



PhD in SCIENZE E TECNOLOGIE ENERGETICHE E NUCLEARI / ENERGY AND NUCLEAR SCIENCE AND TECHNOLOGY - 40th cycle

THEMATIC Research Field: PERFORMANCE AND LIFE CYCLE ASSESSMENT FOR NEW-GENERATION ELECTROLYZERS

Monthly net income of PhDscholarship (max 36 months)

€ 1500.0

In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity

Motivation and objectives of the research in this field

Hydrogen production is expected to grow strongly worldwide and is also part of Europe's and Italy's strategic plans. Hydrogen production turns out to be strategic in terms of highly diversified energy sources; in fact, hydrogen can also be produced widely by exploiting renewable energy and the national power grid. It is crucial for decarbonizing those sectors identified as "hard to abate," and it is the base for producing e-fuels. From the perspective of having high installed power of renewable energies, it is plausible to think of having an energy surplus that can be exploited to produce hydrogen for storage; it turns out to be the best energy carrier for seasonal storage. Electrolyzers are essential for hydrogen production starting from electricity. The research and development are focusing on improving the state-of-the-art of the electrolyzer to have the following characteristics:

- Purer hydrogen at higher efficiency
- Scalable and ideal for linking up with variable renewable energy sources
- Operates at higher current densities and provides flexibility
- Lower capital costs than traditional electrolysis
- Greater tolerance to impurities compared to traditional



	<p>electrolyzers till the possibility to work directly with seawater.</p> <p>To assess the cost-effectiveness of a specific electrolyzer technology, it is important to compare its performance with that of other electrolyzers that use different technologies. In addition to a techno-economic analysis, an environmental comparison is also valuable. Thus, measuring the carbon footprint and evaluating the impacts associated with precious materials and rare earth elements is crucial.</p> <p>TRANSLATE with x</p> <p>English</p> <p>ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese</p> <p>SimplifiedHungarianRussianChinese</p> <p>TraditionallIndonesianSlovakCzechItalianSlovenianDanish</p> <p>JapaneseSpanishDutchKlingonSwedishEnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrenchMalayUrduGermanMalteseVietnameseGreekNorwegianWelshHaitian CreolePersian</p> <p>TRANSLATE with</p> <p>COPY THE URL BELOW</p> <p>Back</p> <p>EMBED THE SNIPPET BELOW IN YOUR SITE</p> <p>Enable collaborative features and customize widget: Bing Webmaster Portal</p> <p>Back</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The project involves determining the materials used in producing the various types of electrolyzers; in this way, it is possible to have an inventory of the materials and, therefore, make clear comparisons among different technologies for the electrolyzers. Once the inventory has been determined, the processes that lead to the production of electrolyzers can be defined. Therefore, it is of fundamental importance to establish the mass and energy flow to estimate the CO₂ emissions emitted to obtain the final product. In this way, obtaining the final product's carbon footprint with an LCA (Life Cycle Assessment) approach is possible. Similarly, the method can be applied to other environmental</p>



	<p>parameters. To this end, different software and databases will be used and updated in order to obtain reliable results. Above all, primary data available from the company collaboration will be used. Moreover, the fundamental scientific base that describes the performances will be deeply studied in order to conduct a techno-economic analysis</p> <p>TRANSLATE with x English ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese SimplifiedHungarianRussianChinese TraditionalIndonesianSlovakCzechItalianSlovenianDanish JapaneseSpanishDutchKlingonSwedishEnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrenchMalayUrduGermanMalteseVietnameseGreekNorwegianWelshHaitian CreolePersian</p> <p>TRANSLATE with COPY THE URL BELOW Back EMBED THE SNIPPET BELOW IN YOUR SITE Enable collaborative features and customize widget: Bing Webmaster Portal Back</p>
Educational objectives	<p>The student will 1) deepen their theoretical knowledge in thermodynamics, transport phenomena, and electrochemistry; 2) develop advanced expertise regarding electrolyzer measurement techniques together with physical-based modeling; 3) apply Life Cycle Assessment; 4) coordinate graduating students' theses; 5) collaborate in international projects.</p> <p>TRANSLATE with x English ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese SimplifiedHungarianRussianChinese TraditionalIndonesianSlovakCzechItalianSlovenianDanish JapaneseSpanishDutchKlingonSwedishEnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrench</p>



	<p>hMalayUrduGermanMalteseVietnameseGreekNorwegian WelshHaitian CreolePersian TRANSLATE with COPY THE URL BELOW Back EMBED THE SNIPPET BELOW IN YOUR SITE Enable collaborative features and customize widget: Bing Webmaster Portal Back</p>
Job opportunities	<p>The acquired experience covers senior R&D positions within the industry, research centers, or academia operating in electrochemical energy technologies, specifically focusing on hydrogen production through electrolyzers and, generally, in the energy field and the analysis with a Life Cycle Assessment perspective. TRANSLATE with x English ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese SimplifiedHungarianRussianChinese TraditionalIndonesianSlovakCzechItalianSlovenianDanish JapaneseSpanishDutchKlingonSwedishEnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrench hMalayUrduGermanMalteseVietnameseGreekNorwegian WelshHaitian CreolePersian TRANSLATE with COPY THE URL BELOW Back EMBED THE SNIPPET BELOW IN YOUR SITE Enable collaborative features and customize widget: Bing Webmaster Portal Back</p>
Composition of the research group	<p>6 Full Professors 9 Associated Professors 5 Assistant Professors 40 PhD Students</p>
Name of the research directors	0

Contacts



davide.bonalumi@polimi.it

TRANSLATE with x

English

ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese

SimplifiedHungarianRussianChinese

TraditionalIndonesianSlovakCzechItalianSlovenianDanishJapaneseSpanishDutchKlingonSwedish

EnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrenchMalayUrduGerman

MalteseVietnameseGreekNorwegianWelshHaitian CreolePersian

TRANSLATE with

COPY THE URL BELOW

Back

EMBED THE SNIPPET BELOW IN YOUR SITE

Enable collaborative features and customize widget: Bing Webmaster Portal

Back

Additional support - Financial aid per PhD student per year (gross amount)

Housing - Foreign Students

--

Housing - Out-of-town residents
(more than 80Km out of Milano)

--

Scholarship Increase for a period abroad

Amount monthly

750.0 €

By number of months

6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities:

Financial aid per PhD student is available for purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences, instrumentation and computer, etc. This amount is equal to 10% of the annual gross amount, for 3 years.

Teaching assistantship:

Availability of funding in recognition of supporting teaching activities by the PhD student. There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability:

Individual use.

Awards:



Awards will be recognized to the PhD candidate up to Euro 1500 (gross amount) for the first year, up to Euro 2500 (gross amount), and up to Euro 4000 (gross amount) in case of exceptional achievements in the research project and availability in cooperation in the group's research activities, subject to the evaluation of the research director.

TRANSLATE with x

English

ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese

SimplifiedHungarianRussianChinese

TraditionalIndonesianSlovakCzechItalianSlovenianDanishJapaneseSpanishDutchKlingonSwedish

EnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrenchMalayUrduGerman

MalteseVietnameseGreekNorwegianWelshHaitian CreolePersian

TRANSLATE with

COPY THE URL BELOW

Back

EMBED THE SNIPPET BELOW IN YOUR SITE

Enable collaborative features and customize widget: Bing Webmaster Portal

Back

TRANSLATE with x

English

ArabicHebrewPolishBulgarianHindiPortugueseCatalanHmong DawRomanianChinese

SimplifiedHungarianRussianChinese

TraditionalIndonesianSlovakCzechItalianSlovenianDanishJapaneseSpanishDutchKlingonSwedish

EnglishKoreanThaiEstonianLatvianTurkishFinnishLithuanianUkrainianFrenchMalayUrduGerman

MalteseVietnameseGreekNorwegianWelshHaitian CreolePersian

TRANSLATE with

COPY THE URL BELOW

Back

EMBED THE SNIPPET BELOW IN YOUR SITE

Enable collaborative features and customize widget: Bing Webmaster Portal

Back