October this year, we are going to start works on MHPP Raška in the vicinity of Novi Pazar.



Snaga MHE Seljašnica povećana za 140 kW
Power of MHPP Seljašnica increased for 140 kW

MHE / MHPP Sitonija i Golubača

Novi kilovati obnovljive energije

New kilowatts of renewable power

SR Prateći najnovije i trendove iz oblasti obnovljive energije, Elnos Grupa je još jednom bila važna spona u realizaciji projekata izgradnje dvije nove mini-hidroelektrane u Republici Srpskoj.

Naše ekipe su u periodu od juna 2018. do marta 2019. gradile mini-hidroelektrane Sitonija i Golubača u Gornjim Podgradicima kod Gradiške, koje su puštene u rad i proizvode električnu energiju.

MHE Sitonija na rječici Tisovača i MHE Golubača na rječici Golubača, protočne su derivacione hidroelektrane, a obje imaju instaliranu snagu do 249 kW i protok od 500 litara u sekundi.

Elnos Grupa je u oba projekta imala zadatak da realizuje isporuku, ugradnju i probno puštanje u rad kompletne hidromehaničke i elektro-mašinske opreme u obje mini-hidroelektrane.

U MHE Sitonija i MHE Golubača smo ugradili Pelton turbine sa četiri mlaznice sa nominalnim brojem obrtaja od 500 o/min. Ove turbine pokreću asinhroni generatori snage 245 kW, koji preko 0,4/20 kV transformatora i 20 kV rasklopog postrojenja predaje energiju u distributivnu mrežu.

Ekipe Elnosa su u okviru realizacije ovih projekata, između ostalog, izvršile ugradnju: SN postrojenja, transformatora, zatim polaganje energetskog i optičkog kabla za vezu mašinska hala – vodozahvat, kabliranje i ožičenje ormara unutar mašinske hale.

Planirana godišnja proizvodnja ovih elektrana obezbiđuje električnu energiju za oko 600 domaćinstava.

Izgradnja ove dvije mini-hidroelektrane je još jedan značajan stepenik ka povećanju zelenih kapaciteta Republike Srpske.

EN Following in the latest trends and trends from the field of renewable energy sources, once again Elnos Group was an important link



MHE Sitonija - instalirana snaga do 245 kW MHPP Sitonija - up to 245 kW of installed power

in realization of the project of construction two new mini hydro power plants in the Republic of Srpska.

In the period from June 2018 to March 2019, our teams built mini hydro power plants Sitonija and Golubača in Gornji Podgradci in the vicinity of Gradiška, which were commissioned for work and are producing electrical energy.

MHPP Sitonija on small river Tisovača and MHPP Golubača on small river Golubača, are free-flowing diversion hydro power plants, and both have installed power up to 249 kW and flow of 500 liters per second.

In both projects, Elnos Group had a task to perform delivery, installation and trial commission of entire hydro-mechanical and electro-mechanical equipment in both mini hydro power plants.

In MHPP Sitonija and MHPP Golubača, we

installed Pelton turbines with four nozzles with nominal revolution rate of 500 rpm. These turbines are started by asynchronous 245 kW generator, which, through 0.4/20 kV transformer and 20 kV switchgear transmits power to distributive network.

Within realization of these projects, Elnos teams, among other tasks, installed as follows: MV plants, transformers, laying power and optical cable for connecting mechanical hall – water intake, cabling and cabinet wiring within mechanical hall.

Planned annual production of these power plants shall provide electrical energy for about 600 households.

The construction of these two mini hydro power plants is another important step to increase green capacity of the Republic of Srpska.



Čibuk 1 - vjetropark snage 158 MW Čibuk 1 - 158 MW strong Wind Farm

LOV NA ZELENE MEGAVATE

HUNT FOR GREEN MEGAWATTS

ODLUČAN ZAOKRET ČOVJEČANSTVA ka obnovljivim izvorima energije, koji je otpočeo prije jedne decenije, nastavljen je i u 2018. godini. Važan korak u okvirima globalne tranzicije prema izvorima zelene energije Srbija je napravila realizacijom kapitalnog poduhvata izgradnje vjetroparka Čibuk 1 – najvećeg vjetroparka na Balkanu. Za Elnos Grupu ovo je poduhvat u okviru kojeg smo gradeći elektroenergetske elemente, koji su danas srce vjetroparka Čibuk 1, pomjerili granice našeg dosadašnjeg projekt menadžmenta

DETERMINED TURNOVER OF HUMANITY towards renewable energy sources, which started a decade ago, was continued in 2018, too. An important step within global transition towards sources of green energy was made by Serbia through realization of capital project of constructing Wind Farm Čibuk 1 – biggest Wind Farm in Balkans. For Elnos Group, this is a project within which we moved limits of our so-far project management by constructing electrical power elements that represent a heart of the Wind Farm Čibuk 1



SR NOVI HORIZONT BANATSKE RAVNICE

U jedinstvenom krajoliku zatalasanih banatskih ravnica, na području Dolova, samo 50 kilometara sjeveroistočno od Beograda, nalazi se vjetropark Čibuk 1, čije turbine svakodnevno vrijedno love nove megavate zelene energije iz vjetrova ovog podneblja.

Prije nešto više od dvije godine, kada je realizacija projekta izgradnje vjetroparka Čibuk 1 počela, nije bilo jednostavno zamisliti da će upravo na ovom lokalitetu živopisne Panonije nastati novi vanvremenski pejzaž koji će najaviti novu energetsku budućnost Srbije.

Naime, na 40 kilometara kvadratnih lokaliteta Dolovo, u protekle dvije godine izgrađeno je 57 vjetroturbina, 35/400 kV trafostanica, i prateća struktura dalekovoda koji zajedno formiraju vjetropark snage 158 megavata.

Ovo je bio veliki poduhvat u okviru kojeg je Elnos Grupa, kao partner američkog General Electric-a, imala zadatku da izgradi elektroenergetske elemente koji su danas okosnica vjetroparka Čibuk 1.

„Naš dio ugovora se odnosio na izgradnju trafostanice 35/400 kV kao i 2x400 kV dalekovoda u dužini od 11 kilometara. Ugovor je baziran po sistemu 'ključ u ruke', prema FIDIC Silver book-u, a u naš opseg poslova je bio uključen kompletan

inženjering, projektovanje, nabavka opreme, ugradnja, montaža, ispitivanje i na kraju puštanje u pogon“, rekao je Lazar Petrović, projekt menadžer Elnos Grupe.

Od samog starta ovo je bio izuzetno dinamičan projekat koji je zahtijevao veliki angažman resursa Elnosa.

Sa 12 inženjera zaposlenih direktno na projektu, više od 70 montera, kompletnom mehanizacijom i uvođenjem nekoliko podizvodova, realizacija izgradnje vjetroparka u Dolovu je bila veliki izazov za sve ekipe na terenu.

Gradjevinski dio radova se odvijao u tri faze: izgradnja rasklopнog priključnog postrojenja od 400 kV, izgradnja trafostanice 35/400 kV i izgradnja priključnog dalekovoda.

„Svi segmenti rada su sačinjeni od specifičnih pozicija. Sama trafostanica se nalazi na zemljanim platoom od 4,2 hektara, na kojem su izgrađena dva objekta ukupne površine 1.270 metara kvadratnih“, precizirao je Dejan Maljenović, inženjer Elnos Grupe.

On je precizirao i da su naše ekipe izgradile dvosistemski dalekovod 2x400 kV, koji čine 33 stuba na dalekovodnoj trasi od 11 kilometara, a koji omogućava priključenje trafostanice vjetroparka na mrežu.

Poduhvat izgradnje vjetroparka Čibuk 1, koji će proizvoditi električnu energiju za 113 hiljada domaćinstava, od samog starta postavila izazov besprijekornog profesionalizma, a izgradnja svih njegovih elemenata od ekipa na terenu zahtijevala najviši stepen odgovornosti.

Elektro faza radova je obuhvatala izgradnju trafostanice 35/400 kV Čibuk 1 koja se sastoji od dva objekta.

„Prvi objekat je 400 kV priključno razvodno postrojenje, koje sadrži dva dalekovodna polja, dva transformatorska polja, mjerno polje i spojno polje, te dvosistemski dalekovod tipa ulaz-izlaz. U okviru ovog objekta izgradili smo komandno-pogonsku zgradu, postrojenje za sopstvenu potrošnju 20 kV, AC/DC razvod, sistem reljene zaštite i daljinskog upravljanja. Drugi objekat sadrži upravnu zgradu, dva energetska transformatora snage 90 MVA, razvodno postrojenje 35 kV, postrojenje za kompenzaciju, postrojenje za sopstvenu potrošnju 20 kV, AC/DC razvod, sistem reljene zaštite i daljinskog upravljanja“, rekao je Mladen Miletić, inženjer Elnos Grupe.

PRVI KORACI SE PAMTE

Vjetropark Čibuk 1 je poduhvat koji će naše ekipe zapamtiti po nizu pionirske iskorake,



LAZAR PETROVIĆ

projekt menadžer Elnos Grupe
Elnos Group Project Manager

„Poznato je da smo kompanija koja već duži niz godina radi u Skandinaviji, gdje smo pokazali spremnost da odgovorimo svim zahtjevima tržišta u okvirima obnovljivih izvora energije. Ovo je poduhvat u okviru kojeg smo ostvarili izuzetnu saradnju sa 'General Electric'-om i pozicionirali se ne samo na ovom tržištu već i šire“.

“We are known to be a company working for many years in Scandinavia, where we showed readiness to respond to all market requirements within renewable energy sources. This is project where we established extraordinary cooperation with 'General Electric' and positioned ourselves not only in this market, but wider as well”.

među kojima su najznačajniji: ispitivanje tri tipa 400 kV stubova, kreiranje rješenja za specifičnu 35 kV kompenzaciju i izvođenje testa usaglašenosti sa GRID kodom koji je po prvi put rađen u Srbiji.

„Prvi put smo radili projekat ovakvih tipova stubova za dalekovod od 400 kV, a kako bismo verifikovali statičke proračune i statičku izdržljivost stubova, izvršili smo ispitivanja u laboratoriji u Bukureštu. Na samom projektu smo postavljali četiri tipa stubova, od kojih su tri ispitana u Rumuniji. Ispitivanje je proteklo uspješno, što je bila potvrda kvalitetne realizacije zacrtanih planova na terenu“, rekao je Petrović.

PRIJE ISTEKA ROKA

I pored ovako kompleksnih procedura naši timovi su uspjeli ne samo da održe dinamiku ugovorenih rokova, već da svoj dio posla završe mjesec dana prije isteka roka. Budućnost obnovljivih izvora energije najavljuje velike promjene zbog njihove sve važnije uloge u nastojanjima Evrope da smanji zavisnost o fosilnim gorivima.

Biti link velikog poduhvata koji je jedna od značajnih prekretnica ka putu obnovljivih izvora je važna potvrda da Elnos Grupa može odgovoriti na neke od najviših investicionih zahtjeva danas, ali i u vremenu koje dolazi.

EN NEW HORIZON OF BANAT PLAINS

Wind farm Čibuk 1 is situated in a unique landscape of wavy Banat plains, in Dolovo region, only 50 kilometers North East from Belgrade, whose turbines are hardworking and catch new megawatts of green energy from wind in this region on daily basis.

About two years ago, when performance of constructing Wind Farm Čibuk 1 started, it was not easy to imagine that timeless landscape would appear on this site of picturesque Pannonia and announce new era of Serbian energy future.

Namely, in Dolovo site, 57 wind turbines were built in 40 square kilometers area in the past two years, 35/400 kV substation and transmission lines, which together form a wind farm of 158 megawatts power.

This was a big project where Elnos Group, being a partner to American General Electric, had been tasked to construct electrical power elements, which represent a heart of nowadays Čibuk 1.

“Our part of the contract referred to construction of 35/400 kV substation as well as 2x400 kV transmission line 11 kilometers long. Contract is based per principle Silver book Fidic, i.e. per ‘turn-key’ principle, where scope of our works included entire engineering, design, equipment purchase, installation, mounting, testing and

commission at the end“, said Lazar Petrović, Elnos Group Project Manager.

From the very beginning to the end, this dynamic project requested a huge engagement of Elnos resources, 12 engineers hired on the project directly, more than 70 fitters, entire machinery and introducing several sub-contractors, realization of project of constructing wind farm in Dolovo was a big challenge for all teams on the field.

Construction part of the works was performed in three phases: construction of 400 kV connecting switchgear, construction of 35/400 kV substation and construction of connecting transmission line.

“All performance segments consist of specific positions. Substation itself is on the ground plateau expanding on 4.2 hectares, where two buildings of total surface 1,270 square meters were built“, stated Dejan Maljenović, Elnos Group Engineer.

He stated that our teams had constructed double circuit 2x400 kV transmission line, made up from 33 towers on transmission line route 11 kilometers long, enabling connection of wind farm substation to network.

Project of constructing Wind Farm Čibuk 1, which shall produce electrical power for 113 thousand of households, from the very start, set a challenge of impeccable professionalism and construction of all of its elements required the

Izgradnja 2x400 kV dalekovoda Construction of 2x400 kV transmission line



NADZOR „NAJVIŠEG NAPONA“

Ugovor između „General Electric“-a i Elnos Grupe je podrazumijevao veoma rigorozna pravila u oblasti bezbjednosti i zaštite na radu, a kontrola je bila nesvakidašnje kompleksna, tako da je sasvim sigurno interesantan podatak da je za vrijeme izgradnje trafostanice 35/400 kV Elnos Grupa imala čak sedam nadzornih organa.

SMANJENJE ZAGAĐENJA

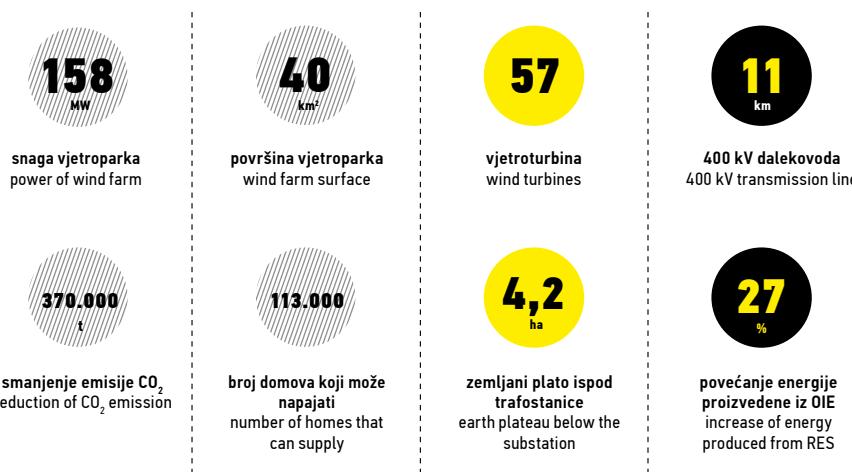
Puštanje u rad vjetroparka Čibuk 1 će osim energetske i ekonomski, znatno unaprijediti i ekološku sliku Srbije. Očekuje se da će njegova realizacija smanjiti emisiju ugljen-dioksida za više od 370.000 tona. Izgradnja vjetroparka Čibuk 1 je garant da će Srbija do 2020. povećati udio energije dobijene iz obnovljivih izvora na 27 odsto ukupne potrošnje.



Tip projekta po sistemu "ključ u ruke" "Turn-key" project type

Brojke

Figures



highest level of responsibility from all teams in the field.

Electrical phase of works included construction of 35/400 kV Čibuk 1 substation consisting of two facilities.

"First facility is 400 kV connection distribution plant, containing, two line bays, two transformer bays, measuring bay and connection bay, and connecting transmission line. We constructed command facility, 20 kV plant for own consumption, AC/DC distribution, system for relay protection and remote control within this facility. Second facility consists of administrative building, two 90 MVA power transformers, 35 kV distribution plant, compensation plant, 20 kV plant for own consumption, AC/DC distribution, system for relay protection and remote control", said Mladen Miletic, Elnos Group Engineer.

FIRST STEPS ARE REMEMBERED

Wind farm Čibuk 1 is a project that our teams shall remember by a series of pioneer step-outs, and most significant are: testing three types of 400 kV towers, designing solution for specific 35 kV power compensation and performance of compliance test with GRID code, which was performed for the first time in Serbia.

"For the first time, we performed a project of these types of towers for 400 kV transmission line in order to verify structural calculations and structural durability of towers, we performed test in laboratories in Bucharest. In the project itself, we installed four types of towers and three of these were tested in Romania", said Petrović.

Test went successfully, which was a confirmation for quality realization of plans set on the filed.

BEFORE DEADLINE EXPIRED

Even besides such complex procedures, our teams managed not only to keep up with dynamics of contracted works, but also to complete works one month before deadline expired.

Future of renewable energy sources announces big changes due to their ever-increasing important role in trying to reduce European dependency on fossil fuels.

To be a link to big endeavor, which is one of significant turnovers towards renewable sources, is an important confirmation that Elnos Group can respond to some of the highest demands by Investors today, but also in times to come.

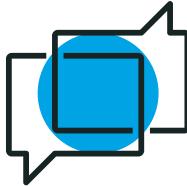
"HIGHEST VOLTAGE" SUPERVISION

Contract between "General Electric" and Elnos Group understood very rigorous rules in the field of security and protection at work, and control was extraordinary complex so it is interesting to mention that during construction of 35/400 kV substation Elnos Group was observed by seven supervisors.

POLLUTION DECREASE

Commission of Wind Farm Čibuk 1, apart from energetic and economic image, shall also significantly improve environmental image of Serbia. It is expected that its realization should decrease emission of carbon-dioxide for more than 370,000 tons.

Construction of Wind Farm Čibuk 1 is a guarantee that Serbia shall increase a share of power acquired from renewable sources to 27 percent of total consumption by 2020.



Inženjer je profesija za koju

z a u z i j e k t o r v a j e

ENGINEERING IS A PROFESSION WITH
AN EVERLASTING CHALLENGE

IZA USPJEHA SVAKE KOMPANIJE prije svega stoje njeni zaposleni, a među njima se svakako na poseban način izdvajaju oni koji su svojim ličnim i profesionalnim pristupom dali posebno obilježe njenom radu.
Lazar Petrović, izvršni direktor inženjeringu Elnos Srbija je jedan od ključnih ljudi ove kompanije. On je sa nama podijelio priču o ljubavi prema znanju, pozivu, najvećim profesionalnim izazovima i 'malim-velikim' mudrostima važnim za profesiju inženjera

SUCCESS OF EACH COMPANY rests primarily on its employees. Those who particularly stand out, however, are the ones whose personal and professional approach left a specific mark on company's operation.
Lazar Petrović, Executive Director of Engineering Department of Elnos Serbia is one of the key experts of this company. He shared with us his story about love of knowledge and profession, his greatest professional challenges and "great and small" wisdoms important to the engineering as a profession

SR Priča o izboru profesije je jedna od najznačajnijih u životu svakog od nas. Kada i zašto ste se odlučili da budete inženjer i kakav je bio početak vašeg profesionalnog puta?

Kao i sve dobre stvari u životu, i ovaj izbor je krenuo iz porodice. Otac je diplomirani inženjer elektrotehnike i sjećam se da sam bio fasciniran HE „Bajina Bašta“ gdje je radio, i gdje me je vodio kad god bi se ukazala prilika za to, tako da sam još od malih nogu znao šta me zanima i u kom pravcu ću ići profesionalno. Nakon završetka fakulteta, zaposlio sam se

kao dispečer u tadašnjem NDC-u. Iskreno, nisam sebe video na tom mjestu, jer sam htio da se bavim operativnim radovima na terenu i da znanje i iskustvo stičem kroz rad sa iskusnijim inženjerima, ali i kroz druženje sa monterima, od kojih i dan-danas ima šta da se nauči. Tako da me je put odveo u „Elektroistok“, a zatim i pet punih godina na Bliski istok (Dubai i Doha).

Kada ste se odlučili da postanete dio Elnosa na profesionalnoj mapi ste počeli realizovati niz uspješnih projekata. Šta danas za vas na toj mapi

predstavlja najveći projektni izazov i zbog čega?

Da budem iskren, dva su projekta između kojih ne bih mogao da se odlučim koji bi izabrao. Jedan je, naravno, izgradnja priključka 400/35 kV vjetroparka Čibuk 1, gdje smo uslijed obima i intenziteta projekta, u kratkom periodu trebali da završimo kompletну izgradnju priključka sa svom pratećom dokumentacijom. Treba istaći i to da smo u tom trenutku bili pioniri na ovom tržištu, jer je Čibuk 1 bio prvi vjetropark tokom čije izgradnje nam je svima, ne samo našoj kompaniji, nego i javnim preduzećima EMS-u i ODS-



Lazar Petrović, izvršni direktor inženjeringu Elnosa Srbija
Lazar Petrović, Executive Director of Engineering Department of Elnos Serbia

u, trebalo vremena da se snađemo oko procedura i protokola izgradnje i puštanja u pogon.

Drugi projekat je rekonstrukcija sistema relejne zaštite i upravljanja u CGES-u na četiri najveća objekta. Ovo je projekat koji smo radili 2014. i 2015. godine, gdje smo kao kompanija trebali da pokažemo da možemo da iznesemo takav projekat na svojim leđima. Specifičnost projekta je bila i priroda energetske mreže CGES-a, jer bi eventualna greška u našem radu mogla da dovede do velikih posljedica po njihov sistem. Morali smo biti vrlo oprezni i precizni u svemu, od inženjeringu, preko radova i na kraju ispitivanja. Na našu sreću, tokom te dvije godine i rada na 45 polja, nismo imali nijedno pogrešno djelovanje uređaja zaštite.

Izgradnja vjetroparka Čibuk 1 je nas kao kompaniju stavila na posebnu poziciju među evropskim kompanijama. U kojoj mjeri je činjenica da je Elnos bio važna karika izgradnje najvećeg vjetroparka na Balkanu važna za Grupu?

Samim tim što smo bili dio tima koji je izgradio prvi vjetropark u sistemu EMS-a, a uz to i najveći na ovim prostorima, daje nam snagu, poziciju i prednost na tržištu za buduće poduhvate, kojih će, nadamo se, biti još.

Čibuk 1 je bio poduhvat koji je stavio poseban pečat na naš rad. Koje najveće izazove vežete za ovu impozantnu projektu priču?

Izazovi su bili mnogobrojni. Oni su prije svega bili ugovorni, jer smo prvi put kao kompanija radili po pravilima srebrnog FIDIC-a, koji je za izvođače dosta nepovoljniji od, na ovim prostorima ustaljenog, žutog FIDIC-a. Bilo je potrebno i finansijski ispratiti cijeli tok izgradnje, napraviti realan plan i sa bankom dogovoriti načine poslovanja kako ni mi, ni naši partneri, ne bismo došli u problem za vrijeme realizacije. Svakog dobavljača, isporučiocu, podizvođača je trebalo ispoštovati, jer kad u jednom takvom mehanizmu zakaže i najmanji dio, onda cio mehanizam trpi. Shodno tome je i koordinacija sa svim partnerima bila veoma izazovna. Na ovu kombinaciju izazova treba dodati General Electric, konsultanta, investitora, EMS, EPS/ODS, tako da je u pojedinim trenucima bilo veoma dinamično.

Opišite jedan svoj radni dan na terenu, na projektu poput Čibuka 1 ili nekog sličnog projekta koji je bio na poseban način zahtjevan?

Što se tiče Čibuka 1, svaki dan je bio različit, jer je trebalo rješavati brojna otvorena pitanja

i stalno je nešto novo bila tema razgovora, sastanaka, dodatnog objašnjavanja...

Radni dan na pomenutom projektu u CGES-u, naročito u početku, bio je zahtjevan. Ispostavilo se da podloge nisu odslikavale realno stanje stvari na terenu, tako da dokumentacija koju smo imali nije bila idealna. Nakon dolaska na objekat, sa kolegama električarima i monterima bih prvo prokomentarisao materijal koji sam spremio prethodnu noć i dogоворili bismo se kako ćemo i šta da radimo. Nakon toga bih pratilo sa njima svaki korak i onda bi se, skoro uvijek pojavilo neko odstupanje od podloga te smo u hodu rješavali 'problemčice'. Naravno, za krupnije stvari sam odmah obavještavao legendu CGES-a, g. Miju Stanišića, te zajedno sa njim iznalazio odgovarajuća rješenja. Po završetku rada popodne, ostao bih još malo da sagledam posao i moguće probleme, a onda u smještaju, nakon večere, pristupio spremanju novog materijal za sutradan. I to je tako bilo u početku na svakom objektu dok nismo 'ušli u fazon'.

Šta je najteže, a šta najljepe u inženjerskom poslu?
Najteže prihvatom neznanje, kako svoje tako i svojih saradnika, kao i nemarnost i neorganizo-

vanost. Najljepše je što svaki dan donosi nešto novo da se nauči, dinamično je i često čovjek ima priliku da se bori sam sa sobom u rješavanju raznih vrsta prepreka, počevši od logičkih i tehničkih, a onda i socijalnih, jer ovaj posao zahtijeva i konstantnu komunikaciju sa ljudima pa kao što kaže stara izreka, treba svuda 'stići i (ponekad) uteći i na strašnom mjestu postojati'.

Spomenuli ste da je dio vaše karijere vezan i za rad u Ujedinjenim Arapskim Emiratima. Koji projekti i iskustva su obilježili ovaj dio vašeg života?

U UAE sam bio dva puta, prvi put skoro godinu dana, drugi put 15-ak mjeseci, a vrijeme između sam proveo u Kataru, dvije i po godine. Najljepše životno iskustvo nosim iz Katara, a to je rođenje sina 2009. godine u Dohi. Sa profesionalne strane, imao sam sreću da u UAE radim na veoma specifičnom projektu ugradnje serijskih reaktora za ograničenje struja kratkih spojeva, i to na 400 kV naponskom nivou, što je u tom trenutku (2011/2012) bio drugi takav poduhvat u svijetu. Pored toga, izuzetno je vrijedno i iskustvo, ne samo rada, nego i života u jednoj takvoj multikulturalnoj i multinacionalnoj sredini, gdje sam se prvi put susreo sa različitim životnim filozofijama (Japan, Indija, Pakistan, Filipini, Kina, Koreja, Njemačka, Francuska, Italija, Brazil, zemlje ex Yu su samo neke od zemalja odalekle su dolazile kolege sa kojima sam svakodnevno bio u kontaktu). To je posebno mjesto gdje čovjek sazna dosta dobrog i lošeg. Srećom, mnogo više dobrog.

Koliko je važno pomjerati granice modernog inženjeringu i koliko mi kao kompanija u tome uspijevamo?

Svi znamo šta se dešavalo sa društвima koja nisu pratila tokove industrijskih revolucija, pa bi trebalo da nam bude normalno, da ne kažem prirodno, da pratimo razvoj modernih tehnologija i industrije. Mi kao kompanija se trudimo i nadam se uspijevamo u tome, tako što šaljemo kadar na obuke i treninge, seminare, konferencije, istovremeno primjenjujući nova znanja u svakodnevnoj realizaciji projekata. Naravno, kao i svuda, mladi su pokretači novih ideja i principa, a na nama iskusnjima je da im to i omogućimo.

U kojoj mjeri je moderni inženjering postavio nove zahtjeve pred svakog ko danas počinje da se bavi ovim poslom? Šta bi bila vaša poruka za nove mlađe inženjere koji su na početku karijere?

Ima jedna kineska izreka: „Samо strpljenje i vrijeme pretvaraju dudovo lišće u svilu“. U vezi sa našom strukom, na ovu poslovnicu dodao bih 'i svakodnevni rad'. Posebnu pažnju, ne samo mladim inženjerima, nego svim mladim ljudima, skrenuo bih na to da budu svjesni svog kruga znanja. Kao što bi rekao jedan od mojih prvih šefova, što je veći krug znanja, veći je i krug neznanja izvan toga, te se ne treba varati da što smo stariji znamo sve. Naprotiv, sa svakim novim saznanjem otvaraju se i nova pitanja, tako da svaki dan moramo biti spremni da naučimo nešto novo.

EN A story about choosing one's profession is one of the most important stories in everyone's life. How and when did you decide to become an engineer and what was it like when you were at the beginning of your professional career?

Like all other good things in life, this choice originated from family. My father is an

electrical engineer and I remember myself being fascinated with HPP "Bajina Bašta" where he worked and where he took me with him whenever he could. Thus, ever since I was a child I knew my interests and my professional direction. After I graduated from university, I got a job as a dispatcher in NDC. To be honest, I never saw myself working there because I wanted to be engaged in actual work done on site. I wanted to gain my experience by working with more experienced engineers and being in company of electrical fitters, that one even today, has so much to learn from. So, the road took me to "Elektroistok" and then to Middle East (Dubai and Doha) for following five years.

A sequence of successfully implemented projects followed your decision to become a part of Elnos. Which one of those points in your career represents the greatest challenge and why?

To be honest, there are two projects and I cannot decide between them. One, of course, is construction of 400/35 kV connection to Wind farm Čibuk 1, where, due to the scope and intensity of the project, it was necessary to finalize entire construction of the connection with all accompanying documentation in a rather short time period. It is necessary to point out that, at the time, we were pioneers on this market since Čibuk 1 was the first wind farm construction of which required time, that not only our company but also public enterprises EMS and ODS had to take, in order to find a way around in procedures and protocols related to the construction and commissioning.

The second project is reconstruction of CGES relay protection and control system on four major structures. This project was implemented in 2014 and 2015 and our task, as a company, was to show that have capacities to bring the project to a successful end. Nature of the CGES network was also specific on this project because any potential mistake in our activities could lead to severe consequences to the system. We had to be extremely careful in every our activity - engineering, works and tests. Fortunately, in 2 years of works on 45 fields we did not have any malfunction of the protective equipment.

Construction of Wind farm Čibuk 1 placed us as a company on a specific position among European companies. How important is it for the Group that Elnos was a vital link in construction of the largest wind farm on Balkans?

Mere fact that we were a part of a team that constructed the first wind farm in EMS system,



which is at the same time the largest one in the region, gives us enormous strength, position and advantage on the market for future endeavours which we hope will follow.

Čibuk 1 was an endeavour that left a special mark on our work. What were, in your opinion, the greatest challenges related to such an impressive project?

Challenges were numerous and primarily related to the contractual domain since it was the first time we worked according to Silver FIDIC which is, from the Contractor's perspective, far less favourable than Yellow FIDIC which is, again, more commonly applied in this region. It was also necessary to financially sustain entire duration of the construction, to develop a realistic plan and to arrange payment methods with the bank so that neither we, nor any of our partners, would have a problem during project realization. All suppliers' and subcontractor's conditions had to be met, because if only one element in such large mechanism fails, entire mechanism suffers. Thus, coordination with all partners proved to be quite a challenge. General Electric, Consultant, Investor, EMS, EPS/ODS are to be added to this combination of challenges. All in all, it was highly dynamic at times.

Describe one of your work days on site, on a project such as Čibuk 1 or one of a similar complexity.
Every work day on Čibuk 1 was different, because there were many outstanding issues and there was always something new to discuss, meet about or provide additional explanation for.

Work days, particularly at the beginning of this project with CGES, were extremely challenging. As it turned out, the maps we had did not reflect actual conditions on site. Thus, the documentation we had at disposal was not ideal. After getting to the site, I would first discuss with my co-workers electricians and fitters the material I had prepared the night before and then we would agree on what to do and how to do it. I would monitor every step in their work and almost always a new deviation from the map would emerge. So, we solved those "small problems" as they occurred. In case of a bigger problem, I would instantly inform a CGES legend, Mr Mijo Stanišić, and together we would find adequate solutions. After the work finished in the afternoon, I would stay a bit longer to put the work done into perspective and to try to anticipate potential problems. After supper, in my accommodation, I would start preparing new materials for the following day. It was like



Najljepše životno iskustvo nosi iz Katar-a
The most beautiful experience brought from Qatar

that at the beginning of every new structure, until we "got into it".

What is the most difficult aspect of engineering as a profession and what is the most beautiful one?

The hardest thing for me is to accept lack of knowledge, my own or that of my co-workers, as well as negligence and disorganization. The most beautiful aspect of engineering for me is that it continuously offers something new to learn. Engineering is dynamic and you often get in a fight with yourself while overcoming various obstacles-logical, technical and social, since this job also requires a constant communication with people. As an old proverb says "one should be able to get everywhere, to escape (occasionally) and to survive in a horrifying place".

You mentioned that a part of your career is related to United Arab Emirates. What would you say were the most important projects and experiences you gained in this period?

I left to UAE twice. First time, I was there for almost a year and the second time I stayed 15 months. Two and a half years in between I spent in Qatar. My son was born in Doha, Qatar in 2009 and that is by far the best personal experience from this country. From professional point of view, I was fortunate enough to work on a highly specific project in UAE - installation of serial reactors to reduce short-circuit currents at 400 kV voltage level. At the time (2011/2012), it was the second such endeavour in the world. Apart from professional experience, the experience I got living in such a multicultural and multinational environment is extremely important. It was there that I first met with various philosophies of life (Japan, India, Pakistan, Philippines, China, Korea, Germany, France, Italy, Brazil, former Yugoslavian republics – are only some of the countries that my colleagues, which I

communicated with daily, came from). It is a very specific place where a person discovers so much of both - the good and the bad. Luckily, the good prevails.

How important is it to push the boundaries of modern engineering and how successful are we as a company in our attempt to do so?

We are all familiar with what happened to societies which did not follow the trends of industrial revolutions. Thus, it should be normal, or even natural, for us to keep up with development of modern technologies and industries. As a company, we are trying hard, and hopefully succeeding, in this respect by providing our personnel with opportunity to go to trainings, seminars and conferences and by simultaneously applying newly gained knowledge in everyday realization of our projects. The young are, of course, initiators of new ideas and principles and it is up to us, more experienced workers, to facilitate such development.

To which extent did the modern engineering raise new demands to all of those who are just starting in this business? What would be your message to young engineers at the beginning of their careers?

There is a Chinese proverb that says "With time and patience mulberry leaf becomes a silk gown". If we are referring to engineering profession, I would also add "every day work". I would like to bring to the attention of not only young engineers, but all young people, that they need to be aware of their own circle of knowledge. As one of my former superiors would say, the greater the circle of knowledge, the greater the circle of ignorance outside of it. We should not also trick ourselves by believing that we know everything just because we grew older. Every new knowledge raises a new question and we must be prepared to learn something new every day.



Dalekovodi za vrijeme koje dolazi
Transmission lines for time to come

TRANSBALKANSKI ELEKTROENERGETSKI KORIDOR

Ovog ljeta ulazimo u novi veliki projekat u Crnoj Gori. U pitanju je učešće u dijelu izgradnje Transbalkanskog elektroenergetskog koridora na dionici kroz Crnu Goru.

U okviru ovog projekta naši timovi će u narednih 30 mjeseci raditi na realizaciji elektromontažnih i građevinskih radova na 15 trafostanica 400, 220 i 110 kV širom zemlje.

Podsjećamo da je Transbalkanski koridor projekt koji će dalekovodnom linijom snage 400 kV povezati Rumuniju, Srbiju, Bosnu i Hercegovinu i Crnu Goru, dok će posredstvom HVDC interkonekcije MONITA ove zemlje u perspektivi od 2022. godine biti energetski povezane sa Italijom.

VIŠE OD 10 GODINA INSPRIŠUĆIH REZULTATA

MORE THAN 10 YEARS OF INSPIRING RESULTS

SR Elnos Grupa u ovoj godini obilježava značajan jubilej – 10 godina rada Elnos inženjeringu u Podgorici. Iza ove članice Elnos Grupe, više je od decenije inspirišućih rezultata sabiranih u nizu ogromnog broja projekata, a prvi među njima realizovani su godinu-dvije prije osnivanja kompanije u Crnoj Gori. Dinamika je od starta bila snažna i sa ponosom možemo reći da smo jedna od vodećih kompanija koja i na ovom tržištu postavlja standarde u elektroenergetici.

Direktor u Podgorici Vladimir Ivanović, pri-družio se kompaniji 2009. godine, te jednako kao i kompanija proslavlja svoj radni jubilej. Svakako, priču o uspjehu na prostoru Crne Gore, te velikoj posvećenosti napretku ovog dijela Grupe, čuli smo upravo od g. Ivanovića. „Prvi veliki iskorak na ovo tržište napravljen je 2008. godine, učešćem u dva kapitalna projekta, instalaciji OPGW-a na 400, 220 i 110 kV

dalekovodima, u ukupnoj dužini od 379 km, i izgradnji TS 110/35 kV Virpazar po principu ključ u ruke. Godinu kasnije, Elnos inženjeringu počinje svoj prvi projekat na trafostanici Podgorica 5”, prisjeća se Ivanović.

Nakon toga, uslijedili su brojni projekti iz oblasti izgradnje dalekovoda, trafostanica i elektrana. Decenijsko putovanje bilo je dinamično, izazovno i plodno. Mnogo je uspješnih projekata koji su dokazali kvalitet, od malih sanacija havarija do rekonstrukcija koje su osigurale bolje i kvalitetnije napajanje prenosom mrežom u Crnoj Gori, pa do učešća na velikom projektu kablovskog povezivanja Italije i Crne Gore, što je prilika kakva se rijetko dobija.

„Najvećim uspjehom Grupe u ovih 10 godina smatramo to što smo pokazali spremnost da pratimo trendove i zahtjeve tržišta“, kaže Ivanović i dodaje da ako se ima u vidu strma geografska Crne Gore, ovo nije uvijek bio jedno-

stavan zadatak. Među najvećim izazovima su oni koji se tiču rekonstrukcije hidroelektrane Piva, impozantan i jedinstven objekat na kome je svaka intervencija izazov. Ovdje smo zabilježili i naš rekord u radu ispod zemlje, na nevjerojatnih 220 m.

Na pitanje kako vidi razvoj elektroenergetike u državi, Ivanović odgovara: „Crna Gora je vrlo posvećena razvoju svog elektroenergetskog sektora. Godinama unazad sam svjedok njegovog osnaživanja. Pri kraju je ciklus modernizacije prenosnog, a u punom jeku je modernizacija distributivnog sistema. Planiran je značajan broj novih modernih objekata. Među njima su vjetroparkovi i solarnе elektrane i realizuju se jedan po jedan. Smatram da Crna Gora postaje značajno energetsko čvorište i da će ovaj sektor ići naprijed u svakom pogledu, a da Elnos Grupa tu ima svoje mjesto“.

Krupnim koracima naprijed ide i kompanija u

Podgorici, koja je prošle godine ušla u novu fazu razvoja povećanjem broja zaposlenih različitih profila. Takođe, u jubilej bi se moglo ubrojati i sve godine podrške niza projekata i inicijativa kojima se doprinosi stvaranju najljepših društvenih vrijednosti u oblasti kulture, sporta i obrazovanja, a u skladu sa korporativnim opredjeljenjem Grupe.

Kada je riječ o ovom dijelu naše Grupe, posebno smo ponosni na odličnu saradnju sa Elektroprivredom Crne Gore, sa Crnogorskim elektroprenosnim sistemom, kao i sa privatnim sektorom iz ove oblasti. „Jednako sam zahvalan svim našim poslovnim partnerima i saradnicima koji su nas podržali na ovom dugom putu. Mi ćemo se i dalje maksimalno zalagati za to da budemo vodeći u energetici za budućnost. Mislim da je najbolji period pred nama”, poručuje Ivanović.

EN This year is an important anniversary for Elnos Group - 10 years of work of Elnos Inženjering in Podgorica. More than a decade of inspiring results, combined in a sequence of numerous projects, is behind this member of Elnos Group.

First of those projects were realized a year or two before the company established itself in Montenegro. Dynamics were strong from the very beginning and we can proudly say we have become one of leading companies in this market, setting standards in electrical engineering.

Director in Podgorica, Vladimir Ivanović, joined the company in 2009. So, he is also celebrating an anniversary, together with the company.

TRANS BALKAN ELECTRICITY CORRIDOR

This summer, we are commencing a new project in Montenegro. The project concerns participation in construction of a section of Trans-Balkan electricity corridor through Montenegro.

During the course of this project, our teams will spend following 30 months performing electrical fitting and construction works on 15 substations 400, 220, and 110 kV all around the country.

Trans-Balkan electricity corridor is a project which implies construction of 400 kV power line connection between Romania, Serbia, Bosnia and Herzegovina and Montenegro, while in future perspective, these countries will also be connected with Italy through MONITA HVDC interconnector.

Story about success in Montenegro and strong dedication to progress of this part of the group is, of course, told by Mr Ivanović. “First important step to this market was made in 2008 when the company participated in two capital projects, installation of OPGW on 400, 220 and 110 kV transmission lines in total length of 379 km and construction of substation Virpazar which was a turn-key project. A year later, Elnos inženjering started its first project on substation Podgorica 5”, Ivanović remembers.

Numerous projects followed, primarily related to construction of power lines, substations and power stations. A decade long journey was dynamic, challenging and thriving. Many successfully implemented projects prove quality of our work, from remedies of smaller defects, over reconstructions which enabled a better and more reliable power distribution in Montenegro, to participation in a colossal project which implies construction of a cable connection between Italy and Montenegro, which is a chance rare companies get.

“We believe the greatest success of the Group in these 10 years is that we have shown readiness to keep up with market trends and requirements”, says Ivanović and adds that this has not always been an easy task, considering the steep geography of Montenegro. Major challenges involve those related to reconstruction of power plant Piva, a remarkable and unique hydro structure where each intervention represents a challenge. One of our working records was registered here- working at 220 m beneath the ground.

When asked about his vision of development of power engineering in the state, Ivanović replied: “Montenegro is highly dedicated to development of electrical power sector. For years I have been a witness of its strengthening. Cycle of modernization of transmission sector is in its final phases while modernization of distribution sector is in full force. Construction of significant number of new modern structures has been planned. Wind farms and solar plants are among these projects which are being realized one by one. I find that Montenegro is becoming an important power node and that this sector will develop further in all aspects, with Elnos Group having a firm position in it”.

Company in Podgorica is strongly marching forward. Last year, the company began a new phase in increasing number of employees of various profiles. Years spent supporting a series of projects and initiatives which significantly contributed to creation of finest social values in area of culture, sports and education can also be counted in, all implemented in accordance with corporative orientation of the company.

Regarding this part of our Group, we are particularly proud of an excellent cooperation with Power Utility Company of Montenegro (EPCG), Montenegrin Electric Transmission System and private companies in this sector. “I am equally grateful to all our business partners and associates who supported us on this long journey. We will remain committed to becoming a leader in electrical engineering of the future. I believe that the best is yet to come”, says Ivanović.

Konvertorska stanica Lastva Grbaljska Converter station Lastva Grbaljska



**STANISLAVA MIŠČEVIĆ**

Menadžer sistema kvaliteta Elnos Grupe
Elnos Group QMS Manager

„Integriranim sistemom menadžmenta Elnos Grupa demonstrira svojim korisnicima i drugim zainteresovanim stranama poslovanje na bazi principa sigurnosti u svim segmentima. Analize zahtjeva, preispitivanje načina i rezultata poslovanja, te stalna edukacija su na prvom mjestu za razvoj svakog poslovnog sistema. Taj koncept se njeguje u svim članicama Elnos Grupe“.

“With integrated management system Elnos Group demonstrated its customers and other interested parties, operating on the basis of safety in all segments. Analysis of requirements, review of the means and operating results, and continuous education is at the first place for the development of any business system. This concept is settled in all members of Elnos Group“.

KVALITET KAO PRIORITET

QUALITY AS PRIORITY

Poslovanje Elnos Grupe u skladu s najboljim svjetskim korporativnim praksama

Elnos Group business operations complies with best global corporate practice

SR Kvalitet poslovanja je prioritet u radu svih zaposlenih Elnos Grupe. Kompanija to konstantno potvrđuje i sertifikatima koji su uskladeni sa međunarodnim ISO standardima, što je najbolji dokaz posvećenosti menadžmenta i svih zaposlenih kontinuiranom unapređenju u svim oblastima poslovanja.

Inicijalna sertifikacija iz serije ISO 9000 započela je 2003. Od tada je Elnos Grupa nadograđila sisteme upravljanja standardima OHSAS 18001:2007 (Sistem menadžmenta bezbjednošću i zdravljem na radu) i ISO 14001:2015 (Sistem menadžmenta životnom sredinom). Blagovremeno je izvršena i tranzicija sa ISO 9000:2008 na ISO 9001:2015 (Sistem upravljanja kvalitetom).

„Važeći sertifikati datiraju od oktobra 2017. i validni su do oktobra 2020. godine. Treba napomenuti da ovlašteni auditori sertifikacionog tijela TÜV NORD CERT svake godine sprovode audite za provjeru usaglašenosti sistema menadžmenta sa zahtjevima standarda. Tako je i u septembru 2018. uspješno završen audit za postojeće sisteme, čime je još jednom potvrđeno da je poslovanje Elnos Grupe u skladu sa zahtjevima standarda i najboljim svjetskim korporativnim praksama. Područje primjene navedenih sistema u okviru Elnos Grupe je inženjering, konsalting, trgovina i proizvodnja elektroenergetske opreme“, rekla je Stanislava Miščević, menadžer sistema kvaliteta Elnos Grupe.

U toku 2018. godine je izvršena implementacija sistema EN ISO 27001:2013 (Sistem menadžmenta bezbjednošću informacija) i EN ISO 50001:2011 (Sistem menadžmenta energijom), a početkom aprila 2019. je izvršen sertifi-

kacijski audit od strane auditora TÜV NORD CERT kada je Elnos Grupa dobila potvrdu da se primjenjuje sistem upravljanja prema zahtjevima navedenih standarda.

ISO 27001:2013 je jedan od najznačajnijih i najprimjenjenijih standarda informacione sigurnosti u svijetu što Elnos Grupu čini konkurentnom u odnosu na druge kompanije koje još uvijek nisu prihvatile ovaj standard. Standardom ISO 50001:2011 Elnos Grupa potvrđuje konstantno poboljšanje energetskih performansi, uključujući energetsku efikasnost i potrošnju energije.

„U periodu implementacije u 2018. godini, kompanija je primjenila napredni sistem praćenja potrošnje konkretno električne energije, koji omogućava realno praćenje potrošnje, što olakšava analize, a posljedično i definisanje mjera za unapređenje energetske performanse. Ovaj sistem je u potpunosti kompatibilan sa ISO 14001“, objasnila je Miščević.

Skup sistema upravljanja koje je Elnos Grupa implementirala jedinstven je po kombinaciji, zbog čega kompanija staje rame uz rame sa najpoznatijim evropskim i svjetskim kompanijama iz elektroenergetskog sektora. Pored toga što implementirani i sertifikovani sistemi ukazuju na društveno odgovorno ponašanje Elnos Grupe, težnja ka izvrsnosti jedna je od prednosti razvoja gledano i iz ugla zaposlenih, korisnika, poslovnih partnera, te investitora. U vezi sa korporativno-društvenom odgovornošću, Elnos Grupa poštuje zahtjeve norme ISO 26000, koja se ne primjenjuje u svrhe sertifikacije.

EN Business operations quality is a priority in work for all employees of the Elnos Group.



Elnos Grupa posluje u skladu s najboljim svjetskim praksama
Elnos Group operating according the best world business practices



Izvršnost je prioritet u radu
Excellence is priority in work

Company constantly supports this by certificates complying with international ISO standards, which is the best evidence of devotion of the management and all employees to constant improvement in all business fields.

Initial certification from series ISO 9000 started in 2003. Since then, Elnos Group upgrades management systems by standards OHSAS 18001:2007 (Occupational Health and Safety Management Certification) and ISO 14001:2015 (Environmental Management System). Transition from ISO 9000:2008 to ISO

9001:2015 (Quality Management System) was also performed timely.

"Valid certificates date from October 2017 and are valid through October 2020. We should mention that authorized auditors of certifying body TÜV NORD CERT perform audits for checking compliance of management system with requirements of the standard every year. So, in September 2018, auditing of the current systems was successfully performed, which again confirms that business operations of the Elnos Group comply with standard requirements of

the best global corporate practice. Application area of the aforementioned systems within Elnos Group is engineering, consulting, trade and production of electrical engineering equipment," said Stanislava Miščević, Elnos Group System Quality Manager.

During 2018, implementation of system EN ISO 27001:2013 (Information Security Management Systems) and EN ISO 50001:2011 (Energy Management Systems) was performed, and certification audit by auditor TÜV NORD CERT was performed in early April 2019, when Elnos Group got a confirmation that management systems in accordance with requirements of the mentioned standards is applied.

ISO 27001:2013 is one of the most significant and most applicable standards of information security worldwide, which makes Elnos Group competitive compared to other companies that have not accepted this standard yet. Through standard ISO 50001:2011, Elnos Group constantly confirms improvement of energy performances, including energy efficiency and energy consumption.

"In implementation period in 2018, company applied advanced monitoring system for consumption of electrical power in the first place, providing real time monitoring of consumption, which again facilitates analysis, and, consequently, defining measures for improvement of energy performance. This system is entirely compatible with ISO 14001", explained Miščević.

Group of management systems that Elnos Group implemented is a unique one in combination, so that company is on the same level with best known world companies in electrical engineering sector. Apart from the fact implemented and certified systems point out to socially responsible behavior of Elnos Group, effort for excellence is one of advantages for development seen from the standpoint of employees, users, business partners and Investors. Referring to corporate-social responsibility, Elnos Group obeys requirements of norm ISO 26000, which is not implemented for the purpose of certification.

BEZBJEDNOST PRIJE SVEGA

SAFETY FIRST

AKTIVNA PRIMJENA MJERA

BEZBJEDNOSTI i zaštite zdravlja je najvažnija investicija u budućnost kompanije

ACTIVE IMPLEMENTATION OF SECURITY

MEASURES and protection of health and safety at work is the most important investment in the company's future

SR Godina 2019. je zvanično godina bezbjednosti, zaštite i zdravlja na radu u Srbiji. Ovo je bio potez kojim je Vlada Srbije i zvanično naglasila da je „radnik najveća vrijednost ove zemlje“.

Efikasna primjena mjera bezbjednosti i zdravlja najvažnija je investicija u budućnost, i predstavlja jedan od bazičnih poslovnih postupaka Elnos Grupe.

Sektor bezbjednosti i zdravlja (BZR) naše kompanije ulaže veliki trud da operativnim upravljanjem obezbijedi zaštitu zdravlja i dobrobit svih zaposlenih za vrijeme rada.

„Za nas je od ključne važnosti da u komunikaciji sa radnicima dobijemo 'iskustvo više' o tome koje istinske rizike radna praksa donosi. Zajedno razrađujemo bolju praksu i primjenjujemo efikasnija rješenja, što je veoma važno za podizanje BZR na viši nivo“, rekla je Radmila Cvetković, koordinator za poslove bezbjednosti i zaštite na radu Elnos Grupe.

Izgradnja najvećeg vjetroparka na Balkanu-Čibuk 1, za Elnos Grupu je potvrda visokih standarda u ovoj oblasti i van evropskih granica.

Možemo se pohvaliti da smo u skladu sa vrlo zahtjevnom BZR procedurom glavnog izvođača „General Electric“-a, svoj posao okončali sa veoma dobrim rezultatima koji su ocijenjeni visokom ocjenom.

Kao kompanija koja je internacionalni koncern za elektroenergetiku, sa uspješno izgra-



Vjetropark Čibuk 1 - zadatak sa visokom BZR ocjenom
Wind Farm Čibuk 1 - task with high HSE mark

denom liderskom pozicijom, nastavićemo da investiramo u zdravlje i bezbjednost, i uložićemo svoje resurse i napore u to da i dalje budemo primjer bezbjednog poslovanja.

EN Year 2019 officially is a year of safety, protection and health at work in Serbia. This was a move that Government of Serbia officially stressed that "employee is the most precious in this country".

Efficient application of health and safety measures is the most important investment in future, and represents one of the basic business principles of the Elnos Group.

Health and safety sector (HSE) of our company makes a great effort to use operational management in order to provide health protection and benefits for all employees at work.

"To us, it is a key importance to acquire 'more experience' through communication with employees on true risks by working practice. Together, we work on better practice and apply

more efficient solutions, which is very important to bring HSE to higher level", said Radmila Cvetković, Health and Safety Coordinator of Elnos Group.

The construction of the largest wind farm in the Balkan-Čibuk 1, for the Elnos Group is a confirmation of high standards in this area and beyond European borders.

Company "General Electric", our partner and the Main Contractor of the project clearly stressed that HSE comes first. We can say proudly that according to very strict HSE procedure by the Main Contractor "General Electric", we completed our works with a very good results evaluated with high marks.

Being an international concern company for electrical power engineering, and company that successfully built a strong leader position, we are going to continue investing in health and safety, and we shall invest our resources and effort to stay an example of safety business operations in future.

Priznanje za internacionalizaciju privrede RS

Reward for internationalization of RS economy

SR Zahvaljujući nizu uspješnih iskoraka u poslovanju na stranim tržištima u 2018. godini, Privredna komora RS je Elnos Grupi uručila posebno priznanje za internacionalizaciju privrednih subjekata iz Republike Srpske.

Nagrada, koja je potvrda našeg uspješnog angažmana u oblasti internacionalnog poslovanja, uručena je Branku Torbicu, generalnom direktoru Elnos BL, u okviru tradicionalne manifestacije Izbora najuspješnijih u privredi Republike Srpske, održanoj ove godine u banja-lučkom Banskom dvoru.

„Priznanje koje smo dobili je potvrda važnosti rada svih zaposlenih u Elnos Grupi koji su pokazali da se uz profesionalan rad i moderan pristup mogu napraviti podvizi u elektroenergetskim sistemima van naše zemlje. Zahvaljujem Privrednoj komori RS koja se potrudila da prepozna značaj poslovnih rezultata koje smo ostvarili“, rekao je Torbica povodom uručenja ovog posebnog priznanja.

Mi u Elnos Grupi smo ponosni činjenicom što smo već godinama kompanija sa uspješno izgrađenom snažnom liderском pozicijom u oblasti elektroenergetike. Vjerujemo da su pred nama brojni novi projektni izazovi i uspjesi, kako na domaćem tako i na stranim tržištima.



Branko Torbica, generalni direktor kompanije Elnos BL, prilikom uručenja nagrade
Branko Torbica, Managing Director of Elnos BL while receiving prize

EN Thanks to a series of successful steps in business operations on international markets in 2018, RS Chamber of Commerce awarded Elnos Group with a special award for internationalization of economic entities from the Republic of Srpska. Award, which is a confirmation of our successful engagement in the field of international business operations, was delivered to Branko Torbica, Elnos BL Managing Director, within traditional ceremony of Selecting the most successful entities in economy in the Republic of Srpska held this year in Banski dvor in Banja Luka.

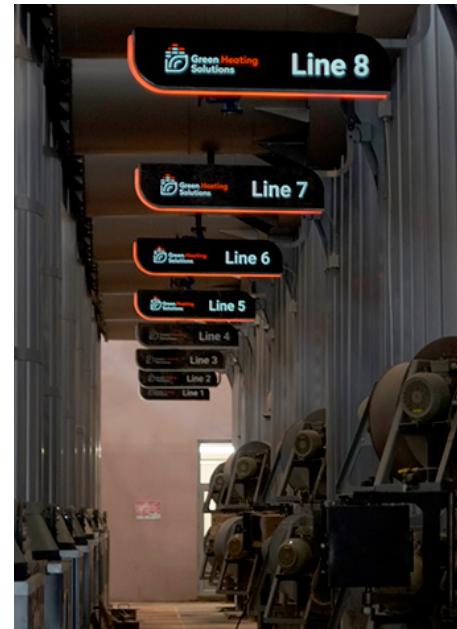
“Award we received is a confirmation of significance of work for all employees in the Elnos Group, who demonstrated that with professional work and modern approach accomplishments in electrical power systems out of boundaries of our country can be performed. I would like to thank RS Chamber of Commerce that recognized significance of the business results we had”, said Torbica when receiving this special recognition.

We, the Elnos Group, are proud of the fact we are a company that has successfully built strong leadership position in the field of electrical power engineering for years. We believe we have numerous new project challenges and successes ahead, both nationally and internationally.

Nagrade za „Eko toplane“ Banjaluka

Awards for “Eko toplane” Banja Luka

EN „Eko toplane“ Banjaluka su višestruko nagrađene kao značajan projekat u oblasti obnovljivih izvora energije u Istočnoj i Jugoistočnoj Evropi u okviru Međunarodnog foruma o čistim energetskim tehnologijama u Novom Sadu.



Pogoni „Eko toplane“
Plants „Eko toplane“

Važnost realizacije projekta je uvažena na regionalnom i globalnom nivou, pa su tako projekt prepoznali program Ujedinjenih nacija za zaštitu životne sredine (UNEP) u Nairobi, Samit gradonačelnika pametnih gradova na Tajvanu, te Institutu za OIE u Stockholmumu.

„Eko toplane“ Banjaluka su osvojile i nagradu kapetan Miša Anastasijević za najbolji projekt, a ovjenčale su se i priznanjem „Top energy“ za najuspješnije izvedeni projekt u kategoriji obnovljivih izvora energije u Istočnoj i Jugoistočnoj Evropi u okviru Međunarodnog foruma o čistim energetskim tehnologijama u Novom Sadu.

EN “Eko toplane” Banja Luka (eng. Eco Heating Plants) have been numerously rewarded as one of significant projects in the field of renewable energy sources.

Importance of project realization has been recognized on regional and global level and also by program by United Nations for Environmental Protection (UNEP) in Nairobi, Summit of Mayors of smart cities in Taiwan as well as Institute for RES in Stockholm.

“Eko toplane” Banja Luka also won prize Miša Anastasijević for the best project as well as recognition “Top energy” for the most successful realized project in the category of the renewable energy sources in East and Southeast Europe within International forum on clean energy technologies in Novi Sad.

7 SEDAM PITANJA ZA ŽENE n a z a d a t k u

SEVEN QUESTIONS FOR
WOMEN ON A MISSION



RADMILA
CVETKOVIĆ

koordinator BZR
HSE Coordinator

Kada ste poželjeli da odaberete svoj poziv?

Moj otac, mašinski inženjer, radio je u kompaniji u kojoj je bezbjednost na radu bila na najvišem mogućem nivou, a moj stariji brat je inženjer BZR. Oduvijek sam se interesovala za njihov posao. Iako je u pitanju profesija atipična za ženu, vremenom mi je postalo jasno da će BZR biti i moj poziv.

Šta smatrate svojim najvećim uspjehom i zašto?

To je svakako projekat Vjetropark Čibuk 1, na kojem smo pokazali značaj i važnost bezbjednosti na radu. Svaki čovjek angažovan na ovom projektu se svakog dana vraćao porodici bez povrede stjećene na radu, a upravo to je naš najvažniji cilj – 0 povreda na radu.

Šta je ono što vas inspiriše?

Dnevna interakcija sa ljudima različitih profesija i zanimanja.

Šta vam predstavlja najveće zadovoljstvo u poslu?

Kada kolege prihvate sve sugestije i zadatke BZR-a bez primjedbi i negodovanja.

Šalim se! Veliko zadovoljstvo mi donosi dobar timski rad i uspješno završen projekat.

Da li je izazov biti žena u profesiji koja i dalje nosi muški predznak?

Jeste! Želim, trudim se i trudiću se da razbijem predrasude i stereotipe da ženi treba dodjeljivati samo određeni, ženski posao.

Šta je za vas najveći profesionalni izazov?

Suočavanje sa rizicima koji se pojavljuju na dnevnom nivou, na različitim mjestima, u različitim situacijama.

Šta najviše volite da radite u slobodno vrijeme?

Dobar trening je ono što je imperativ.

Uživanje u prirodi, šetnja, smijeh i zabava sa prijateljima.

When did you first feel the inclination towards your profession?

My father is a mechanical engineer and he worked in a company where safety at work was at highest level possible. My older brother is a health and safety engineer. I always took an interest in their job. Although this profession is quite atypical for a women, with time it became clear to me that health and safety engineering would become my profession too.

What do you believe is your greatest success and why?

It would most definitely be the project Wind farm Čibuk 1, where we showed the importance of health and safety engineering. Every man engaged on this project came back home, to his family, every day without any injury and that is our utmost goal - 0 injuries at work.

What inspires you?

Daily interaction with people of different professions and occupations.

What gives you the greatest pleasure in your work?

When colleagues accept all suggestions and assignments related to health and safety without any objections or disapproval. I am joking! A good team work and a successfully finished project give me greatest satisfaction.

Is it a challenge to be a woman in what is still often considered typically male profession?

ANA
KOVIĆ
*inženjer
građevinarstva
Civil Engineer*



Kada ste poželjeli da odaberete svoj poziv?

Oduvijek sam znala da će se baviti nekom od tehničkih nauka, gdje će moći primjenjivati matematički alat u konkretnim problemima. Građevinarstvo sam izabrala baš iz tog razloga. Kasnije sam saznala da je to bila želja mog djeda, što je bio dodatni motiv i podsticaj za učenje i usavršavanje. Danas, nakon četiri godine radnog iskustva u praksi, mogu reći da bih opet izabrala isto zanimanje.

Šta smatrate svojim najvećim uspjehom i zašto?

Uspjehom smatram priliku da primjenjujem stečeno znanje i kvalitet svog rada podignem na viši nivo.

Šta je ono što vas inspiriše?

Nedokućivost svih znanja je nešto što svakodnevno donosi novu inspiraciju.

Šta vam predstavlja najveće zadovoljstvo u poslu?

Veliko zadovoljstvo mi donosi svaka uspješna primjena znanja u praksi. Da li je izazov biti žena u profesiji koja i dalje nosi muški predznak?

Mislim da je izazov biti uspješan u bilo kom poslu, što zavisi od ličnosti i ambicija pojedinca, ali ne i od pola.

Šta je za vas najveći profesionalni izazov?

Potrebno je mnogo rada i ulaganja da bi se profesionalne granice pomjerale, ali svaka ta 'investicija' se isplati kada na terenu riješite izazove. Izazov je svaki novi dan na terenu.

Šta najviše volite da radite u slobodno vrijeme?

Bavim se sportom i odlazim u prirodu. Takođe volim da planinarim i vozim bicikl.

Kada ste poželjeli da odaberete svoj poziv?

Arhitektura me je počela zanimati u višim razredima osnovne škole. Od tog perioda sam postala pasionirani čitač literature na temu umjetnosti, istorije arhitekture, kao i savremenog grada, što je kasnije presudilo u mom odabiru profesije arhitekte.

Šta smatrate svojim najvećim uspjehom i zašto?

Uspjeh su bivši studenti koji su danas moje kolege, dok bih na terenu svakako izdvojila rad na Glavnom projektu hidroelektrane Ulog, projektu MHE kućna turbina pri HE Bočac, te realizaciji, materijalizaciji i opremanju Upravne zgrade Elnos Grupe.

Šta je ono što vas inspiriše?

Možda zvuči kao floskula, ali inspiriše me svaki novi projektni zadatak ili tema za promišljanje. Proces projektovanja čak i na najsvedenijem nivou je inspirativan sam po себи.

Šta vam predstavlja najveće zadovoljstvo u poslu?

It really is! I am eager to break prejudice and stereotypes that women should be engaged only for some specific, women jobs.

What is your greatest professional challenge?

Facing with risks occurring on daily basis, on various locations and in different situations.

What do you like to do most in your free time?

A good training is an imperative. Enjoying in nature, taking a walk, laughing and having a good time with friends.

When did you first feel the inclination towards your profession?

I always knew that I would choose one of technical sciences for a profession, because I wanted to be able to use mathematical tools to solve actual problems. I chose civil engineering for this particular reason. I found out later that my grandfather also wanted me to become a civil engineer, which served as additional motive and incentive for learning and further development. Today, after 4 years of experience, I can say that I would choose the same profession again.

What do you believe is your greatest success and why?

I believe success is the opportunity I have to apply knowledge gained and to raise quality of my work to a higher level.

What inspires you?

Unattainability of all knowledge is an unlimited source of inspiration.

What gives you the greatest pleasure in your work?

Every successful use of knowledge in practice brings me great pleasure.

Is it a challenge to be a woman in what is still often considered typically male profession?

I think it is a challenge to be successful in any job, which depends on individual's personality and ambition, rather than gender.

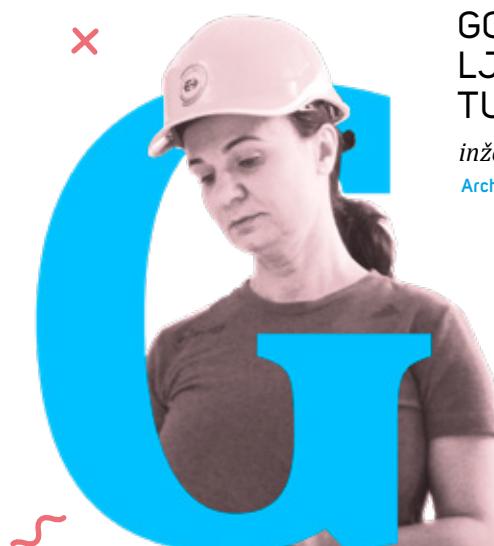
What is your greatest professional challenge?

It takes a lot of work and investing to push professional boundaries, but each such "investment" pays off when you successfully cope with challenges on site. Every new day on site is a challenge.

What do you like to do most in your free time?

I engage in sports and go to nature. I also like mountain climbing and riding a bicycle.

GORDANA
LJUBIČIĆ-
TUVIĆ
*inženjer arhitekture
Architecture Engineer*



When did you first feel the inclination towards your profession?

I started taking interest in architecture when I was in senior classes of

Najveće zadovoljstvo je trenutak kad se ideje materijalizuju i postanu stvarne i izvedene. Takođe, kad postoji jasna namjera cijelog tima da se uspješno realizuje posao.

Da li je izazov biti žena u profesiji koja i dalje nosi muški predznak?

Arhitektura je podjednako zastupljena kao profesija kod oba pola, tako da ovaj predznak nije relevantan u našem pozivu. Inače sam veliki pobornik rodne ravnopravnosti i osnaživanja žena. Društveno uslovljene razlike između polova su naučene i treba ih mijenjati.

Šta je za vas najveći profesionalni izazov?

Ostvariti interakciju i kvalitetnu saradnju sa timom profesionalaca različitih oblasti na nekom projektu. Kad se to uskladi, svaki novi izazovniji zadatak se rješava.

Šta najviše volite da radite u slobodno vrijeme?

Slobodno vrijeme je prije svega posvećeno porodici. To je najveće zadovoljstvo. Volim ga provoditi i uz muziku i dobru knjigu.

**SANJA
TASKOJ BABIĆ**
*monter
Electrical Filter*



Kada ste poželjeli da odaberete svoj poziv?

Oduvijek sam voljela obavljati tehničke radove, pa me to inspirisalo da promjenim prvično odabranu profesiju vaspitačice djece.

Šta smatrate svojim najvećim uspjehom i zašto?

Moj najveći uspjeh je kada samostalno ispunim zadatak koji se obično radi timski, kao što je vješanje kolata na čelične konstrukcije dalekovodnih stubova upotrebom konopa, samostalno sastavljanje čeličnih konstrukcija i stični radovi.

Šta vam predstavlja najveće zadovoljstvo u poslu?

Najveće zadovoljstvo je dobro obavljen posao, čemu najviše doprinosi dobra organizacija poslovode, kao i dobra volja i energija ostalih saradnika.

Šta je ono što vas inspiriše?

Inspirise me sam rad, koji je raznolik, intenzivan i zanimljiv, kao i saradnici koji me bode na svakom profesionalnom koraku i izazovu.

Da li je izazov biti žena u profesiji koja i dalje nosi muški predznak?

Slažem se da je velik izazov biti žena u muškoj profesiji. U slučaju nas monterki se to prije svega odnosi na razlike u fizičkoj snazi, iako uz pomoć saradnika ova razlika postaje zanemariva.

Šta je za vas najveći profesionalni izazov?

Usvajanje novih znanja i spretnosti, pošto je ovo moje prvo zaposlenje na tehničkom području.

Šta najviše volite da radite u slobodno vrijeme?

Volim šetnje u prirodi sa moja dva psa, čavrčanje sa prijateljcama uz kafu ili popiti pivo sa mojim kolegama saradnicima nakon napornog rada na terenu.

primary school. Since then, I have become a passionate reader of literature concerned with art, history of architecture and contemporary work. I believe that was decisive for my choice of architecture as a profession.

What do you believe is your greatest success and why?

My success are my former students who are now my colleagues. Concerning job done on site, I would underline main design for hydro power plant Ulog, design for small hydro power plant Home Turbine at power plant Bočac as well as realization, materialization and furnishing the Administration building of Elnos Group.

What inspires you?

It may sound as a truism, but every new design assignment inspires me, or a new topic that requires deep consideration. Designing process is inspiring by itself, even when reduced to the simplest level.

What gives you the greatest pleasure in your work?

The greatest pleasure is the moment when ideas are materialized, when they become actual and realized. Pleasure is also when entire team has an obvious and clear intention to successfully perform a task.

Is it a challenge to be a woman in what is still often considered typically male profession?

Architecture as a profession is equally distributed among genders, so gender is not of particular relevance in this vocation. I am generally high supportive of gender equality and women's empowerment. Socially conditioned differences between genders are learned and this should be changed.

What is your greatest professional challenge?

To actually interact and create high-quality cooperation on a project with a team of professionals from different disciplines. When this is achieved, each new demanding task is easily solved.

What do you like to do most in your free time?

I like to spend my free time primarily with my family. That gives me the greatest pleasure. I also like to listen to music or read a good book.

When did you first feel the inclination towards your profession?

I have always liked performing technical tasks and that inspired me to change my initially chosen profession which was a kindergarten teacher.

What do you believe is your greatest success and why?

My greatest success is when I complete a task, which is generally performed by a team, by myself, such as mounting a wheel on steel structures of electric poles using a rope, assembling steel structures and similar.

What inspires you?

The work itself inspires me, which is diversified, intensive and interesting, as well as my co-workers who encourage me in every move in my career and every challenge I face.

What gives you the greatest pleasure in your work?

The greatest pleasure for me is a job done, which is mostly contributed by manager's proper organization and good will and energy of other participants in the activity.

Is it a challenge to be a woman in what is still often considered typically male profession?

I agree that being a woman in a male dominated profession is a big challenge. The challenge is primarily reflected in the most obvious difference between male and female filters which is physical strength. However, with help of co-workers, this difference becomes neglectable.

What is your greatest professional challenge?

Adopting new knowledge and developing new capabilities, since this is my first employment in the industry.

What do you like to do most in your free time?

I like taking walks in nature with my two dogs, chit-chatting with my friends or having a coffee or a beer with my co-workers after a difficult day on site.



MAJA MARA KURUZOVIĆ

*prevodilac i koordinator BZR
Interpreter and HSE Coordinator*

Kada ste poželjeli da odaberete svoj poziv?

Još od vremena kada sam kao dijete išla u posjete rođacima u Švedsku, zainteresovala sam se za jezik i kulturu ove zemlje. Moje interesovanje je dovelo do toga da sam postala prevodilac za švedski jezik. Ipak, naglašena potreba za pomjeranjem sopstvenih granica me je usmjerila na to dodatno usavršavanje, tako da danas radim i na poslovima koordinacije i implementacije bezbjednosti na radu u Švedskoj.

Šta smatrate svojim najvećim uspjehom i zašto?

Smatram da je moj najveći uspjeh sam prelazak u drugu branšu.

Šta je ono što vas inspiriše?

Izvor nove energije i motivaciju pronašao sam u putovanjima, novim saznanjima i čitanju.

Šta vam predstavlja najveće zadovoljstvo u poslu?

Najveće zadovoljstvo predstavlja uspješno završen projekat sa stranim investitorom i dobra interna komunikacija u poslovnom miljeu.

Da li je izazov biti žena u profesiji koja i dalje nosi muški predznak?

Žena u novom vijeku u energetici sve više zauzima važnu ulogu, ipak ona i dalje nije na zavidnom nivou. Stvaranje novih sistema i inkluzija u edukacijskim programima mogu posporušiti novu eru žena u profesijama poput ove.

Šta je za vas najveći profesionalni izazov?

Savladavanje svih aspekata posla sa kojima se neposredno susrećem, kao i kreiranje nove vizije na području zaštite i sigurnosti na radu.

Šta najviše volite da radite u slobodno vrijeme?

Slobodno vrijeme koristim za jogu, džogiranje, pisanje i gledanje dobrih filmova.

When did you first feel the inclination towards your profession?

Ever since I was a child I have visited my cousins in Sweden. That is how I took interest in the language and culture of this country. My interest led me to becoming an interpreter for Swedish language. However, my prominent need to push my own boundaries directed me towards further professional development. So, now, I am also engaged for health and safety coordination and implementation in Sweden.

What do you believe is your greatest success and why?

I believe that my greatest success is changing career.

What inspires you?

For me, traveling, new knowledge and reading are a source of new energy and motivation.

What gives you the greatest pleasure in your work?

What gives me the biggest pleasure is a project with a foreign investor brought to a successful end and good internal business communication.

Is it a challenge to be a woman in what is still often considered typically male profession?

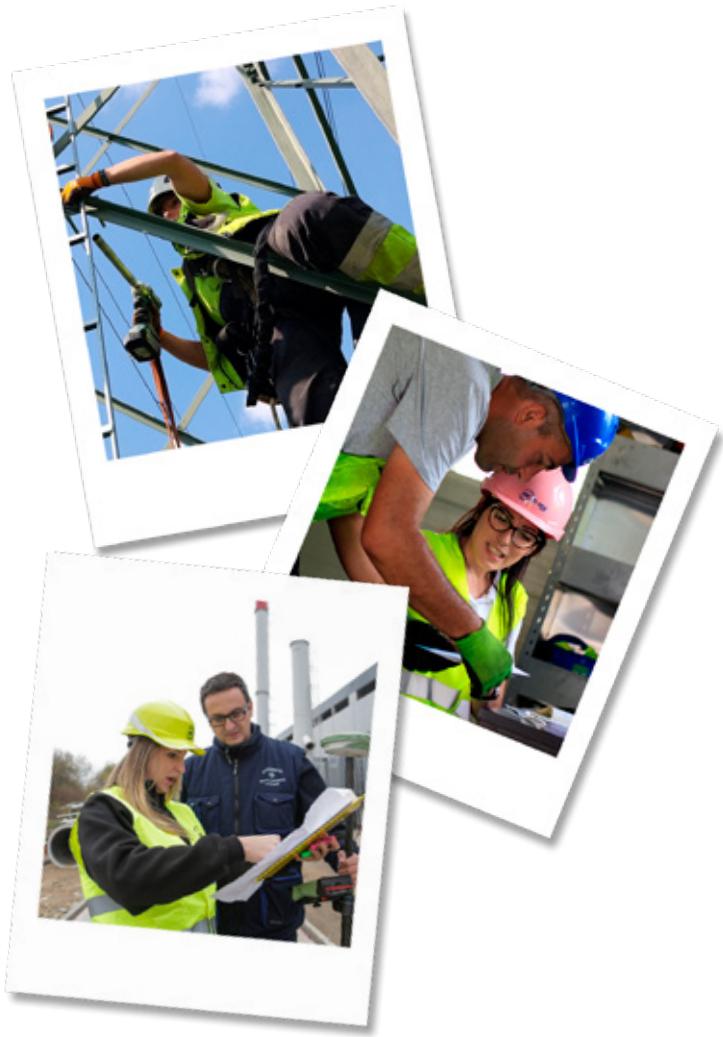
Women continue taking more and more important roles in modern power engineering. Nevertheless, position of women in this industry is still not enviable. Creating new systems and adopting inclusion in educational programmes might encourage a new era for women in a profession such as this one.

What is your greatest professional challenge?

Mastering all aspects of the job that I am directly faced with, as well as creating a new vision in area of occupational health and safety.

What do you like to do most in your free time?

I use my free time to practice yoga, jog, write and watch good movies.



NOVI PROJEKTI/ NEW PROJECTS



BIH
BOSNIA AND
HERZEGOVINA

- SR** 1 Kompletna rekonstrukcija TS 110/35/10 kV Bijeljina 1
2 Izgradnja DV 2x110 kV za HE Ulog
3 Zamjena 6 kV i 0,4 kV postrojenja u objektu 64 RiTE Ugljevik
4 Izgradnja MHE Kotor Varoš
5 Rekonstrukcija SN i NN mreže u Gradišći, Prnjavoru, Mrkonjić Gradu i Kozarskoj Dubici

- EN** 1 Entire reconstruction of SS 110/35/10 kV Bijeljina 1
2 Construction of TL 2x110 kV for HPP Ulog
3 Replacement of 6 kV and 0.4 kV facilities in the object 64 M&TPP Ugljevik
4 Construction of MHPP Kotor Varoš
5 Reconstruction of MV and LV network in Gradiška, Prnjavor, Mrkonjić Grad and Kozarska Dubica

SRB
SERBIA

- SR** 1 Rekonstrukcija TS 110/35 kV Beograd 2
2 Rekonstrukcija TS 110/35/10 kV Užice 2
3 Rekonstrukcija DV 400 kV Smederevo-Drmno 3
4 Modernizacija pruge Jajinci-Mala Krsna
5 Modernizacija kontaktnе mreže u Beogradu, projekat Zeleni bulevar
6 Rekonstrukcija 110 kV postrojenja u TS 110/35 kV Gornji Milanovac

- EN** 1 Reconstruction of SS 110/35 kV Beograd 2
2 Reconstruction of SS 110/35/10 kV Užice 2
3 Reconstruction of TL 400 kV Smederevo-Drmno 3
4 Modernization of railway Jajinci-Mala Krsna
5 Modernization of catenary system in Belgrade, project Green Boulevard
6 Reconstruction of 110 kV facility in SS 110/35 kV Gornji Milanovac



CG
MONTENEGRO

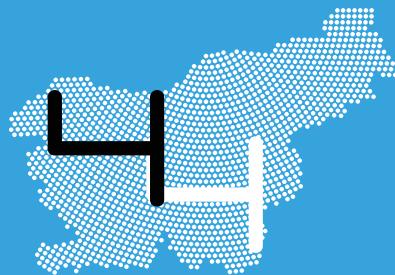


- SR** 1 Izgradnja OPGW i ADSS kablovske mreže
2 Izgradnja DV 35 kV Cmiljača-Ribarevine
3 Rekonstrukcija i modernizacija 15 trafostanica 400, 220 i 110 kV u okviru projekta Trans Balkan Electricity Corridor (I)

- EN** 1 Construction of OPGW and ADSS cable network
2 Construction of TL 35 kV Cmiljača-Ribarevine
3 Reconstruction and modernization of 15 substations 400, 220 and 110 kV as part of the project Trans Balkan Electricity Corridor (I)



SLO
SLOVENIA



- SR**
- 1 Elektromontažni radovi na TS Divača u 400, 220 i 110 kV rasklopnim postrojenjima
 - 2 Izgradnja DV 110 kV Grosuplje-Trebnje
 - 3 Montaža 110 kV kablovskog sistema u TS Vojnik
 - 4 Elektromontažni radovi u TS Cirkovce:
 - Rasplet 110 kV dalekovoda (nadzemni dio)
 - Montaža 110 kV kablovskog sistema
 - Montaža čeličnih konstrukcija u RP od 110 do 400 kV

- EN**
- 1 Electrical installation works on SS Divača at 400, 220 and 110 kV switching facilities
 - 2 Construction of TL 110 kV Grosuplje-Trebnje
 - 3 Installation of 110 kV cable system in Vojnik
 - 4 Electrical installation works on SS Cirkovce:
 - Reconstruction of 110 kV transmission line (above ground part)
 - Installation of 110 kV cable system
 - Installation of steel structure at switching facilities from 110 to 400 kV

ŠVE
SWEDEN



- SR**
- 1 Elektromontažni radovi na DV i TS 400 kV Skoggssäter
 - 2 Elektromontažni radovi na TS 130/50/20 kV Farhult
 - 3 Elektromontažni radovi na TS 50/10 kV Böda-Löttorp
 - 4 Rekonstrukcija DV 400 kV Barsebäck
 - 5 Izgradnja DV 220 kV Rätanklustret
 - 6 Izgradnja DV 130 kV Östansjö-Tälle
 - 7 Rekonstrukcija DV 130 kV Backgården-Falköping Norra

- EN**
- 1 Electrical installation works on TL and SS 400 kV Skoggssäter
 - 2 Electrical installation works on SS 130/50/20 kV Farhult
 - 3 Electrical installation works on SS 50/10 kV Böda-Löttorp
 - 4 Reconstruction of TL 400 kV Barsebäck
 - 5 Construction of TL 220 kV Rätanklustret
 - 6 Construction of TL 130 kV Östansjö-Tälle
 - 7 Reconstruction of TL 130 kV Backgården-Falköping Norra

SMK
NORTH
MACEDONIA

- SR**
- 1 Rekonstrukcija DV 110 kV Veles-Ovče Polje
 - 2 Izgradnja novog 2x110 kV DV priključka za TS Neokazi
 - 3 Izmjeneštanje 400 i 110 kV dalekovoda zbog izgradnje novih autoputeva

- EN**
- 1 Reconstruction of TL 110 kV Veles-Ovče Polje
 - 2 Construction of a new 2x110 kV TL connector for SS Neokazi
 - 3 Relocation of the 400 and 110 kV TL due to the construction of new highways

- SR**
- 1 Rekonstrukcija DV 220 kV Hamraneslinur 1-2
 - 2 Izgradnja novog DV 220 kV Kröflulína 3

- EN**
- 1 Reconstruction of TL 220 kV Hamraneslinur 1-2
 - 2 Construction of new TL 220 kV Kröflulína 3

ISL
ICELAND



IZGRADNJA
ENERGETSKIH
MREŽA

NOVE GENERACIJE



CONSTRUCTION OF
POWER NETWORKS OF
**NEW
GENERATION**

 Medunarodna agencija za energiju (IEA) je u izvještaju "World Energy Outlook 2018" prognozirala da će svjetska potražnja za električnom energijom sve do 2040. rasti 2,1 odsto na godišnjem nivou. Najava poput ove, pred energetiku modernog doba stavlja nimalo jednostavno pitanje – kako u budućnosti 'nahrani' planetu energijom?

Dio stručne javnosti smatra da se odgovor na ovo pitanje krije u većoj primjeni HVDC tehnologija, koje su potvrđile svoju efikasnost na polju prenosa velikih količina električne energije na velikim udaljenostima a koje obezbjeđuje znatno manje gubitke. Ovakvim karakteristikama HVDC tehnologija stvara neophodnu fleksibilnost na energetskim tržištima, koja je ključna za rješavanje problema sve veće potražnje za energijom.

Jedan od veličanstvenih projekata izgradnje HVDC sistema čiji smo bili dio nosi naziv MONITA. U pitanju je savremeni HVDC sistem koji predstavlja energetski most između Crne Gore i Italije. Ponosni smo što smo bili dio dinamičnog poduhvata tranzicije ka novoj energetskoj budućnosti.

 In the report "World Energy Outlook 2018", International Energy Agency (IEA) projected that world demand for electrical energy shall grow all up to year 2040 for 2.1 percent annually. Such an announcement poses not a simple question at all to modern electrical engineering – how would planet be 'fed' by energy in future?

A part of professional audience believes that answer to this question is hidden in bigger implementation of HVDC technologies, which ascertained their efficiency in the field of transmission of large amounts of electrical energy on long distances, which are provided by significantly less losses. By these features, HVDC technology creates necessary flexibility on power markets, which is crucial for solving problem of more and more demand for power.

One of the magnificent construction project HVDC systems, which we were a part of, is entitled as MONITA. It is a modern HVDC system, which represents a kind of energy link between Montenegro and Italy. We are proud to be part of a dynamic effort of transition to a new energy future.

MONITA

HVDC INTERKONECIJA / INTERCONNECTION

SNAGA/POWER:

600 MW

PODVODNI KABL/
SUBSEA CABLE:

423 km

PODZEMNI KABL / UNDERGROUND CABLE:

22 km



JEDAN OD VELIKIH ISKORAKA na planu primjene HVDC tehnologije je realizovan kroz poduhvat polaganja podmorske kablovske HVDC veze prenosa električne energije između Italije i Crne Gore. Biti karika ovako velikog poduhvata koji je prvi link ovog tipa u regiji bivše Jugoslavije je bio veliki izazov za ekipe Elnos Grupe u proteklih godinu dana

ONE OF THE BIG STEPS forward in the field of applying HVDC technology was performed through p of laying undersea cable HVDC link for transmission electrical power between Italy and Montenegro. It v challenge for Elnos Groups teams to be a part of su endeavor, which is the first link of this type in the re the former Yugoslavia in previous years

JADRANSKI LINK ZA ENERGETSKU INTEGRACIJU EVROPE

ADRIATIC LINK FOR ENERGY
INTEGRATION OF EUROPE

SR Izgradnja prve HVDC interkonekcije između Italije i Crne Gore, poznate i pod nazivom MONITA je pored polaganja 445 kilometara podvodnog i podzemnog kabla u Jadransko more, podrazumijevala i gradnju konvertorskih stanica u blizini obala dvije zemlje.

Ekipa Elnosa su bile angažovane na izvođenju elektromontažnih radova u HVDC konvertorskoj stanicu u Lastvi Grbaljskoj, instalirane snage 1000 MW, naponskog nivoa ± 500 kV DC. Uloga konvertorske stanice je pretvaranje električne energije naizmjeničnog napona u istosmjerni, i njeno slanje u kabl prema Italiji. Konvertorska stanica u Lastvi Grbaljskoj se sastoji od razvodnog postrojenja naizmjenične i razvodnog postrojenja jednosmjerne struje. Prostire se na 17,1 hektara površine i nalazi se u blizini magistralnog puta od Tivta prema Budvi. Ekipa Elnos Grupe je dobila zadatak da zajedno sa tri konzorcijalna partnera, izvrši elektro-

montažne radove na 400 kV postrojenju, filterskom postrojenju i na konvertorskim transformatorima u okviru ove konvertorske stanice", precizirao je Aleksandar Čomić, projekt menadžer Elnos Grupe.

Pored ovih poslova, tim Elnos Grupe obavljao je elektromontažne radove u kontrolnoj zgradi, ispravljačkom postrojenju i DC postrojenju, a koji se odnose na: instalaciju sistema sopstvene potrošnje, daljinskog upravljanja i relejne zaštite, instalaciju sistema opšte potrošnje, tehničkih potrošača i rasvjete, slabe struje i termotehničku instalaciju mašinskog postrojenja i vanjsko uređenje.

NIZ VELIKIH IZAZOVA

Biti jedan od izvođača u izgradnji konvertorske stanice je samo po sebi bilo veliki izazov, a naše ekipu su u okviru ovog poduhvata potvrdile svoj praktičan pristup poslu radeći pod pritiskom



project
of
was a big
such a big
region of



Rad pod pritiskom kratkih rokova Working pressured by short deadlines

kratkih rokova, često teških vremenskih uslova, ali i u radu sa novim vrstama tehnologija. Tim Elnos Grupe je na gradilište ovog primorskog mjeseta u blizini grada Kotora stigao početkom januara 2018. godine, a od samog početka je znao da se nalazi pred veoma zahtjevnim projektom.

PRVI HVDC IZGRAĐEN U ŠVEDSKOJ

Prvi operativni HVDC sistem izgrađen je u Švedskoj 1954. godine, kada je na ovaj način povezano ostrvo Gotland sa kopnjem. Nakon tog vremena, ova tehnologija je primijenjena i za povezivanje ostrva Novog Zelanda, Japana, Italije sa Sardinijom, skandinavskih zemalja. Razvojem energetske elektronike, HVDC tehnologija je postala još pristupačnija i isplativija, pa su se s vremenom mnoge druge zemlje uključile u primjenu ove tehnologije (SAD, Brazil i Kina).

Važno je istaći da je ovo bio projekat u okviru kojeg smo stekli veliko iskustvo izvodeći elektromontažne radove na sedam konvertorskih transformatora koji su težili više od 409 tona, a čija visina u kompletno montiranoj fazi iznosi 14 metara.

Konvertorski transformatori igraju veoma važnu ulogu u prenosu velike količine električne energije na dugim relacijama. Naši timovi su na ovim transformatorima izvršili poslove montaže kompletne opreme, odnosno kabliranje, ožičavanje i pozicioniranje transformatora.

Timovi Elnosa su kompletirali mašinsku fazu radova, sistem za hlađenje i ventilacijski sistem na tiristorima, takođe važnom elementu konvertorske stanice.

Ništa manje zahtjevna nije bila ni etapa ugradnje više od 200 elektro ormara u roku od šest mjeseci. Uz dosta napora, zalaganja naše ekipe su i ovaj posao završile uspješno.

Izvršili smo kompletne elektromontažne radove na AC postrojenju jednog pola konvertorske stanice. Uspješno smo izveli i zahtjevnu montažu i podizanje dva velika reflektorska stuba visoka po 35 metara. Ovi stubovi snagom svjetlosti od 12.000 vati stoje u rangu s onima koji se postavljaju na stadione.

EN The construction of the first HVDC interconnection between Italy and Montenegro, in addition to laying 445 kilometers of undersea and underground cables to the Adriatic Sea, implied the construction of converter stations near the coasts of both countries.

Elnos teams were hired to perform electrical assembly works in HVDC converter station in Lastva Grbaljska, 1000 MW installed power, voltage level ± 500 kV DC.

Converter station's purpose is to convert electrical power of AC voltage to DC voltage and its directing to the cable leading to Italy.

Converter station in Lastva Grbaljska consists of distribution plant of AC power and distribution plant of DC power. It covers 17.1 hectares of surface and is close to motorway from Tivat to Budva.

Elnos Group team was tasked to perform electrical assembly works on 400 kV plant, filter plant and converter transformers within this converter station along with three consortium partners", stated Aleksandar Čomić, Elnos Group Project Manager.

Apart from these works, Elnos Group team also performed electrical assembly works in the control facility, rectifier plant and DC plant



Converter transformers play a very important role in transmitting a large amount of energy on long distances. On these transformers, our teams performed assembly of entire equipment i.e. transformers cabling, wiring and positioning.

Elnos teams completed mechanical phase of the works, cooling and ventilation system on thyristors, also an important element of converter station.

Phase of installing more than 200 electrical cabinets was also very demanding with a deadline of six months. With a lot of effort and commitment, our team completed this job successfully as well. Our workers did all electrical assembly works on AC plant of one pole of the converter station. We also successfully performed challenging mounting and erecting of two big headlight poles 35 meters high each. These poles with light power of 12,000 Watts are in line with those set on stadiums.

FIRST HVDC BUILT IN SWEDEN

First operating HVDC system was built in Sweden in 1954, when it connected island Gotland with mainland. After this time, this technology was applied to connect islands of New Zealand, Japan, Italy with Sardinia, Scandinavian countries, too. Developing electrical power electronics, HVDC technology became even more available and profitable, so, in time, many other countries included in application of this technology (USA, Brazil, and China).

all referring to: installation of plant for in-house consumption, remote control and relay protection, installation of the general consumption system, technical consumers and lighting, low-voltage power as well as thermal-technical installation of mechanical plant and landscaping.

A SERIES OF BIG CHALLENGES

To be one of contractors in constructing converters station was a big challenge itself. Besides, in the frame of this project, our teams confirmed their practical approach to work by executing the works under short deadlines' pressure, often with harsh weather conditions, but also working with new technologies.

Elnos Group team came to the building site of this seaside place near Kotor at the beginning of January 2018. From the very beginning, they knew they were facing a very demanding project.

It is important to mention that this was a project, where we gained a lot of experience through performance of electrical assembly works on seven converter transformers, which weighed more than 409 tons and whose height, when fully assembled, was 14 meters.

Konvertorski transformator teži 409 t. Converter transformer weighs of 409 t



GIANTS OF LAKE MÄLAREN

DIV OVI JEZERA

MÄLAREN



NA OBALAMA jednog od najprometnijih vodenih puteva Švedske, timovi Elnos Grupe su uspjeli podići dva istinska diva među dalekovodnim stubovima, čija visina seže do nevjerojatnih 86 i 100 metara. Bio je ovo podvig koji je ime naše hrabre ekipe upisao u istoriju nove energetske budućnosti ove nordijske zemlje

ON THE BANKS of one of the most frequent waterways in Sweden, Elnos Group teams managed to build two true giants among transmission line towers, whose height goes up to amazing 86 and 100 meters. This was a project to write a name of our brave team into history of new energetic future of this Nordic country

SR PUT U SREDIŠTE ŠVEDSKE

Desetine hiljada brodova svake godine prepolovi jezerom Mälaren. Ovo treće po veličini jezero u Švedskoj je jedna od najvećih i najznačajnijih vodenih saobraćajnica između prestonice Stokholma i unutrašnjosti zemlje.

Upravo na obalama ovog jezera ekipe Elnos Grupe su uspješno realizovale jedan od najizazovnijih projekata u istoriji ove zemlje. Demon tirale su dva dalekovodna stuba visoka 73 i 75 metara na dalekovodu Hamra-Åker, kako bi podigli nove stubove visoke 86 i 100 metara.

Kolosalni stubovi koji teže više od 75 tona su podignuti kako bi sigurnosna visina provodnika bila pomjerena na 40,5 metara iznad vode. Ovakvim visinskim pomjeranjem provodnika povećan je stepen bezbjednosti plovidbe, a istovremeno je otvorena mogućnost saobraćaja za još veće brodove ka 'srcu' Švedske.

POGLED REZERVISAN ZA NAJHRABRIJE

„Kada radeći na dalekovodima prevaziđete visinsku granicu od 50 metara, poprilično lako idete i na 100 metara. Tako je bilo i sa nama. Iako je ovo bio prvi put da radimo montažu ovakvo visokih stubova, naši momci u pomjeranju ove granice u visini nisu vidjeli veliki problem”, rekao je Slobodan Mičić, rukovodilac gradilišta Elnos Grupe.

Ipak, za većinu ljudi među kojima su rijetki oni koji su se penjali i na vrhove nebodera ove visine, pomisao o izgradnji i penjanju na stub od 100 metara zvuči kao velika adrenalinska avantura.

Upravo je ovakva avantura za naše ekipe bila i više nego ozbiljan posao.

Intenzivnim radom, za manje od tri mjeseca, odnosno 22 dana prije postavljenog roka, naša ekipa je realizovala posao demontaže starih i montaže novih stubova.

Put ka uspješnom izvršenju zadatka nije bio nimalo lak. Jeden stub je montiran na kopnu, a drugi na ostrvu Bryggholmen.

Činjenica da ne postoji kopneni put do ostrvske lokacije na kojoj je montiran jedan od divovskih stubova je sa sobom donijela veliki logistički poduhvat, sa nizom gabaritnih elemenata među kojima su: dizalice teške stotine tona, veliki radni trajekt, brod, dok je za potrebe izgradnje velikog stuba izgrađeno i pristanište.

Sve velike mašine su morale biti transportovane brodom preko mora.

Prije početka montaže stuba na Bryggholmen-u, svaki dio dalekovodnog stuba je montiran do maksimalne moguće veličine za transport brodom, nakon čega je prevožen prema ostrvu, na kojem je podizan dio po dio.

„Bio je ovo jedinstven logistički problem. Sve

se moralo transportovati preko mora. Kada smo počeli sa prvim stubom, imali smo veliki radni trajekt, dizalicu od 100 tona, dizalicu od 500 tona i tada smo imali 18 montera, tri skipera, auto-dizalicu, utovarivač na točkovima. Postojao je rizik da se desi mnogo toga, ali je sve prošlo sjajno”, rekao je Oscar Fyhrlund, rukovodilac radova u ime kompanije NCC, jedne od najvećih građevinskih firmi koja je bila zadužena za građevinske radove u okviru ovog projekta.

Na lokaciji izgradnje je svakodnevno vrvilo od različitih mašina i dizalica. Složenost projekta je na gradilištima na obje obale napravila pravu košnicu u kojoj je ipak svakodnevno postizan vrhunski stepen organizacije svih članova.

„Zbog visine stubova radnici su se za vrijeme izvođenja poduhvata mogli čuti jedino radio-vezom. Stubovi su tip ukrštenih tornjeva, a njihova montaža teče klasičnim pristupom. Ipak, sva naša oprema je morala da bude prilagođena izgradnji ovako velikih stubova. Možda je dovoljno reći da je pri njihovoj izgradnji korišten kran koji služi za podizanje vjetrenjača, a koji teži 500 tona. Ovaj kran je morao biti transportovan brodom na ostrvo u četiri navrata. Sva konstrukcija, sve mašine su prevožene brodom do ostrva, a veliki kran je direktno sa broda podizao konstrukciju na stubno mjesto”, rekao je Mičić i dodao da je ekipa od početka pokazala sjajan timski duh u težnji da ispunи veliki zajednički cilj.

Važno je naglasiti da je ovo još jedan u nizu poduhvata u okviru kojeg su naše ekipe pokazale da mogu ispoštovati najviše ekološke zahtjeve EU, jer su se radovi odvijali u jednom od zaštićenih rezervata prirode.

Timovi Elnos Grupe su ponosni što su uz rame sa kompanijama NCC, Linjemontage i Grästorp i investitorom Svenska Kraftnät, bili dio jednog od najzahtjevnijih energetskih projekata u Švedskoj.

SPEKTAKULARNA MONTAŽA STUBOVA

Nedaleko od lokacije izgradnje gigantskih stubova na Mälaren-u, timovi Elnosa su uspješno izvršili spektakularnu montažu stubova 130 kV dalekovoda preko kanala Södertälje.

Montaža novih dalekovodnih stubova je izvršena uz podršku helikoptera, koji su ekipama na tlu spuštali dio po dio rešetkastih elemenata stubova. Naši monteri su radili tako što su preuzimali dijelove iz vazduha i montirali ih na licu mjesta.

Podrška helikoptera na ovom dijelu projekta je bila neophodna, jer su oni bili jedino dozvoljeno sredstvo za prevoz teškog transporta u ekološki zaštićenoj oblasti ovog dijela Švedske,



SLOBODAN MIČIĆ

Rukovodilac gradilišta Elnos Grupe
Site Manager of Elnos Group

„Biti dio jednog od najreprezentativnijih poslova u Švedskoj, zajedno sa najvećim kompanijama ove zemlje, za nas je bila velika čast. Veoma smo zadovoljni što smo posao završili prije roka, za što su prije svega zasluzni naši ljudi koji su se odlično snašli u radu, koji su diktirali uslovni ovog projekta.“

“It was a great honour for us to be a part of one of the most presentative works in Sweden, along with the biggest companies of this country. We were very pleased to complete the works before deadline, which was a merit of our staff in the first place, who had been excellent in works directed by conditions and terms of this project.”

JEDAN OD TOP-PROJEKATA GODINE

Visina izazova, stepen komplikovanosti radova pri izgradnji velikih stubova na jezeru Mälaren su ovaj reprezentativan projekat stavile u najuži izbor za projekat godine u Švedskoj za 2018. godinu.

Za sve vrijeme izvođenja radova, ovaj poduhvat je zbog svoje grandioznosti i atraktivnosti veoma često izazivao veliku pažnju javnosti, jer su izgrađeni džinovski stubovi, između ostalog, drugi po veličini u nacionalnoj mreži Švedske.

ali i zbog činjenice da su nepristupačne klisure na kojima se nalaze stubovi dozvoljavale samo ovakav pristup.

Ovakav jedinstven poduhvat se ne viđa često, a njegovim uspjehšnjem izvršenjem smo potvrdili da ispunjavamo najzahtjevnije uslove na EU tržištu.

Važno je naglasiti da je ovo bio projekat u okviru kojeg se morao poštovati čitav niz procedura za zaštitu životne sredine. Radnici su preko kanala prevoženi čamcima na radna mesta, hemikalije su morale imati specijalno odlagalište, zabranjena je bila upotreba vatre.

Ekipe Elnos Grupe u okviru ovog projekta realizovale su posao demontaže i montaže pet novih dalekovodnih stubova, te instalaciju čeličnih provodnika i OPGW kabla na trasi dugoj dva kilometra.

EN A JOURNEY TO CENTER OF SWEDEN

Every year, tens thousands of ships sail Lake Mälaren. This third biggest lake in Sweden is one of the biggest and most important waterways between capital Stockholm and mainland.

Elnos Group teams successfully performed one of the most challenging projects in history of this country on the banks of this lake. They dismounted two transmission line towers 73 and 75 meters high of the transmission line Hamra-Åker, in order to erect new towers 86 and 100 meters high.

Colossal towers weighing more than 75 tons were erected in order to move safety height of conductors to 40.5 meters above water. This height moving of conductors increased sailing

safety level and provided a traffic possibility for even bigger vessels towards Swedish 'heart' at the same time.

VIEW RESERVED FOR THE BRAVEST ONLY

"When working on transmission lines you overcome height limit of 50 meters, it is quite easy for you to go as far as 100 meters. This is what happened to us. Although this was the first time to work on mounting of this high towers, our boys did not experience a big problem in moving this height limit", stated Slobodan Mičić, Site Manager from Elnos Group.

However, to majority of people, rather small number of which climbed skyscrapers of this height, mere idea of constructing or climbing a 100 m high pole sounds like an adrenaline adventure.

Such an adventure was more than a serious job for our teams.

Intensive work, for less than three months, i.e. 22 days before set deadline, our team performed works of dismantling old towers as well as mounting the new ones.

Road to successful works completion was not an easy one at all. One tower was mounted on the land, and the other one on Island Bryggholmen.

Fact there is no land road to the island location where one of the giant towers was mounted also brought a big logistic undertaking with a series of huge dimension elements such as: cranes weighing hundreds of tons, bug operation ferry, ship, and dock was also built for the purpose of constructing giant tower.

All big machines had to be transported by ship over the sea.

Visina provodnika podignuta na 40,5 m Conductor's height raised to 40,5 m





Montaža stubova 130 kV DV preko kanala Södertälje | Installation of 130 kV TL towers over the Canal Södertälje

Before start of mounting the tower in Bryggholmen, each part of transmission line towers was mounted to maximum possible size for ship transport and transported to island afterwards, where it was erected, piece by piece.

"This was a unique logistic problem. All was supposed to be transported overseas. Once we started with the first tower, we had a big working ferry, 100 tons crane, 500 tons crane and we had 18 fitters, three skippers, truck crane, wheel loader. There was a risk for so many things to happen, but everything went just great", said Oscar Fyhrlund, Manager of works from NCC, one of the biggest construction companies in charge of construction works within this project.

On the construction site, there were numerous various machines and cranes every day. Project complexity on the construction sites on both banks created a beehive, where, however, there was top degree organization of all members achieved.

"Due to towers' height, during work performance, workers could contact each other only by wire radio communication. Towers are crossed towers type, and classic approach is applied in their mounting. However, all our equipment had to be adjusted to construction of such big towers. Maybe it is enough to say that during their construction we had to use a crane used for lifting wind mills, weighing 500 tons. This crane had to be transported by ship to the island on four occasions. Entire construction and all machinery were transported by ship to the island, and big crane lifted structure to the tower position directly from the ships", said Mičić and added that team showed great team spirit from the very beginning trying to achieve a big joint aim.

It is important to emphasize that this is another project where our teams showed they could obey the highest EU ecological requirements, since works

were performed in one of protected nature reserves. Elnos Group teams are proud to be alongside companies NCC, Linjemontage i Grästorp and Investor Svenska Kraftnät, and a part of one of the most demanding energetic projects in Sweden.

SPECTACULAR TOWER MOUNTING

Not far from the construction site of giant towers in Mälaren, Elnos teams successfully completed spectacular towers mounting for 130 kV transmission line over Canal Södertälje.

Mounting of these transmission line towers was performed with helicopter support, who delivered tower grid elements piece by piece to teams on the ground. Our linemen worked in the way they took pieces from the air and assembled them in the position.

Helicopter support was necessary in this part of the project, since they were the only allowed means of transport in ecologically protected area of this part of Sweden but also due to the fact that inapproachable canyons, where towers were located, allowed only this kind of approach.

Such a unique project is not experienced often, and its successful completion confirms that we meet the most demanding conditions on EU markets.

It is important to mention that this was a project where we had to obey a whole series of procedures for protection of environment. Workers were transported over canal to working posts by boats, chemicals had to have a special deposit location, fire was banned.

In the frame of this project, Elnos Group teams performed mounting and dismounting of five new transmission line towers, installation of steel conductors and OPGW cable on two kilometers long route.

ONE OF TOP PROJECTS OF THE YEAR

Challenge level, works complexity degree in constructing big towers on the Lake Mälaren shortlisted this representative project for a project of the year 2018 in Sweden.

For entire duration of work performance, due to its grandiosity and attractiveness, this project drew big public attention very often, since giant towers were built, among other works, were the second biggest in the national Swedish network.



Dokazana ekspertiza u zaštićenim područjima Proven expertise in protected areas

ŠIROM ŠVEDSKE

ALL OVER SWEDEN

RADOM NA NISKIM TEMPERATURAMA u ekološki zaštićenim zonama, na velikim visinama, timovi Elnos Grupe su nastavili da potvrđuju visoku ekspertizu u realizaciji najzahtjevnijih projekata širom Švedske. Ova nordijska zemlja koja danas kotira kao jedna od energetski najnaprednijih je u protekloj deceniji svijetu održala ozbiljnu lekciju kako se efikasno gradi održiva energetska budućnost. Kroz niz poduhvata izgradnje i rekonstrukcije trafostanica, ekipa Elnos Grupe su u godini iza nas potvrdile da su veoma važna spona u stvaranju snažne energetske mreže ove države

ELNOS GROUP TEAMS continued to confirm high expertise in realization of the most demanding projects throughout Sweden by working in low temperatures, in ecologically protected areas, at big heights.

This Nordic country, which is nowadays considered to be one of energetically most prosperous countries in the previous decade, taught the world a lesson on efficient construction of sustainable energy future. In the year behind us, Elnos Group teams affirmed they were a very strong link in creating a strong energy network of this country through a series of substation construction and reconstruction projects

SR U ARKTIČKOM KRUGU

Porjus je ime jedne od najstarijih hidroelektrana Švedske, čije su se turbine prvi put počele vrtjeti prije više od 100 godina. Njeni stari pogoni su pretvoreni u muzej, dok novi i dalje proizvode 465 MW električne energije.

Zadatak naših ekipa je bio izvođenje kompletnih elektromontažnih radova u 130 kV postrojenju nove 400/130 kV trafostanice Porjusberget, koja je novi važan link za priključenje hidroelektrane Porjus na elektroenergetsku mrežu.

Nova trafostanica je zamijenila staru – Porjus Gamla. Sastoji se od osam dalekovodnih, dva transformatorska i jednog reaktorskog polja.

Naše su ekipa, u okviru ovog projekta, izvršile radove na polaganju i povezivanju energetskih i komandno-signalnih kablova u postrojenju nove trafostanice. Okončali smo i radove na montaži čeličnih portala i čelične konstrukcije, završili montažu primarne opreme i primarnih veza, montažu ormara zaštite i upravljanja, polaganje i povezivanje svih energetskih i komandno-signalnih kablova u postrojenju, uzemljenje konstrukcije i aparata, povezivanje energetskih transformatora i povezivanje reaktora.

Ovaj projekat je za naše timove značio niz profesionalnih izazova koje su pred nas postavili specifični vremenski uslovi, ekološki zaštićena sredina, ali i ambiciozno kratki rokovi za izvođenje radova.

„Većina ugovorenih radova se odvijala na vanjskom postrojenju, a kako se trafostanica nalazi u arktičkom krugu, uslovi rada su bili teški. Možda situaciju dovoljno dobro oslikava činjenica da su na ovoj lokaciji ogromne količine snijega prisutne sve do maja. Veći dio radnog perioda smo imali kratku dnevnu svjetlost, tako da smo veoma često radili pod reflektorima“, rekao je Nenad Vukomanović, projekt menadžer Elnos Grupe.

Pored toga, lokacija izgradnje trafostanice se nalazi blizu nacionalnog parka Muddus, koji je prirodno stanište zaštićene vrste losova, tako da su tokom zime bili zabranjeni bučni radovi na vanjskim postrojenjima.

Uspješna realizacija izgradnje trafostanice Porjusberget je novi garant sigurnosti isporuke električne energije u sjevernom dijelu Švedske.

EN IN ARCTIC CIRCLE

Porjus is the name for one of the oldest hydro power plants in Sweden, whose turbine started spinning more than 100 years ago for the first time. Its old plants were turned into museum, whereas new ones still produce up to 465 MW of electrical power.

Our teams were tasked with performance of entire electrical assembly works in 130 kV plant

of new 400/130 kV substation Porjusberget, which is a new important link for connecting Hydro Power Plant Porjus to electrical power network.

New substation replaced the old one – Porjus Gamla. It consists of eight line, two transformer and one reactor bay.

Within this project, our teams performed works on laying and connecting energetic and command-signal cables in substation of the new plant. We also completed works on mounting steel portals and steel structure, completed assembly of primary equipment and primary connections, assembly of cabinets for protection and control, laying and connecting all power and command-signal cables in the plant, grounding of structure and devices, connecting generator transformers and connection of reactors.

As for our teams, this project meant a series of professional challenges imposed to us by specific weather conditions, ecologically protected environment, but also ambitiously short deadlines for works performance.

“Most of contracted works were performed on external plant, and since the substation is located in Arctic Circle, work conditions were very difficult. Situation might be well depicted by the fact that this location has enormous

amounts of snow all through to May. Most of work period we had short daylight, so we had to work under headlights very often“, said Nenad Vukomanović, Project Manager from Elnos Group.

Apart from this, construction site for substation is located very close to the national park Muddus, which is habitat for protected type of elks, so, during winter, we were banned from performing noisy works on external plants.

Successful realization of constructing substation Porjusberget is a new safety guarantee for delivering electrical power in North part of Sweden.

SR NOVA KARIKA STABILNOSTI NA JUGU ZEMLJE

U deceniji iza nas Švedska je ušla u veoma ozbiljan obračun sa svojim starim nuklearnim izvorima energije. Jedna od starih nuklearnih elektrana, koja je dio ovog procesa je Barsebäck.

Prateća energetska struktura ove nuklearne elektrane je trafostanica FT6 Barsebäck, koja je puštena u rad prije 44 godine. Trafostanica je nakon niza godina rada postala nepouzdana. Zbog toga je izgrađena nova trafostanica 400 kV FT6 Barsebäck.

Izgradnja nove TS 400 KV FT6 Barsebäck Constructing new SS 400 KV FT6 Barsebäck



U okviru projekta, čiji je dio i Elnos Grupa, postojeće postrojenje ove trafostanice je podijeljeno na novo 400 kV interkonektivno postrojenje i postojeće 130 kV postrojenje predviđeno za potrebe regionalne mreže.

Izvršili smo poslove montaže primarne opreme na objektu nove trafostanice 400 kV FT6 Barsebäck, koji podrazumijevaju montažu 400 kV postrojenja sa dvostrukim sistemom sabirnica neposredno pored postojećeg 400/130 kV postrojenja.

Naši zadaci su podrazumijevali montažu centralnih portala, čelične konstrukcije za sabirnice i sabirnica, strujnih i naponskih mjernih transformatora, zatim spajanje primarnih visokonaponskih veza u svim poljima.

Nova trafostanica 400 kV FT6 Barsebäck danas je značajna spona energetske stabilnosti južnog dijela ove zemlje.

EN NEW LINK FOR STABILITY IN SOUTHERN PART OF THE COUNTRY

In decade behind us, Sweden entered a very serious showdown with its old sources of nuclear power. Barsebäck is one of the oldest nuclear power plants and a part of this process.

Accessory power structure of this nuclear power plant is a substation FT6 Barsebäck, which was commissioned 44 years ago. Substation became unreliable after a series of years of operation. Due to this, a new substation was built - 400 kV FT6 Barsebäck.

In the frame of the project, whose part also was Elnos Group, existing plant of this substa-

tion has been divided into new 400 kV interconnection plant and existing 130 kV plant planned for regional network needs.

We did works on installing primary equipment of the facility of the new substation 400 kV FT6 Barsebäck, which included mounting of 400 kV plant with double system of busbars directly next to the existing 400/130 kV plant.

Our tasks included mounting central portals, steel structure for busbars and busbars themselves, current and voltage measuring transformers, as well as connecting primary high-voltage connections in all bays.

New substation 400 kV FT6 Barsebäck today is a significant link of energy stability of Southern part of this country.

SR NOVO ENERGETSKO ČVORIŠTE NA ZAPADU

Ekipe Elnos Grupe, u saradnji sa partnerskom kompanijom OneCo, realizuju još jedan veliki i sveobuhvatni poduhvat u Švedskoj. U pitanju je izgradnja dvije nove 400 kV trafostanice Skogssäter, ali i rekonstrukcija dijela istoimene stare 400 kV trafostanice u mjestu Trollhättan, na zapadu ove zemlje.

Postojeća trafostanica Skogssäter je dio sistema kompanije Svenska Kraftnät. Puštena je u rad prije 45 godina i njen tehnički vijek trajanja se približio kraju.

Zbog rastućih potreba elektroenergetskog sistema Švedske, grade se dvije nove trafostanice u blizini stare, dok se stara trafostanica djelimično rekonstruiše, a u najvećoj mjeri uklanja.

U okviru projekta, čiji je dio i Elnos Grupa, montiraju se dva nova 400 kV interkonektivna postrojenja CT15 i CT16 u novim trafostanicama. Naše ekipe su okončale svoj dio radova u okviru posla na CT16 koje je bilo grifild investicija, dok nam radovi na CT15 postrojenju tek predstoje.

Poslovi Elnosa obuhvataju montažu primarne opreme u rasklopnom postrojenju trafostanice 400 kV Skogssäter, montažu čelične konstrukcije za visokonaponske aparate, zatim montažu visokonaponskih aparata i sistema sabirnica, izradu visokonaponskih veza u poljima, spađanje na uzemljjenje konstrukcije i aparata, te montažu kondenzatorskih baterija.

Naši radovi podrazumijevaju i primarno vezivanje dva postojeća transformatora i reaktora za nova interkonektivna postrojenja, te montažu rastavljača i šest naponskih transformatora u 130 kV dalekovodnom polju.

Ukoliko se radovi nastave odvijati planiranim dinamikom, nove trafostanice će postati operativne u fazama do 2019, odnosno do 2021. godine, dok će stara trafostanica Skogssäter u potpunosti prestati sa radom 2022. godine.

Izgradnjom novih trafostanica Skogssäter nastaje novo i snažno energetsko čvoriste u zapadnom dijelu Švedske.

EN NEW POWER LOOP ON THE WEST

Elnos Group teams, in cooperation with partner company OneCo, are performing another big and comprehensive project in Sweden. This is a project of constructing two new 400 kV sub-

Na zadatu izgradnje TS 400 kV Skogssäter Constructing SS 400 kV Skogssäter





Rekonstrukcija TS 130/20 kV Skånes-Fagerhult Reconstructing SS 130/20 kV Skånes-Fagerhult

stations Skogssäter, but also upgrade a part of the old 400 kV substation of the same name in Trollhättan, in the West part of this country.

Existing substation Skogssäter is a part of the system belonging to the company Svenska Kraftnät. It was commissioned 45 years ago and its technical age was at its end.

Due to increasing needs of electrical power system of Sweden, there are two new substations being built in the vicinity of an old one, whereas the old substation shall be partially reconstructed and mostly removed.

In the frame of the project, where Elnos Group is taking a part, two new 400 kV interconnection plants CT15 and CT16 are being mounted in new substations. Our teams completed their part of works within CT16, which was a green-field investment whereas works on CT15 plant are yet to come.

Elnos works include installation of primary equipment in switchyard plant of substation 400 kV Skogssäter, installation of steel structure for high-voltage devices, as well as installation high-voltage devices and busbars system, construction of high-voltage connections in bays, connecting to structure and devices grounding, as well as installation of compensator batteries.

Our works also include primary connecting of two existing transformers and reactor for new interconnection plants, as well installation of separators and six voltage transformers in 130 kV transmission line bay.

If works continue as per scheduled time, new substations shall become operational in phases up to 2019, and to 2021, whereas old substation Skogssäter shall completely end its work in 2022.

Construction of new substations Skogssäter creates a new and strong power loop in Western part of Sweden.

SR REKONSTRUKCIJOM DO BOLJE MREŽE

Ekipte Elnosa su tokom prošle godine završile projekat rekonstrukcije trafostanica 130/20 kV Skånes-Fagerhult i 130/20 kV Bjärnum, čiji je investitor Siemens. Ovo je jedna od važnih spona za stvaranje modernijeg i stabilnijeg sistema distribucije električne energije.

U okviru prve etape radova rekonstrukcije naši timovi su u obje trafostanice izvršili montažu novog 130 kV dalekovodnog polja, novog 130 kV trafo polja i novog spojnjog 130 kV polja. Potom je uslijedilo puštanje novoizgrađenog 130 kV postrojenja pod napon, te uklanjanje postojećeg 130 kV dalekovodnog i trafo polja.

Druga etapa je donijela nastavak poslova u domenu montaže novog dalekovodnog i trafo polja.

Naši radovi su podrazumijevali i montažu kompletnih metalnih konstrukcija, elektroenergetskih elemenata u navedenim poljima, kao i izradu svih primarnih veza. Takođe su izvršena sekundarna ožičenja, kao i ugradnja novih mikroprocesorskih uređaja za 130 kV i 20 kV postrojenja u trafostanici Bjärnum i novih zaštitnih mikroprocesorskih uređaja za 130 kV, 20 kV i 10 kV postrojenja u trafostanicu Skånes-Fagerhult.

Projekat je bio uslovjen mnogobrojnim isključenjima i beznaponskim periodima, što je ograničilo periode izvođenja pojedinih vrsta radova. Ipak, svi rokovi su ispoštovani, a naše ekipe su radove završile na vrijeme.

EN RECONSTRUCTION FOR BETTER NETWORK

During last year, Elnos teams completed a project of upgrading substations 130/20 kV Skånes-Fagerhult and 130/20 kV Bjärnum, whose investor is Siemens.

This is one of important links for creating more modern and reliable system for distribution of electrical power.

Within the first stage of reconstruction works, our teams assembled new 130 kV transmission line bay, new 130 kV transformer bay and new 130 kV coupler bay for both substations.

After this, newly-built 130 kV plant was commissioned and energized, and the existing 130 kV line and transformer bay were dismantled.

The second stage brought continuance of works in the domain of installation of new transmission line and transformer bay.

Our works also included mounting of entire metal constructions, electrical power elements in aforementioned bays, as well as installation of all primary connections.

Likewise, secondary wiring was performed, as well as installation of new protective devices for 130 kV and 20 kV plants in substation Bjärnum and new protective microprocessor devices for 130 kV, 20 kV and 10 kV plants in substation Skånes-Fagerhult.

Project was conditioned by numerous cut-offs and outage periods, which limited periods for performing certain parts of works. Yet, all deadlines were met and our teams completed their works timely.

STARĀ ŽELJEZNICA ZA NOVO DOBA

OLD RAILWAY FOR NEW AGE

VIJEKOVIMA UNAZAD željeznice spajaju gradove i jedan su od najvjernijih saveznika u borbi sa daljinama. Dva velika grada i regionalna centra, luka Rijeka i prestonica Slovenije, već 140 godina su bliži jedan drugom upravo zahvaljujući željeznicu

FOR CENTURIES IN THE PAST, railways connect cities and are one of the most devoted allies in fighting distances. Two big cities and reginal centers, Port of Rijeka and capital of Slovenia, have been closer to each other for more than 140 years thanks to the railway



SR Da bi željeznička pruga bila dobar saveznik mora biti bezbjedna, a jedan od prioritetnih predušlova za stvaranje sigurnosti je njeno kvalitetno napajanje električnom energijom.

Decenijama unazad napajanje pruge između Ljubljane i Rijeke je jednim dijelom omogućavao dalekovod izgrađen prije Drugog svjetskog rata, koji je ujedno jedan od najstarijih dalekovoda u Sloveniji.

Zadatak izvođenja radova na rekonstrukciji ovog dalekovoda nije bio nimalo lak, a upravo je on povjeren „Elektro novim sistemima“, našoj slovenačkoj članici, koja je bila nadležna za ovaj posao.

Od aprila do oktobra prošle godine, ekipa „Elektro novih sistema“ su, na dionici od transformatorice do ENP pogona Pivka, izvršile kompletну rekonstrukciju starog 110 kV jednosistemskog dalekovoda u 2x110 kV dvosistemski dalekovod.

Projekat je podrazumijevao demontažu 28 stubova, zajedno sa pripadajućim vodičima i izolatorima, na dužini trase od 1,6 kilometara, te podizanje deset novih dalekovodnih stubova.

Ovo je bio projekat u okviru kojeg su „Elektro novi sistemi“ bili na čelu konzorcijuma. U pitanju je jedan od rijetkih poslova u Sloveniji kod kojeg su snabdijevanje opremom i izvođenje radova bili predmet istog ugovora.

Rekonstrukcija dalekovoda je pred konzorcijum stavila širok i raznolik spektar poslova koji su obuhvatili snabdijevanje čeličnim konstrukcijama i svom opremom, prosijecanje osovine trase, geodetskih radova, te izvođenja građevinskih i elektromontažnih radova.

„Za uspješno izvođenje projekta mnogo dugujemo požrtvovanosti našeg rukovodioca radova, ali i svim našim monterima i saradnicima na projektu. Bila je ovo zaista vrijedna, efikasna i odlično uigrana ekipa koja je upravo zahvaljujući svojim sjajnim osobinama uspjela da se izbori sa svim izazovima i ostvari zacrtani cilj“, rekao je Franci Milhar, voda projekta.

U okviru projekta rekonstrukcije dalekovoda, jedan od najvećih neprijatelja timovima na terenu su bili veoma striktni periodi u kojima su pojedine etape poslova morale biti realizovane. Zbog kratkog roka radovi su morali biti veoma dobro organizovani i planirani ‘u minut’, što je pred timove na terenu stavilo zahtjev maksimalne fleksibilnosti.

Tako je posao podizanja deset novih dalekovodnih stubova morao biti okončan u roku od 30 dana. U to vrijeme je u potpunosti i demonteran stari dalekovod na staroj trasi i izgrađen novi dvosistemski dalekovod na novoj trasi.

Mjesto najvećeg projektnog izazova u ovom smislu je bilo ukrštanje dalekovoda sa želje-



Ukrštanje dalekovoda sa željezničkom prugom Crossing transmission line with railway

zničkom prugom Divača–Pivka, jer su radovi morali da budu izvedeni u dvije dvosatne etape u toku samo jednog dana, odnosno nedjelje. To je bio jedini period u kojem je bilo moguće dobiti dozvolu za izvođenje radova. Ovaj rok je bio veliki test koji su naši timovi uspješno prošli.

EN In order to have a railway as a good ally, it has to be safe and one of priority pre-conditions for creating safety is its high-quality power supply.

For decades in the past, powering of railway between Ljubljana and Rijeka was partly enabled by transmission line constructed before the Second World War, which also is one of the oldest transmission lines in Slovenia.

Task of works performance on reconstruction of this transmission line was not an easy one at all and it was entrusted with “Elektro novi sistemi” (eng. New electrical systems), our Slovenian member in charge of these works.

Since April to October last year, ENS teams, on route from substation to ENP plant Pivka, performed entire reconstruction of old 110 kV one-system transmission line into 2x110 kV two-system transmission line.

Project included dismantling of 28 towers along with appertaining guiders and isolator on a route 1.6 kilometers long, as well as erecting of ten new transmission line towers.

This was a project where ENS lead consortium. This is one of rare works in Slovenia, where equipment provision and works performance were subject to the same contract.

Reconstruction of transmission line placed a wide and versatile scope of works before the consortium, which included provision of steel structures and entire equipment, clearing right of way, survey, as well as performance of civil and stringing works.

“We owe a lot to devotion of our works Manager, but also to fitters and collaborators of the project for successful project performance. It was a really hard-working, efficient and well-coordinated team, which, thanks to its great characteristics only, won a fight with all challenges and managed to reach projected goal”, said Franci Milhar, Project manager.

In the frame of the project of reconstructing transmission line, one of the biggest enemies for the team on the field were very strict periods for individual project phases to be performed. Due to short deadline, all works had to be well-organized and planned ‘in a minute’, which faced field teams with request of maximum flexibility.

So, works on erecting ten new towers had to be finished in 30 days. In this period, old transmission line was also dismantled on the old route and a new double circuit transmission line was constructed on the new route.

Place of the biggest project challenge in this sense was crossing transmission line and railway Divača–Pivka, since works had to be performed in two two-hours stages within only one day, i.e. week. This was the only period possible to get a permit for works performance. This deadline was a big test our teams passed successfully.



Tim Elnosa na visini zadatka Elnos team meets challenges

NOVA ENERGETSKA VEZA HERCEGOVINE

NEW ENERGY CONNECTION IN HERZEGOVINA

SK Svi koji su nekada putovali kroz Istočnu Hercegovinu sigurno nisu zaboravili surovost i ljeputu njenih predjela. Upravo u ovoj regiji koju opisuju kao područje 'prebogate istorije i nezaboravne geografije', na svega pedesetak kilometara udaljenosti, jedan do drugog, vijekovima unazad žive dva mala grada, Gacko i Nevesinje.

Između dva gradića se proteže visoki kraški vijenac Rudine, preko čijih visina do sada nije bila izgrađena direktna energetska veza između dva naseljena mjesta.

Praktično govoreći, ovo znači da se Gacko do

sada napajalo električnom energijom iz pravca Bileće, a Nevesinje iz Mostara. Ovakvi uslovi su značili energetsku nestabilnost, pogotovo u zimskim mjesecima kada se dešavalо da Nevesinje zbog pada jednog dalekovodnog stuba ostane u mraku i po nekoliko dana.

Ekipe Elnosa BL su kao lider konzorcijuma "Elektroenergetika", a u okviru niza kapitalnih projekata koje realizujemo u investicionom ciklusu "Elektroprenosa BiH", s početkom septembra 2018. godine započele projekat izgradnje novog 110 kV dalekovoda Gacko–Nevesinje.

Konzorcijumu su povjereni poslovi nabavke materijala i opreme i kompletni radovi na izgradnji dalekovoda.

U surovim uslovima kraškog područja, naši timovi su zajedno sa ekipama ostalih podizvođača tokom jeseni, zime i proljeća uspješno izgradili 40 kilometara 110 kV dalekovoda.

"Realizacijom ovog projekta u velikoj mjeri je povećana sigurnost napajanja obje opštine, te obezbijedeno dvostrano napajanje električnom energijom između njih. Za nas je ovaj posao predstavlja izazov, a veliku satisfakciju nam

daje i činjenica da smo bili dio jednog značajnog projekta u našoj zemlji”, rekla je Božana Nišević, projekt menadžer Elnos Grupe.

Izgradnja dalekovoda Gacko–Nevesinje je dio procesa modernizacije i integracije energetskog sektora BiH u moderne evropske energetske tokove i predstavlja proces od primarnog značaja za elektroenergetski sistem zemlje.

Ekipa Elnosa su ponosne na to što su u protekle dvije decenije dale značajan doprinos u izgradnji novih i modernizaciji postojećih energetskih objekata širom BiH.

EN Everyone who has ever travelled through East Herzegovina surely remember roughness and beauty of its landscape. Here, in the region described as ‘extremely rich history and unforgettable geography’, only about fifty kilometers away, exist two small towns, Gacko and Nevesinje, next to each other for centuries.

High karst chain Rudine is set between these two towns. There was no direct energy line built between these two towns up to now over the height of Rudine.

In practice, this means that Gacko, so far, was powered from Bileća and Nevesinje from Mostar. These conditions meant power instability, especially in winter months when it happened that Nevesinje, due to fall of one of the transmission poles, got power cut even for several days.

Elnos BL teams, being leader of consortium

“Elektroenergetika”, and in the frame of series of capital projects realized in investment cycle of “Elektroprenos BiH”, from September 2018, started project of constructing new 110 kV Gacko–Nevesinje transmission line.

Consortium was entrusted with supply of materials and equipment, as well as entire works on building transmission line.

In harsh conditions of karst area, our teams, along with teams of other subcontractors, successfully constructed 40 kilometers of 110 kV transmission line during autumn, winter and spring.

“Realization of this project, in a great measure, increased security of energy supply to both municipalities and provided two-way supply between them. This project was a challenge for us and we see a great satisfaction in the fact that we were a part of an important project in our country”, said Božana Nišević, Elnos Group Project Manager.

Construction of transmission line Gacko–Nevesinje is a part of modernization process and integration of electrical power sector of BiH in modern energy trends and represents a process of primary importance for electrical power system of the country.

Elnos teams are proud to have significantly contributed in construction of new and modernization of existing power facilities throughout BiH in the past two decades.

POBJEDA NAD SUROVOŠĆU RUDINA

Kraški vijenac Rudine, čiji vrhovi sežu i preko vrtoglavih 2.000 metara nadmorske visine, istinski je predstavnik ljepote i surorosti najviših krajeva Istočne Hercegovine.

Ovaj planinski masiv, nezvaničnog naziva “visoka Hercegovina” se upravo između Nevesinja (885 m) i Gacka (940 m) pruža prema Jadranskom moru.

Sama činjenica da su naše ekipa izgradile dalekovod preko Rudina ilustruje pravu pobjedu ljudske umjetnosti nad surovošću prirode.

VICTORY OVER CRUEL RUDINE

Karst range mountains Rudine, whose peaks go as high as dazzling 2,000 meters above sea level, is a true representative of beautiful and cruel top regions of East Herzegovina. This mountain massif, unofficially called “high Herzegovina”, between Nevesinje (885 m) and Gacko (940 m) ranges towards Adriatic Sea.

Fact that our teams built a transmission line over Rudine illustrates true victory of human skill over cruel nature.



Izgrađeno 40 km 110 kV dalekovoda Constructed 40 km 110 kV of transmission line



Dionica auto-puta Banjaluka-Doboj Section of Highway Banja Luka-Doboj

SAOBRAĆAJNICA ZA VRIJEME KOJE DOLAZI

ROAD FOR TIME YET TO COME

SR Infrastruktura modernog doba, sa svakim novim projektom pred graditelje postavlja težak zadatak – izgraditi uvijek kvalitetniju, sigurniju i bržu saobraćajnicu. Upravo u toj borbi između visokih zahtjeva i terenskih mogućnosti nastaju nove saobraćajnice, dinamični spojevi bez kojih je život danas nezamisliv.

Jednu od priča o saobraćajnici za vrijeme koje dolazi, u 2018. godini iza sebe ostavlja poduhvat izgradnje auto-puta Banjaluka–Doboj.

Timovi Elnosa su bili važna karika izgradnje auto-puta Banjaluka–Doboj, poduhvata najvišeg značaja za saobraćajnu integraciju unutar Republike Srpske. Radi se o modernoj saobraćajnici koja posjeduje najveći potencijal za dalju integraciju unutar Republike Srpske, kao i povezivanje auto-puta Gradiška–Banjaluka sa panevropskim koridorom 5C. Krajem izgradnje druge dionice Banjaluka–Prnjavor u oktobru

2018. godine, auto-put Banjaluka–Doboj je u potpunosti pušten u rad.

NAJSAVREMENIJE RJEŠENJE

Timovi Elnos Grupe su u okviru izgradnje dionice auto-puta Banja Luka–Prnjavor bili zaduženi za izradu projektne dokumentacije elektrofaze, za radove koji su obuhvatili rekonstrukcije 400 kV i 110 kV dalekovoda i izmještanje SN i NN mreže, te instalirali četiri montažne betonske trafostanice tipa Biosco CS, vlastite proizvodnje.

U okviru ove etape radova smo postavili osvjetljenje na ukrštanjima, magistralnim putevima, petljama Mahovljani 2 i Drugovići i putnom odmorištu Vrbas, ali i izgradili sistem napajanja sa dva nezavisna izvora.

Upravo u dijelu koji se odnosi na montažu Biosco CS trafostanica je početak priče o pio-

nirskom iskoraku Elnosa u izgradnji daljinski upravlјivog sistema napajanja auto-puta električnom energijom.

“U sistemu ove trafostanice se nalazi motorno upravlјivi srednjenačenski blok RMU i RTU uređaj, koji u sistemu daljinskog upravljanja i nadzora trafostanicama čine zajedno tzv. Smart RMU. Ovo rješenje je na auto-putu Banjaluka–Doboj prvi put primijenjeno u BiH i jedno je od najsavremenijih rješenja za auto-puteve”, rekao je Nenad Marjanović, projekt menadžer Elnos Grupe. Cilj ugrađivanja ovakvog sistema je bio obezbjeđenje upravljanja i nadzora električnom energijom na kompletном auto-putu. Radi se o sistemu koji je nezavisan, jer se napaja iz dvije čvrste tačke i posjeduje SCADA sistem za upravljanje i nadzor koji se nalazi u centru za obavještavanje i komunikaciju saobraćaja iz čijeg se dispečerskog centra upravlja kompletним

Brojke

Figures

71,9
km

dužina auto-puta
highway length

100
km

SN kablovske vodove
MV cable duct

290

instaliranih
rasvjetnih stubova
installed light poles

71,900
m

postavljenog
optičkog kabla
of installed optical
cable

operated medium voltage block RMU and RTU device, which in the system of remote controlling and supervision of substations along makes up so called Smarth RMU. This solution on Highway Banja Luka-Doboj was for the first time applied in BiH and is one of the most modern solutions for highways", said Nenad Marjanović, project manager of Elnos Group.

Aim of constructing such a system was control and supervision of electrical power on entire highway. It is an independent system, since it is powered from two firm points and is equipped with SCADA system for control and supervision in the center for traffic signaling and communication, whose dispatcher center controls entire electrical power system of facilities on whole highway. This system provides entire supervision of all electrical power facilities located on the highway and speed of manipulating possible faults is measured by several seconds only, whereas earlier, in classical management of electrical power facilities, this would take half an hour or more.

Highway Banja Luka-Doboj is a modern infrastructural solution, which represents more than just a traffic connection for two cities. This is a road, which has a capacity for connecting to European network of modern roads by connecting to Corridor 5C and Corridor 10.

This was an endeavor where Elnos teams overcame big challenges and successfully made some of their pioneer steps out and often fought harsh weather and landscape conditions. We are proud to be a part of storytelling for new traffic future of the region through our work.

sistemom elektroenergetskih objekata na cijelom auto-putu. Ovaj sistem obezbeđuje kompletan nadzor svih elektroenergetskih objekata koji se nalaze na auto-putu i brzinu manipulacije eventualnim kvarovima za svega nekoliko sekundi, dok je u ranijim, klasičnim upravljanjima elektroenergetskim objektima taj period trajao pola sata i duže.

Auto-put Banjaluka-Doboj je savremeno infrastrukturno rješenje koje je mnogo više od saobraćajnog spoja dva grada, ovo je saobraćajnica koja posjeduje potencijal za povezivanje sa evropskom mrežom modernih saobraćajnica kroz uvezivanje sa koridorom 5C i koridorom 10.

Bio je ovo poduhvat na kojem su ekipi Elnosa savladale velike izazove i uspješno napravile neke od svojih pionirskih iskoraka i izborile se sa često neumoljivim vremenskim i geografskim uslovima. Ponosni smo što smo kroz rad na ovom poduhvatu bili dio ispisa priče nove saobraćajne budućnosti regije.

EN Infrastructure of modern age, with each new project, faces builders with tough task – construct always better, safer and faster road. In the middle of the fight between high demands and ground conditions, new roads, dynamic connections appear and nowadays life cannot be imagined without them.

Construction of Highway Banja Luka-Doboj leaves one of the roads of upcoming age in 2018 behind.

Elnos teams were an important link in constructing Highway Banja Luka-Doboj, project of the highest importance for traffic integration within the Republic of Srpska. It is a modern road of highest capacity for further integration within the Republic of Srpska, as well as connecting of Highway Gradiška-Banja Luka with Pan-European Corridor 5C. At the end of constructing the second section of the road Banja Luka-Prnjavor in October 2018, Highway Banja Luka-Doboj was commissioned in its entirety.

STATE-OF-ART SOLUTION

In the framework of constructing last section of Highway Banja Luka-Prnjavor, Elnos Group teams were in charge of design documentation for electrical phase, works encompassing reconstructions of 400 kV and 110 kV transmission lines and relocation of MV and LV network, and also installed four Biosco CS type substations of own production.

Within this phase of works, we set up lights on junctions, motorways, interchanges Mahovljani 2 and Drugovići as well as rest stop Vrbas, but also built a power system for two independent sources.

Part referring to assembly of Biosco CS substations starts a story on Elnos' pioneer step forward in constructing remote controllable powering system for highway.

"System of this substation contains motor



Izgradili smo daljinski upravljiv sistem napajanja auto-puta
We constructed remotely controllable supply system for the highway

Ekološka transformacija / Ecological transformation

RiTE Ugljevik



Termoelektrana Ugljevik Thermal Power Plant Ugljevik

RiTE UGLJEVIK se uspješno uhvatio u koštač sa sveobuhvatnim postupkom izgradnje sistema za odsumporavanje dimnih gasova koji je jedan od najvećih ekoloških projekata u Jugoistočnoj Evropi. Ovo je postupak transformacije ugljevičke termoelektrane iz velikog zagađivača u jednu od ekološki najčistijih u okruženju

RiTE UGLJEVIK successfully confronted comprehensive procedure of building a system for desulphurization of flue gases, which is one of the biggest ecological projects in Southeast Europe. This is a procedure of transforming thermal power plant in Ugljevik from being a big polluter to one of ecologically cleanest plants in region

SR Prva organizovana eksploracija uglja u podnožju planine Majevica počela je prije više od 130 godina, u vrijeme vladavine Austro-Ugarske monarhije u BiH. To je bilo doba kada je potencijal kopova ovog kraja tek otkrivan, a malo ko je mogao da zamisli da će u budućnosti ekonomski život ove regije biti u najvećoj mjeri povezan sa iskopom uglja i proizvodnjom električne energije iz njega.

Pogoni Rudnika i termoelektrane Ugljevik su na lokaciji gradića koji nosi isti naziv pušteni u rad prije više od tri decenije. Termoelektrana Ugljevik instalirane snage 300 MW i prosječne godišnje proizvodnje 1.601 GWh i danas podmiruje trećinu energetskih potreba Republike Srbije.

U proteklih godinu dana u pogonima termoelektrane Ugljevik je započet sveobuhvatan postupak izgradnje sistema za odsumporavanje dimnih gasova. U pitanju je jedan od najznačajnijih projekata za nastavak rada termoelektrane, koji je ujedno i jedan od najvažnijih ekoloških poslova u regionu.

Ekipe Elnosa dio su ovog velikog ekološkog projekta koji će donijeti čistiju energetsku budućnost regiji.

Veličinu i kompleksnost projekta najbolje oslikava činjenica da su naše ekipe položile oko 120 kilometara kablova različitih tipova i presjeka, prije čega je bilo potrebno postaviti više od pet kilometara kablovskih regala i nosača.

Preciznije govoreći, našim ekipama su povje-

SMANJENJE ZAGAĐENJA

Termoelektrana Ugljevik za proizvodnju električne energije koristi ugalj sa visokim procentom sumpora (3,5-5%). Nakon završetka ovog projekta emisija sumpornih oksida u atmosferu će iznositi oko 400 miligrama po kubnom metru, naspram trenutnih 20 hiljada miligrama.

reni zadaci: izvođenja elektro instalacija opšte potrošnje, rasvjete, instalacija slabe struje, isporuke i montaže kablovskih regala isporuke, polaganja i priključenja SN, NN i kontrolnih kablova za gotovo kompletno postrojenje, izradu kompletne gromobranske instalacije, kao i isporuka i montaža razvodnih i UPS ormara.

„Posebnu vrstu izazova predstavlja je i rad na vrhu novog dimnjaka visine 100 metara, što je posao koji smo izvršili izuzetno uspješno. Sama veličina, značaj i kompleksnost projekta su bili veliki izazov za nas. Još jednom smo pokazali da je naš mladi, ali i iskusni tim, sposoban za realizaciju kapitalnih projekata“, rekao je Duško Čabrilović, inženjer na projektu.

Elnos Grupa u okviru izgradnje sistema za odsumporavanje dimnih gasova u RiTE Ugljevik učestvuje kao partner slovenačke kompanije „Rudis“ koji je dio konzorcijuma u realizaciji kompletног projekta sa kompanijama „Mitsubishi Hitachi Power Systems Ltd“ Japan i „Mitsubishi Hitachi Power Systems Europe GmbH“ Njemačka.

EN First organized exploitation of coal in the foot of mountain Majevica started more than 130 years ago in times when Austrian-Hungarian monarchy ruled in BiH. Those were time when capacity of these pits had just been discovered,

and there were only a few people to imagine that economy of this region would be mostly related to coal mining, and production of electrical power afterwards.

Plant within Mine and Thermal Power Plant Ugljevik are located in a small town bearing the same name commissioned more than three decades ago. Thermal Power Plant Ugljevik of 300 MW installed power 1,601 GWh of average annual production, even today provides third of energy needs for the Republic of Srpska.

In the last year, plants of the Thermal Power Plant Ugljevik started comprehensive procedure of building a system for desulphurization of flue gases. This is one of the most important projects in order for thermal power plant to continue its operation, which is one of the most significant ecological projects in the region at the same time.

Elnos teams are a part of this big ecological project that shall provide the region with cleaner energy future.

Size and complexity of the project is best described by the fact that our teams laid 120 kilometers of different types and diameters of cables. Before this, they had to mount more than five kilometers of cable trays and supports.

More precisely, our teams were tasked with the following: trays electrical installations of general consumption, lighting, low voltage installation, supply and mounting cable cabinets, supply, laying and connection of MV, LV and control cables for almost entire plant, con-

struction of entire lightning installations, as well as delivery and installation of distribution and UPS cabinets.

“Special challenge was work on the top of 100 meters high new chimney, which is a work we did extremely successfully. Size, significance and complexity of the project were of great importance for us. Once again, we showed that our young, but also experienced team, is capable for realization of major projects”, said Duško Čabrilović, Project Engineer.

Within building a system for desulphurization of flue gases at Mine and TPP Ugljevik, Elnos Group is a partner of Slovenian company “Rudis”, which is a part of consortium in realization of entire project with companies “Mitsubi-

POLLUTION DECREASE

Thermal Power Plant Ugljevik uses coal with high percentage of Sulphur (3.5-5%) for production of electrical power. After completion of this project, emission of Sulphur oxides into atmosphere shall amount to about 400 milligram per cubic meter, compared to the current 20 thousand milligrams.

shi Hitachi Power Systems Ltd”, Japan and “Mitsubishi Hitachi Power Systems Europe GmbH”, Germany.



Naš tim je dio velikog ekološkog projekta Our team is a part of a big ecological project



Izvođenje elektromontažnih radova Performing electrical installation works

U SLUŽBI PRIVREDE

IN SERVICE OF ECONOMY

DIO SMO PODUHVATA koji donosi novi privredni život u agroindustrijsku zonu Nova Topola

WE ARE A PART OF ENDEAVOR
bringing new life to agricultural-industrial zone Nova Topola

SR Agroindustrijska zona u Novoj Topoli kod Gradiške uskoro će useliti svog najvećeg stanačara. Riječ je o fabrići „Ella textile“, novoj proizvodnoj karici poznatog italijanskog proizvođača donjeg rublja i čarapa „Calzedonia“.

Pogoni fabrike „Ella textile“ se prostiru na 13.000 metara kvadratnih i zapošljavaće više od 500 novih radnika. Ove brojke pokazuju da je u pitanju najveći fabrički pogon izgrađen na području opštine Gradiška još od osamdesetih godina prošlog vijeka.

Naš tim izvodi kompletne elektroenergetske radove na fabričkom objektu, čija će instalirana snaga iznositi 2,5 MW.

Radovima na projektu „Ella textile“ smo zaokružili sve elektroenergetske poslove u jednom industrijskom objektu, jer je naš angažman obuhvatio oblasti: elektroenergetike, automatike, programiranja i puštanja sistema u rad.

Za potrebe nove fabrike ekipe Elnos Grupe su izvele elektromontažne radove na izgradnji transformatorice čiji je maksimalan kapacitet 2x1250 kVA, sa rasklopnim postrojenjem izvan objekta.

Važno je istaći da je ovo proizvodni objekat u kojem izvodimo i radove instalacije slabe struje, koji podrazumijevaju instalaciju: LAN mreže, sisteme vatrodojave i video-nadzora, te alarmne sisteme.

U proizvodnim pogonima koji nastaju, naše ekipe izvode i montažu signalnih provodnika i automatičke za kompletan objekat, te podizanje i programiranje SCADA sistema.

Ovo je projekat u okviru kojeg smo potvrdili spremnost da ispunimo najviše i specifične zahtjeve investitora, koji su se odnosili na postavljanje najsavremenije opreme iz oblasti elektroenergetike, automatike, vatrodojave i sigurnosnog sistema.

I ovaj segment zadatka smo uspješno realizovali u pogonima nove fabrike.

Ugradili smo elektroenergetsku opremu proizvodača „Schneider electric“ i „Legrand“. Automatika i SCADA sistem su „Honeywell“, dok su vatrodojavni sistem i video-nadzor takođe renomiranih svjetskih proizvođača opreme.

Ovo je projekat u okviru kojeg je od novembra prošle godine aktivno angažovano 20 elektromontera. Elnos Grupa je ponosna na to što je dio značajnog privrednog projekta na domaćem terenu.

EN Agricultural-industrial zone Nova Topola in the vicinity of Gradiška will soon accommodate its newest tenant. This is factory "Ella textile", new production link of famous Italian producer of lingeries and socks "Calzedonia".

Plants for factory "Ella textile" cover 13,000 square meters and shall employ more than 500 new employees. These numbers show this is the biggest factory plant built within the Municipality of Gradiška since 80's of the last century.

Our team performs entire electrical power works of the factory facility, whose installed power shall amount to 2.5 MW.

Works of project in factory "Ella textile" sums up all electrical power works in one industrial facility, since our engagement covers the following areas: electrical power engineering, automatics, programming and commission of the system.

For needs of the new factory, Elnos Group teams performed electrical installation works in constructing substation whose maximum capacity amounts to 2×1250 kVA with switchgear outside facility.

It is important to mention it is a production facility where we perform works on low voltage installation, which, again, include as follows: LAN network, fire alarm system and video supervision, as well as alarm systems.

In new production plant, our teams also assemble signal conductors and automatics for entire facility, as well as establishment and programming SCADA system.

This is a project where we affirmed readiness to meet highest and specific demands by Investor, which referred to installation of the state-of-art equipment in the field of electrical power engineering, automatics, fire alarm system and safety system.

We also successfully performed this part of the project in the plant of the new factory.

We installed electrical power equipment produced by "Schneider electric" and "Legrand". Automatic and SCADA system are produced by "Honeywell", whereas fire alarm system and video supervision were also produced by renowned world producers of the equipment.

This is a project where, since November last year, 20 electricians are engaged. Elnos Group is proud to be a part of significant economic project in home field.

AGROINDUSTRIJSKA ZONA U FOKUSU

Rad u agroindustrijskoj zoni u Novoj Topoli je od ranije poznat našoj kompaniji. To je lokacija gdje smo već uspješno realizovali poslove uvođenja kompletnih elektroinstalacija, od temelja do proizvodnih pogona, na objektu najvećeg regionalnog centra kompanije "Lattonedil".

Ova italijanska kompanija spada među najveće svjetske proizvođače krovnih panela, a o veličini naših poslova u okviru ovog projekta dosta govori činjenica da se njeni proizvodni pogoni prostiru na površini od 12.000 metara kvadratnih.

AGRICULTURAL-INDUSTRIAL ZONE IN FOCUS

Work in agricultural-industrial zone in Nova Topola has already been recognized by our company. This is a location where we have already performed activities on introducing entire electrical installations, from foundations to production plants, on the facility of the largest regional center of the company "Lattonedil". This Italian company fall into a group of biggest world producers of roof panels. Fact that its production plants cover more than 12,000 square meters is an evidence of size of our activities within this project.



Pogoni fabrike na 13.000 m^2 Factory plant covering 13.000 m^2

Znanje i biznis:



Energetika novog doba

**KNOWLEDGE AND BUSINESS:
ELECTRICITY OF THE NEW AGE**

SARADNJA ZA NOVO DOBA

Realizacija optimalnih privrednih mogućnosti u okviru Sporazuma o specijalnim i paralelnim vezama Republike Srbije i Srbije, tema je koja nikada ne gubi na aktuelnosti.

Upravo je ona bila osnov panel diskusije, održane kao dio poslovnog foruma Republika Srpska-Srbija, u kojoj je, kao jedan od panelista, učestvovao Dušan Mijatović, član Uprave Elnos Grupe za tehničke poslove.

Panel je bio prilika da u okviru aktivne diskusije budu predstavljena poslovna iskustva Elnos Grupe, kako u Srbiji, Republici Srpskoj, tako i na tržištu EU.

Poslovni forum je ujedno bio prilika da se prezentuju potencijali za ulaganje, ali i za organizaciju bilateralnih susreta privrednika.

JUBILEJ U SLUŽBI MODERNE ENERGETIKE

Dvadeseti rođendan Akademije inženjerskih nauka Srbije i Međunarodna konferencija „Energy and Ecology Industry EEI 2018“, organizovana povodom obilježavanja jubileja, još jednom su bili prilika da damo podršku dogadjajima usmjerenim na njegovanje naučnog i stručnog rada u modernom inženjeringu.

Konferencija je bila prilika i da se razgovara

o najaktuelnijim pitanjima inovacija u energetskom sektoru, globalnom zagrijavanju i klimatskim promjenama, efikasnosti i optimalnom energetskom razvoju.

Akademija inženjerskih nauka Srbije od osnivanja 1998. godine do danas uspješno ostvaruje misiju razvoja tehničkih nauka i njihove primjene u privredi.

NA PRAGU 4. INDUSTRIJSKE REVOLUCIJE

Iako posjeduje relativno kratku tradiciju, četvrti Jahorina biznis forum, koji je ove godine okupio više od 550 učesnika iz 14 zemalja, postao je jedan od najuticajnijih ekonomskih događaja u regiji.

Cilj ovogodišnjeg foruma je bio da ukaže na značaj usmjerenja ka digitalnoj ekonomiji i razvoju informaciono-komunikacionih tehnologija, odnosno četvrtoj industrijskoj revoluciji.

U okviru foruma održana je panel diskusija „Aktuelni trendovi u energetskom sektoru“, u okviru koje je jedan od panelista bio Borko Torbic, predsjednik Uprave IEE Corporation, koji je ovom prilikom govorio o najvažnijim globalnim energetskim trendovima i značaju korištenja OIE potencijala Srpske.

Zajedno sa Torbicom, u ovom panelu su učestvovali Petar Đokić, ministar energetike i

rudarstva RS, Luka Petrović, direktor Elektroprivrede RS, te Mirko Ilić iz globalne konsultantske kuće "Deloitte".

USPJEŠNO NA CIRED-U

Elnos Grupa se uspješno predstavila na tradicionalnom savjetovanju o elektrodistributivnim mrežama Srbije, u organizaciji nacionalnog komiteta CIRED, održanom u septembru 2018. godine, na Kopaoniku.

Činjenica da smo realizovali značajne i velike projekte izgradnje, modernizacije i rekonstrukcije, izazvala je veliko interesovanje učesnika koji su u velikom broju posjetili poslovnu prezentaciju i izložbeni stand Elnos Grupe.

Savjetovanje, za koje se akreditovalo više od 700 učesnika, bilo je prilika da zainteresovane upoznamo sa rastućim brojem projekata iz oblasti obnovljivih izvora energije, te otvorilo mogućnost da predstavimo svoju eksperitizu od najsjevernijih dijelova Islanda do naših regionalnih poduhvata.

U okviru jedanaestog CIRED savjetovanja se predstavilo rekordnih 67 izlagača, a za vrijeme panelskog dijela konferencije je prezentovano 120 radova.

EN COOPERATION FOR NEW AGE

Realization of optimal economic possibilities

within Agreement on Special Parallel Relations between the Republic of Srpska and Serbia is ever-ongoing topic.

It was a ground for panel discussion held as a part of business forum Republic of Srpska-Serbia, where, being one of panelists, Dušan Mijatović, Member of the Management of the Elnos Group for technical affairs took part as well.

Panel was a chance to present business experiences of the Elnos Group in an active discussion, both in Serbia and the Republic of Srpska as well as EU market.

Business forum also was a chance to present investment capacities and organization of bilateral meetings of entrepreneurs.

JUBILEE IN THE SERVICE OF MODERN ENGINEERING

Twentieth birthday of the Academy of engineering sciences of Serbia and international conference "Energy and Ecology Industry EEI 2018", organized on behalf of celebrating jubilee, once again were a chance to support events directed to nurturing scientific and professional work in modern engineering.

Conference was a chance to talk about the most current issues in innovations of energy

sector, global warming and climatic changes, efficiency and optimal energetic development.

Academy of engineering sciences of Serbia, since its establishment in 1998 till today, successfully accomplished mission of developing technical sciences and their application in economy.

FACING 4TH INDUSTRIAL REVOLUTION

Although it has a relatively short tradition, fourth Jahorina business forum, which gathered more than 550 participants from 14 countries, became one of the most influencing economic events in the region.

Aim of this year's forum was to point out to significance of facing digital economy and development of information-communication technologies, i.e. fourth industrial revolution.

Within forum, there was a panel discussion titled "Current trends in energy sector" held, where Borko Torbica, the President of IEE Corporation, was one of the panelists. He used this opportunity to talk about the most important global energetic trends and significance of using RES capacities of the Republic of Srpska.

Along with Torbica, Petar Đokić, the Minister of energy and mining of the RS, Luka Petrović,

general manager of Elektroprivreda RS, as well as Mirko Ilić from global consultancy agency "Deloitte" were participated.

SUCCESSFUL CIRED

Elnos Group successfully introduced itself on traditional consulting on electrical power distribution networks of Serbia, organized by the national committee CIRED, held in September 2018 in Kopaonik.

Fact we performed significant and big projects in construction, modernization and reconstruction, resulted in big interest of participants, who attended business presentation and exhibition stand of the Elnos Group.

Consulting, which had more than 700 participants accredited, was a chance to introduce the interest side to increasing number of projects in the field of renewable energy sources and also opened a possibility to present our expertise from the far North parts of Iceland to our regional endeavors.

Record 67 exhibitors introduced themselves within eleventh CIRED consulting, and during panel part of the conference 120 works were presented.



Borko Torbica, predsjednik Uprave IEE Corporation
Borko Torbica, the President of IEE Corporation



Panel u Privrednoj komori RS
Panel in the RS Chamber of Commerce



Donatorsko veče "S ljubavlju hrabrim srcima" Donator's night "With love for brave hearts"



Podržavamo izdavačku djelatnost
Supporting publishing



Scena iz predstave "Korešpodencija"
Scene from theatre play "Korešpodencija"

SR „S LJUBAVLJU HRABRIM SRCIMA“

Elnos Grupa je prošlog decembra bila dio humane porodice koja se odazvala da učestvuje u devetoj humanitarnoj akciji „S ljubavlju hrabrim srcima“.

Sredstva prikupljena u ovogodišnjoj humanitarnoj akciji su namijenjena za nabavku uređaja za robotski asistiranu rehabilitaciju djece sa poremećajima kretanja.

Kao kompanija koja njeguje poseban odnos odgovornosti prema najmladima, i u budućnosti ćemo biti spremni da se odazovemo akcijama usmjerenim na stvaranje boljih uslova života kako za najmlade, tako i za ostale kojima je pomoć potrebna.

OIE KROZ NOVU LITERATURU

Kao i prethodnih godina, i ove smo nastavili da aktivno pružamo podršku izdavačkoj djelatnosti, s posebnim naglaskom na literaturu usmjerenu na savremene trendove iz oblasti elektroenergetike.

Drago nam je što smo bili u prilici da podržimo izlazak na svjetlo dana knjiga: „Obnovljivi izvori energije - Solarna energetika“, prof. dr Čedomira Zeljkovića, profesora Elektrotehničkog fakulteta u Banjaluci i „Vetroelektrane“, prof. dr Željka Đurišića, profesora Elektrotehničkog fakulteta u Beogradu.

NOVA GODINA „TEATAR FESTA“

Elnos Grupa je tradicionalno podržala održavanje „Teatar festa Petar Kočić“, omiljenog banjalučkog festivala pozorišne umjetnosti.

Bila nam je čast da budemo pokrovitelji predstave „Korešpodencija“, u izvedenju beogradskog „Zvezdara teatra“, koja je na radost velikog broja teatrofila izvedena na daskama Narodnog pozorišta Republike Srpske.

Tradicionalna pozorišna manifestacija „Teatar fest“ je i prošle godine okupila veliki broj najpoznatijih imena pozorišnih scena iz regionalnih Jugoslavije.

EN “FOR BRAVE HEARTS WITH LOVE”

In last December, Elnos Group was a part of humane family that had participated ninth humanitarian activity "For brave hearts with love".

Funds collected in this year's humanitarian activity are meant for acquisition of devices for robot-assisted rehabilitation of children with movement disabilities.

Being a company nurturing a special relationship with responsibilities for the youngest ones, we shall in future be ready for respond to activities directed towards creation of better life conditions both for the youngest and other people in need for help.

RES THROUGH NEW LITERATURE

As same as in previous years, this year also we continued to provide active support to publishing industry with special accent to literature meant for modern trends in electrical power engineering.

We are glad we had a chance to support publishing the following books titled: "Renewable energy sources - Solar engineering", by prof. Čedomir Zeljković, Ph.D, professor of the Electrical Engineering Faculty in Banja Luka and "Wind Electrical Plants", by Željko Đurišić, Ph.D, professor of the Electrical Engineering Faculty in Belgrade.

NEW YEAR FOR “TEATAR FEST”

Elnos Group traditionally supported organization of "Teatar fest Petar Kočić", favorite Banja Luka theatre festival.

We are honored to be sponsor of the play "Korešpodencija", acted by Belgrade "Zvezdara teatra", which, on pleasure of theater lovers was performed in the National Theater of the Republic of Srpska.

Traditional theater event "Teatar fest" also last year gathered a big number of the most famous names of theater scenes from former Yugoslavia theaters .

SR RECEPT ZA DOMAĆINSKO UPRAVLJANJE TROŠKOVIMA

Kompanija Elnos je početkom ove godine organizovala novu obuku svojih zaposlenih o upravljanju projektima, troškovima i rizicima.

Tokom četiri dana, koliko je trajala obuka, naši radnici su stekli nova znanja i vještine koje će im pomoći u daljoj realizaciji projekata i obogatiti poslovnu klimu Elnosa.

Domaćinsko upravljanje troškovima prilikom realizacije investicionih projekata važan je segment poslovanja, pa je ova obuka poslužila i za sticanje znanja bitnih za procjenu, planiranje i kontrolu troškova, odnosno smanjenje nepotrebnih troškova.

BEZBJEDNOST PODATAKA KAO PRIORITET

Naši zaposleni u IT i QMS sektoru pohađali su seminar na temu General Data Protection Regulation-GDPR - "Opšta uredba EU o zaštiti ličnih podataka". Seminar je održan polovinom marta ove godine na Univerzitetu za poslovne studije Banjaluka.

Tokom stručnog usavršavanja oni su stekli nova znanja iz oblasti zaštite ličnih podataka, što je posebno važno ako se ima u vidu činjenica da se opšta uredba o zaštiti podataka primjenjuje u svim državama članicama EU od 25. maja prošle godine.

Opšta uredba o zaštiti podataka omogućuje građanima EU bolji nadzor nad njihovim ličnim podacima čime će se poboljšati njihova bezbjednost kako na internetu tako i izvan njega.

NOVA OBUKA ZA SEE ELECTRICAL

Naši inženjeri i tehničari su krajem februara i početkom marta ove godine u banjalučkom hotelu „Jelena“ prošli novu obuku koja je obuhvatala programski paket SEE Electrical sa modulima SEE Electrical Circuit Diagrams i SEE Electrical Cabinet.

Za nekoliko dana, koliko je trajala obuka, 15-ak naših inženjera i tehničara je uspješno prošlo kroz praktičan i teorijski dio ove obuke, zahvaljujući kojоj su značajno unaprijedili svoje vještine.

Programski paket SEE Electrical koristi se za izradu projekata elektroenergetskih postrojenja i omogućava izradu svih vrsta šeme kao što su jednopolne i tropolne šeme djelovanja, kao i izradu potrebne prateće dokumentacije koja je sastavni dio projekta bilo kojeg elektroenergetskog postrojenja poput kablovske liste, liste vezivanja, liste rednih stezaljki, popis opreme i slično.

EN RECIPE FOR GOOD ECONOMIC DISTRIBUTION

At the beginning of this year, company Elnos organized a new training on project, costs and risk management, for their employees.

For four days, training lasted that long, our employees acquired new knowledge and skills to help them in further project realization and enrich Elnos atmosphere.

Economic distribution is an important segment in realization of investment projects, so, this training was also used for acquiring knowledge important for estimations, planning and control of costs, i.e. decreasing unnecessary costs.

DATA SAFETY AS PRIORITY

Our staff in IT and QMS Sector attended seminar titled General Data Protection Regulation-GDPR – "General EU Directive on protection of personal data". Seminar was held in mid-March this year at the University for Business Studies in Banja Luka.

During professional training, they acquired new knowledge on protection of personal data, which is especially important having in mind that general directive on data protection has been applied in all states EU members since May 25 last year.

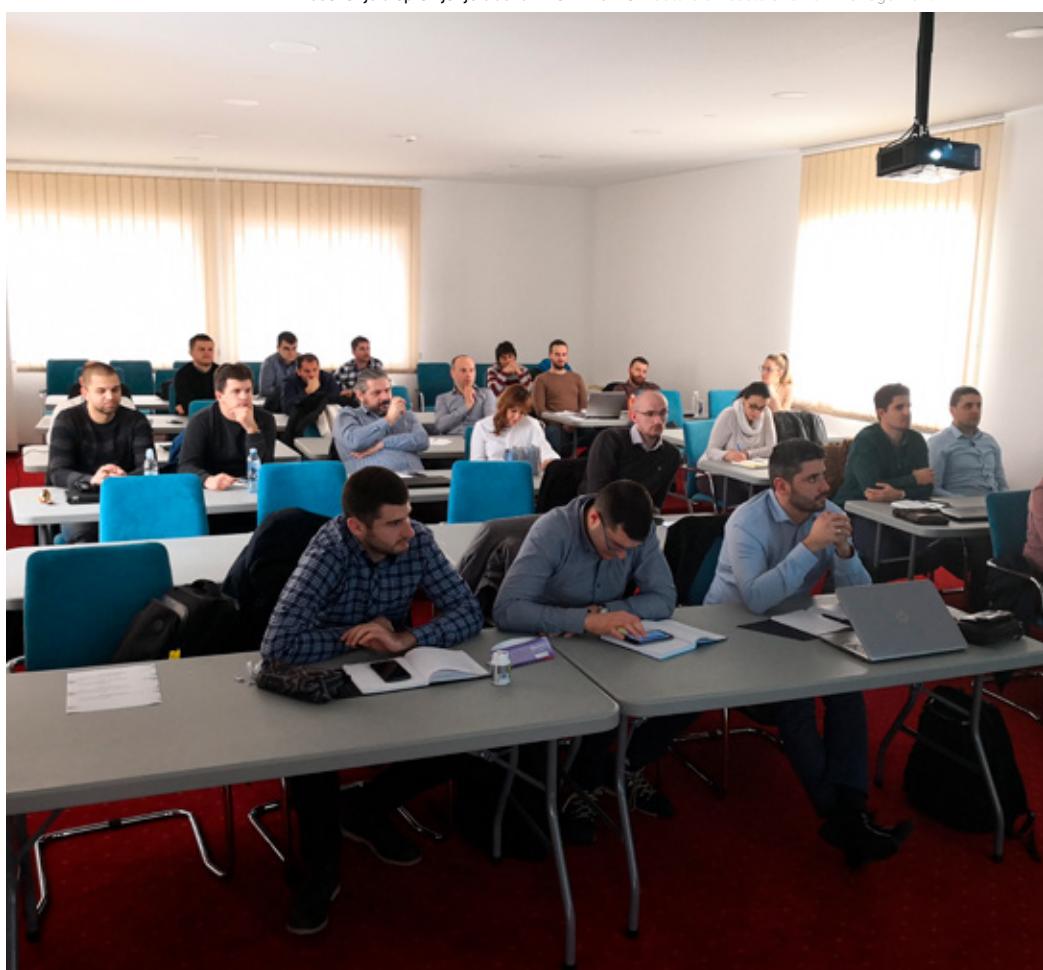
General Directive on Data Protection is going to provide EU citizens with better surveillance over their personal data, which is going to improve their safety, both on Internet and beyond.

NEW TRAINING FOR SEE ELECTRICAL

Our engineers and technicians attended another training in Banja Luka hotel "Jelena" at the end of February and early March. This training included program package SEE Electrical with modules SEE Electrical Circuit Diagrams and SEE Electrical Cabinet.

In a few days, during training, about 15 of our engineers and technicians successfully attended practical and theoretical part of this training thanks to which they improved their skills. Program package SEE Electrical is used for making projects of electrical engineering plants and provides creation of all types of schemes such as one-pole and three-pole operation diagrams as well as output of necessary accessory documents being a constituent part of the project for any electrical engineering plant, such as cable list, connection list, band clamps list, list of equipment etc.

Predavanje o upravljanju troškovima i rizicima Lecture on costs and risk management





Pred izazovima profesije
Challenged by profession

Pogled u budućnost

A look into the future

SR Studenti završnih godina Građevinskog fakulteta iz Beograda su, u organizaciji Elnos Grupe, posjetili gradilište vjetroparka Čibuk 1 u jugoistočnom Banatu.

Iz prve ruke vidjeti napredovanje projekta izgradnje najvećeg vjetroparka na Balkanu za njih je značilo jedinstvenu priliku da teorijska znanja upotpune iskustvima sa terena.

„Studentima je pružena mogućnost da na jednom mjestu vide sve ono što ih u profesionalnom životu čeka. Vidjeli su radove, mehanizaciju i upoznali su se sa procedurama na gradilištu poput Čibuka 1, što je od velikog značaja za njihovo obrazovanje”, rekao je Nenad Fric, jedan od profesora koji je predvodio stručnu ekskurziju u vjetroparku Čibuk 1, u ime Građevinskog fakulteta.

Budući inženjeri su prilikom posjete pokazali veliku znatiželju i interesovanje, postavljajući brojna pitanja o ovom, jednom od najvećih projekata iz oblasti OIE na Balkanu.

„Izuzetno mi je draga da vidim da se u našoj zemlji radi na ovako kompleksnim projektima koji su veoma zahtjevni iz aspekta izgradnje. Radovi koji se ovdje izvode su jedinstveni u Srbiji, a ovakvi projekti stvaraju svijest o potrebi za

energijom iz obnovljivih izvora i za očuvanjem prirodnih resursa”, rekao je David Kojadinović, student četvrte godine modula za konstrukcije Građevinskog fakulteta, prilikom posjete.

Kao društveno odgovorna kompanija, Elnos Grupa je odavno prepoznala važnost ulaganja u mladi kadar, pa je i mogućnost da na svojim gradilištima ugosti buduće inženjere bila pravo zadovoljstvo.

„Drago mi je što smo bili u prilici da budemo domaćini studentima i našim budućim kolegama na gradilištu vjetroparka Čibuk 1. Ovo je jedinstven poduhvat na Balkanu, a mi u Elnosu smo ponosni na činjenicu da smo bili značajna karika izgradnje ovog veoma važnog i kompleksnog zelenog projekta za Republiku Srbiju”, rekao je Dejan Maljenović, rukovodilac građevinskog sektora u Elnosu Srbija.

EN Organized by Elnos Group, graduate students of the Civil Engineering Faculty in Belgrade are visited Wind Park Čibuk 1 in Southeast Banat.

To see progress of the construction project of the biggest wind park in Balkans was a unique opportunity to complement theoretical knowledge with experience in the field directly.

“Students were provided with possibility to see everything they are going to be faced with in their lives in one place. They saw works, mechanization and got introduced to procedures in a building site such as Čibuk 1, which is extremely important for their education”, stated Nenad Fric, one of the professors who lead professional visit to Wind Farm Čibuk 1 on behalf of the Civil Engineering Faculty.

During the visit, future engineers showed a great curiosity and interest by asking numerous questions on this, one of the biggest projects in the RES field in Balkans.

“I am very happy to see that our country is working on such complex projects, which are very demanding in construction sense. Works being performed here are unique in Serbia and such projects build awareness on need for energy from renewable energy sources and preservation of natural resources”, said David Kojadinović, fourth year student in Construction Module of the Civil Engineering Faculty, during the visit.

Elnos Group, being socially responsible company, recognized importance in investing in young staff long ago, so it was a true pleasure to have future engineers on its building sites.

“I am glad we had a chance to host students and our future colleagues in the building site of the Wind Farm Čibuk 1. This is one-of-a-kind project in Balkans and Elnos is proud of the fact we were significant link of constructing such an important complex green project for the Republic of Serbia”, said Dejan Maljenović, Head of the construction sector in Elnos Serbia.



Monteri na obukama u Švedskoj i Njemačkoj

Linemen on trainings in Sweden and Germany

SR Elektro novi sistemi (ENS), slovenačka članica Elnos Grupe, posebnu je pažnju posvetila edukaciji kadrova za instalaciju kablovskih glava u Švedskoj i u Njemačkoj.

Imajući u vidu činjenicu da je instalacija 110 kV kablovskih sistema jedan od najvažnijih elemenata u portfoliju usluga ENS-a, u ovoj kompaniji trajno su opredijeljeni za edukaciju zaposljenih za instalaciju 110 kV kablovskih sistema različitih renomiranih evropskih proizvodača.

Uz stručnu koordinaciju sertifikovanih trenera, obučenih za pružanje praktičnih i teorijskih znanja, pet montera je uspješno prošlo



Monteri na obuci za instalaciju kablovskih glava Fitters on training for installation of cable ends

trening za montažu opreme za 110 kV kablove. Naime, dva montera su krajem marta 2018. godine prošla trening NKT HV u Training centru u Švedskoj za instalaciju kablovskih završnica do 145 kV. Takođe, tri montera su u junu iste godine prošla edukaciju za instalaciju kablovskih glava 110 kV u njemačkom Südkabel training centru u Meinheim-u.

Novom edukacijom monteri su usvojili znanja za realizaciju poslova montiranja kablovskih glava. Istovremeno, ovakav pristup obuci je odlična prilika za sticanje praktičnih znanja za kasnije samostalno obavljanje sličnih poslova. Naime, zahvaljujući projektima dodatnog školovanja naših montera, u protekle dvije godine ENS je okončao tri važna projekta montaže kablovskih spojnica i glava na trafostanicama Slovenska Bistrica, Bežigrad, te Cirkovci.

EN Elektro novi sistemi (ENS), Slovenian member of Elnos Group, paid a special attention to education of staff for installation of cable ends in Sweden and Germany.

Having in mind that installation of 110 kV cable systems is one of the most important elements in ENS service portfolio, this company

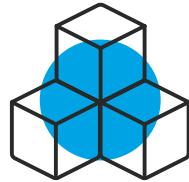
permanently is devoted to education of staff for installation of 110 kV cable system of various renowned European producers.

Along with professional coordination of certified trainers educated for providing practical and theoretical knowledge, five fitters successfully attended training for assembly of 110 kV cables. Namely, two fitters completed training NKT HV for installation of cable terminations up to 145 kV in the Training center in Sweden at the end of March 2018. Likewise, three fitters completed education for installation of 110 kV cable ends in German Südkabel training Centre in Meinheim in June of the same year.

Acquiring new knowledge provided linemen with conditions to perform works on assembling cable ends. At the same time, such an approach to the training is an excellent opportunity for acquiring practical knowledge for independent performance of similar works later on. Namely, thanks to projects of additional education of our fitters, ENS completed three important projects of fitting cable connectors in and ends on substations in Slovenska Bistrica, Bežigrad and Cirkovci in the last two years.



Studenti u posjeti vjetroparku Čibuk 1
Students visiting Wind Farm Čibuk 1



Pišemo putanje

prijateljstva

WE CREATE FRIENDSHIP ROADS

SR TRESLI SMO FUDBALSKE MREŽE U BANJALUCI I BEOGRADU

Sportske aktivnosti i učestvovanje na brojnim takmičarskim turnirima sastavni su dio funkcionalisanja velikog tima Elnos Grupe. Samo neki od njih su i turniri u malom fudbalu u Beogradu i u Banjaluci koji su održani u junu prošle, te u maju ove godine.

Saradnja, ali i želja za takmičenjem odvela je tim Elnosa na terene S.C. Lokomotiva u Železniku, gdje su se sportski nadmetale 24 ekipe. Treći AHK fudbalski turnir nastavak je tradicionalnog DSW turnira koji se uspješno organizuje već devet godina. Sportski duh i timski nastup je pokazao da naše kolege znaju da nižu uspjehu i mimo radnih mjesta.

Ni Radničke sportske igre u malom fudbalu održane u Banjaluci nisu prošle sa ništa manje dobrog sportskog raspoloženja. Naime, u maju ove godine, među 12 ekipa svoje snage su odmjerili i naši timovi koji su u Ramićima kod Banjaluке pokazali zavidne sportske rezultate.

Njegovanje sportskog duha i poštovanje protivnika dokaz su izgradnje timskog rada koji vodi ka sigurnom cilju i uspjehu.

MARATONCI ISTRČALI NOVE KRUGOVE ZA PAMĆENJE

Da trčanje nije samo za profesionalce, već i za rekreativce, ponovo su pokazali predstavnici

Elnos Grupe koji su sa brojnim ljubiteljima trka na duge staze učestvovali na Ljubljanskom maratonu, u oktobru 2018. godine, te na Banjalučkom polumaratonu koji je održan u aprilu ove godine. Spremnost i odvažnost da se izade na crtu sa uvježbanim trkačima pokazala je istrajnost naših kolega koji su sa osmijehom na licima pretrčali zadate kilometre.

Ovo je bila prilika da naši odvažni učesnici još jednom potvrde da znaju kako se gradi sportski duh, da svojim primjerom pokažu da je upornost garancija sigurnog uspjeha, ali i da podstaknu druge da više vremena provode na otvorenom kako bi održavali i fizičko i mentalno zdravlje. A da rekreativno trčanje podrazumijeva i dozu zabave, potvrdili su i naši 'maratonci' koji su poznate trke na duge trase iskoristili za sjajno druženje s drugim učesnicima. Upravo zato se raduju novim sportskim uspjesima u godinama koje dolaze.

BISERI OHRIDA KAO OSMOMARTOVSKI DAR

Evropski gradovi nižu se na mapi osmomartovskih putovanja koje Elnos Grupa svake godine organizuje za pripadnice ženskog dijela kolektiva. Ovogodišnji Dan žena bio je prilika za posjetu veličanstvenom Skoplju, ali i makedonskom biseru Ohridu, te Bitolju. Živopisno putovanje je bilo sjajna prilika za obilazak veli-

kog broja znamenitosti Makedonije, kao i za odličnu zabavu.

Poseban utisak na sve učesnice putovanja ostavio je Ohrid, koji leži na istoimenom jezeru, ali i Bitolj, jedna od najpopularnijih turističkih destinacija nekadašnje jugoslovenske republike.

Vesela družina obišla je i Skoplje, te uživala u raznolikosti predjela i fantastičnoj arhitekturi, ali i nadaleko poznatoj bogatoj kuhinji. Da su putovanja lijek i za dušu i za tijelo, a Makedonija sjajno mjesto za odmor i opuštanje, složile su se 'Elnosovke' koje su se sa novih destinacija vratile prepune utisaka i nezaboravnih uspomena.

EN WE SHOOK FOOTBALL NETS IN BANJA LUKA AND BELGRADE

Sport activities and participation in numerous tournaments are a constituent part of a big Elnos Group team. Only some of them are indoor football tournaments in Belgrade and Banja Luka held in June last year and May this year.

Cooperation, as well as competition spirit, lead Elnos team to the fields of S.C. Lokomotiva in Železnik, where 24 sport teams competed. Third AHK football tournament continues traditional DSW tournament successfully organized for nine years. Sport spirit and team presenta-

tion showed that our colleagues know how to stay successful out of working posts.

Employees' sport games in indoor soccer also were marked by good sport spirit in the same way and these were held in Banja Luka. Namely, in May this year, among 12 teams, our teams showed renown sport results in Ramići in the vicinity of Banja Luka.

Nurturing sport spirit and respecting opponent are a proof for building team work leading to guaranteed goal and success.

MARATHON RUNNERS RAN NEW CIRCLES TO REMEMBER

Representatives of the Elnos Group, after participating Ljubljana Marathon in October 2018 and Banja Luka Half Marathon held in April this year, once again showed numerous long-track running fans that running is not reserved for professionals only but for recreative runners

as well. Readiness and boldness to face trained runners showed persistence of our colleagues to run over tasked kilometers with smile on their faces.

This was a chance for our daring participants to confirm they know how to build team spirit once again, to use their example and show that persistence is a guarantee for definite success, but also to encourage other people to spend more time outdoors in order to be healthy - physically and mentally. Our "marathon runners" ascertained that recreative running also includes fun. They used well known long track running to have a great time with other participants. This is why they look forward to new sport successes in years to come.

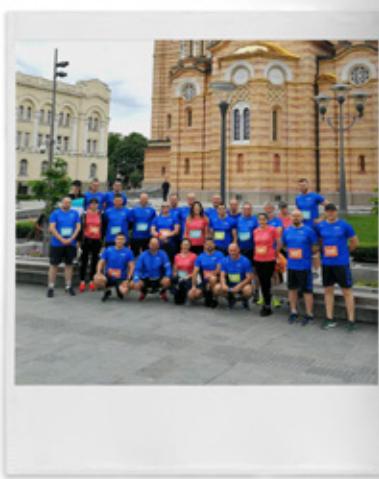
OHRID PEARLS AS A GIFT FOR MARCH 8

European towns list extends on the map of

March 8 travel that Elnos Group organizes every year for female staff in the company. This years' Woman's day was a chance to visit magnificent Skoplje, but also Macedonian pearl, city of Ohrid, and Bitola. Picturesque travelling was a great chance to have a sightseeing of numerous Macedonian landmarks as well as for great fun.

All female travelers were especially moved by Ohrid, a town located on the lake of the same name, as well as Bitola, one of the most popular touristic destinations of the former Yugoslav Republic.

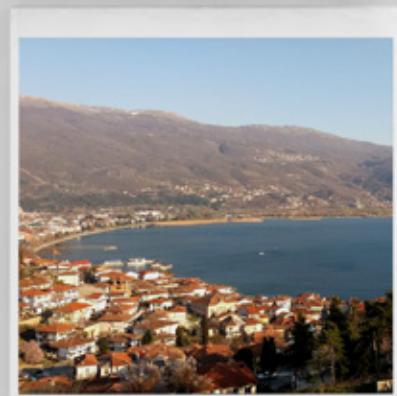
Jolly company went to Skoplje and enjoyed differences of landscapes and fantastic architecture but also well-known cuisine. Elnos women agree that travelling is cure for souls and body, and that Macedonia a great place for rest and relaxation. They returned from the trip with a bunch of impressions and unforgettable memories.



Maratonci sve brojniji i izdržljiviji
Marathon runners more numerous and fitter



Fudbaleri Elnosa
Elnos football players



Ohridsko jezero
Ohrid lake



Putovanje za pamćenje
A journey to remember

Tim building u srcu Šumadije

Team building in the heart of Šumadija



SR Sunčani oktobar je bio pravo vrijeme za kratak predah od dinamike poslovnih obaveza za menadžment Elnos Grupe. Pauza od obaveza organizovana je u vidu novog tim bildinga koji je ovaj put održan u hotelu "Izvor" u Arandelovcu.

Vrijeme provedeno u živopisnoj Šumadiji je bilo prilika da se posjeti znamenitosti poput Oplenca, Kraljevih vinograda, Karadordevgog konaka, Bukovačke pećine, ali i da se u okviru sportsko-rekreativnog dijela programa odmjeru snage na fudbalskom terenu.

Uz odlično raspoloženje, puno zabave i smljeha, vrijeme povedeno u Arandelovcu je bilo više nego sjajna priprema za poslovne izazove koji predstoje.

EN Sunny October was the right time for a short stop from business duties dynamics for Elnos Group Management. A little business break is organized within a new team-building which this time was held in hotel "Izvor" in Arandelovac.

Time spent in picturesque Šumadija was a chance to visit sights such as Oplenac, Kraljevi vinogradi (eng. King's vineyards), Karadorđev konak (eng. Karadjordje's lodge), Bukovačka pećina (Bukovica cave), but also to match up within sport-recreational part of the program on a football field.

With excellent atmosphere, lot of fun and laughter, time spent in Arandelovac was more than excellent preparation for upcoming business challenges.



MHE Bočac 2, BiH
Predvođenje elektromehaničke i hidromehaničke faze radova
SHPP Bočac 2, BiH
Leading electro-mechanical and hydro-mechanical phase of works



JEDAN ZELENI MW ZA SVAKI DAN U GODINI

U godini iza nas, kroz projekte čiji smo bili dio, učestvovali smo u stvaranju novih **365 MW zelene energije**. Simboličnih po 1 MW za svaki dan u godini je naš doprinos u tranziciji ka nastanku Zemlje čija pluća će moći duboko da dišu.

ONE GREEN MW FOR EACH DAY OF THE YEAR

In the year behind us, through projects we had been a part of, we participated in creation of new **365 MW of green energy**. Symbolically, 1 MW for each day of the year is our contribution in transition toward genesis of the Earth, whose lungs shall be able to breathe deeply.

