Prof. dr. sc. Slavko Krajcar, UNIZG

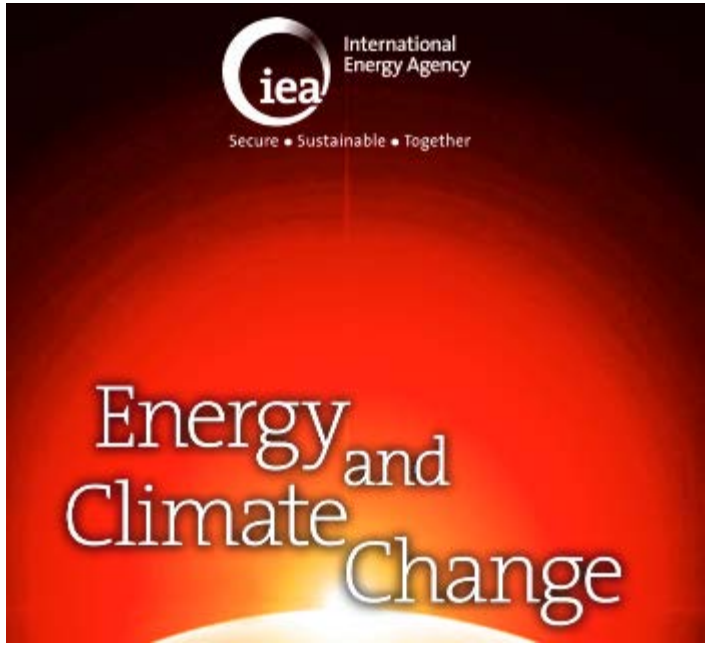
OD PARIZA DO +2^0 C

i još ponešto …

U Mostaru 8. LIPNJA 2016.

JP ELEKTROPRIVREDA
HRVATSKE ZAJEDNICE HERCEG BOSNE d.d. Mostar

"It is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able to adapt to and to adjust best to the changing environment in which it finds itself" (Charles Darwin)

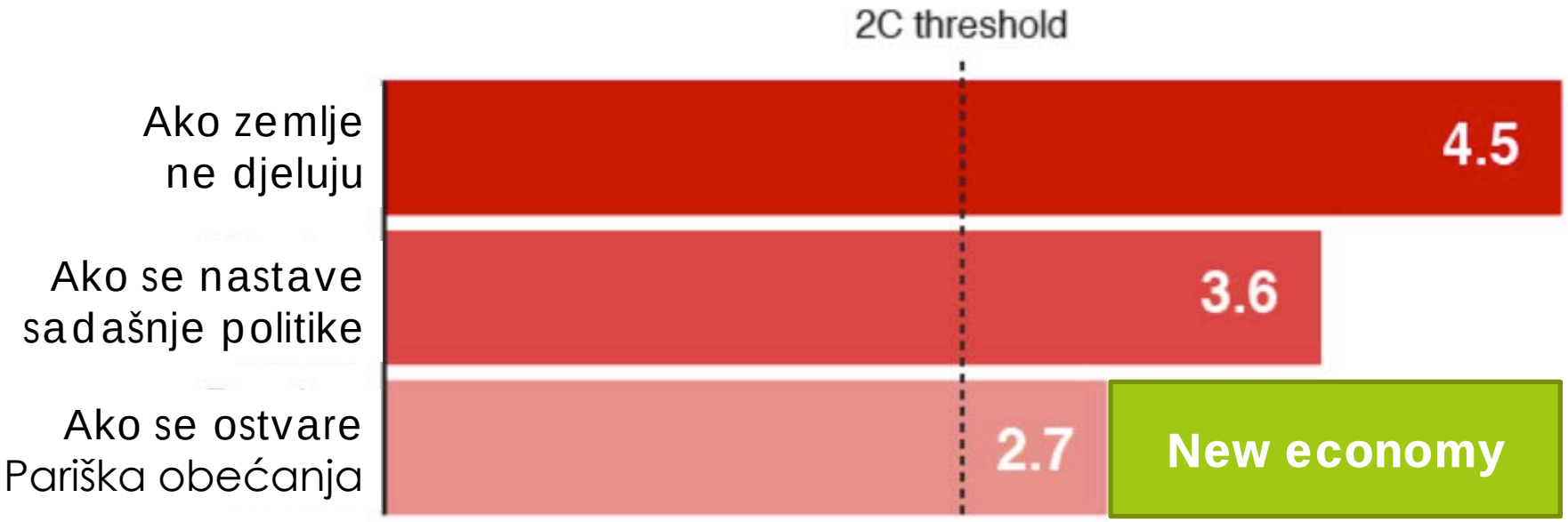


IEA priča prije Pariza (dokument koji je bio podloga za dogovor)

https://www.iea.org/publications/freepublications/publication/WEO2015SpecialReportonEnergyandClimateChange.pdf

Podsjetimo se … što ako?

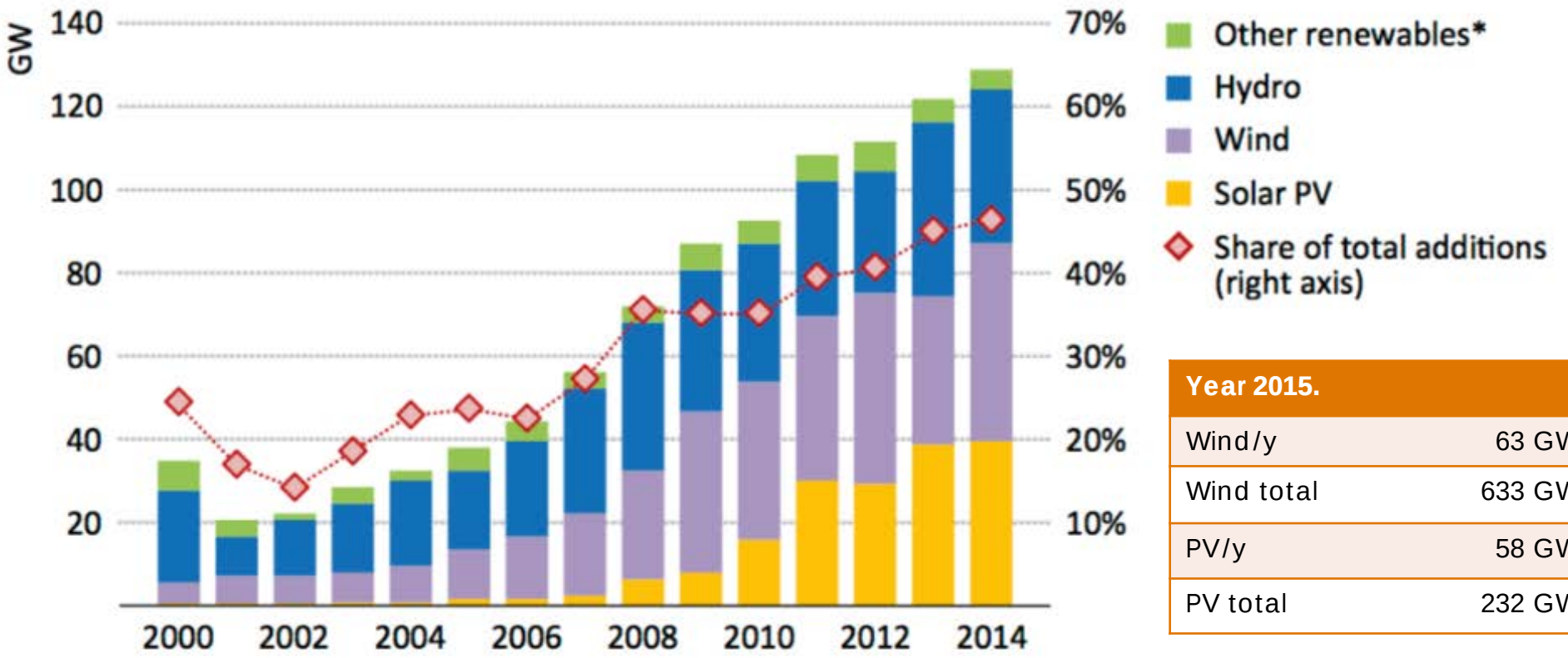
Prosječno zagrijavanje (^{0}C) projicirano na 2100. godinu



Source: Climate Action Tracker, data compiled by Climate Analytics, ECOFYS, New Climate Institute and Potsdam Institute for Climate Impact Research.

Što je učinjeno u ovom desetljeću u izgradnji objekata za proizvodnju ee?

Godišnje novi obnovljivi izvori i njihovo učešće u novoj izgradnji

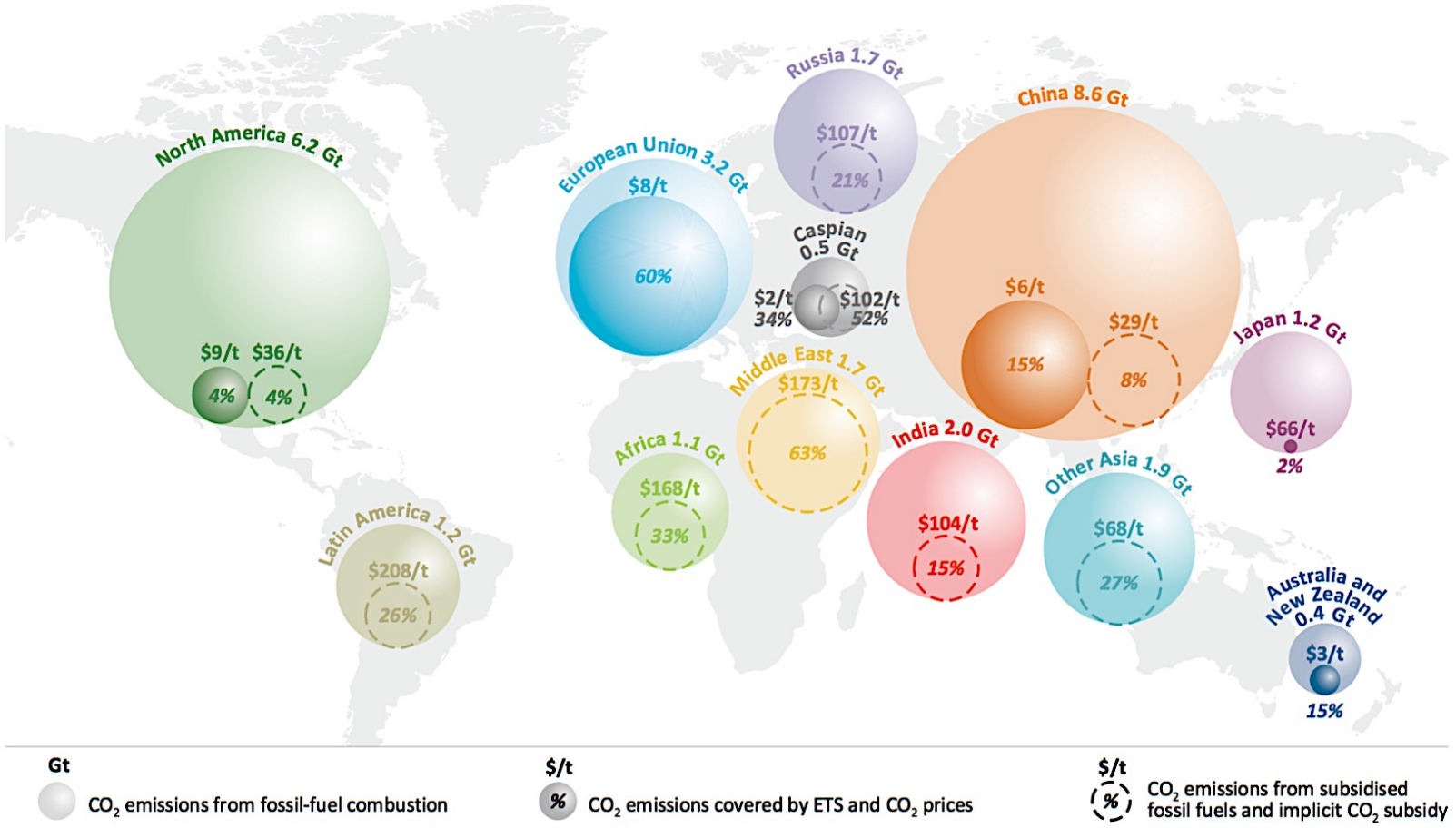


Year 2015.	
Wind/y	63 GW
Wind total	633 GW
PV/y	58 GW
PV total	232 GW

* Includes geothermal, marine, bioenergy and concentrating solar power.

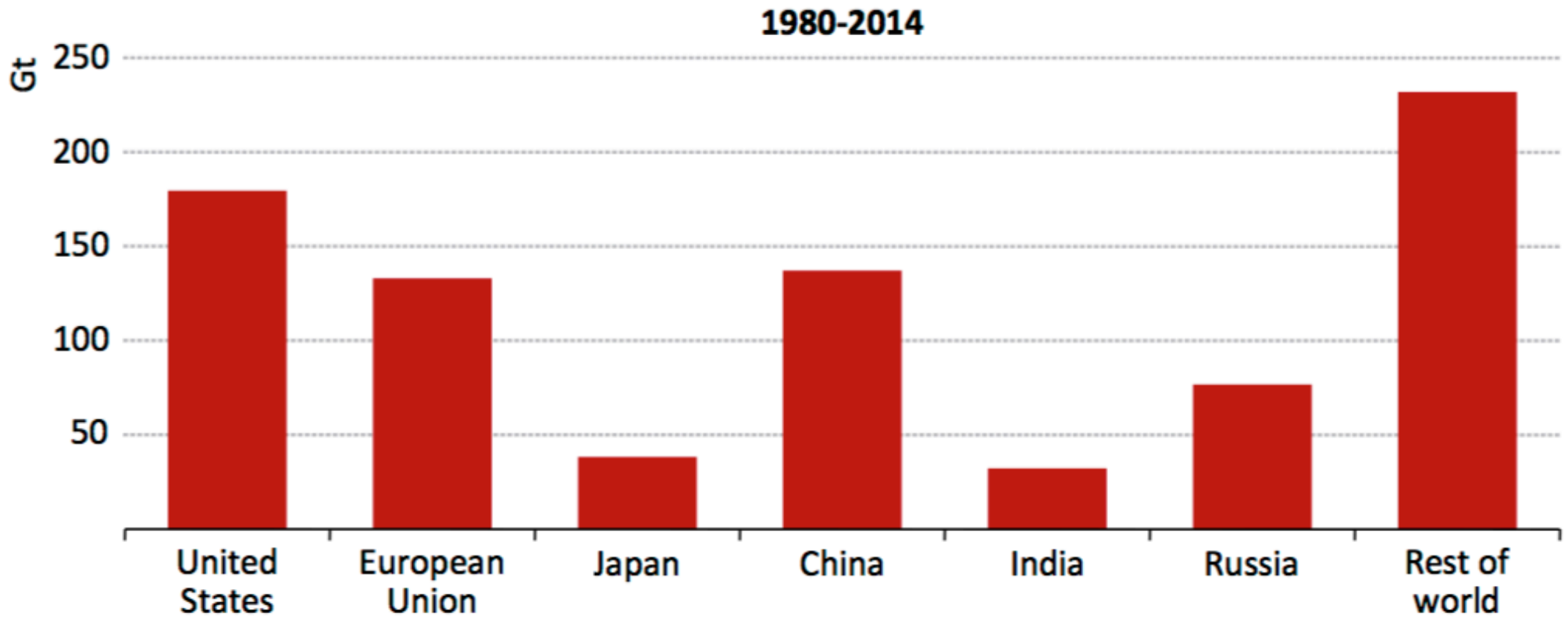
Tko može najviše za globalni okoliš?

CO_2 emisije iz energetskih postrojenja po regijama (2014.) (1)

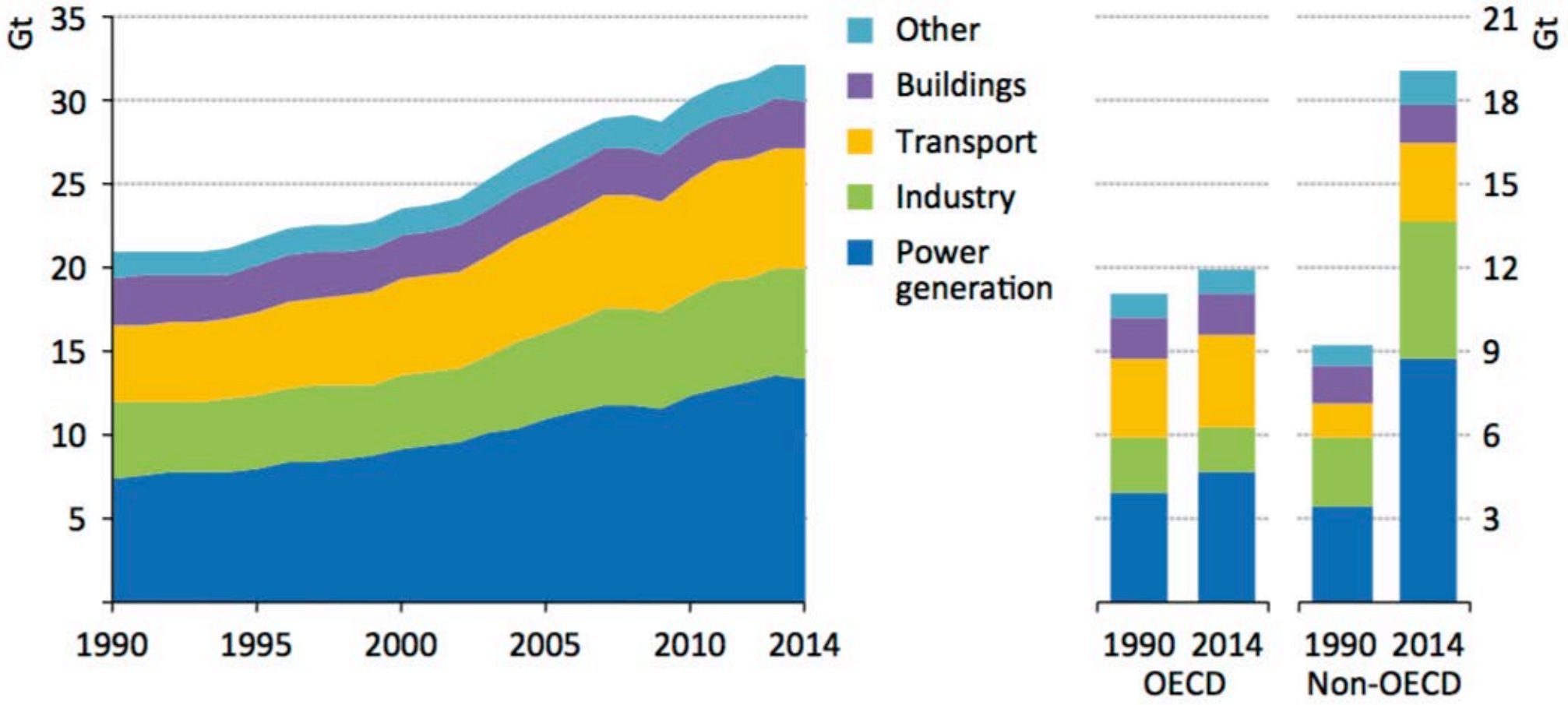


Notes: The implicit CO_2 subsidy is calculated as the ratio of the economic value of those subsidies to the CO_2 emissions released from subsidised energy consumption. ETS = emissions trading scheme.

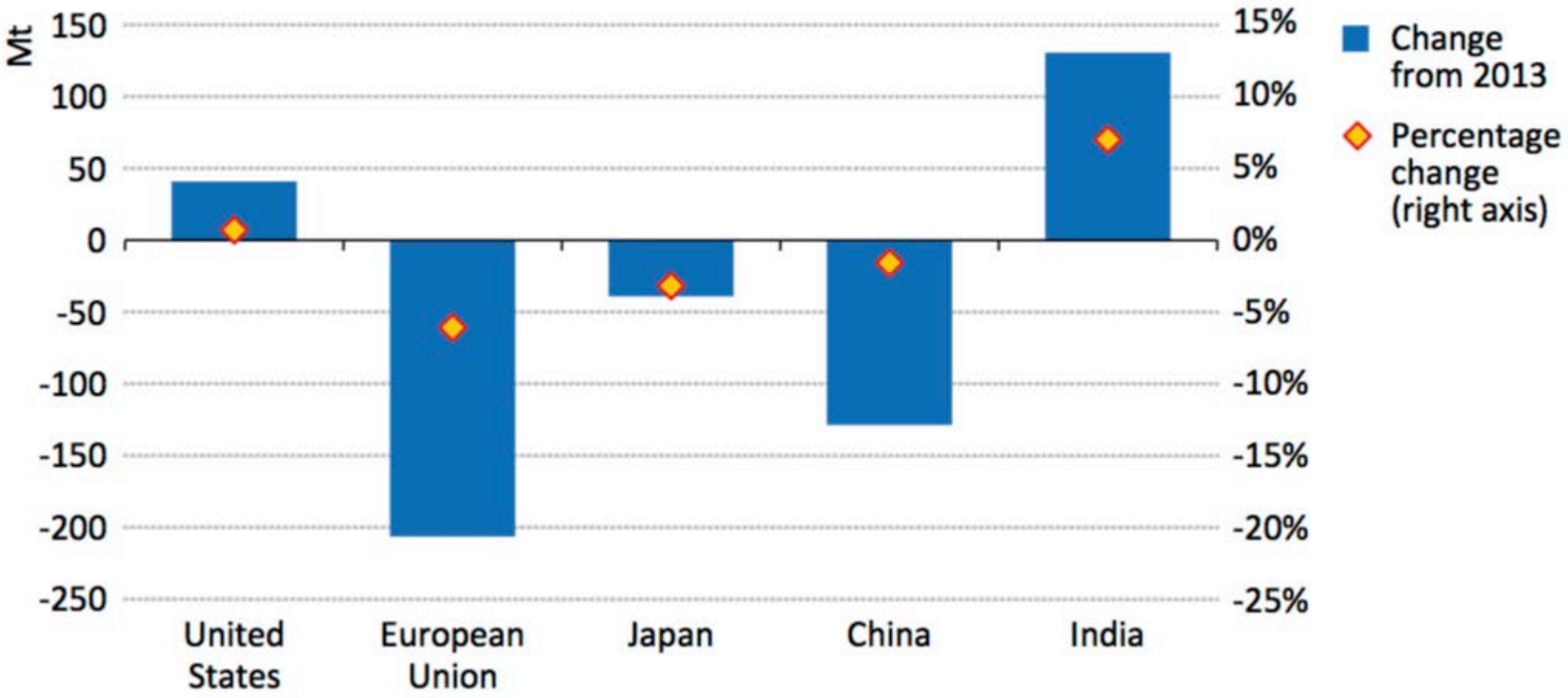
CO_2 emisije iz energetskih postrojenja po regijama



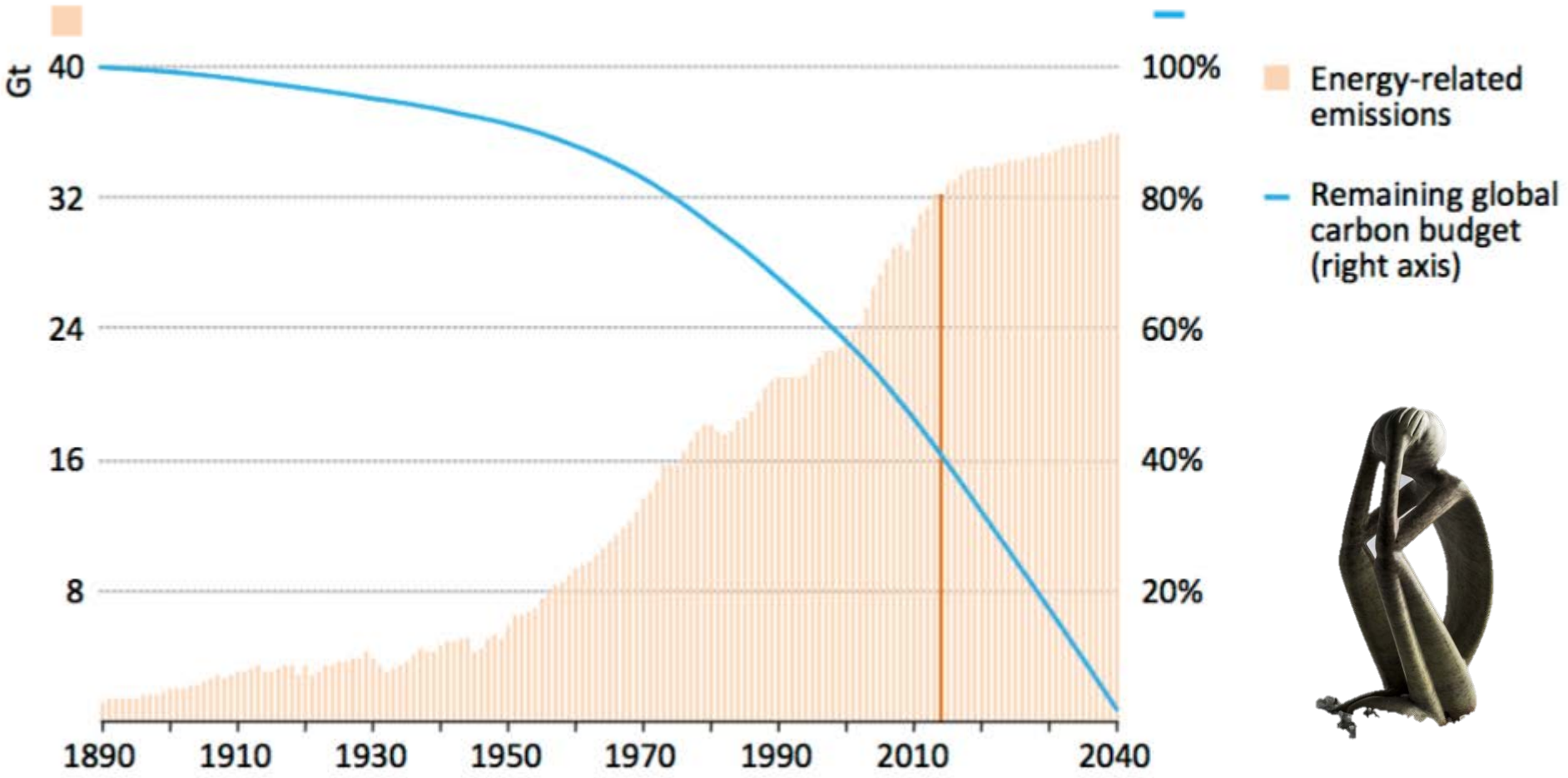
CO_2 emisije po sektorima i OECD vs nonOECD



Promjene CO_2 emisija po regijama 2013.– 2014.



CO_2 emisije u INDCs* scenariju i ostatne količine po godinama za vjerojatnost >50% postizanja 2 °C



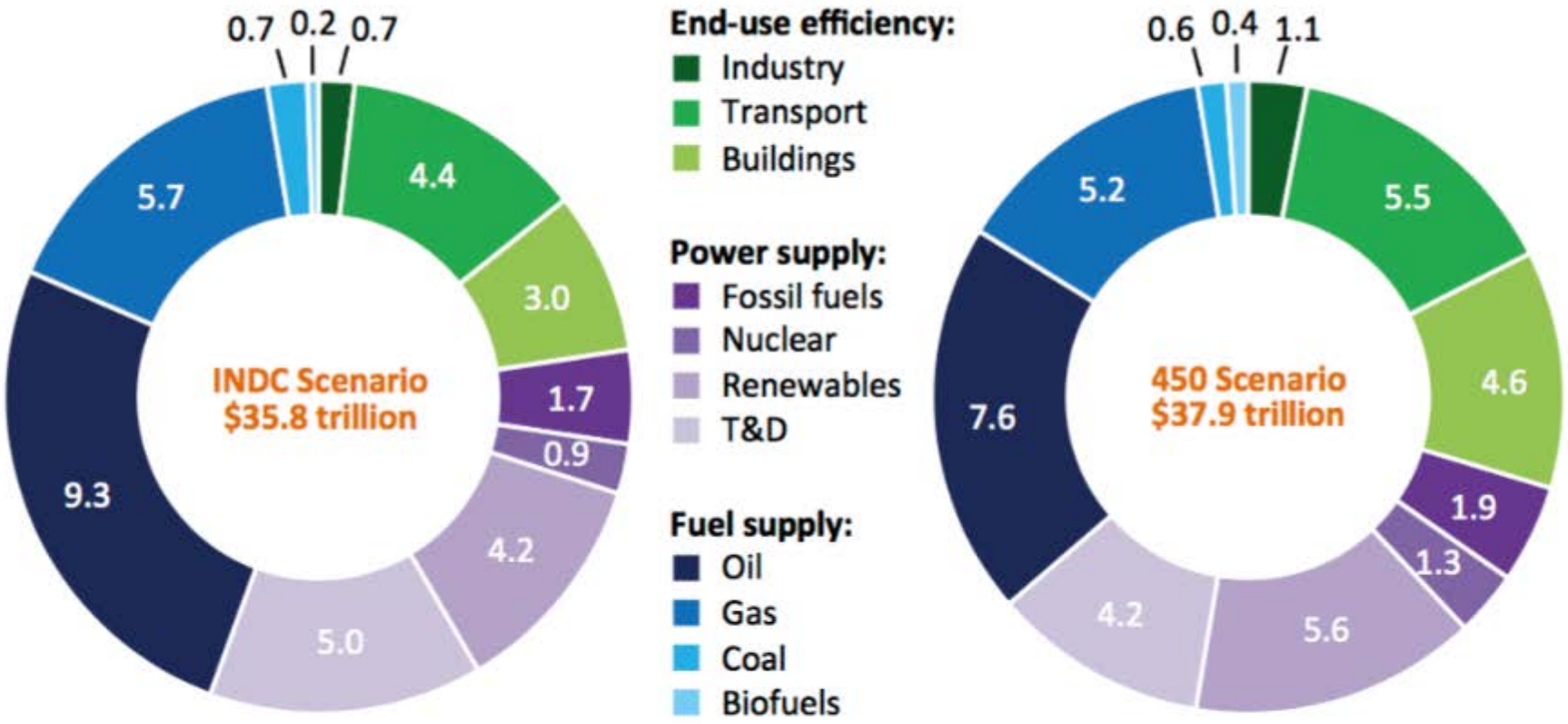
*Intended Nationally Determined Contributions (INDCs) (made for COP21)

INDC po zemljama

UNFCCC Party	Intended Nationally Determined Contribution (INDC)
Switzerland	Reduce GHG emissions by 50% below 1990 levels by 2030 (35% below by 2025).
European Union	Reduce EU domestic GHG emissions by at least 40% below 1990 levels by 2030.
Norway	Reduce GHG emissions by at least 40% compared with 1990 levels by 2030.
Mexico	Reduce GHG and short-lived climate pollutant emissions unconditionally by 25% by 2030 with respect to a business-as-usual scenario.
United States	Reduce net GHG emissions by 26% to 28% below 2005 levels by 2025.
Gabon	Reduce CO_2, CH_4, N_2O emissions by at least 50% with respect to a reference scenario by 2025.
Russia	Reduce anthropogenic GHG emissions by 25% to 30% below 1990 levels by 2030 subject to the maximum possible account of absorptive capacity of forests.
Liechtenstein	Reduce GHG emissions by 40% compared with 1990 by 2030.
Andorra	Reduce GHG emissions by 37% with respect to a business-as-usual scenario by 2030.

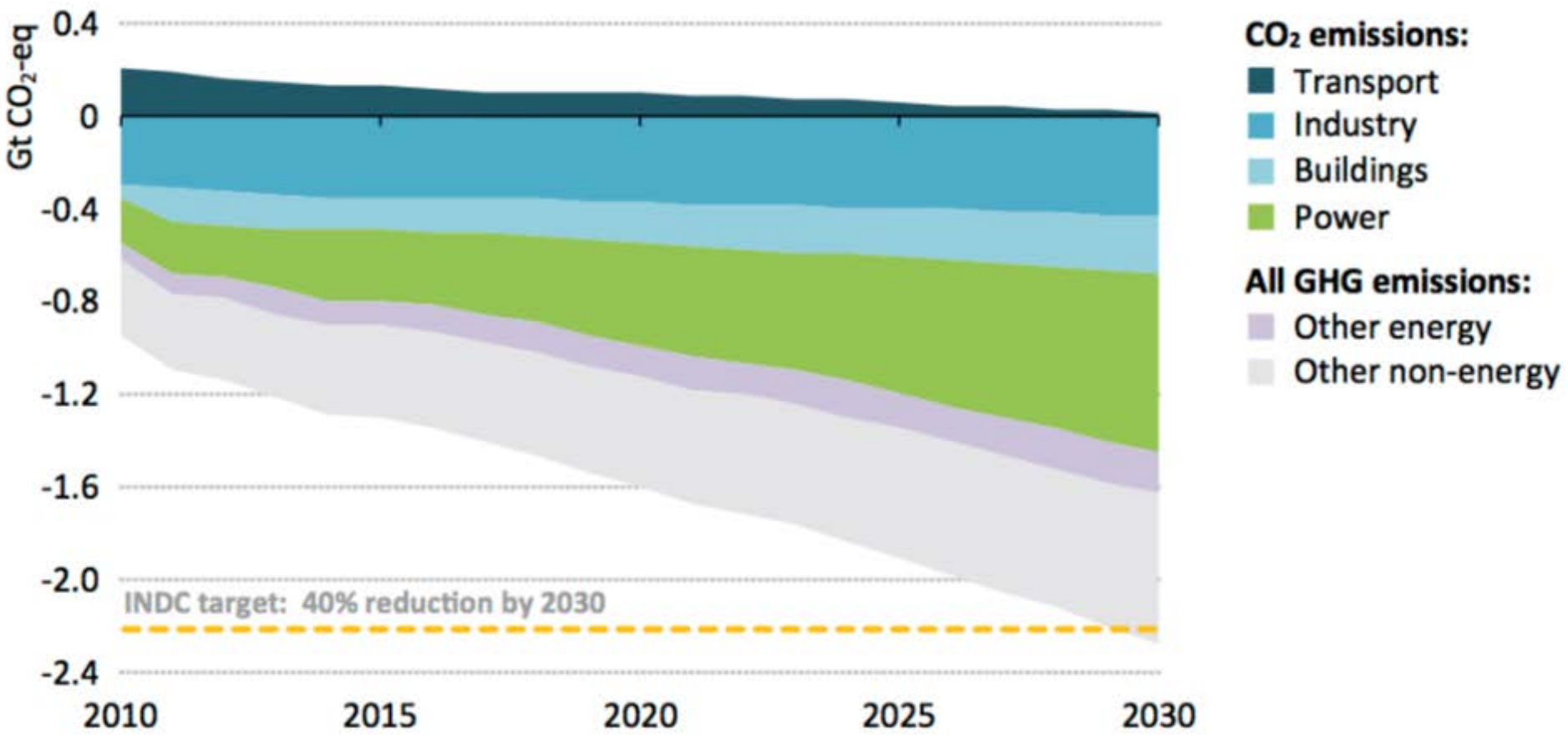
Note: This table contains all contributions that had been submitted to the UNFCCC by 14 May 2015 and is in the order in which they have been submitted.

Potrebne investicije po sektorima u INDC i 450 scenariju – 2015.-2030. (mld $2013)

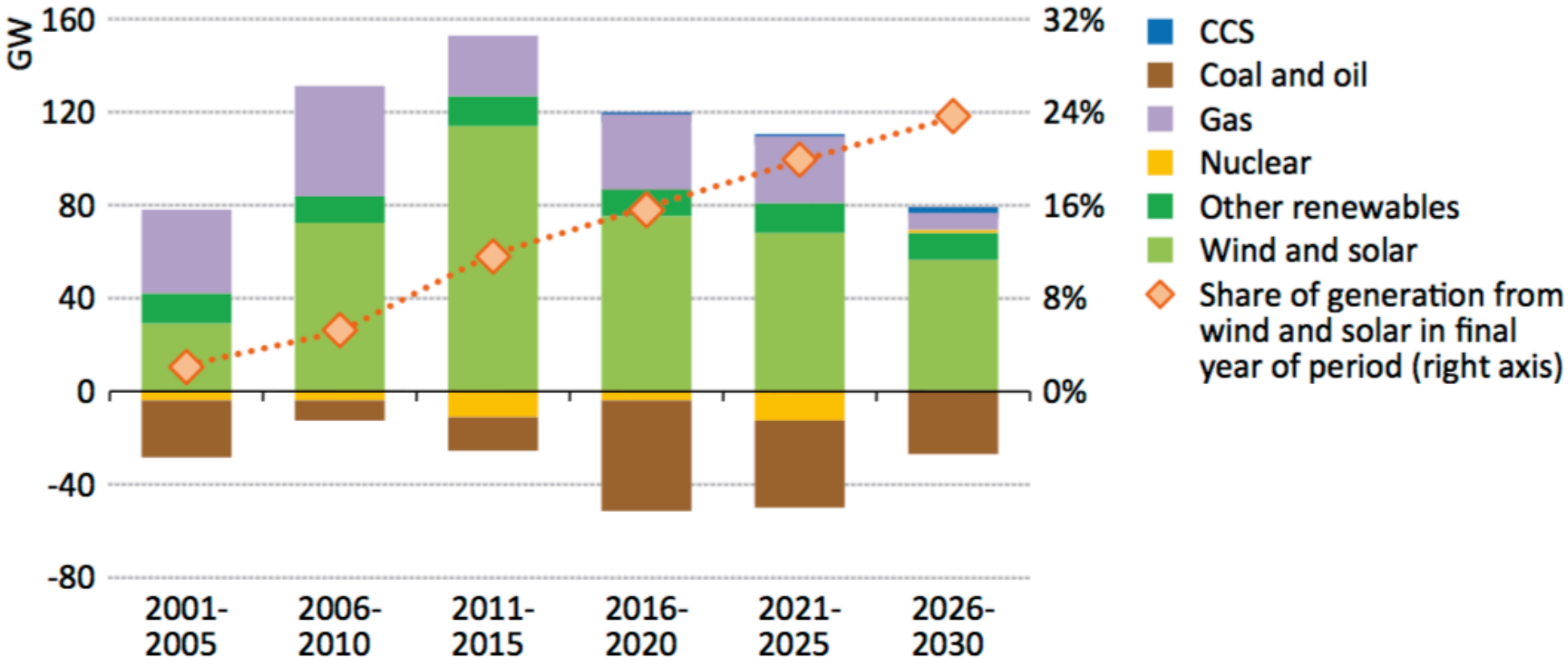


Note: T&D is transmission and distribution.

EU - CO_2 smanjenje prema 1990. u INDCs scenariju



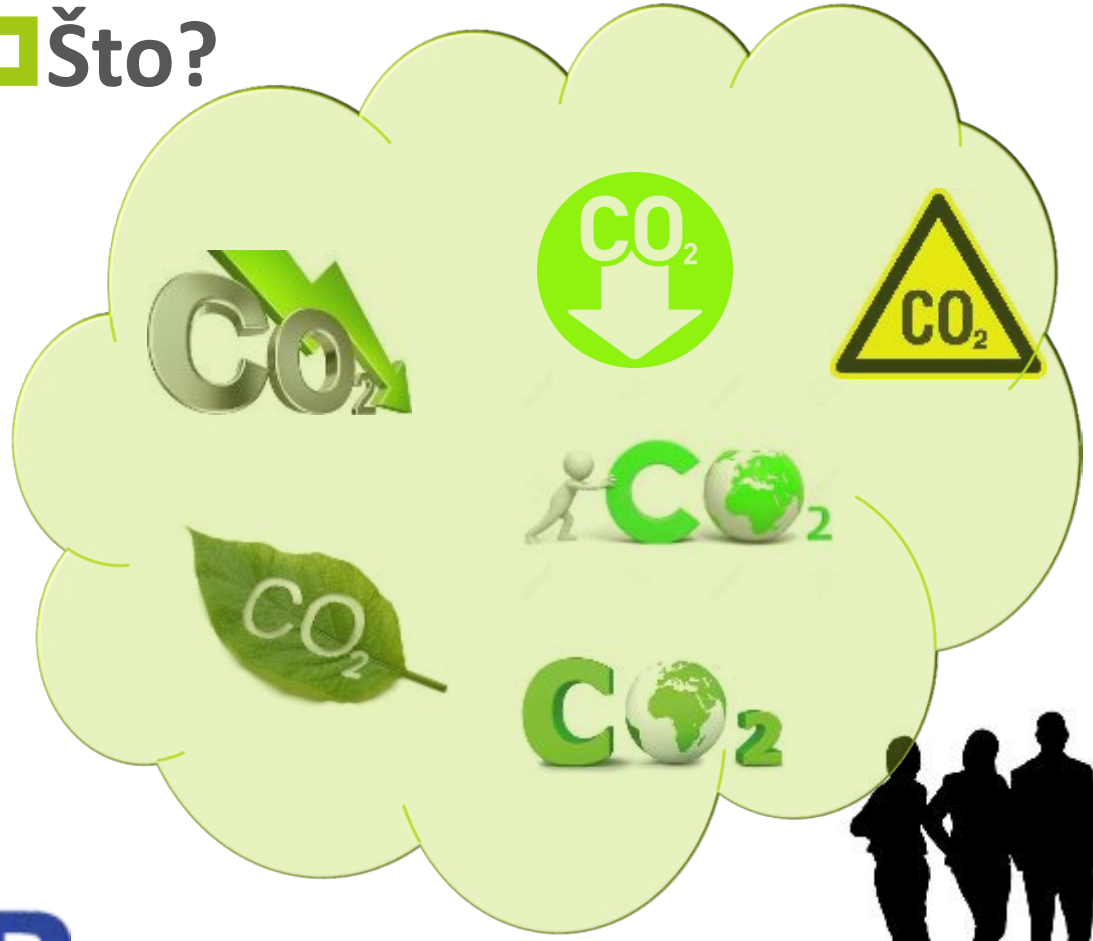
EU neto izgradnja po tipovima elektrana i učešće *W&S* u INDCs scenariju



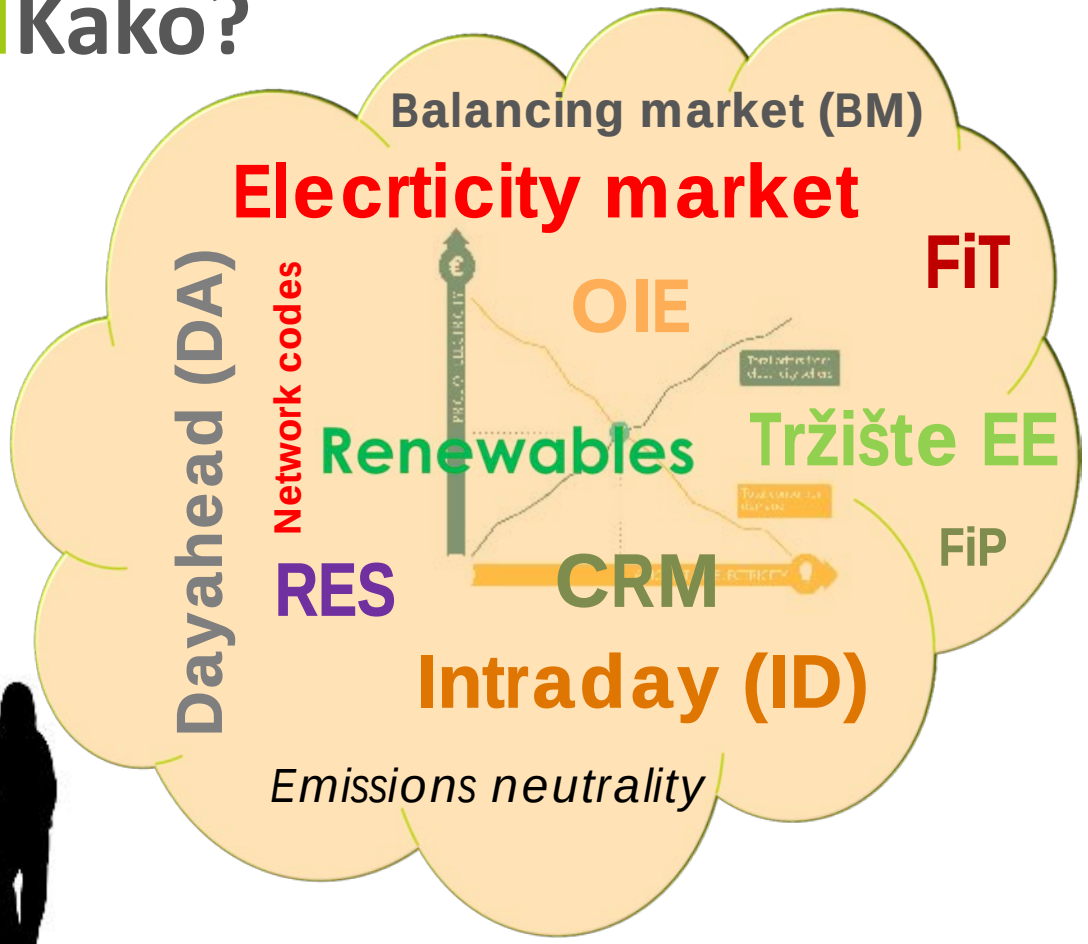
Kako dalje?

Ključne riječi ili **okvir(i) za "promjenu"**

Što?



Kako?



I DIO
Pariški dogovor

PARIS2015
CONFÉRENCE DES NATIONS UNIES SUR LES CHANGEMENTS CLIMATIQUES
COP21·CMP11

COP21: *Paris Climate Agreement (PCA)* - što znači za nas?

http://www.bbc.com/news/science-environment-35092127

PARIS2015
CONFÉRENCE DES NATIONS UNIES SUR LES CHANGEMENTS CLIMATIQUES
COP21·CMP11

Pariški dogovor kroz pitanja i odgovore …

http://www.mirror.co.uk/news/world-news/cop21-you-need-know-after-7002387

Zašto nam je trebao “Pariški dogovor”? (1)

- **Što je postignuto?**
  - Prvi *Climate change* dogovor koji može zaustaviti porast globalne temperature, a da u njemu sudjeluju sve zemlje
- **Zašto nam je Pariški ugovor tako važan i zašto tek sada?**
  - Kyotski protokol (1997.) bio je dogovor samo razvijenih zemalja, a k tome **USA ga nije nikada ratificirala**
  - Kyotski protokol ističe 2020. i Pariški bi ugovor trebao biti njegov (na)slijednik
- **2020. nije daleko – zašto se tek sada dogovaramo?**
  - Ozbiljan je pokušaj bio i 2009. u Kopenhagenu, ali pokazalo se da nije postojala ozbiljna namjera i da neke zemlje nisu bile spremne za taj “radikalan” korak (SAD, Kina, …)

Zašto nam je trebao “Pariški dogovor”? (2)

- **Što je ovaj puta bilo drugačije?**
  - Svijet više **nije u recesiji** kao 2009. godine
  - Cijena ***nonCO2*** tehnologija znatno je pala (*learning curve i economy of scale*) što je stvorilo eksponencijalni rast izgradnje
  - **Kina** se odlučila ozbiljnije pozabaviti s tim problemom (ali i zagađenjem zraka u širem smislu)
  - **Znanost** je postala gotovo **jedinstvena** - *Climate change* je danas znanstveno “nedvosmislen”
  - **Priprema** za COP21 je počela **na vrijeme**. Obavljene su mnoge političke i stručne pripreme prije konferencije
  - **Mnoge zemlje** (njih 187, a koje pokrivaju 95% emisija) već su donijele svoje službene **politike za smanjenje emisija** s ciljevima do 2030 (INDCs)

Zašto nam je trebao “Pariški dogovor”? (3)

- **Ako imamo planove za smanjenje CO_{2eq} zašto trebamo i ugovor na svjetskoj razini?**
  - Planovi za smanjenje po zemljama nisu dovoljni. Nastavak današnjih politika vodi ka povišenju globalne temperature od 3 ^{0}C u 2100.
  - Ugovor predviđa jednu vrstu "*review and ratchet*” sustava za sve zemlje odnosno obvezu da se **ciljevi provjeravaju na globalnoj razini** i da se politike “jačaju” u skladu s (ne)postignutim
  - Zemlje su se obvezale da će dostaviti “2020 *update*”, a za ciljeve 2030., nakon inventure 2018.

Zašto nam je trebao “Pariški dogovor”? (4)

- **Imamo li pozitivnih primjera iz prošlosti? Koliko je prethodnih dogovora na globalnoj razini dalo rezultate?**
  - **Ima ih** iako ne tako sveobuhvatnih kao što je *Climate change*. Npr. Montrealski dogovor o stavljanju van uporabe kemikalija koje izazivaju ozonske rupe
- **Hoćemo li “sačuvati” planet Zemlju?**
  - Samo **budućnost će znati** reći koliko smo bili uspješni
  - Predviđeni “**Pariški alati**” omogućavaju sveobuhvatno sagledavanje i prijelaz iz fosilnih ka “čistijim” tehnologijama
  - Predviđa se potreba “***net zero emissions***” u **kasnijim godinama** ovoga stoljeća
  - Nada iz Pariza treba **potaći investitore** da ulažu u tehnologije koje omogućavaju zaustavljanje rasta CO_2 emisija, ali i da se spremaju za “*zero-carbon world*”

Zašto je PCA (*Paris Climate Agreement*) uspio?

China's Next Steps After COP21 by Richard Brubaker (Forbes)

So, while nothing in COP21 is legally binding, I think that in combination with the US-China announcement, **China has already begun a process of transacting on commitments to bring emissions under control**. It may not be coming out of a sense of moral obligation to the global climate, but perhaps that is why many view China as one of the leaders.

Because, beyond the emotions behind the issues, concrete actions are being taken in China every day

Agreement itself was a major achievement because it's the first time that all the major parties, including the United States, **were able to reach a consensus.**

http://www.forbes.com/sites/ceibs/2015/12/30/chinas-next-steps-after-cop21/#57bed9e07ba1

Ima li nade budući da su mnogi dogovorili “pali” u primjeni?
Pogled industrije i drugih …

Reakcije: Nade industrije nakon COP21 (1)

- Thomas Richterich, CEO Onshore, Siemens Wind Power and Renewables:
  - "The Paris Agreement marks a **historic turning point and represents a strong signal towards political support** of a long-term path to decarbonization and confidence that governments will progressively raise their emissions reductions commitments."
- Morten Dyrholm, vice president, head of public affairs, Vestas:
  - "The Paris Agreement is **a positive step in the right direction** and will accelerate the momentum that wind energy and other renewables have built in recent years, and thus further strengthen the foundation for investments in renewable energy."

http://www.windpowermonthly.com/article/1376844/reaction-industry-hopeful-cop21-updated-17-december

Reakcije: Nade industrije nakon COP21 (2)

- James Hansen, climate change scientist:
  - "It's a fraud really, **a fake**. There is **no action, just promises**. As long as fossil fuels appear to be the cheapest fuels out there, they will continue to be burned."
- John Childs, head of business development in EMEA, Envision Energy:
  - "With the agreement, there is an **ambitious plan for investments in wind energy** in the global effort to combat climate change. The agreement will result in an increased commitment throughout the world since we need to stand together if we are to solve the challenges related to global warming. **We are extremely optimistic**"

COP21 nakon … neki ključni koraci su ispred nas …

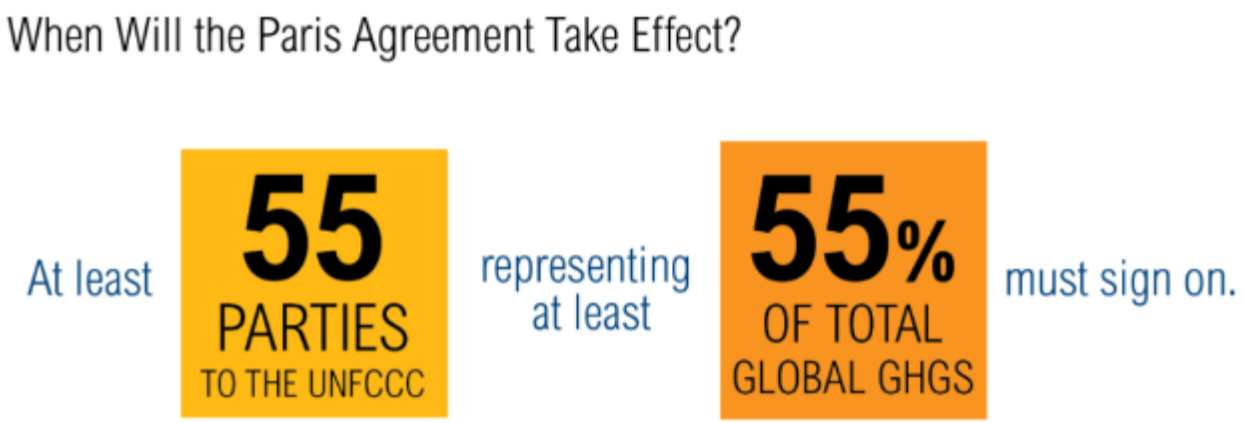
http://www.wri.org/sites/default/files/uploads/Paris_Ratification_blogrraphics_v2-03.png

Koraci koji slijede (1)

- **Na COP21 zemlje (njih 196) su se usuglasile. Znači li to da je Ugovor na snazi?**
  - Ne. Nekoliko je koraka ispred svih zemalja. Korak u Parizu (12. prosinca 2015.) dio je procedure koja se naziva *"adoption of COP to UNFCCC"*. No, taj tekst dio je i sadržaja budućeg Ugovora.
  - Postignut je dogovor i oko mnogo drugih detalja. Npr. koji su **potrebni koraci** da Ugovor stupi na snagu; Dogovor kako zemlje trebaju dovršiti svoje planove *(from Intended Nationally Determined Conttributions – INDCs to the Nationally Determined Conttributions (NDCs))* itd.

Koraci koji slijede (2)

- **Što se još mora dogoditi?**
  - Općenito govoreći, zemlje formalno moraju pristupiti Ugovoru. Nakon što 55 zemalja UNFCCC (tzv. *Parties*), a koje predstavljaju najmanje 55% ukupnih emisija, daju svoj pristanak da budu dio Ugovora, Ugovor će stupiti na snagu
  - Nakon što Ugovor i formalno stupi na snagu održat će se prvi sastanak zemalja potpisnica na kojem će se dogovoriti svi detalji oko primjene Ugovora

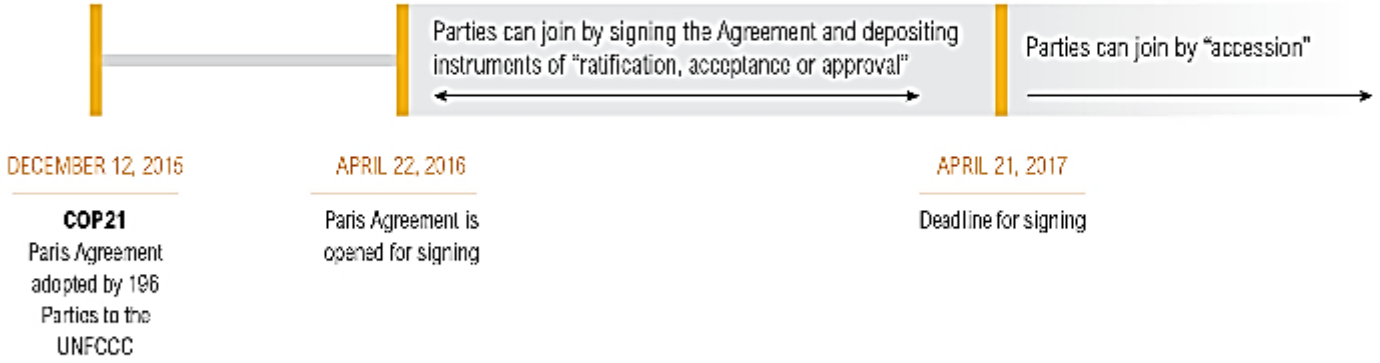


WORLD RESOURCES INSTITUTE

Koraci koji slijede (3)

- **Koji je vremenski rok za davanje pristanka na Ugovor?**
  - **22.4.2016.** održalo se potpisivanje na visokoj razini u UN (175 *Parties* - 174 zemalja+EU potpisalo)
  - Potpisivanje će biti moguće kroz godinu dana (do 21.4.2017.). Bit će moguće i kasnije (tzv. *accession*)
  - Samo potpisivanje ne znači i "pristanak" na Ugovor. Smatra se da zemlja postaje "*Party*" kada Ugovor ratificira u svojim parlamentima ili na neki drugi nacionalan način (Senat, Predsjednik i sl.)

Timeline for Signature and Ratification of the Paris Agreement



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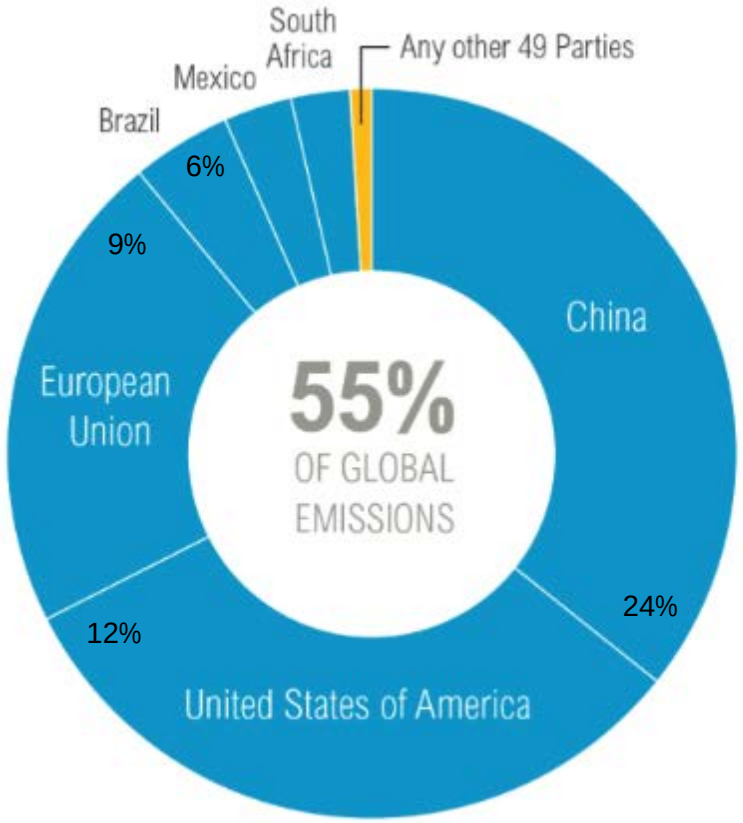
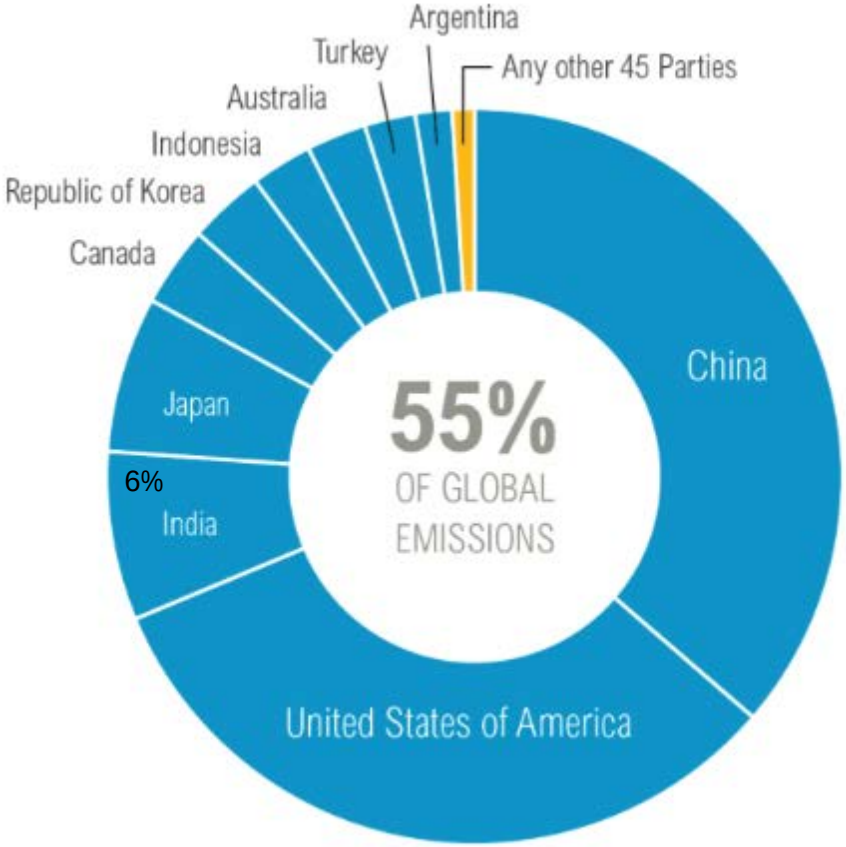
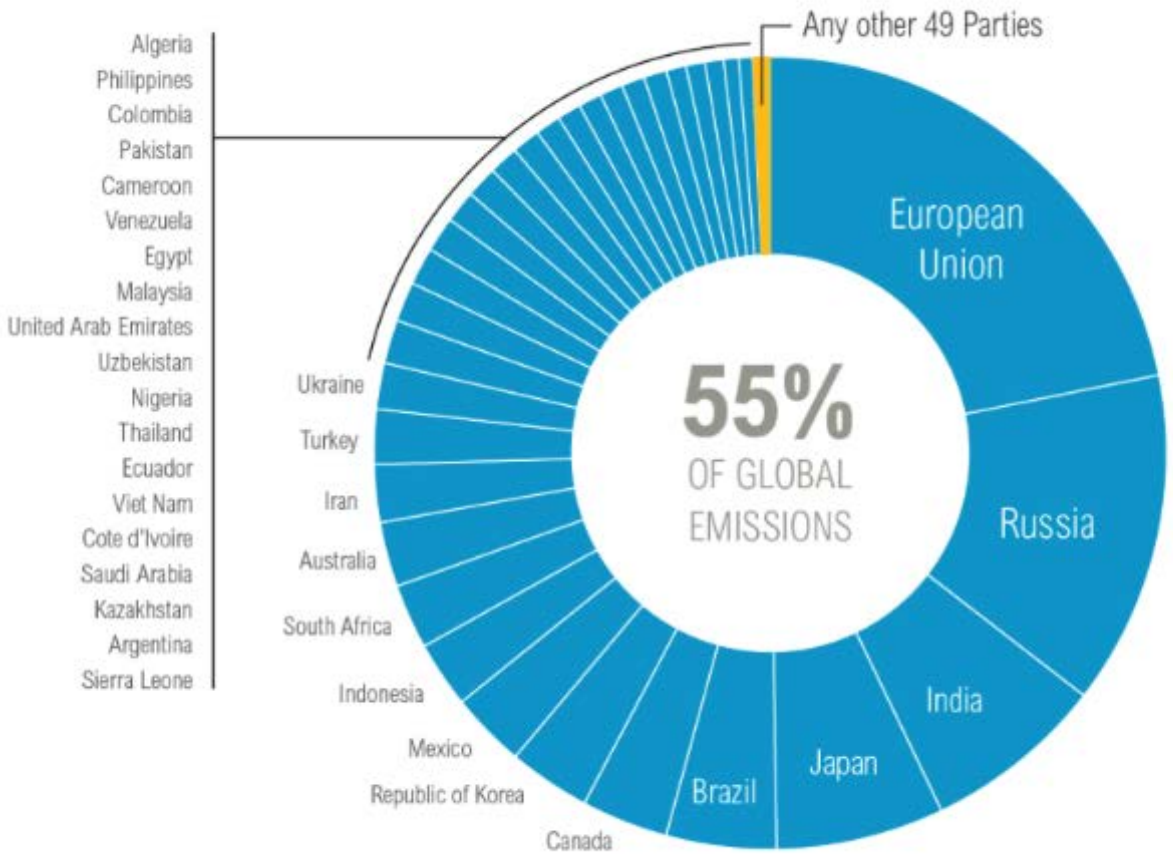
Tri primjera kako Ugovor može stupiti na snagu (1)





Tri primjera kako Ugovor može stupiti na snagu (2)



Nakon COP21:
7 ključnih zadaća za implementaciju Pariškog ugovora

http://www.wri.org/blog/2016/03/after-cop21-7-key-tasks-implement-paris-agreement

After COP21: 7 Key Tasks to Implement the Paris Agreement (2016-2019)

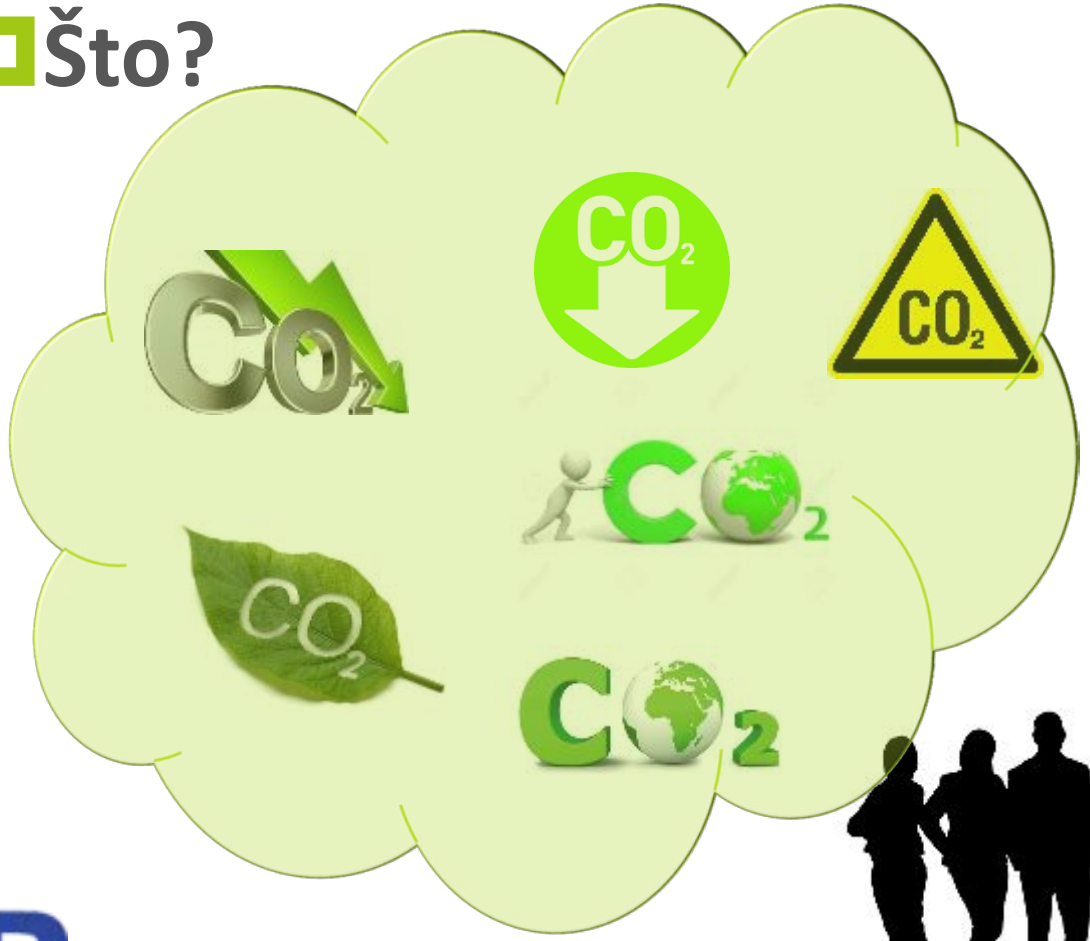
- Provide Guidance for Countries to Increase their Ambition
- Ensure Transparency and Accountability
- Track Climate Finance
- Create an Adaptation Cycle of Ambition
- Design the First Dedicated Committee for Capacity Building
- Decide How Countries Can Achieve their Mitigation Targets Cooperatively
- Create a New Technology Framework

Kako to postići?

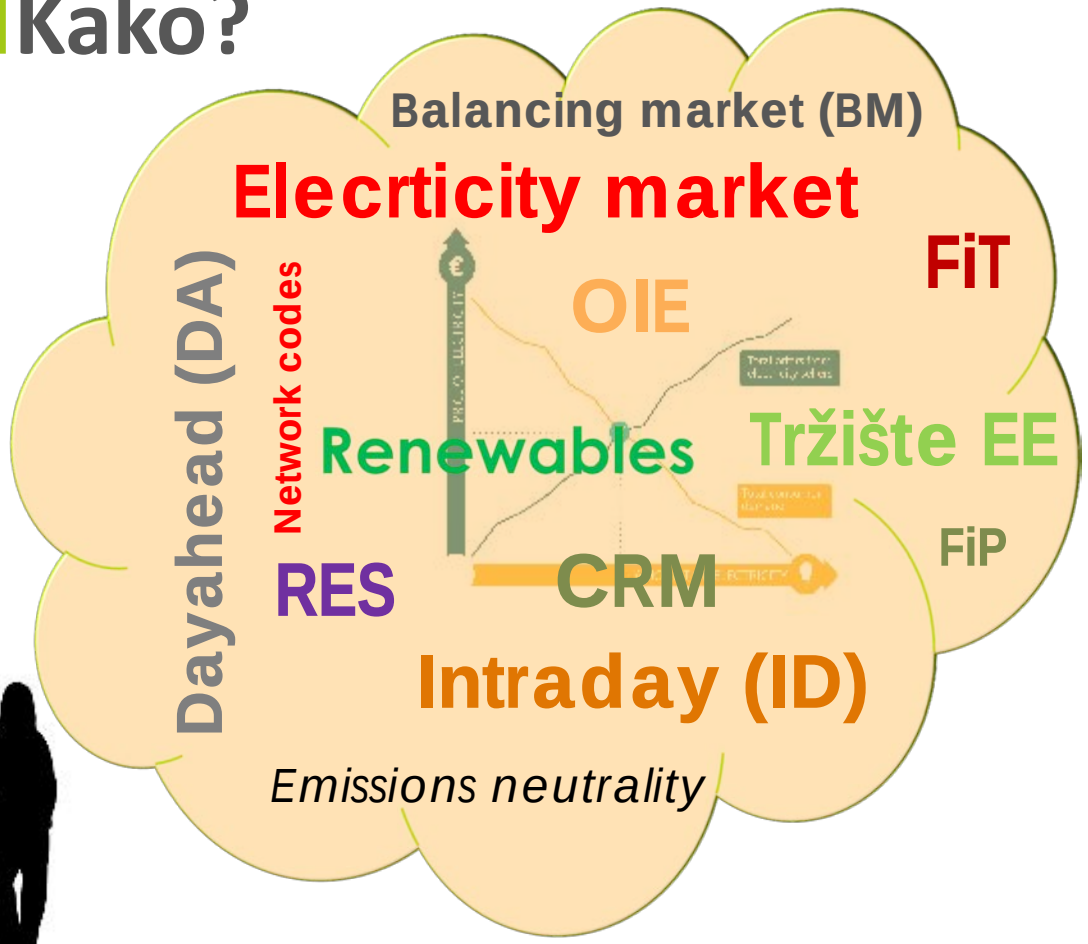
II DIO
Razvoj tržišta električnom energijom

Podsjetimo se: **Okvir(i) za "promjenu"**

- **Što?**

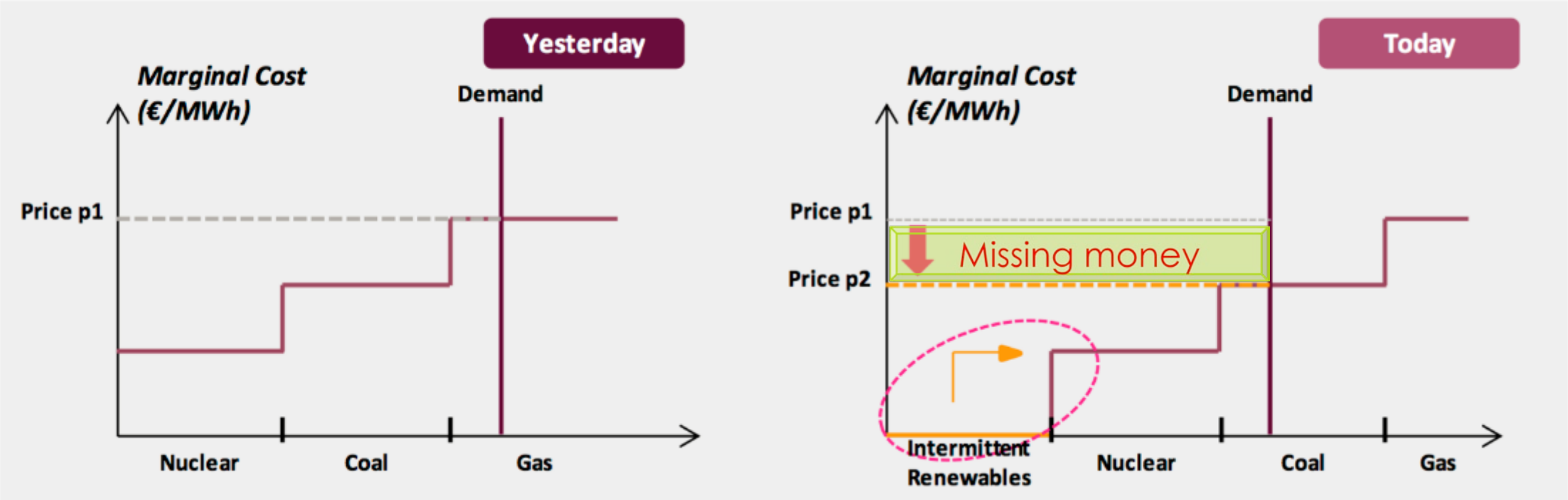


- **Kako?**



Missing money problem i Load factor problem kada imamo kompetitivnost …

Evolution of the Marginal Cost due to the emergence of renewable



Tržište električnom energijom u okruženju < CO_2 i > OIE

- **Otvoreni izazovi**
  - Sigurnost opskrbe (*Security of Supply*)
  - Nedostatni novac za nova ulaganja *(Missing money problem)*
  - Tržište kapacitetima (*Capacity Remuneration Mechanism* – CRM) - Florance Forum, October 2015
  - Treći (četvrti?) energetski paket (*Enforcement Third Energy Package*) - Florance Forum, June 2015
  - Mrežna pravila (*Network codes*) - Florance Forum, October 2015 and March 2016
  - Novi model tržišta – europska dimenzije (*New Market design*) - Florance Forum, June 2015
  - Tržište za dan-unaprijed (*Day ahead market*) - Florance Forum, March 2016
  - Unutar-dnevno tržište (*Intraday market*) - Florance Forum, March 2016
  - Tržište uravnoteženja (*Balancing market*) – Florance Forum, March 2016

Present transformation(s):

“This is not plug-and-play; it is civilization reboot”

THE END