METADATA (*)

TOPIC C – Training Unit 6: Asset Digitalization

Source

Partner: **NORCE**

Project: TRINEFLEX - Transformation of energy intensive process industries through integration of energy, process, and feedstock flexibility, Grant agreement ID: 101058174

The contents of this lesson were developed using the following sources

- ScienceDirect.com | Science, health and medical journals, full text articles and books.
- Energy Electricity Sticker by STEAG for iOS & Android | GIPHY
- https://bildearkiv.norceresearch.no/, NORCE data images
- Steag Steagenergy GIF - Steag Steagenergy Energy - Discover & Share GIFs (tenor.com)
- Renewable capacity statistics 2023 (irena.org)
- Extreme Security Data

Ownership

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Abstract

Asset digitalization refers to the process of incorporating digital technologies, data, and automation to optimize the management of physical assets such us in energy. Energy digitalization covers the application of digital tools, data analysis, and automation to improve the effectiveness, sustainability, and dependability of energy generation, distribution, and consumption. The lesson will cover the following topics:

- An overview of asset digitalization system.
- Exploring the concept of digital twin technology.
- Understanding the pivotal role played by digitalization and smart grid technologies in the integration of renewable energy sources.

Structure

- Lesson 1: Asset digitalization
  A short description of asset digitalization and Digital twin technology, which involves creating virtual replicas of physical assets. This can be highly valuable in asset management and predictive maintenance.
- Lesson 2: Renewable Energy Integration in Industrial level
  The challenge of integration of renewable energy sources in general and into industrial level includes understanding the encounters and opportunities associated with solar, wind, hydrogen, and other renewable technologies. Role of digitalization in integration.

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Learning Outcomes

After this Training Unit, the trainees will be able to identify and describe the principles and concepts of Energy in industrials level.

- Lesson 1: Asset digitalization
  - Overview of digitalization
  - Steps for digitalization
  - Digital Twin Technologies
  - Benefits of Digitalization and Digital twin

- Lesson 2: Renewable Energy Integration in Industrial level
  - Understand the Variable Renewable Energy (VRE) and their Conditions.
  - What is the process of conducting a Variable Renewable Energy (VRE) in grid integration?
  - Key Integration at industrial level and Strategies

Intended Audience

Students, researchers, and industrial operators looking for the basics of asset digitalization concepts and the integration of variable renewable energy can benefit from exploring this training unit.

Pre-requisites

The training unit is designed for individuals with basic knowledge of energy who are interested in gaining a fundamental understanding of asset digitalization and the integration of variable renewable energy. We offer introductory definitions to initiate learning in these areas, laying the groundwork for understanding the transition to green energy practices within industrial settings.

Language: English

Format: Video mp4, PDF

Expected workload: 30 minutes

Complementary additional training material:

- Wei Yu, Panos Patros, Brent Young, Elsa Klinac, Timothy Gordon Walmsley, "Energy digital twin technology for industrial energy management: Classification, challenges and future", Renewable and Sustainable Energy Reviews,Volume 161,2022,112407,ISSN 1364-0321,https://doi.org/10.1016/j.rser.2022.112407. (https://www.sciencedirect.com/science/article/pii/S136403212200315X)

- Ellis B. Hammond, Frederic Coulon, Stephen H. Hallett, Russell Thomas, Drew Hardy, Darren J. Beriro,"Digital tools for brownfield redevelopment: Stakeholder perspectives and opportunities",Journal of Environmental Management,Volume 325, Part A,2023,116393,ISSN 0301-4797, https://doi.org/10.1016/j.jenvman.2022.116393, https://www.sciencedirect.com/science/article/pii/S0301479722019661

- D. Ntamo, E. Lopez-Montero, J. Mack, C. Omar, M.I. Highett, D. Moss, N. Mitchell, P. Soulatintork, P.Z. Moghadam, M. Zandi, "Industry 4.0 in Action: Digitalisation of a Continuous Process Manufacturing for Formulated Products", Digital Chemical Engineering, Volume 3,2022,100025,ISSN 2772-5081, https://doi.org/10.1016/j.dche.2022.100025.

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- Timothy Gordon Walmsley, Matthias Philipp, Martín Picón-Núñez, Henning Meschede, Matthew Thomas Taylor, Florian Schlosser, Martin John Atkins, “Hybrid renewable energy utility systems for industrial sites: A review”, Renewable and Sustainable Energy Reviews, Volume 188,2023,113802,ISSN 1364-0321, https://doi.org/10.1016/j.rser.2023.113802, (https://www.sciencedirect.com/science/article/pii/S1364032123006597)
- Kamran Zamanpour, Mohammad Amin Vaziri Rad, Negar Saberi, Leila Fereidooni, Alibakhsh Kasaeian, “Techno-economic comparison of dispatch strategies for stand-alone industrial demand integrated with fossil and renewable energy resources”, Energy Reports, Volume 10, 2023, Pages 2962-2981, ISSN 2352-4847,https://doi.org/10.1016/j.egyr.2023.09.095. (https://www.sciencedirect.com/science/article/pii/S2352484723013409)

(*) The structure of the Metadata for the Training Units derives from the training Metadata model developed within the Leonardo da Vinci project LINKVIT (2013-15, GA N. 2013-IT1-LEO05-04046)

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