Syntax Literate: Jurnal Ilmiah Indonesia p–ISSN: 2541-0849
e-ISSN: 2548-1398
Vol. 9, No. 12, Desember 2024

TRANSITIONING TO A GREENER FUTURE: STRATEGIES FOR ENHANCING EMPLOYEE COMPETENCIES IN INDONESIA UTILITY COMPANY MOVING TOWARDS RENEWABLE ENERGY

Sandy Febrian Robiady[1], Riani Rachmawati[2]
University Indonesia, Indonesia[1,2]
Email: sandy.febrian21@ui.ac.id[1], riani.rachmawati@ui.ac.id[2]

Abstract

This research aims to analyze the competencies required by employees related to renewable energy at Indonesia Utility Company and to explore the challenges involved in developing IUC employees during the energy transition era. The study employs qualitative methods. this study employs both primary and secondary data. Subject Matter Experts, structural and functional ranks in charge of human resource development and the renewable energy sector were used as an samples in this study to conducting in-depth interview and Focus Group Discussion. The results of this study elucidate the presence of technical competencies, such as RE planning, ammonia and biomass co-firing, and rooftop solar PV installation. Additionally, generic competencies including Adaptability of New Technologies, Business Savvy, Critical Thinking, and Learning Agility were identified. All these competencies collectively contribute to the competency framework concerning renewable energy at Indonesia Utility Company. Other findings indicate challenges, such as the yet-to-be-validated validity and reliability of hard competence assessment methods, uneven distribution of assessments among employees, and the need for optimization in the capacity and capability development programs for employees regarding energy transition, such as the Colony program. This study provides new insights and supports the argument for the need to enhance the capacity and capabilities of employees to adapt to the energy transition towards clean energy. The existence of a competency framework that serves as guidance for IUC regarding renewable energy competencies and its support system underscores the necessity for the development of hard competency assessment tools capable of validly and reliably measuring competency levels and gaps.

***Keywords**: Renewable Energy, Competences, energy transition, competency development*

Introduction

The renewable energy sector encompasses various technologies that harness energy from renewable sources such as wind, solar, hydropower, geothermal, biofuels, and others. Renewable energy plays a pivotal role in the energy transition towards achieving net-zero emissions/carbon by 2060 and contributes to the decarbonization efforts necessary to combat climate change. This sector has witnessed significant advancements over the past few decades, as evidenced by the increasing number of renewable energy generators in the global energy market (IEA, 2023).The focus on new and renewable energy (NRE) has gained prominence worldwide following the Paris Agreement and has been accelerated by geopolitical conflicts such as the Russia-Ukraine conflict. Many countries have formulated policies to promote renewable energy and prioritize electricity generation from NRE-based power plants. Yolcan (2023) reported that global electricity production from NRE sources has been steadily increasing. Over the past decade from

How to cite:	Robiady, S. F., & Rachmawati, R. (2024). Transitioning to a Greener Future: Strategies for Enhancing Employee Competencies in Indonesia Utility Company Moving Towards Renewable Energy. *Syntax Literate. (9)12*. http://dx.doi.org/10.36418/syntax-literate.v9i12
E-ISSN:	2548-1398

2012 to 2022, there was an addition of 1465 GW of NRE power plants, marking a fourfold increase compared to 2012. Furthermore, in 2021, several European Union countries such as Germany, the Netherlands, Spain, and the United Kingdom generated a quarter of their annual electricity production from NRE sources. Transitioning from the current fossil fuel-based economy to a new paradigm of clean energy in the economy and achieving net-zero carbon presents a number of challenges that need to be addressed. These challenges range from the development of broader policies and implementation strategies to more specific and practical issues, such as the availability of technology and a country's ability and/or capacity to effectively implement it. One of the major challenges is developing a workforce with the knowledge, skills, and competencies needed to maximize all available energy efficiency options and renewable technologies.

Competencies refer to a set or collection of various competency units deemed essential for demonstrating superior performance in a position or role (Loma, 1998). Competencies are a combination of knowledge, skills, attitudes, and other characteristics (generally known as KSAOs) or personal attributes crucial for success in a specific job, industry, or organization. Management literature increasingly recognizes the importance of competency development in enhancing competitiveness and organizational performance. Thus, competency development has become a vital strategic management tool in today's workplace (Bergenhenegouwen, ten Horn, & Mooijman, 1997; Nyhan, 1998). Company growth related to the ability to anticipate changes in the business environment, manage resources, and enhance competitiveness can be achieved by continuously evaluating and developing the types of competencies that must be continually assessed and developed within the organization. In this regard, competency development is one of the keys to the success and sustainability of a company's long life cycle

Several studies have been conducted to examine the role of human capital in the energy transition. According to Bano et al. (2018)'s research, human capital has an impact on gas emissions, with increasing knowledge and skills having an impact on reducing gas emissions. Through their knowledge capacities and technical ability, skilled and competent individuals assist drive the development of green technology and green innovation (Siedschlag et al, 2019). Furthermore, skill and knowledge development is critical in the energy transition (Fytili & Zabaniotou, 2022). Several studies have also found that employee development is an important problem in this period of energy transition. One of the most significant issues is the lack of a workforce with the skills and adaptability to deal with the rapidly changing evolution of the renewable energy sector (Arcelay et al., 2021). One of the impediments to the planned development of the renewable energy market is the scarcity of appropriately skilled human resources (Lucas et al., 2018). Because the renewable energy industry is becoming increasingly linked to digital technology and the development of Industry 4.0, human resources must be skilled in utilizing these technologies in order to meet the sector's demands (Akyazi et al., 2020). This necessitates a process of upskilling and knowledge upgrading for the existing workforce to guarantee that they have the necessary abilities to handle the shift (Akyazi et al., 2020).

Despite the growth of the NRE market in many parts of the world, Indonesia's energy transition has been progressing slowly. One indicator is that Indonesia Utility Company is targeted to achieve a 23% energy mix from NRE sources by 2025. However, as of 2022, IUC has only achieved 13.41% of this target. Additionally, the goals for adding NRE power plants and converting Diesel Power Plants to NRE power plants have not been met. According to a study by the Institute for Essential Services Reform (IESR) as outlined in the Indonesia Energy Outlook 2023 report, integrating a high level of NRE into an island-based power network poses significant challenges. IUC, as the operator of the power grid, has limited experience in operating a power grid with a high proportion of NRE. This is further supported by IUC management's statements in their annual and sustainability reports, indicating that employees lack business k nowledge and readiness to face decarbonization due to the dominance of fossil fuels in the energy mix, high emissions levels, and low NRE penetration as of 2022. Employee competencies have not been aligned with the requirements of globalization, which includes decarbonization and NRE. These competencies have not been accommodated in the existing Competency Directory and Job Competency Requirements (KKJ).

Therefore, this research will focus on competency-related issues for IUC employees in the context of renewable energy during the energy transition. This research aims to assist Indonesia in achieving Net Zero Carbon by 2060 by define the competencies architecture needed by IUC employees in the renewable energy sector and determining what is the challenges for develop the employees that required to create highly skilled, competitive, and adaptable talents during this energy transition.

Research Method

This study takes a qualitative approach with a case study method. The qualitative technique is chosen to investigate the viewpoints or experiences of the subject matter experts who participate. As for the methodology used in this research, it is a case study. According to Zhang & Wildemuth, (2009), the defining characteristic of a case study is its focus on a specific entity, taking into consideration the particular context of that entity's existence. The entity in question can be an organization, a community, an individual, or a specific event. In this research, the entity used as the unit of analysis for the case study is an organization, namely Indonesia Utility Company, with a specific focus on the case or issue related to the development of employee competencies at Indonesia Utility Company concerning renewable energy.

This study will employ a non-probability sampling strategy, which does not give every element or member of the population an equal chance of being chosen as a sample (Sugiyono, 2019). This approach was chosen since the sample selection criteria are specific, making it impossible for every member of the population to be included in the research sample. Purposive sampling was also used in this study as a research technique. Sugiyono, (2021) defines purposeful sampling as a data source sampling approach based on special considerations. In other words, it is a sampling approach in which the researcher uses their discretion in selecting people of the population to participate in the study.

In this case, the researcher will collect data from specific targets that meet the criteria, such Subject Matter Experts that certified in renewable energy/energy transition and employees that Hold a structural role, a generalist, specialist, or expert, and have a minimum person grade of 11 with at least 5 (five) years of experience with Indonesia Utility Company and the spesific criteria such as

a) Have been/are in charge of the function in charge of human resource development for at least one year and/or
b) Have been/are currently serving in the function in charge of renewable energy / energy transition for at least one year and / or

c) Has been/is currently serving in a function in charge of corporate planning/business development for at least one year and/or
d) Have/have been in charge of the function in charge of education and training for at least one year.

The researcher employed two types of data in this study: primary data and secondary data. Primary data is information received directly from a data source for specific goals in a research project, and it can be collected via methods such as interviews, observations, or questionnaires (Sekaran, 2016). In-depth interviews were used to acquire primary data for this study. The researcher will ask pre-selected respondents a series of questions. To obtain appropriate data and information for the instrumentation plan, the author employed a semi-structured interview method. As a result of what the interviewee says, semi-structured interviews enable for additional questions to be posed throughout the interview (Fitria, 2024). Furthermore, numerous questions were created to be open-ended interview, allowing respondents to freely express themselves in a more relaxed manner about what the research intends to understand (McCluskey et al., 2010).

In addition to primary data, this study employs secondary data because secondary data enables researchers to have access to existing data sets that may be large and comprehensive, including a lot of information. Secondary data generated from competency directory data, as well as statistical data on staff development programs and literature studies on Indonesia Utility Company regulatory/policy papers relevant to the research topic. In addition, the outcomes of Forum Group Discussions and Meeting Minutes linked to this research that have been given permission to be utilized as references in this research will be used as secondary data.

In qualitative research, data analysis begins with preparing and organizing the data (such as textual data such as transcripts or visual data such as images) for analysis. The material is then distilled into themes via a coding and summarization procedure. Finally, the data is visualized using charts, tables, or conversations Creswell, (2019) In this research, thematic analysis will be conducted by researcher. Thematic analysis is a qualitative data analysis method that focuses on identifying, categorizing, and interpreting themes in text-based data. The data analysis procedure in this study began with data familiarization, first coding, looking for prospective themes, data review and refinement, defining and naming themes, and report preparation.

Result and Discussion

The data for this study came from in-depth interviews with informants who agreed to be research participants. The major informants in this study are twe people who have the following traits and statistics.

Table 1 Informant Data

Informant	Division	Gender	Age	Position	Position Level	Working Duration
01	Human Capital Strategy	Female	35	Senior Officer of Competency System	*Generalist 3*	12
02	Energy Transition and Sustainability	Male	29	Climate Change Control Technician	Generalist 2	6
03	Corporate Planning	Female	37	Senior Officer of Strategy	*Generalist 3*	12

Informant	Division	Gender	Age	Position	Position Level	Working Duration
				Implementation and Evaluation		
04	Corporate Planning	Male	40	Strategy Alignment and Development Manager	Base Management	15
05	Talent Development	Female	55	Senior Manager of Corporate Talent Development	Middle Management	31
06	Human Capital Strategy	Male	37	Senior Officer of Human Capital Evaluation and Performancec	Generalist 3	13
07	Human Capital Strategy	Female	44	Human Capital Evaluation and Performance Manager	Basic Management	21
08	Education & Training Center	Female	43	Material Development and Data Processing Manager	Basic Management	15
09	Talent Development	Female	38	Human Capital Skills Development Manager	Basic Management	14
10	Education & Training Center	Male	43	Personnel and Financial Certification Manager	Basic Management	17
11	Education & Training Center	Male	46	Primary Energy, Generation, and Renewable Energy Learning Manager	Basic Management	19
12	Energy Transition & Sustainability	Male	36	Energy Transition Manager	Basic Management	12

(Source: Processed by Researcher, 2023)

In the exploratory phase of thematic analysis, researchers undertake a comprehensive examination of data on a broader scale. The initial codes generated during the coding stage are then organized into potential themes, with pertinent codes subsequently amalgamated to construct overarching themes. The researcher contends that the established codes may persist as principal themes. Through the conducted analysis, the author posits that the cultivation of renewable energy competencies among employees at Indonesia Utility Company in anticipation of the energy transition can be encapsulated within two primary themes: " Framework Competencies needed by employees related to renewable energy " and "Develop Employee in Energy Transition era" These two themes represent overarching constructs formulated with definitions or terms closely aligned with or extending from the previously generated codes. Subsequently, the author refines the initially stipulated codes into sub-themes, elucidating the nuanced facets of each thematic category.

Framework Competencies needed by employees related to renewable energy

The research findings depict the first theme surrounding the identification of competency needs related to the energy transition strategy at Indonesia Utility Company. This sub-theme highlights the emergence of new competencies required by employees to support the achievement of the ongoing energy transition strategy.Within this theme, it is revealed that Indonesia Utility Company is currently undergoing a transformation 2.0, which includes an energy transition strategy named the 8 Lighthouse Initiatives to achieve the net-zero emission target by 2060. Statements from informants and internal company documentation indicate that this strategy encompasses decarbonization, increasing the capacity of new renewable energy generators, and developing a green ecosystem.

Various informants, including interview results and information from Focus Group Discussions (FGD), indicate that employees need to have technical competencies related to new renewable energy sources, such as hydro, hydrogen, ammonia, biomass, bioenergy, solar, wind, and geothermal. Additionally, emphasis is placed on competencies related to new technologies such as Carbon Capture, Utilization, and Storage (CCUS), Battery Energy Storage System (BESS), and the operation of RE power plant electrical systems. Informants assert that RE generators will become the base load, replacing fossil fuel-based generators, requiring employees to understand and master related technologies. Competencies related to energy transition management, carbon footprint, and climate change management are also deemed essential.

Moving forward, Carbon Capture, Utilization, and Storage (CCUS) hold great promise for reducing carbon emissions from fossil power plants. However, we must also consider its substitute energy sources. One such substitute is ammonia. Ammonia is currently undergoing development and research due to its less visible presence in the energy landscape. Additionally, hydrogen is being explored as a replacement for natural gas, but it is still in the developmental stages. (Informant 04)

We can gain a better understanding of these new technologies and ensure that our human resources comprehend them to harness their potential in the future for the energy transition at IUC.. (Informant 12)

In addition to technical competencies, soft skills such as critical thinking, business savvy, learning agility, and adaptability to new technologies are identified as necessities for facing the energy transition. Employees are expected to adapt to new business models and possess critical thinking and business acumen. To develop these competencies, informants suggest the implementation of training and voluntary programs, especially those related to renewable energy and energy transition. This is considered crucial as there are still positions that have not been widely covered by training related to renewable energy.

Challenges in Developing Employees in the Era of Energy Transition

The second discovery arising from this study pertains to the challenges encountered by IUC in its current employee development initiatives during the energy transition period. Substantiated by identified challenges, including the unreliable nature of hard competency assessments, a predominant focus on structural or talent candidates in soft competency evaluations, and the organization's workforce preparedness for achieving Net Zero Emissions (NZE), the study exposes the obstacles IUC faces in its employee development endeavors. Notably, the challenges encompass issues related to the evaluation and assessment of employee competencies, with a particular emphasis on the uneven distribution of competency development programs across the entire workforce.

Yes, indeed, the self-assessment method can be considered measurable. However, its measurement accuracy may be relatively low. (Informant 01)

Well, in UPAC currently, the assessments are primarily focused on leadership. So, it seems that the functional needs haven't been fully captured in the matrix (Informant 08)

Several participants conveyed that, in the course of employee development, IUC confronts significant hurdles. One such challenge pertains to the assessment of employee competencies, specifically the subjective nature of evaluations and the existing disparities in competency development programs among employees. Furthermore, the study explores the strategies implemented by IUC to enhance employee competencies, ensuring their ability to seamlessly transition into roles that align with IUC's goal of achieving Net Zero Emissions (NZE).

Presently, IUC employs hard competency assessments for employees designated as Key Position Employees (KPE). KPEs encompass individuals holding positions crucial to the direct realization of IUC's strategic themes and plans. The assessment procedure involves self-evaluations by employees regarding their competencies, subsequently validated by their immediate superiors. This process is instrumental in identifying competency gaps and determining suitable development programs such as certifications, training, field assignments, and those aligned with employee aspirations.Nevertheless, concerns have been raised by some participants regarding the subjective nature of self-assessment, with potential implications for the objectivity of evaluations conducted by superiors. Additionally, not all employees undergo hard competency assessments, particularly those not classified as KPEs in their respective units, resulting in potential gaps in competency mapping and development programs.

Regarding soft competency assessments, IUC conducts evaluations for employees in structural roles or those aspiring to such positions. The Unit Pelaksana Assessment Center (UPAC), under IUC Pusdiklat, oversees these assessments, primarily focusing on leadership roles such as supervisors and managers at various levels, encompassing five distinct roles.

The readiness of IUC employees to support the company's energy transition strategy is explored through the COLONY (Collaboration Learning and Innovation Opportunity) program. COLONY aims to prepare and reinforce the capacities of human resources to acquire new competencies and technologies, particularly those associated with renewable energy. Serving as a talent tagging function, the program identifies and nurtures employees possessing competencies vital for IUC's future requirements. Despite the initiation of the COLONY program, it was revealed that IUC employees are presently inadequately prepared for the energy transition. Many lack competencies associated with renewable energy, necessitating upskilling and collaboration with external experts or institutions with expertise in renewable energy. Current employee development primarily targets talents identified through an Individual Development Program (IDP), leaving non-talent employees without such developmental plans.

Framework Competencies needed by employees related to renewable energy

The initial findings reveal that IUC employees require a competency framework related to renewable energy to face the energy transition. This is supported by the statements of the majority of informants indicating that IUC needs new competencies or future competencies related to the transition to renewable energy. This is due to the fact that currently, most IUC employees lack these competencies, and IUC also faces a shortage of experts with comprehensive understanding of energy transition and renewable energy. Notably, the interesting aspect uncovered by the research is that most informants emphasize the need for specific technical competencies for positions that will be affected by the energy transition.

The identified competencies include technical competencies related to renewable energy sources in power generation and technologies associated with the energy transition. Competencies related to renewable energy sources encompass Hydro/Water, Hydrogen, Ammonia, Biomass, Solar, Wind, and Geothermal, which will be used as energy sources in power generation. Additionally, competencies related to technologies associated with the energy transition include CCUS (Carbon Capture, Utilization, and Storage), BESS (Battery Energy Storage System), Co-Firing, and operation of systems based on renewable energy generation. Other competencies with relevance to renewable energy or energy transition include Energy Transition Management and Carbon Footprint & Net Zero Management, as well as Climate Change Management.

These competencies fall into the categories of technical competencies and critical competencies. Critical competencies are behaviors specific to a job within a job family (Salman et al., 2024). Technical competencies are considered critical competencies because they are highly specific and essential for the success of particular tasks or roles. The emergence of competencies more inclined toward critical and technical competencies among the informants is attributed to the nature of these competencies. Technical competencies are more tangible and visible, unlike soft competencies that are intangible and concealed, as depicted by the iceberg model popularized by Spencer & Spencer (1993).

Critical Competencies

Some technical competencies related to renewable energy sources mentioned by most informants are already included in IUC's existing competency directory. For instance, Hydro is defined as a competency in the operation and maintenance of hydropower plants, while Solar is defined as a competency in the operation and maintenance of solar power plants. Similarly, Biomass, Wind, and Geothermal are defined as competencies in the operation and maintenance of biomass, wind, and geothermal power plants, respectively. However, competencies related to Hydrogen and Ammonia, which are anticipated to be used as substitutes for fossil fuel-based power plants, are not yet included in IUC's competency directory. Hydrogen, in particular, is considered crucial in the transition to renewable energy due to its potential applications in various sectors such as electricity generation, heating, industry, transportation, and energy storage (IUC, 2023). Ammonia, besides being used as a source of renewable energy, can also be used in Co-Firing with coal-fired power plants. Additionally, competencies related to emerging renewable energy technologies like rooftop PV are not yet captured in IUC's competency requirements, despite rooftop PV being the fastest-growing renewable energy source in the past five years, according to data from the IEA and IRENA in 2022.

Furthermore, several competencies related to RE (Renewable Energy) are identified, such as the development of RE power plants, operation and maintenance management of RE power plants, long-term planning of RE generation systems, and expertise in RE. An additional competency that should be considered is RE energy planning, given that the existing competency directory includes primary energy planning for coal, gas, and oil, which may become less prevalent or even a minority in the era of energy transition.

Technical competencies related to technology associated with renewable energy, such as CCUS, BESS, Co-Firing, and the operation of RE generation systems, are not yet present in IUC's existing competency directory. CCUS and BESS are new technologies currently under development to reduce carbon emissions. CCUS involves capturing carbon dioxide emissions from fossil fuel power plants and storing or utilizing them to prevent their release into the atmosphere. BESS, on the other hand, is a storage system designed to reduce carbon emissions from intermittent renewable energy sources such as solar and wind, ensuring the reliability of RE-based power systems.

The significance of acquiring BESS competencies, as highlighted by informants, is supported by various studies emphasizing the relevance of BESS in the transition to renewable energy. BESS is recognized for its significant contributions to supporting the grid, optimizing energy production, enhancing load balancing, environmental sustainability, and improving overall power quality and system reliability (Cai & Li, 2021; Eskandari et al., 2022; Sadhukhan & Christensen, 2021; Zhuo, 2018). CCUS is acknowledged as a key strategy in climate change mitigation, providing benefits in resource conservation and carbon emissions reduction. Therefore, informant statements affirming the need for IUC employees to understand and learn about CCUS align with these perspectives (Mac Dowell et al., 2017). Co-Firing, also known as the process of blending RE sources such as biomass and ammonia with fossil fuel power plants to reduce carbon emissions, is identified as a crucial competency for IUC employees. This is particularly relevant for those working in coal-fired power plants, as Co-Firing is a performance target set by the government for IUC to achieve a 23% share of RE in the energy mix by 2025 (IUC, 2022). Operation of RE generation systems is also identified as a critical competency for IUC employees holding positions such as transmission system operators and dispatchers. This competency is crucial for maintaining the reliability of IUC's power system when intermittent renewable energy sources, such as solar and wind, become the base load in a region. Moreover, competencies related to the management of energy transition, such as energy transition management, carbon footprint & net-zero management, and climate change management, are identified. Energy transition management and carbon footprint & net-zero management are new competencies emerging from informant statements, while climate change management is already accommodated in the existing competency directory.

Soft Competencies

In addition to the technical competencies outlined by the majority of informants, there are also soft competencies required for IUC employees to be prepared for the transition to clean energy. These include critical thinking, adaptability to new technologies, business savvy, and learning agility. Learning agility refers to the capacity and willingness to acquire new skills to perform well in dynamic or challenging situations (DeRue et al., 2012). Learning agility involves proactively seeking new knowledge and applying it in unique or unfamiliar situations (Lee & Song, 2022). It is associated with the ability to quickly adapt and gain knowledge from experiences, demonstrating a combination of competency and enthusiasm for knowledge acquisition (Lee & Song, 2022). Learning agility is particularly crucial for IUC employees, considering that, during this energy transition, they may lack an understanding of certain new technologies. This necessitates upskilling in the field of renewable energy, as the current expertise of IUC employees is predominantly in fossil fuel power plants such as coal-fired power plants.Adaptability to new technologies is a competency of utmost importance for IUC employees due to the multitude of new technologies that have already emerged and will continue to emerge during the transition to clean energy. As these technologies mature and become more cost-effective in the future, IUC employees need to be ready to adopt and implement them. This aligns with research indicating that adaptability to new technologies is a critical factor for future success. Competencies related to information and communication technologies (ICT) are essential for various jobs related to renewable energy, such as solar energy engineers and wind turbine technicians, requiring adaptability and the ability to adapt to technological change (Arcelay et al., 2021).Digital adaptability, introduced by Puckett, (2022), emphasizes the importance of strategies and learning skills to effectively engage with new technologies. The OECD (2016) also underscores the significance of having skills for adaptation and learning about technological changes.

Critical thinking is identified as a necessary competency, supported by literature emphasizing its importance in facing upcoming business challenges. Critical thinking skills, encompassing reflective and independent thinking, information analysis and evaluation, and decision-making based on rational considerations, are considered essential for addressing complex and ever-changing challenges in the business world (Calma & Davies, 2021; Pacheco-Velázquez et al., 2023). In the context of the energy transition, Arcelay et al., (2021) stress that critical thinking is a future competency required for all jobs related to the renewable energy sector. The need for critical thinking is also acknowledged by informants who state that when IUC faces situations related to renewable energy, which were previously unfamiliar in handling a power system dominated by renewable energy, employees must be able to identify, evaluate, and solve associated problems. This includes tasks such as creating daily, weekly, monthly, and yearly operational plans when intermittent renewable energy sources become the base load in a region. Critical thinking is complemented by a deep understanding of business, commonly referred to as business savvy. Business savvy is the ability to recognize and thoroughly understand the business environment in which an organization operates. It involves a comprehensive understanding of customers, competitors, industry trends, and regulatory changes that could potentially impact the company's activities (Conger & Fulmer, 2003). The importance of business savvy is recognized by IUC itself, as it is included in the existing competency directory. However, it is currently specified as a behavior competency that must be possessed by employees in upper management positions and Functional 1 roles within specific business streams. Notably, it is absent from business streams related to renewable energy and energy transition. Business savvy should ideally be a competency for employees across all levels, especially in streams related to renewable energy, given the strategic importance of this competence in identifying and addressing future business challenges.

Upon identifying these competencies, the next step involves analyzing and synthesizing them to develop a competency framework guideline for IUC regarding the energy transition to renewable energy. These competencies will be categorized into new competencies mentioned by informants, combined with existing competencies in the competency directory, and aligned with the energy transition strategies outlined by informants. The framework will delineate competencies into critical competencies (technical), generic competencies (soft), and core competencies, with the latter being mandatory for all IUC employees. The framework will be designed by examining the energy transition strategies, which include decarbonization, the development of RE power plants and their support systems, and additional considerations for energy transition management. Competencies within each strategy will be mapped out, and the framework will distinguish between Key Position Employees (KPE) and non-KPE employees, considering the diverse skill requirements at different organizational levels. KPEs are defined as employees holding positions that directly support the achievement of IUC's strategic themes and plans, such as those in distribution, transmission, and generation functions.

Table 2 Framework Competencies for Renewable Energy

Business Process	**Competencies**		
	Critical Competencies	**Core Competencies**	**Generic Competencies**
Ammonia Co Firing	Ammonia Co-Firing Operation	Adaptability	Adaptability of New Technology
	Ammonia Production Management	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Biomass Co-firing	Biomass Co-Firing Operation	Adaptability	Adaptability of New Technology
	Biomass Management	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Hydrogen Management	Hydrogen Co-Firing Operation	Adaptability	Adaptability of New Technology
	Green Hydrogen Production	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Carbon Capture, Utilization, and Storage	CCUS Planning	Adaptability	Adaptability of New Technology
	CCUS Operation and Maintenance	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility

Business Process	Competencies		
	Critical Competencies	Core Competencies	Generic Competencies
		Customer Expereince Excellence	
Renewable Energy Planning	Renewable Energy Planning	Adaptability	Adaptability of New Technology
	Renewable Energy Plant Development	Building Trust	Business Savvy
	Operation Planning of Electricity System Based on NRE Plants	Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Hydro Powerplant	Water Type Management	Adaptability	Adaptability of New Technology
	Operation and Maintenance of Hydropower	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Solar Powerplant	Operation and Maintenance of Solar Power Plant	Adaptability	Adaptability of New Technology
	Rooftop Solar PV Installation	Building Trust	Business Savvy
	Maintenance of Rooftop Solar Power Plant	Collaboration	Critical Thinking
	Rooftop Solar Energy Management	Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Wind Powerplant	Wind Farm Operation and Maintenance	Adaptability	Adaptability of New Technology
		Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Geothermal Power Plant	Geothermal Exploration	Adaptability	Adaptability of New Technology
	Geothermal Exploitation	Building Trust	Business Savvy
	Operation and Maintenance of Geothermal Power Plant	Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	

Business Process	Competencies		
	Critical Competencies	**Core Competencies**	**Generic Competencies**
Baterry Energy Storage System	BESS Energy Reserve Planning	Adaptability	Adaptability of New Technology
	Operation and Maintenance of BESS	Building Trust	Business Savvy
		Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Renewable Energy Engineering	Engineering of Renewable Energy Generating Machine	Adaptability	Adaptability of New Technology
	RE Electrical System Engineering	Building Trust	Business Savvy
	RE Testing	Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	
Energy Transition Management	Energy Transition Management	Adaptability	Adaptability of New Technology
		Building Trust	Business Savvy
	Carbon Footprint and Net Zero Management	Collaboration	Critical Thinking
		Continuous Learning	Learning Agility
		Customer Expereince Excellence	

(Source: Processed by Researcher, 2023)

Challenges in Developing Employees in the Era of Energy Transition

The Second Finding reveals that there are several challenges in developing employees in this energy transition era that could hinder IUC in achieving the Net Zero Emission 2060 target. Although IUC is currently implementing a capacity-building program for its employees to prepare them for the transition to clean energy, there are potential factors that may confine IUC employees to performing and maintaining business-as-usual competencies, rendering them unable to adapt to evolving business conditions, both internal and external.

Presently, IUC employees are accustomed to and possess profound expertise in business-as-usual practices, specifically in electricity generation processes using fossil fuels as the primary energy source for electrifying Indonesia. Consequently, when the Indonesian government and IUC set a target of 23% Renewable Energy Mix by 2025 and net zero emissions by 2060, IUC employees are not adequately prepared to shift their competencies towards clean energy. Additionally, there is a need for upskilling, acquiring new skill sets, and implementing learning programs in collaboration with experts or institutions with profound knowledge of renewable energy and energy transition. This aligns with the International Energy Agency's (IEA) statement in 2022 that targeted upskilling or reskilling programs for existing workforce will be critical during this energy transition. In line with the findings from BP's 2021 annual and sustainability reports, BP has initiated the X-Academy program to assist its employees in developing skills relevant to the future energy system, including the low-carbon economy and renewable energy domains. This involves utilizing skill projections and capability plans to support recruitment decisions, designing career paths, and offering development programs for employees interested in transitioning to new job families.

Based on statements from various sources, IUC is currently developing and implementing a capacity-building program for its employees called "Colony." Colony is designed to prepare and strengthen human resources to respond to and adopt new competencies and technologies. The program emphasizes enhancing the capacity and skills of IUC employees, with a primary focus on energy transition, encompassing competency learning related to renewable energy such as hydro, solar, geothermal, and more. Through Colony, efforts are made to identify, group, and assess employees who have undergone development and demonstrated interest in the same core competencies. The critical aspect here is how the knowledge transfer or sharing process can be effectively executed when employees who have completed the Colony program can add value to the company and the surrounding environment. Moreover, when IUC recruits experts to provide insights to its employees in a short time frame, methods or approaches need to be applied to ensure that the knowledge is transferred, shared, and ingrained in the understanding of the employees receiving the knowledge from the experts. IUC should also be cautious not to deprive certain employees of equal opportunities to participate in the Colony program. Some employees may have an interest in energy transition but may lack a background or position related to it, preventing them from joining the program.

This research also reveals that the hard competency assessment system is still unreliable and its validity is questionable. This is attributed to the use of self-assessment methods for hard competency evaluation, where the employee determines their own competency level. This is supported by previous research indicating that self-assessment validity is often questioned, leading to overestimation and unreliability, especially for specific and non-general competencies (Ahmed et al., 2011; Andrade, 2019; Ballantine et al., 2007; Ghaderi et al., 2015; Ross, 2019). Even though the self-assessment results are later validated by immediate supervisors, bias may still occur due to subjectivity and the supervisor's competency in the assessment. As supervisors climb the hierarchy, they tend to have better soft competencies than hard competencies. The purpose of the assessment is to identify competency gaps in employees and determine their existing capabilities for development needs. Therefore, when self-assessment is performed, potential errors may arise, hindering an accurate measurement of the employee's competency gap. Hence, there is a need for an assessment tool capable of comprehensively and validly measuring employees' technical competencies to determine their competency levels, guiding IUC in developing appropriate employee development programs. Beyond the mentioned challenges, currently, only KPE employees are mandated to undergo hard competency assessments. KPE employees hold positions directly supporting IUC's strategic themes and strategies, such as those in power generation, transmission, distribution, construction, and commerce (aligned with IUC's core business). KPE employees are also required to have certifications to support and prove their capabilities in their respective functions. Interestingly, non-KPE employees are not subjected to competency gap identification assessments, despite their critical roles in enabler functions, including HR, Finance, Legal, IT, Procurement, and others, supporting IUC's strategic plans. Therefore, IUC still needs to assess the technical competencies of non-KPE employees in enabler functions to determine their competency levels and identify any existing gaps, considering alignment with IUC's strategic themes and each unit's goals.

IUC has conducted soft competency assessments for its employees to measure their readiness and suitability for occupying a position. Currently, soft competency assessments focus on leaders/potential leaders and are conducted on structural/employees entering the talent pool. Employees categorized to enter the talent pool and occupy structural positions fall into the promotable/high potential category. To be in this category, employees must consistently achieve optimal performance levels or be assessed as having very potential performance levels or above. Employees who have undergone assessments will be informed of their assessment scores through the Catalyst application or conveyed by their immediate supervisors. It is important to note that IUC currently implements a Force Distribution Ranking System (FDRS) to determine the performance scores of its employees. Moon et al., (2016) describe FDRS as a performance assessment system requiring supervisors to allocate a percentage of employees into specific categories based on their relative performance compared to colleagues. In summary, Armstrong, (2022) further emphasizes that the effectiveness of the FDRS method depends on employees' understanding of the expectations placed on them, fair procedures for assessing and classifying performance levels, and employee trust in their supervisors using this procedure fairly to evaluate their performance. However, the application of FDRS carries certain risks, including the emergence of perceptions of injustice among employees, especially when supervisors must identify employees considered more outstanding than others within a team. Furthermore, FDRS may lead to dysfunctional competition, disrupting team dynamics as employees may prioritize personal performance achievements and potentially impede the performance of their colleagues (Moon et al., 2016). This has become a complaint among IUC employees, where the imposed "quota" system may potentially hinder their career development or promotion. The application of FDRS also results in some IUC employees with good performance and excellent soft competencies not being assessed because their performance assessment only falls into the potential level. Therefore, IUC should conduct periodic soft competency assessments for all employees at all levels to focus on leadership assessments and functional assessments. This is essential to identify competency gaps and determine suitable soft competency development programs to enhance the soft competencies of employees, especially key competencies and role competencies that all employees must possess when at their respective job levels.

The findings from this research support several studies analyzing the impact of employee competencies in the context of energy transition. Various studies have highlighted the implications of human capital during this transitional period. Bano et al., (2018) found that human capital influences gas emissions, where an individual's increased knowledge and skills can reduce emissions. Employees with high skills and competencies can positively contribute to driving green technology development and sustainable innovation through their technical knowledge and skills (Siedschlag et al., 2019). Another study by Fytili & Zabaniotou, (2022) emphasized that skill and knowledge development plays a crucial role in supporting energy transition. Facing the challenges of energy transition, Arcelay et al., (2021) noted that the success of the renewable energy sector depends heavily on the need for a workforce with skills and adaptability to rapid changes.

Conclusion

This study aims to explore the competencies required by employees of IUC (Indonesia's state-owned electricity company) in the context of renewable energy and to identify challenges in developing their competencies during the energy transition towards Net Zero Emission by 2060. Employing a qualitative approach with a case study method, this research reveals two main findings.irst, concerning the "Competency Framework," the study identifies critical and generic competencies necessary for IUC employees involved in renewable energy. The competency framework is structured for two types of employees, namely Technical Employees (KPE) and Non-Technical Employees, involving technical aspects such as ammonia co-firing, biomass co-firing, hydrogen co-firing, CCUS, and other renewable energy technologies. Meanwhile, generic competencies encompass adaptability to new technologies, business acumen, critical thinking, and learning agility.Second, regarding "Employee Development Challenges," the research highlights issues in both soft and hard competency assessments, particularly in the context of self-assessment, which is deemed to have low validity and reliability. The implementation of FDR (Forced Distribution Ranking) is also assessed to introduce unfairness in employee performance evaluations. Although IUC has launched a capacity-building program named Colony, its success will heavily depend on the effectiveness of the knowledge transfer process. Therefore, effective strategies and methods are required to ensure that acquired knowledge adds value to the company.

BIBLIOGRAPHY

Ahmed, K., Miskovic, D., Darzi, A., Athanasiou, T., & Hanna, G. B. (2011). Observational tools for assessment of procedural skills: a systematic review. *The American Journal of Surgery*, *202*(4), 469–480.

Akyazi, T., Goti, A., Oyarbide, A., Alberdi, E., & Bayon, F. (2020). A guide for the food industry to meet the future skills requirements emerging with industry 4.0. *Foods*, *9*(4), 492.

Andrade, H. L. (2019). A critical review of research on student self-assessment. *Frontiers in Education*, *4*, 87.

Arcelay, I., Goti, A., Oyarbide-Zubillaga, A., Akyazi, T., Alberdi, E., & Garcia-Bringas, P. (2021). Definition of the future skills needs of job profiles in the renewable energy sector. *Energies*, *14*(9), 2609.

Armstrong, M. (2022). *Armstrong's Handbook of Performance Management: An Evidence-Based Guide to Performance Leadership*. Kogan Page Publishers.

Ballantine, J. A., Larres, P. M., & Oyelere, P. (2007). Computer usage and the validity of self-assessed computer competence among first-year business students. *Computers & Education*, *49*(4), 976–990.

Bano, S., Zhao, Y., Ahmad, A., Wang, S., & Liu, Y. (2018). Identifying the impacts of human capital on carbon emissions in Pakistan. *Journal of Cleaner Production*, *183*, 1082–1092.

Cai, S., & Li, Y. (2021). Incentive policy for battery energy storage systems based on economic evaluation considering flexibility and reliability benefits. *Frontiers in Energy Research*, *9*, 634912.

Calma, A., & Davies, M. (2021). Critical thinking in business education: Current outlook and future prospects. *Studies in Higher Education*, *46*(11), 2279–2295.

Conger, J. A., & Fulmer, R. M. (2003). Developing your leadership pipeline. *Harvard Business Review*, *81*(12), 76–85.

Creswell, J. W. (2019). *Research design: Pendekatan metode kualitatif, kuantitatif dan campuran*.

DeRue, D. S., Ashford, S. J., & Myers, C. G. (2012). Learning agility: In search of conceptual clarity and theoretical grounding. *Industrial and Organizational Psychology*, *5*(3), 258–279.

Eskandari, M., Rajabi, A., Savkin, A. V, Moradi, M. H., & Dong, Z. Y. (2022). Battery energy storage systems (BESSs) and the economy-dynamics of microgrids: Review, analysis, and classification for standardization of BESSs applications. *Journal of Energy Storage*, *55*, 105627.

Fitria, T. N. (2024). *Qualitative Research Method in Education Field: A Guide for Researchers, Lecturers and Students (Metode Penelitian Kualitatif di Bidang Pendidikan: Panduan bagi Peneliti, Dosen dan Mahasiswa)*.

Fytili, D., & Zabaniotou, A. (2022). Organizational, societal, knowledge and skills capacity for a low carbon energy transition in a Circular Waste Bioeconomy (CWBE): Observational evidence of the Thessaly region in Greece. *Science of the Total Environment*, *813*, 151870.

Ghaderi, I., Manji, F., Park, Y. S., Juul, D., Ott, M., Harris, I., & Farrell, T. M. (2015). Technical skills assessment toolbox: a review using the unitary framework of validity. *Annals of Surgery*, *261*(2), 251–262.

Lee, J., & Song, J. H. (2022). Developing a measurement of employee learning agility. *European Journal of Training and Development*, *46*(5/6), 450–467.

Lucas, H., Pinnington, S., & Cabeza, L. F. (2018). Education and training gaps in the renewable energy sector. *Solar Energy*, *173*, 449–455.

Mac Dowell, N., Fennell, P. S., Shah, N., & Maitland, G. C. (2017). The role of CO2 capture and utilization in mitigating climate change. *Nature Climate Change*, *7*(4), 243–249.

McCluskey, K., Wiest, A., & Plamann, M. (2010). The Fungal Genetics Stock Center: a repository for 50 years of fungal genetics research. *Journal of Biosciences*, *35*, 119–126.

Moon, S. H., Scullen, S. E., & Latham, G. P. (2016). Precarious curve ahead: The effects of forced distribution rating systems on job performance. *Human Resource Management Review*, *26*(2), 166–179.

Pacheco-Velázquez, E. A., Vázquez-Parra, J. C., Cruz-Sandoval, M., Salinas-Navarro, D. E., & Carlos-Arroyo, M. (2023). Business decision-making and complex thinking: A bibliometric study. *Administrative Sciences*, *13*(3), 80.

Puckett, C. (2022). Digital Adaptability: A new measure for digital inequality research. *Social Science Computer Review*, *40*(3), 641–662.

Ross, J. A. (2019). The reliability, validity, and utility of self-assessment. *Practical Assessment, Research, and Evaluation*, *11*(1), 10.

Sadhukhan, J., & Christensen, M. (2021). An in-depth life cycle assessment (LCA) of lithium-ion battery for climate impact mitigation strategies. *Energies*, *14*(17), 5555.

Salman, M., Anwar, I., Ganie, S. A., & Saleem, I. (2024). Impact of Human Resource Management Practices on Organizational Performance: Evidence From the Indian Banking Industry. *Management and Labour Studies*, *49*(1), 97–118.

Sekaran, U. (2016). *Research methods for business: A skill building approach*. John

Wiley & Sons.
Siedschlag, I., Meneto, S., & Tong Koecklin, M. (2019). *Determinants of green innovations: Firm-level evidence. ESRI WP643, November 2019*.
Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif dan R&D*. Alfabeta.
Sugiyono. (2021). *Metode Penelitian Kuantitaif, Kualitatif, R&D*. Alfabeta.
Zhang, Y., & Wildemuth, B. M. (2009). Unstructured interviews. *Applications of Social Research Methods to Questions in Information and Library Science*, *2*, 222–231.
Zhuo, W. (2018). Microgrid energy management strategy with battery energy storage system and approximate dynamic programming. *2018 37th Chinese Control Conference (CCC)*, 7581–7587.