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Short bio

In 2022, François Marechal was ranked by [research.com](https://www.research.com) in the top 10 of the Swiss researchers in the field of engineering and technology. He holds a process engineering degree (1986) and a Ph D from University of Liège in Belgium (1995), where he realised a Ph D. in the field of process integration of industrial sites. In 2001, he moved to Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland where is professor in EPFL in the EPFL Valais-Wallis Campus, heading the Industrial Process and Energy Systems Engineering group. He is conducting research in the field of computer aided decision support for process and energy systems engineering. His activities are focussing on integrating rational use of energy, renewable energy resources and circular economy concepts in industrial processes and energy systems design.

François Marechal is the founding member and the co-chair of the energy section of the European Federation of Chemical Engineering and is representative of Switzerland in the Working Party on the Use of Computers in Chemical Engineering of the European Federation of Chemical Engineering. François Marechal is the editor in chief of the process and energy systems engineering specialty of the open access journal *Frontiers in Energy Research*. He is also the president of the scientific committee of the industry decarbonization research initiative of the French Government. He serves in the scientific committee of MinesParisTech, Institut Mines Télécom, and CEA energy division in France.

Qui Suis-je

En 2022 : François Marechal est classé par [research.com](https://www.research.com) dans le top 10 des chercheurs suisses dans le domaine de l'ingénierie et de la technologie. Il est titulaire d'un diplôme d'ingénieur en génie des procédés (1986) et d'un doctorat de l'Université de Liège en Belgique (1995), où il a réalisé un doctorat dans le domaine de l'intégration des procédés des sites industriels. En 2001, il a rejoint l'Ecole Polytechnique Fédérale de Lausanne (EPFL) en Suisse où il est professeur à l'EPFL sur le Campus Valais-Wallis de l'EPFL, à la tête du groupe d'Ingénierie des Procédés Industriels et des Systèmes Energétiques. Il mène des recherches dans le domaine de l'aide à la décision assistée par ordinateur pour l'ingénierie des processus et des systèmes énergétiques. Ses activités se concentrent sur l'intégration de l'utilisation rationnelle de l'énergie, des ressources énergétiques renouvelables et des concepts d'économie circulaire dans la conception des processus industriels et des systèmes énergétiques.

François Marechal est le membre fondateur et ancien co-président de la section énergie de la Fédération européenne de génie chimique et représente la Suisse au sein du groupe de travail sur l'utilisation des ordinateurs en génie chimique de la Fédération européenne de génie chimique. François Marechal est rédacteur en chef de la spécialité "Process and Energy Systems Engineering" de la revue en libre accès "Frontiers in Energy Research".

My research

My team exploring the use of the digital twin concepts to explore the transition pathways towards a net zero future. My team is developing a comprehensive superstructure based multi-objective optimisation method to

design integrated processes and systems considering life cycle sustainability assessment metrics. Our pioneering work in sustainable energy conversion has demonstrated the importance of process integration to design efficient processes co-producing heat and fuels from lignocellulosic materials while demonstrating CO₂ capture and the renewable energy storage by integrating electrolysis. The process design methods have also been applied to design patented technologies like a SOFC system which reaches more than 80% electrical efficiency with CO₂ capture, a system to capture CO₂ on trucks exhausts or an innovative design for hydro-thermal gasification for the recovery of pure water, salts and natural gas from wet waste biomass. At the system level, our work aims at leveraging the value of system integration of industrial processes, energy management and urban systems. In urban systems, we are exploring on the one hand the concept of renewable energy hubs at buildings and district levels to promote the integration of the use of renewable energy in smart cities and the use of the CO₂ based district heating and cooling networks that distributes low grade waste heat to the end users's heat pumps.

François Marechal has contributed to the creation of six start-up companies : [Bluewatt Engineering](#) now part of [PSE Siemens](#) : energy efficient waste water treatment, [Trea-tech](#) : hydrothermal gasification for water treatment and biomass conversion, [Exergo.ch](#) : multi-energy systems design by CO₂ based district heating and cooling systems, [Urbio](#) : decision support in urban energy system planing. [Qaptis](#) : CO₂ capture in transportation systems. [Emissium](#) : CO₂ tracking and certification.

Graphical abstract

EPFL Digitat Twins to make Switzerland Independent (in Energy) and Neutral (in CO₂)

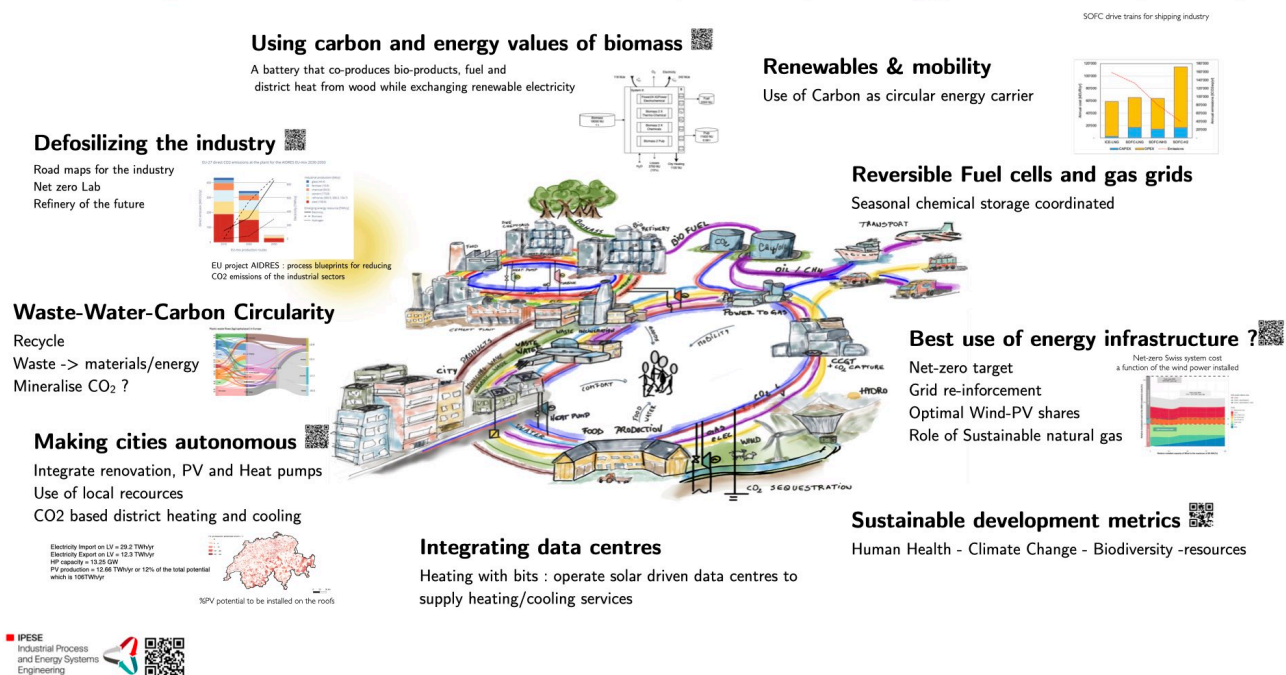


FIGURE 1 – My Graphical Abstract

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