

Viitorul pe care ni-l asigurăm

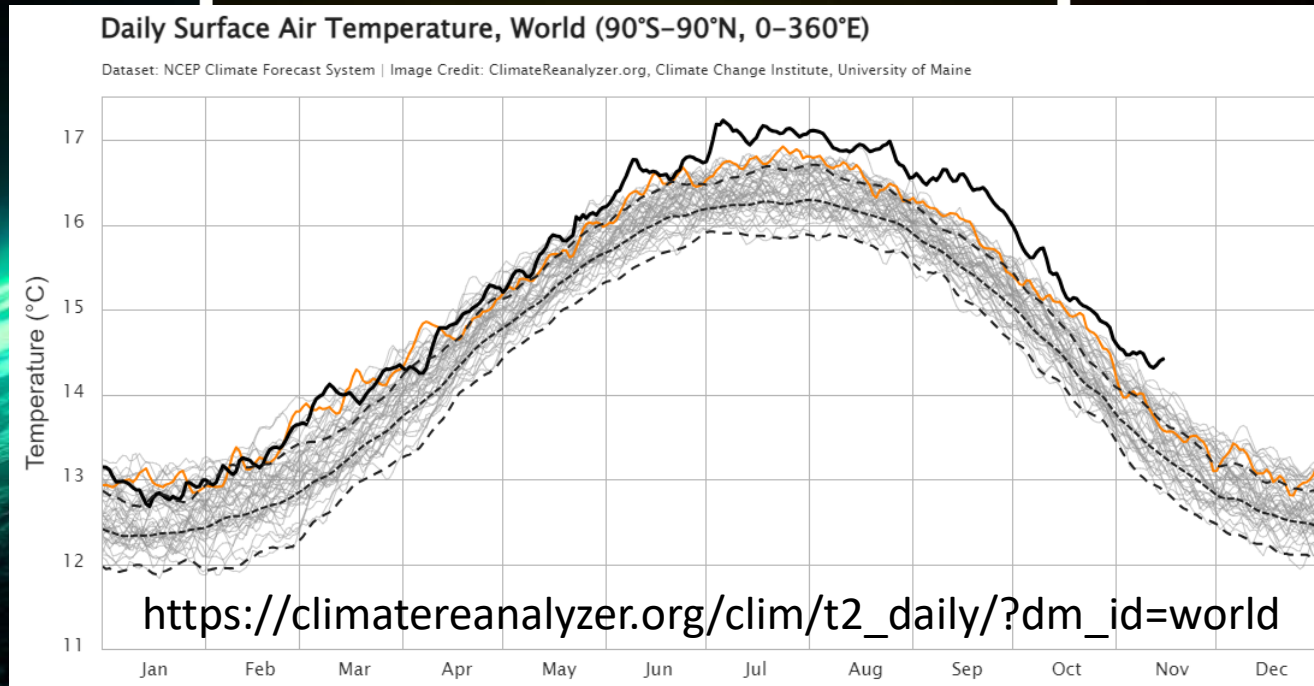
Prof. Lucian Toma, Prof. Mihai Sănduleac

Universitatea Națională de Știință și Tehnologie Politehnica București



United Nations
Climate Change

The different futures that lie ahead.



+1.5 °C

+2 °C

+3 °C

THE ENERGY TRANSITION



The European Commission's strategy

- In 2010, the EU's 2020 target was to reduce greenhouse gas emissions by at least 20%, increase electricity production from renewable sources to at least 20% of final consumption and achieve efficiency of at least 20% [European Commission, “Energy 2020. A strategy for competitive, sustainable and secure energy, Brussels, 10.11.2010].
- **EU Winter Package**, issued in November 2016, sets new targets for reducing greenhouse gas emissions by at least 40% by 2030. The proposal has three objectives: to put **energy efficiency first**, to become a world leader in renewable energy production, and to ensure a **fair environment for customers**. [http://europa.eu/rapid/press-release_IP-16-4009_en.htm].
- The new strategy aims to increase production from renewable sources by at least 27% by 2030, but the ultimate goal is to get 100% clean energy by 2050.. [<http://www.europe-infos.eu/the-winter-package-of-the-european-commission>].

The European Commission's strategy

https://energy.ec.europa.eu/topics/markets-and-consumers/energy-communities_en

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32018R1999>

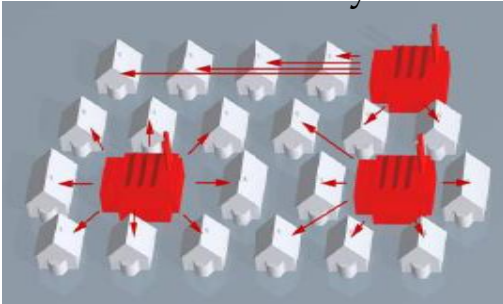
- (64) Member States should use the energy efficiency first principle, which means to consider, before taking energy planning, policy and investment decisions, whether cost-efficient, technically, economically and environmentally sound alternative energy efficiency measures could replace in whole or in part the envisaged planning, policy and investment measures, whilst still achieving the objectives of the respective decisions. This includes, in particular, initiatives and more efficient conversion, transmission and distribution of energy. Member States should also encourage the spread of that principle in regional and local government, as well as in the private sector.
- (19) Electricity from renewable sources should be deployed at the lowest possible cost to consumers and taxpayers. When designing support schemes and when allocating support, Member States should seek to

THE ENERGY TRANSITION

19th Century

Electrification society
"the coal age"

Unsustainable system



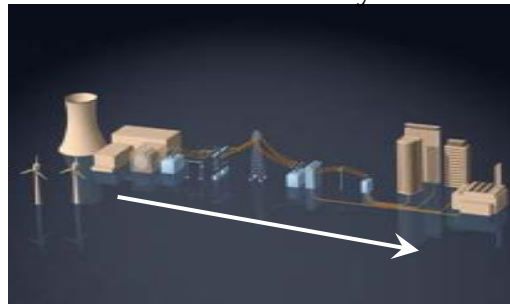
Generation and load at islanded
Islanded supply and stochastic load

Fossil fuel based sources, hydro

20th Century

Development and diversification of generation
"fossil fuels age"

Unsustainable system



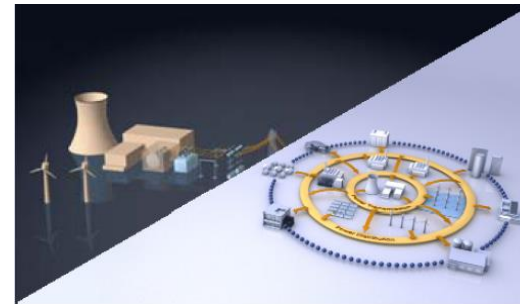
Generation follows the load
Integrated network, central generation, predictable stochastic load, unidirectional load flow

Fossil fuel based sources, hydro, nuclear

21st Century

Transition to the age of electrification

Challenges for a new approach
1) Demographics; 2) Resources availability; 3) Climatic changes



Choice to use various generation sources
Decentralization, Intermittent generation, the consumer becomes prosumer

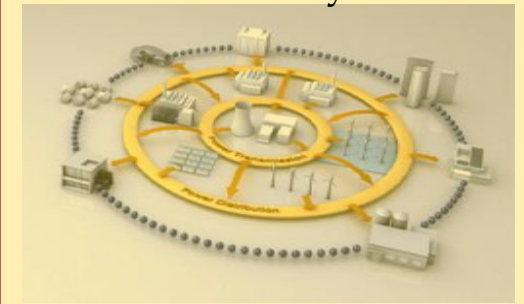
Fossil fuel based sources, hydro, nuclear, biomass, wind, solar

21st Century

New electricity age

The electricity will be the energy source for most of the daily applications

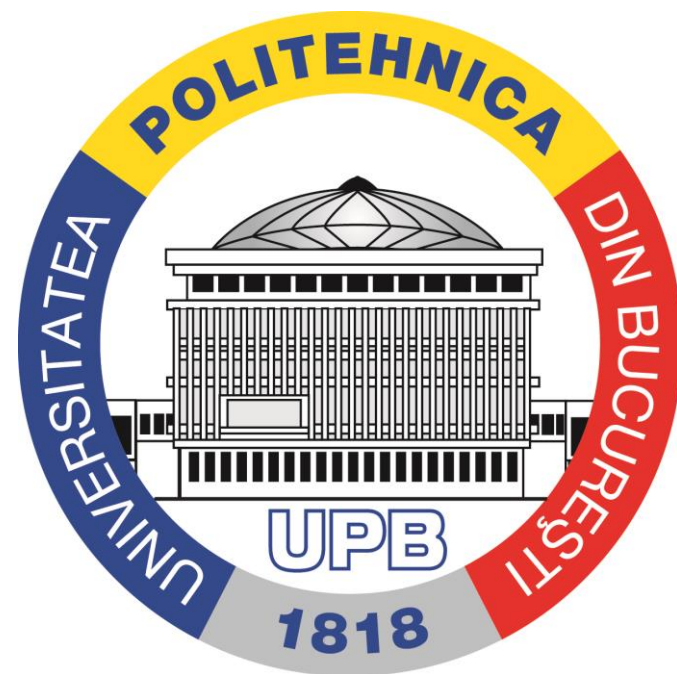
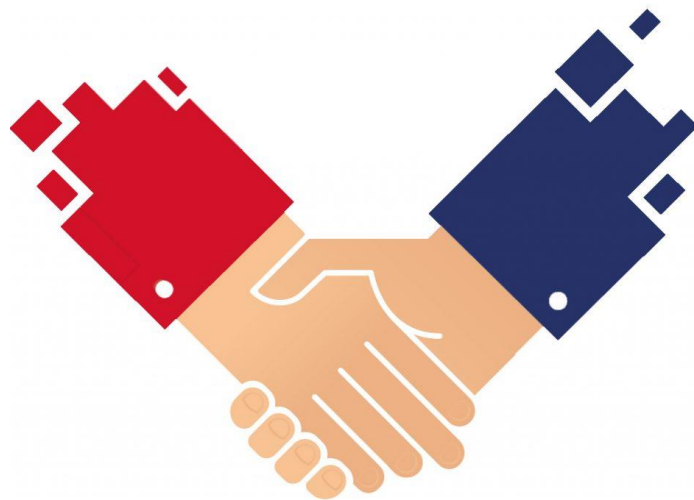
Sustainable system



Load follows generation
Centralized + decentralized generation, intelligence with ICT, bidirectional load flows

Renewable energy sources (wind, solar, hydro, biomass)
clean coal, gas, nuclear

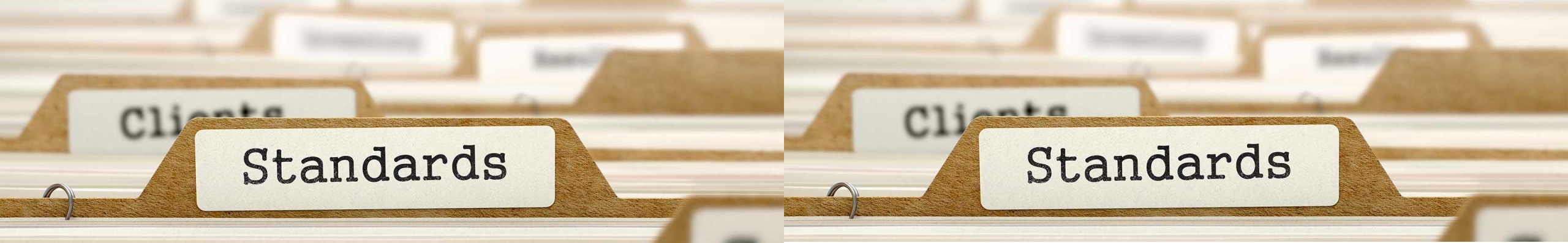
Let's work together ...



The electrical infrastructure is always at risk ...

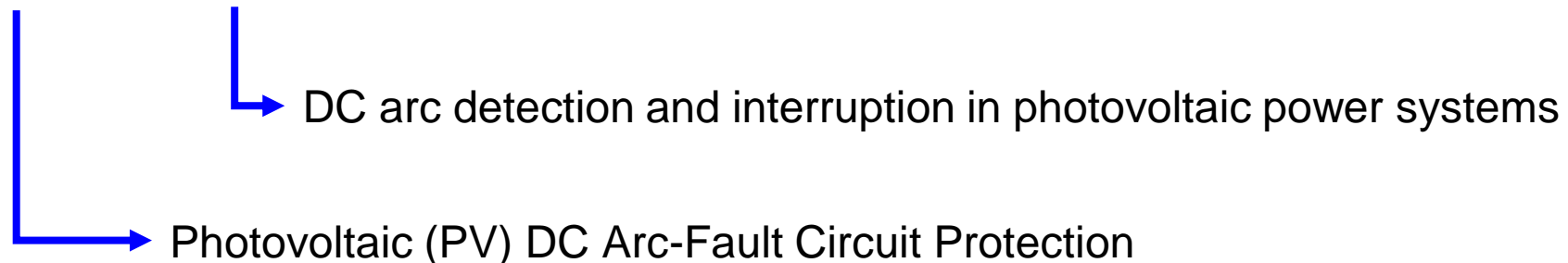






- Arc risk assessment standards (IEEE 1584, NFPA 70E)
- PV system and installation standards (IEC 62548, IEC 60364-7-712)
- PV inverter standards (IEC 62109, UL 1741)

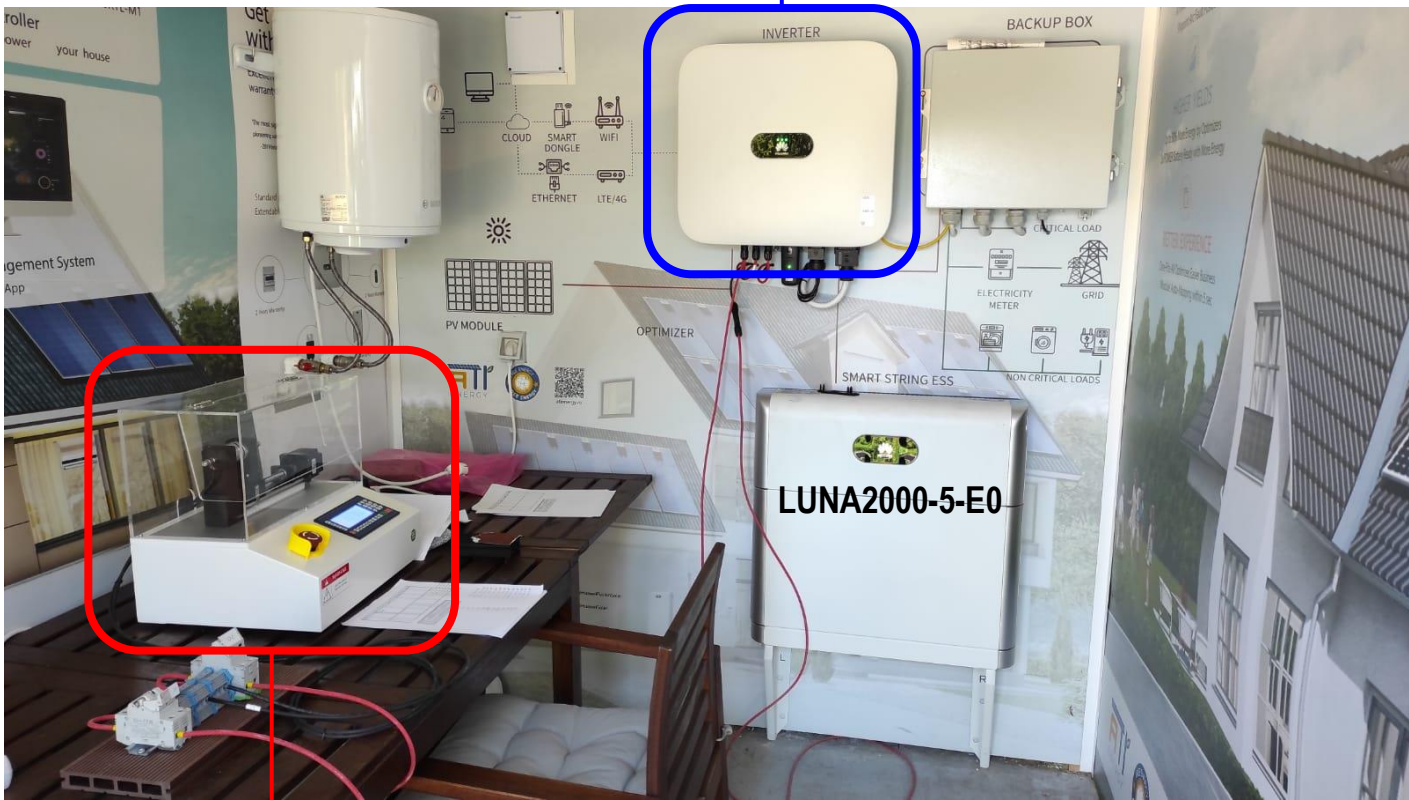
➤ AFCI standards (UL 1699B, IEC 63027, GB/T 39750)





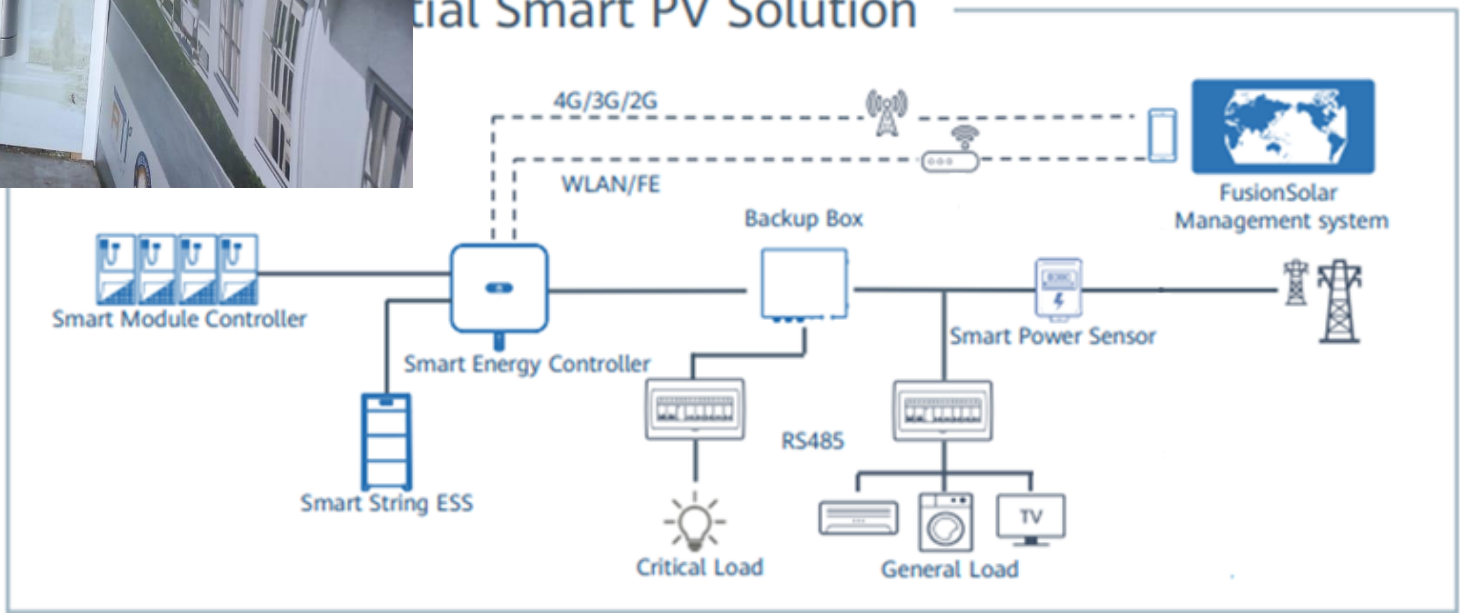
SUN2000-xKTL-XX

HUAWEI SUN2000-6KTL-M1



Arc generator tooling

Smart PV Solution

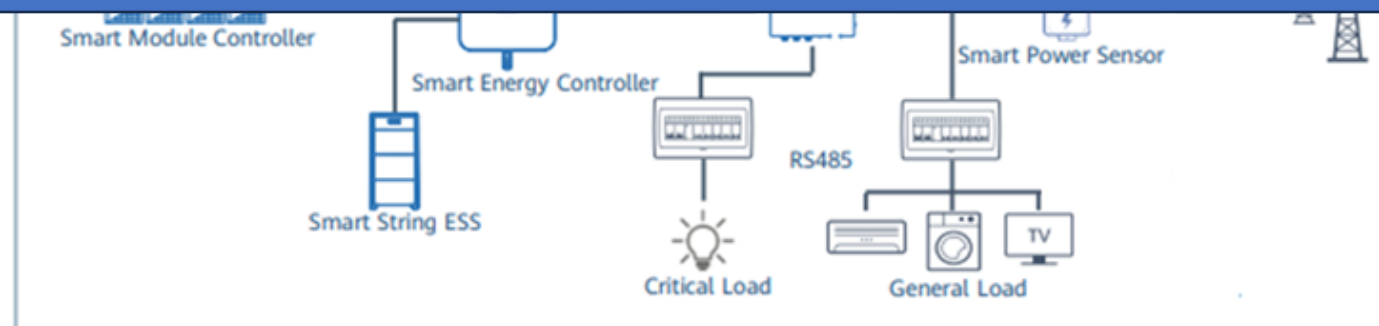


Arc energy was always under 100 J, far below the limits of the standard, max. arc energy (750 J), which is 453 J, while the response time was maximum 150 milliseconds. A low energy of the arc has been obtained due to the short time of arc clearance and to the low voltage of the arc.

The measurements show that it is essential that an arc must be detected and cleared by disconnecting the string and reducing the current at zero as soon as possible, to minimize the energy and thus to ensure more safe operation of the inverter's strings.

Accuracy: 100% accurate detection and response (based on test results of on-site tests made at two levels of the string current – around 3 and 8 A).

The above information leads us to the conclusion, that Huawei's AFCI function is effective and safe with rapid response, ensuring the smooth and protected operation of the PV system. The values of the measurement which have been evaluated show that the AFCI of Huawei inverters complies with the details of the standards which have been tested and is an appropriate and suitable integrated system for residential and C&I scenarios which can prevent hazardous consequences that can occur from an uninterrupted DC arc fault.





Teaching the next generations of specialists ...



TRAINING

Viitorul pe care ni-l asigurăm

Prof. Lucian Toma, Prof. Mihai Sănduleac

Universitatea Națională de Știință și Tehnologie Politehnica București