International Workshop

Innovative Electrical Networks for a Sustainable Development in Low Carbon Scenarios

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Terna Rete Italia – Head of Development Technologies

Strategic Plan

What facts shape the future?

- **The growing demand for electricity**: more people connected; higher standards of living; new usages of electricity (transportation...); electricity is more and more the favoured form of energy
- **The climate change and the development of carbon free generation- renewable/nuclear**: thousands/millions of small dispersed units near the loads, intermittent and fluctuating, or large plants remote from the main loads - fluctuating or with limited flexibility-.
- **The scarcity and cost of energy**: need to tap all sources, no spilling; storage; efficiency; demand side management.
- **The acceptability of power infrastructures**: more environment friendly equipment; limit the extension of the system, use the full built-incapability of equipment and system..
- **The existing infrastructures**: use them efficiently, upgrade them, extend their life..

Prepare of the strong and smart power system of the future

Make the best use of the existing equipment and system

Developing knolewdge and information

Answer the environment concerns

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The Expos in their history have always been characterized by significant events in the field of technological development of the electricity.

During the recent years, with the integration of renewable energy on a massive scale into the power system and with huge quantities of distributed generation , the Electrical Grids presents innovative solutions in many aspects of electricity field .

According with the Strategic Plan of CIGRE this workshop wants to be an opportunity of presentation of innovative solution, experiences and research to permit the development of the networks, serving territories and cities, combining environmental sustainability and safety requirements.

Technical solutions to preserve rural and agriculture life , public acceptance of power infrastructures, reduction of energy losses with storage devices , upgrading and extension of life of existing components are the main topics to present during the workshop.

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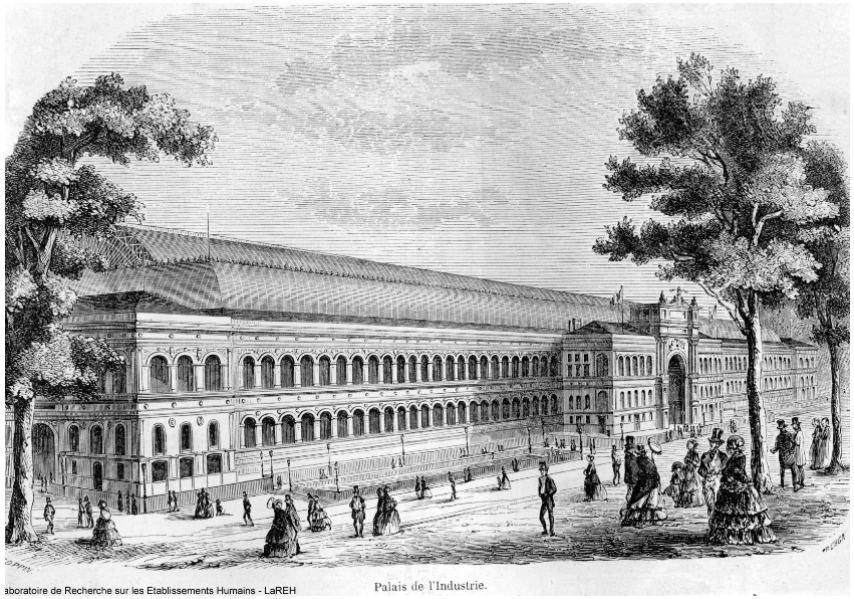
From Menlo Park to Paris Exibition of 1881

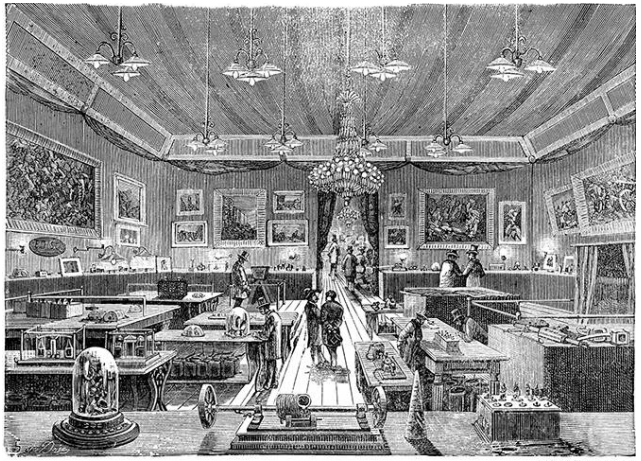
From August to November 1881 the first International Electrical Exhibition was held in Paris at the Palais de l'Industrie with an associated international congress. Great advances in electrical technology, especially in electric lighting, had been made and the exhibition was the showcase for a new branch of engineering-electrical engineering.

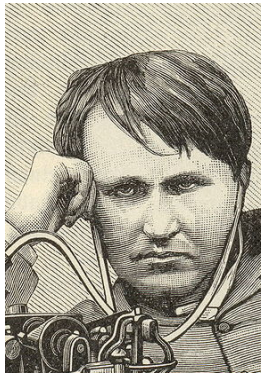


aboratoire de Recherche sur les Etablissements Humains - LaREH

Palais de l'Industrie.

Edison Exhibit, Paris Exposition, 1889.
SI neg. # 85-8767.





Edison

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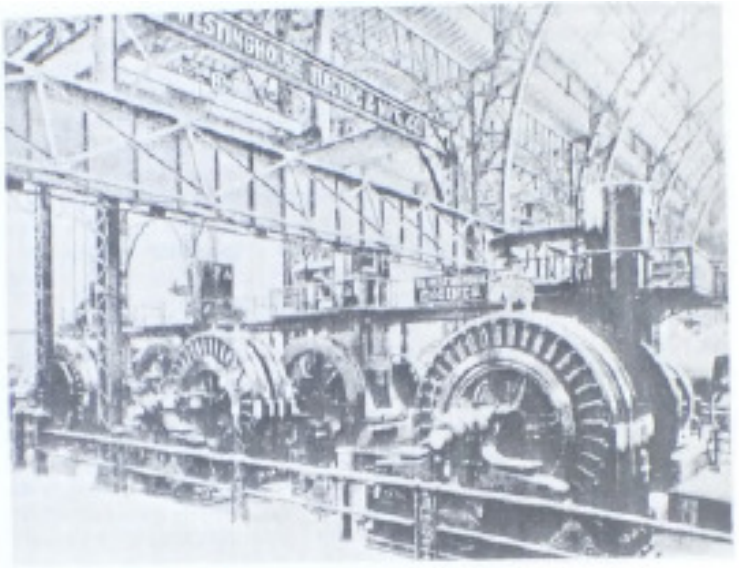
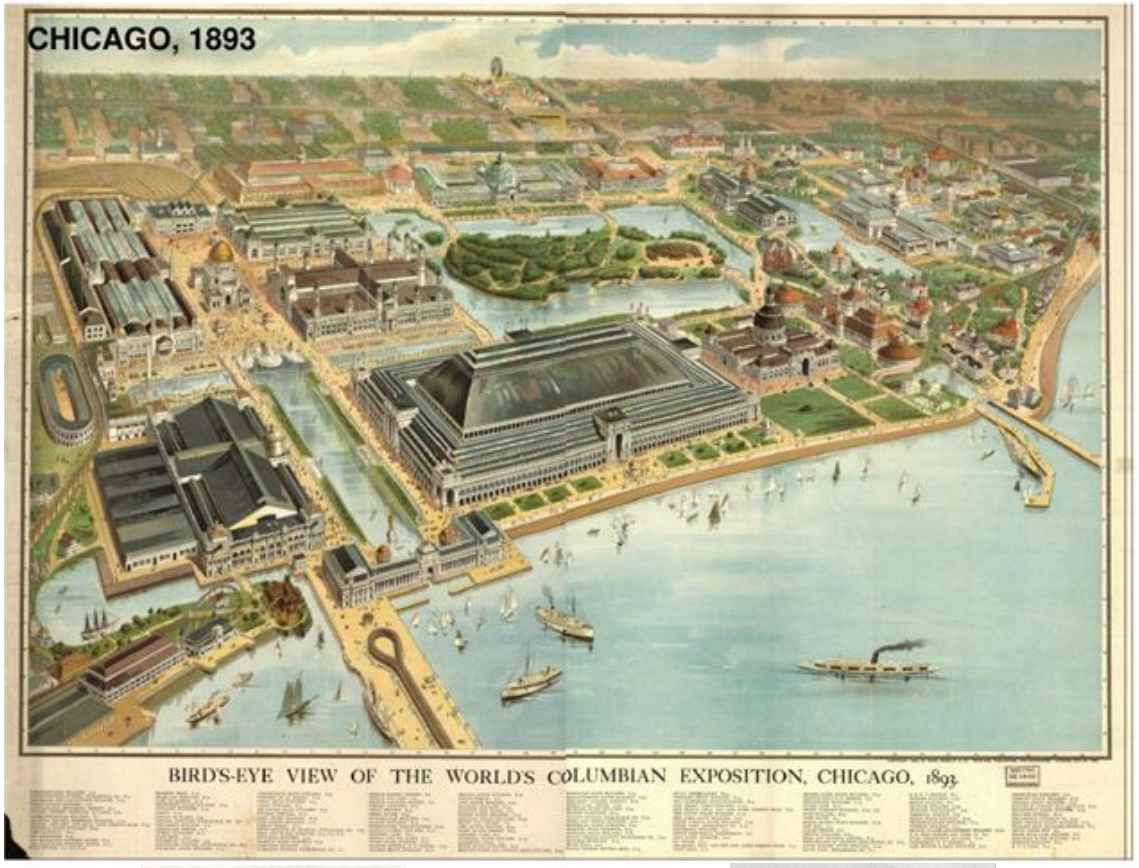
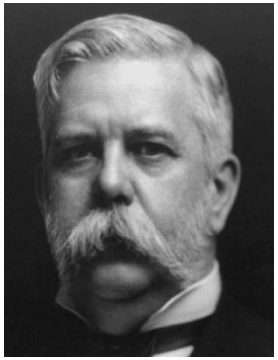
Figure V.4. Westinghouse exhibit, Chicago, 1893. From Edward D. Adams, Niagara Power: History of the Niagara Falls Power Company, 2 vols. (Niagara Falls, N.Y.: Niagara Falls Power Co., 1927), 2: 192.

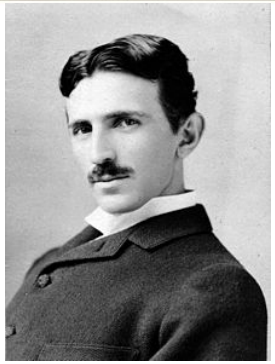






Westinghouse

Ferraris



Tesla

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From DC to AC System:
The war of currents

Because alternating-current transmission ultimately displaced direct-current and storage-battery substations, historians have tended to ignore the battery installations. R. H. Parsons, however, historian of the first generation of central power stations, has succinctly recounted the history of the use of storage batteries by the Colchester, England, undertaking and by the Chelsea Electricity Supply Company in London. The South Eastern Brush Electric Light Company, Ltd., built the Colchester system, which began operating in 1884. The Brush Company, British counterpart of American Edison, pioneered in the introduction of arc-light systems, and the Colchester plan was drawn up to accommodate Edison's incandescent electric lighting system. High-voltage Brush arc-light generators, which enjoyed a good reputation, were installed in the central station at Colchester and transmitted current to five battery substations located in cellars beneath the town's shops. Batteries that were charged in series discharged in parallel at 60 volts. The organizers of the plan intended to supply power to two thousand incandescent lamps, but they failed to do so because the batteries caused unending and insurmountable problems.[13]

On the other hand, for about forty years the Chelsea Electricity Supply Company successfully used batteries as part of its transmission-distribution system. It used Brush-Victorian generators to send out direct current at more than 1,000 volts. When the load on the system was relatively low, the generators charged the batteries, which were connected in series, as at Colchester; when the load was relatively high, the batteries, which automatically reconnected in parallel, discharged to the load at about 100 volts. The company also used motor generators in the substations to act as "continuous-current transformers." After 1893 the company supplied virtually all of Chelsea. Only in 1928 when standardization was introduced throughout England, did it convert its system to alternating current.[14]

Current trend: DC links in the AC Grid

Increasing Intelligent Systems integrating ICT and Electric Equipment

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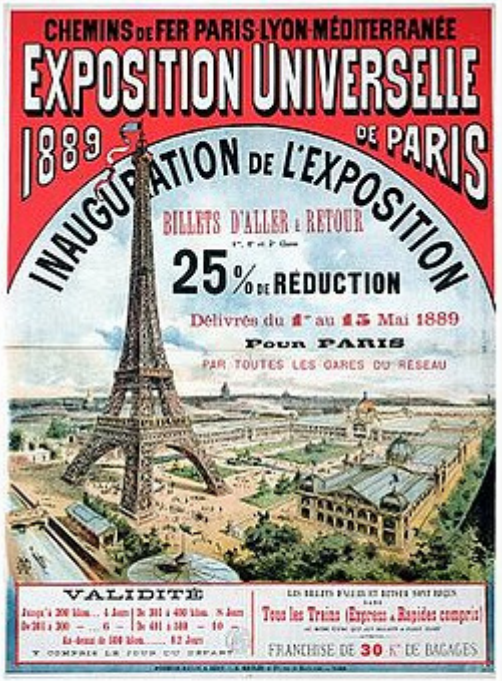
Expo 1889



Esposizione Universale

Stato	Francia
Città	Parigi
Tema	*Celebrazione del Centenario della Rivoluzione Francese*

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“Innovations for the “smart cities”

“Innovations for the “smart cities”

Expo 1958

Exposition Universelle et Internationale de Bruxelles Wereldtentoonstelling Brussel 1958 Expo'58

Esposizione generale di 1ª categoria

Stato	Belgio
Città	Bruxelles
Tema	*Valutazione del Mondo per un mondo più umano*

During 50 and 70 ties

Electrical Generation from Nuclear symbol of peace and sustainability

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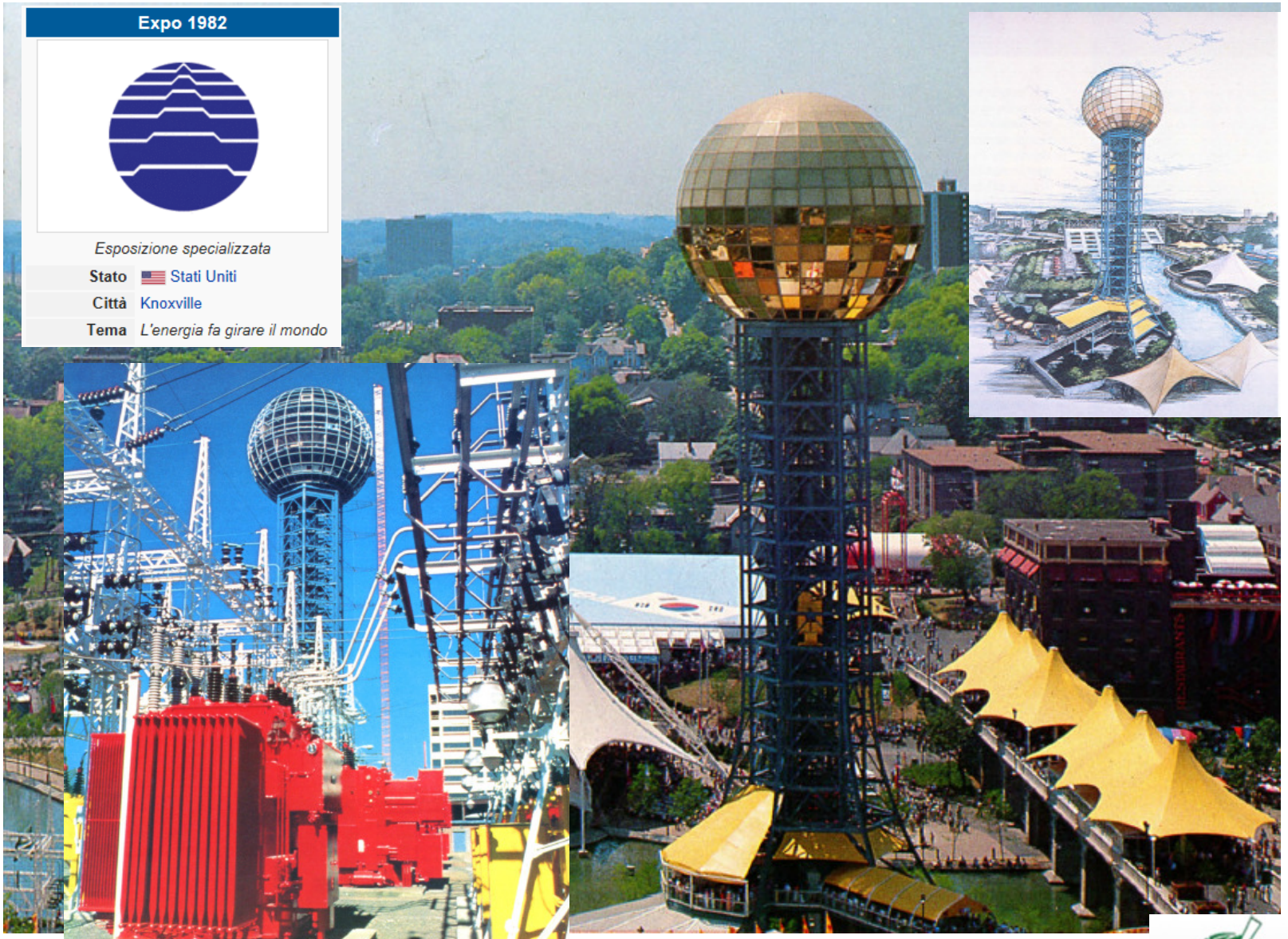
Energy from Sun : symbol of Sustainable future

Expo 1982

Esposizione specializzata

Stato	Stati Uniti
Città	Knoxville
Tema	*L'energia fa girare il mondo*



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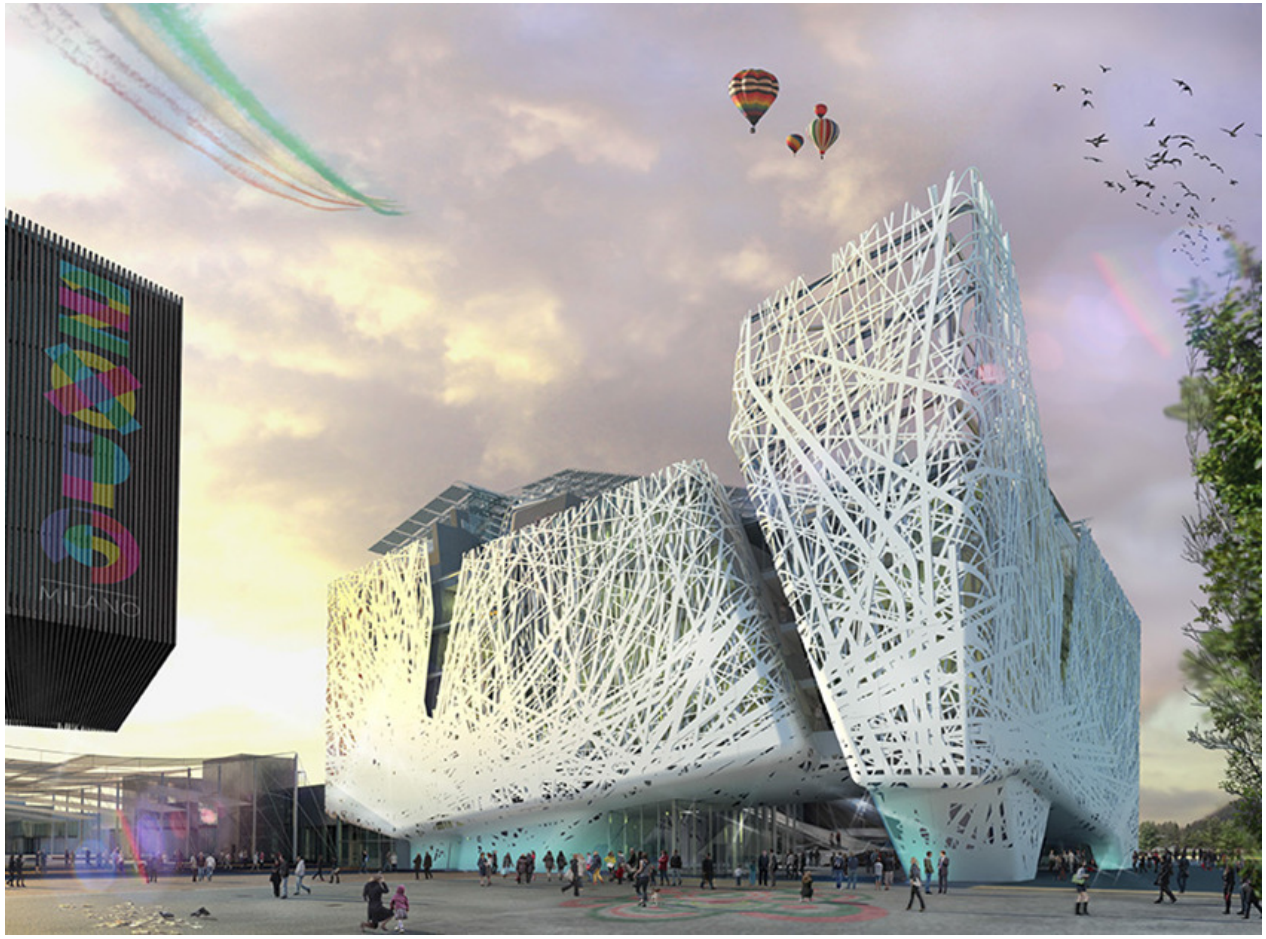
EXPO

MILANO 2015

NOURRIR LA PLANETE
ENERGIE POUR LA VIE



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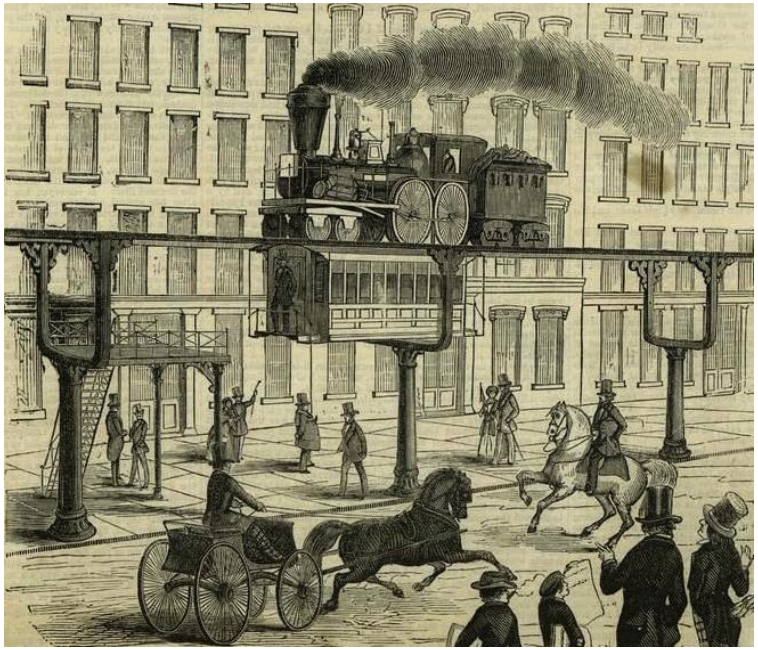
Innovations for a better compatibility with the environment and the territory

“Innovations for the “smart cities”

“Architecture and Power System infrastructures: a vision toward sustainability for the present and the future

These are visions in 1853 and 1915 of the future Railway System.
But now ,that we are in the present, the vision of lattice towers and coal seems represent the past

What are the works of architects and engineer for new electrical infrastructures ?



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