Energy Innovation HUB
TRANSITIONING TO RENEWABLE ENERGY

Co-Funded by the European Union

UNDP

ENERGY INNOVATION HUB

A Lebanese Incubator & Accelerator Program in support of Lebanon's Green Energy Transition

CONTENTS

01
INTRODUCTION

The United Nations Development Programme, in support of the Ministry of Energy and Water, has initiated the implementation of the Country Entrepreneurship for Distributed Renewables Opportunities 5 (CEDRO 5) project, funded by the European Union (EU). CEDRO 5 is implemented in partnership with the Association of Lebanese Industrialists (ALI), The Lebanon Green Building Council (LGBC), and the International Renewable Energy Credits (I-REC) Institution. The European Commission (EC) is encouraging innovation and entrepreneurship in Lebanon to support a clean energy transition. The overall aim of the EC is to facilitate job creation and growth in support of Lebanon's economy, in line with the first priority sector of the Single Support Framework for EU Support to Lebanon (2017-2020), while supporting Climate Change Mitigation in Lebanon. The specific objective is to promote innovation, entrepreneurship, and job creation in support of Lebanon's clean energy transition and Nationally Determined Contributions (NDCs) for the energy sector. The EC proposes a gradual energy transition (phasing out from fossil fuels by switching to renewable energy sources) and implementation of circular economy principles. This proposal paves the way for (1) tapping into the potential for green jobs and growth (in the energy sector), (2) alleviating financial and economic burden of the current energy system on the various sectors and sub-sectors of Lebanon, (3) facilitating access to financing, and (4) improving the linkages amongst green entrepreneurship, small-and-medium sized enterprises (SMEs), industries and research/technology centers. The CEDRO 5 project aims to achieve the above outlined objectives through enhancing innovation, entrepreneurship, research, assisting in technology transfer and the creation of new value chains in the renewable energy and energy efficiency sector, supporting and initiating enabling policy, training and capacity building, and targeting effective awareness initiatives on renewable energy (RE) and energy efficiency (EE).

02
MAIN STAGES OF THE EIH

The EU co-funded UNDP CEDRO 5 project team has launched its "Energy Innovation Hub" (EIH) incubation and acceleration project in October 2020 by competitively contracting Nucleus Ventures (NV), the winning bidder of the call for proposals launched in May 2020. Nucleus Ventures partnered with (1) the Lebanese American University (LAU) for support in mentoring and lab testing, and (2) Ovation, the international partner for mentoring and accessing international markets. The contract duration was set at 22 months and divided into 5 main stages:

1. Market Assessment
2. Outreach and Selection of Teams
3. Incubation
4. Acceleration
5. Final Assessment and Evaluation

2.1. Market Assessment

A market assessment was conducted by the CEDRO 5 team to identify the main challenges and opportunities facing the Energy sector in Lebanon, and to better plan and prioritize all the future activities of the program. On another note, a stakeholder identification exercise was also conducted, to facilitate the cooperation and coordination with public and private partners, which would help start-ups with potential investment, deal-making, mentorship, and growth opportunities.

2.1.1. Challenges

The renewable energy and energy efficiency sector in Lebanon faces several limiting factors, affecting the growth potential of startups. The main factors identified in the sector are as follows:

- Inadequate support, due to a lack of sector-specific coaching, connections, and insights.
- Failure to effectively develop products in line with market needs, due to gaps in technical knowledge, a lack of technology partners, and a lack of customer insights.
- Failure to secure critical partnerships, which are essential for renewable energy and energy efficiency technology businesses to get off the ground, and to secure user/consumer trust.
- A large gap in specialized funding for early-stage businesses in the energy sector, where incumbents and traditional players fail to produce new and innovative spin outs.
- Local regulatory challenges, such as a slow legislative process within the energy sector, adding to the obstacles faced by the private sector to accelerate the adoption of new technologies and unlock growth potential in local, regional, and international markets.

- The absence of reliable power generation and transmission infrastructure, forcing many businesses to bear the added cost of having to purchase and operate diesel generators, or subscribe to a private diesel genset provider. A hybrid distributed photovoltaic system seems like a viable option to Lebanon's peculiar reliance on residential generators (as will be discussed in the opportunities section). However, despite its benefits, the hybrid distributed photovoltaic system model faces serious challenges caused by the lack of availability of proper electricity storage – which can lead to wasted energy – and an overall lack of education in the market. This is coupled with the lack of current learning initiatives that could potentially improve the cost and efficiency of deploying such systems. Another hindering factor is the absence of proper real time data collection on consumption by EDL that would allow for a better understanding of the system and the exploration of possible solutions. Therefore, the adoption of smart meters would give EDL a real-time stream of data, that can be processed for further learning and optimization downstream.

In the context of the entrepreneurship landscape in Lebanon, if the above factors are not mitigated, the existing and future renewable energy startups end up putting forward products and solutions that may work theoretically but fail in practice, having very little chance of success to begin with.

Mitigation measures would thus ensure the survival and progress of startups having passed through the Energy Innovation Hub. Proper mitigation measures within a long-term result-oriented framework would help de-risk investments in Lebanese renewable energy projects, opening the door for more innovative solutions.

2.1.2. Opportunities

The EIH program was able to shortlist themes that could benefit from the incubation and acceleration services. The following are major trends that were identified as preliminary innovation opportunities:

- **Energy Monitoring Software, Smart Meters & Automation**

Lebanon's electricity sector has been plagued with power outages and sub-par performance since the end of the Civil War and to date. Unmet demand for electricity rose from 22% in 2008 to 37% in 2018, or about 8.1 TWh of electricity needed. This has created a massive (1.1 billion USD) market for a subscription-based electricity generator services, serving about 1.8 million customers, and delivering an estimated 4 TWh of electricity [1].

However, despite the high cost of electricity from diesel generators, the sector has proven to be a blessing in disguise as it provided the Lebanese infrastructure a level of resilience against unforeseen circumstances like forced outages or wars - something Lebanon is susceptible to. To increase supply, it was found that distributed solar PV (Photovoltaic) systems in a hybrid model alongside diesel generators makes the most financial sense. For example, Beirut has a solar PV capacity between 200 and 300 MWp through the installation of rooftop solar PV [1].

From a consumer standpoint, the smart meters come at a perfect time, in light of the potential plan to decrease or lift subsidies on energy prices, creating an urgent need to save on energy consumption. This justifies the need to further develop and scale smart metering solutions, while embedding data analytics, dashboard visualization and recommendation engines/features in those off-the-shelf products.

- **Renewable Energy Innovation: Hardware, Software and Business Models**

Several projects have been implemented in Lebanon where communities managed to deploy pilot Solar PV projects, supported by the UNDP and other international and local institutions and/or non-governmental organizations, whereby the electricity produced constitutes a mix of traditional grid (fuel) and other renewable energy sources. These projects provide good simulation environments where potential start-up projects can work on solutions to optimize the energy mix utilization, given the presence of several energy inputs (Grid, Solar, Wind, etc.). These algorithms can be reengineered to be implemented in optimizing Levelized Cost of Energy (LCOE), and the resulting solutions can be scaled and commercialized in international markets.

- **Fuel Replacement: Bioenergy**

Biomass solutions are modular, scalable and can achieve carbon neutrality. It is used to meet waste remediation needs and reduces solid wastes going to landfills, generates energy and returns economic value to the community. One example of biomass are briquettes and/or pellets, attractive sources due to the diversity of available source materials (wood byproducts like charcoal, sawdust, or ash…), as well as their carbon-neutral combustion, and their low sulfur emissions. Biomass briquettes and/or pellets are also an attractive option due to their relatively high energy per square foot of storage and their applications in both domestic and industrial environments. Rural areas in Lebanon can use Briquettes for heating and cooking.

Moving on to economic benefits, biomass briquettes and pellets production could decrease dependency on energy imports, boost local production and provide employment opportunities, especially in rural areas. They also are unique for not requiring highly skilled work in their production. Despite the availability of pine and oak forests from which residues can be collected, biomass production still faces numerous challenges. These challenges are, yet not limited to, the (i) difficulty in accessing, collecting and delivering the raw material in a sustainable and cost-effective manner, (ii) the challenges related to operating the biomass briquette and/or pellet plant (requires a substantial budget in terms of fuel use for electricity and spare parts of the main plant components), and (iii) the lack of significant know-how in the sector.

Furthermore, the process of converting biological material into energy is not the only one. There are other options which are suited to different cases and applications, most notably waste-to-fuel processes and the generation of biogas.

Waste-to-fuel allows for the creation of biofuels from waste organic material (which has been separated), the output of which creates a fuel with low sulfur content that can be achieved through a relatively new process known as hydrothermal liquefaction [2].

Biogas on the other hand allows for the creation of methane gas through anaerobic digestion. As opposed to waste-to-fuel, biogas production processes rely on biological phenomena. Organic waste material is introduced to bacteria in an environment deprived of oxygen, also known as anaerobic conditions. The bacteria thus break down the material, simultaneously producing a gas (biomethane), which can then be used for energy generation [3].

- **Alternative Financing: Crowdfunding**

Energy companies are increasingly turning to citizens to raise funds. For example, a peer-to-peer (P2P) crowdfunding and P2P lending platform, Crowd Power, raised £24 million for energy access companies and projects in 2018, 90% of which were in Europe, Japan, and USA. In 2015, Crowd Power implemented a cutting-edge research program to kick-start crowdfunding for energy access companies in low and middle-income countries. However, Lebanon's situation may not be as simple. Indeed, most of the population is not able to lend funds to startups,

which are known for their capital-intensive requirements. As such, democratized crowdfunding platforms may not be as successfully applicable. Lebanon does however benefit from its sizeable diaspora, which in some estimates is assumed to encompass more than 14 million individuals [4]. This figure represents an untapped potential. Furthermore, several initiatives exist which aim to facilitate access to funding, one of which is TADAMON (https://tadamon.community/). TADAMON is a community and a platform for CSOs (Civil Society Organizations) in 57 OIC (Organization of Islamic Cooperation) Member Countries [5]. One of TADAMON's major dimensions, mentioned in their vision is the support of innovation in member states. This, in conjunction with its vast diaspora, might be a viable source of startup funding for the Lebanese energy sector.

- **Efficient Transport: Electric Vehicles, Charging Stations and Ride sharing**

Traffic, affordability of fuel, and environmental concerns are all pushing for a transition in the transport sector globally, and in Lebanon particularly. The recent success of ride sharing and ride hailing platforms confirms the need for alternative modes of transport, especially for vehicles that run on alternative fuels such as renewable powered electricity, hydrogen, and others.

2.2. Outreach and Selection of Teams

2.2.1. Marketing Strategy

A full marketing strategy has been developed, given the audience has been thoroughly analyzed (building on the ongoing insights from the market assessment activities) but at a high-level, it focused on the following activities to drive overall awareness and promotion of the program:

- Program brand creation aligning with EU-UNDP needs (Logo, social media channels and digital collateral);
- Program introductory blasts through existing Incubator programs to identify and source startups;
- Program launch event with guest speaker, live competitions, and media presence;
- Social media awareness campaign; followed by a targeted email and LinkedIn outreach to program partners (including investors and POC clients). The team believes the role of the media is a critical one in the recruitment and nurturing of female founders and aimed to partner with them on an ongoing basis to showcase our female participants and their businesses in addition to thought leadership content on this topic.
- Dedicated program website / landing page: https://eihub-lb.com/

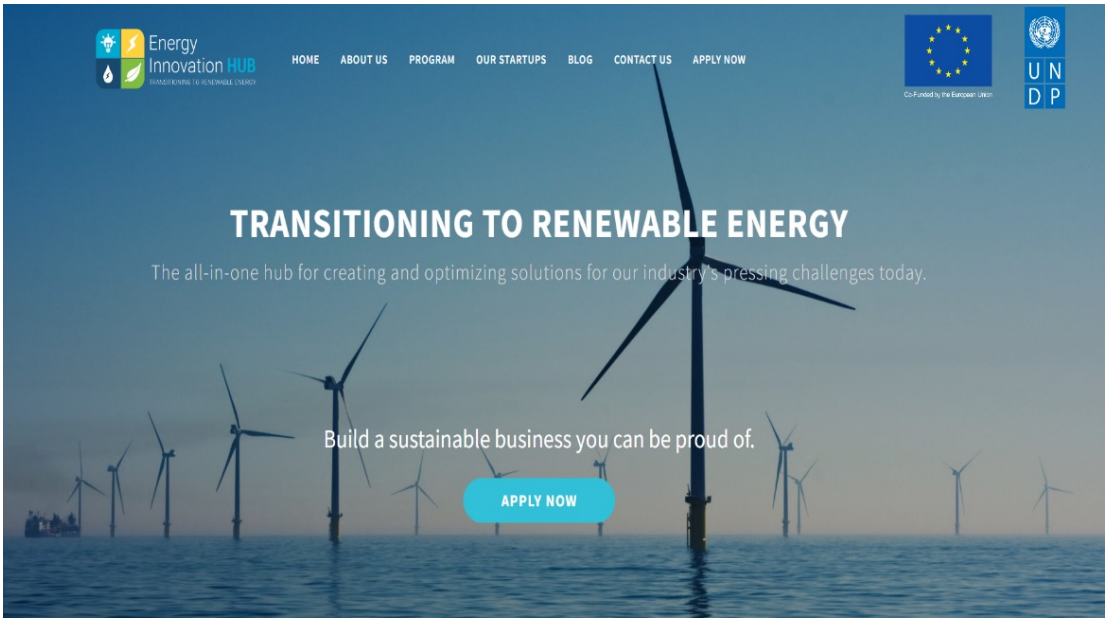

Figure 1 - Landing Page of the EIH website

- Program spotlights at university events and marketing channels.
- Program cross-promotion with existing ecosystem players.
- Startup Weekend (Hackathons) presenting information about the program, with a guest speaker, and 1:1 value proposition mentoring.
- The program marketing efforts usually reference previous startup success stories. In these stories, the team ensures it is capturing and celebrating female founders as much as possible. With this program, the team took that a step further by specifically spotlighting female success stories and founders (both from alumni and other high-profile founders) in standalone features to encourage and inspire female applicants and teams.
- Through the partnership with LAU, the team worked with the university to host a series of speaker events to entice more women into entrepreneurship and STEM, as well as a Women in Tech society on campus, developed on the Women Google framework.

2.2.2. Outreach Campaign

The ability to attract startups impacts a program's capacity to be selective, and, as a result to be successful. Therefore, the Program continuously deployed significant marketing and communication efforts to strengthen its brand awareness and highlight its added value.

The objective of the campaign was to:

- Raise awareness around the program and ensure a media coverage of its activities
- Raise awareness and encourage women entrepreneurs to participate in the program.
- Recruit new participants and onboard new strategic partners
- Celebrate the program's successes and showcase its positive results

Advertisement Material Consisted of the following:

Webpages	Dedicated pages on the Platform that promote the program, explain its components, and list its stakeholders. This includes a variety of sections such as: • About the program • Milestones/achievements • Application Submission Form • List of partners • List of mentors • Participating startups profiles • Blog posts https://eihub-lb.com/
Short Videos	Less than 2-minute animated/filmed video content published on the Platform and/or its social media accounts: • Teasers • Call for applications • Event/activity round-up

Social Media Posts	Posts published on the Program's social media pages: • Teaser posts • Call for applications posts • Live posts • Virtual / Physical event or activity coverage posts
Article / Blog Posts	Written stories published on the Program Platform and promoted on its social media accounts: • Industry-focused articles • Success stories • Startup profiles • Announcements • Event / activity coverage
Promotional Emails	Advertising e-shots sent on a regular basis to the Program's database: • Call for applications • Invitations to events / activities • Announcements
Press Releases	Official statements covering important announcements issued by the Program and distributed to the local and regional press and media outlets. Press releases can also be sent as e-shots to the Program's database
Presentation Decks	A series of slides presenting the Program's components that is used during information sessions and shared with the program's potential strategic partners (e.g., potential clients, potential trainers, interested investors, etc.)
Webinars	A series of 4 webinars during the period of call for applicants to inspire potential applicants. The webinars debated challenges and opportunities of the Lebanese Energy sector

2.2.3. Selection Process and Criteria

The aim was to receive at least 40 applications of which 20 teams would be selected to enter the incubation phase of the program, of which 5 teams have selected to join the acceleration phase of the program. In the case of renewable energy and energy efficiency, the EIH also focused its assessment on their commercial readiness, potential and possibilities in the context the major challenges being faced in Lebanon:

- Is the research/innovation ready to commercialize?
- Is it commercially viable? Is it scalable?
- Should it be licensed to an industry partner or spun it out into a startup?

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When it comes to investment, the EIH put that decision to a dedicated investment committee comprising a range of subject matter experts, industry experts and investors in the relevant field / sector.

The applications were received through the online application form and the teams were preliminarily assessed in terms of their relevance and the phase each of their start-ups were in. Consequently, an online video call was scheduled with each start-up team to further assess the team and the solution based on carefully tailored selection criteria.

In specific, the selection criteria were applied to the applicants depending on the phase each team was in, which are listed hereafter:

Selection Criteria	Applicable Phase		
	Explore	Validate	Execute
Problem-Sector Assessment	✓	✓	✓
Value Proposition	✓	✓	✓
Creativity and Originality	✓		
Practical Implementation	✓		
Competition Analysis		✓	✓
Business Model		✓	✓
Growth Plan		✓	✓
Target Market		✓	✓
Existing Traction		✓	✓
Start-up Track Record			✓
Financial Due Diligence			✓
Entrepreneur / Team Qualification	✓	✓	✓
Female Founders	✓	✓	✓

The call for applicants' campaign lasted over 2 months (March 2021 – May 2021), totaling 58 applications, with 52 being considered for interviews. The 52 applicants were divided into 3 maturity stages (Explore, Validate and Execute). For the Explore phase there were 29 applicants in total, for the validate phase there were 19 applicants and 4 applicants in the execute phase.

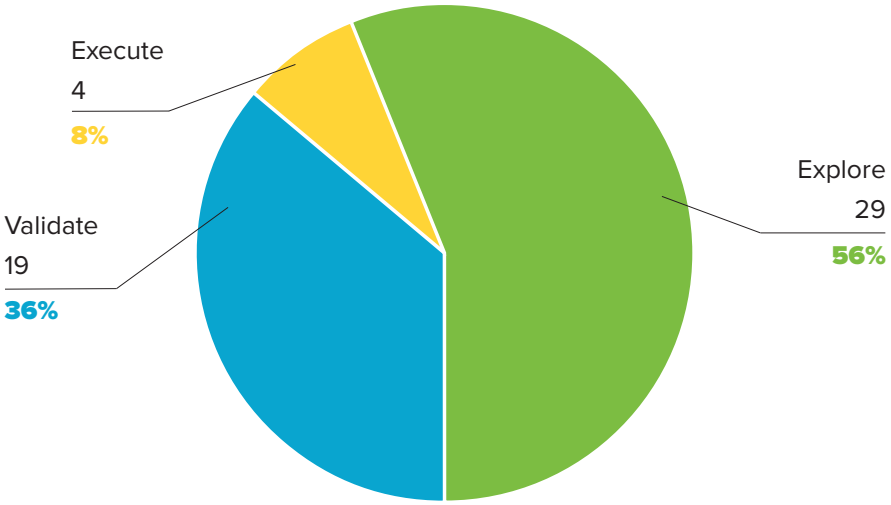


Figure 2 - Pie chart Illustrating the spread of the 52 startups

The selection process took into consideration the gender balance of the teams and one of the selection criteria clearly gave preference to teams with female co-founders and gender balanced teams. In total from the 52 interviewed applicants, the teams' compositions were divided as follows: 15 teams had female co-founders, 27 teams were balanced teams with female members in the start-up and 10 teams had no female members at all.

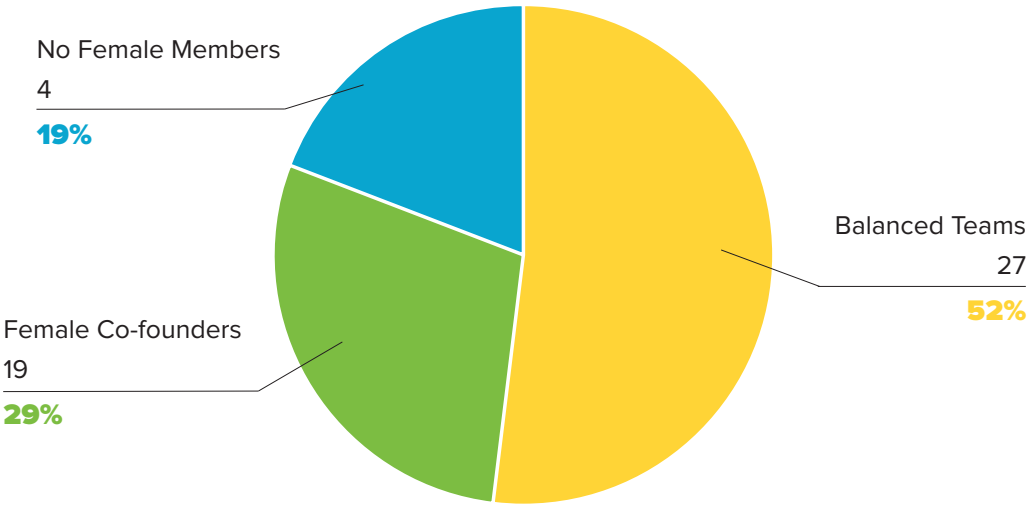
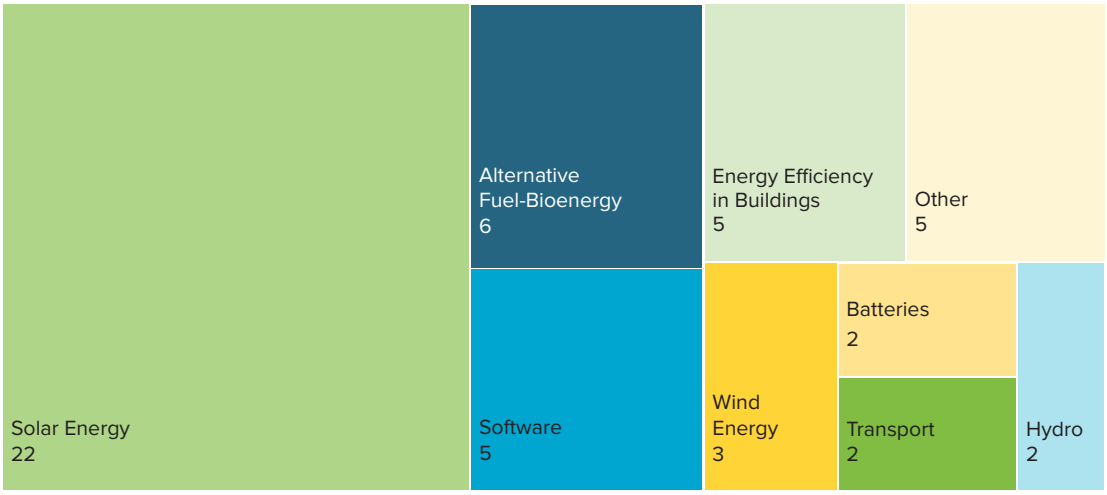


Figure 3 - Gender Balance in Applicant Startups

The applicants were spread over 9 different energy sectors with 22 teams working in field of solar energy, 6 teams working on alternative fuels and bioenergy, 5 teams working on innovations related to energy efficiency in buildings, 5 teams working on software solutions related to renewable energy or energy efficiency, 3 teams working on solutions related to wind energy, 2 teams working on businesses related to alternative transport solutions, 2 teams working on innovation related to batteries and storage and 2 teams working on solutions related to hydropower.

52 Applications per Energy Sector



The selection process is a rigorous multi-staged procedure designed to scout, select, and evaluate the ventures that will take part in the program.

Its objectives are to identify the best participants to join the program and to determine which phase (Explore, Validate, Execute) these participants were to be admitted into, based on the progress made in the startup's journey.

Its detailed steps are as follows:

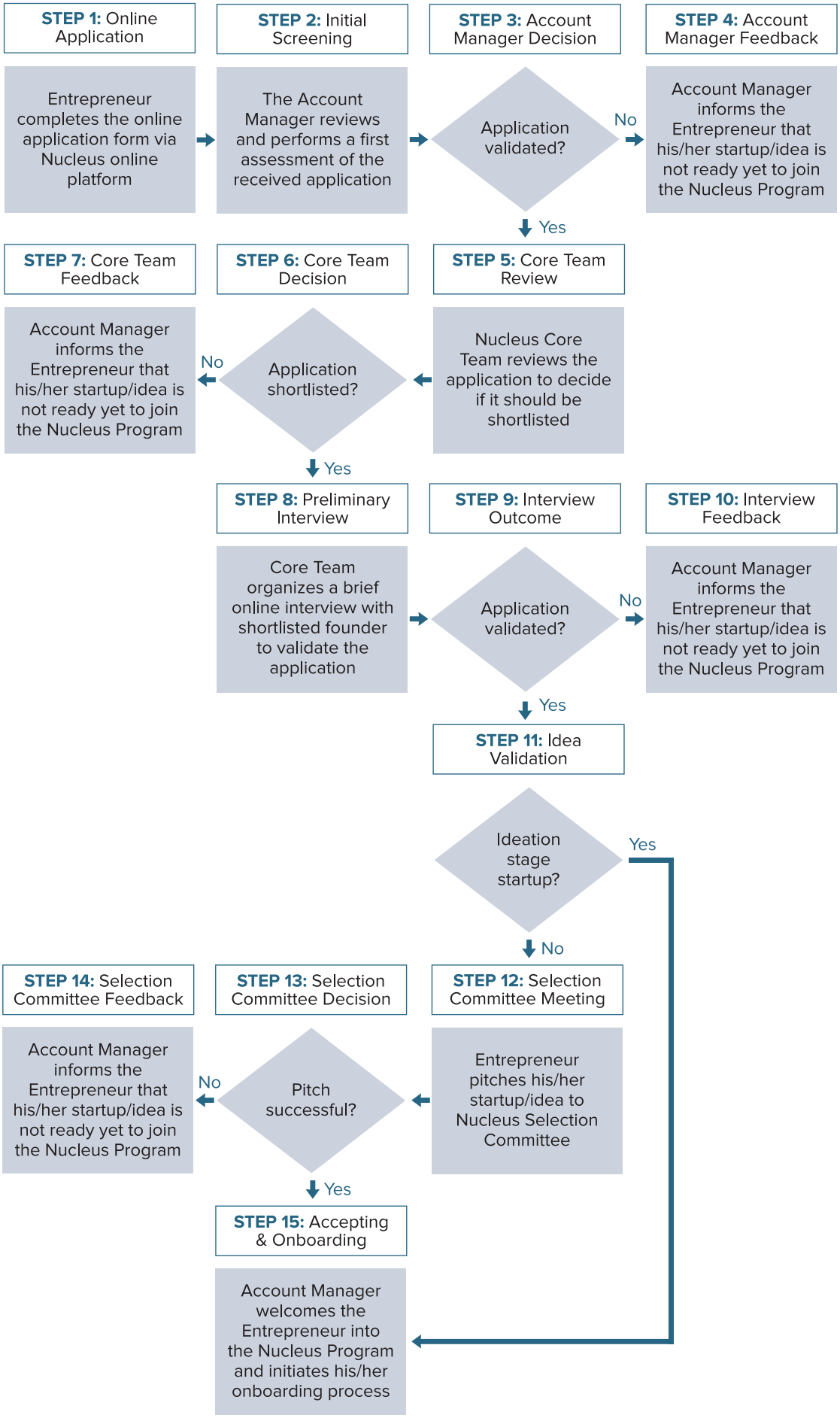


Figure 4 - Flow Chart Detailing the Selection Process

Step 1: Online application

Entrepreneurs wishing to participate in the Program complete the online application form available on the program's digital platform. In this application, the founders specify the existence an idea or a product/business and answer a series of questions about it. It is worth mentioning that the applicants should have/create a digital profile on the Program platform to be able to apply.

Steps 2 to 4: Initial screening

The Account Manager is in charge of reviewing the received applications on a rolling basis. He/she actually performs an initial screening where he/she:

- Checks if the applicants are eligible to join the program against the selection criteria
- Verifies that all the fields have been properly filled
- Confirms the stage of the application (the level of maturity of the startup)
- Makes sure that the answers provided are well-structured and detailed enough to gain a sound understanding of the proposed idea/venture
- Validates whether the idea is "worth the time and effort to explore it further"

In case an application is ineligible and/or incomplete and/or inconsistent, the Account Manager should email the participant in question and inform them that the idea/venture is not ready yet to join the Program. The Account Manager should also provide them, whenever relevant, with recommendations and indications on areas for improvement.

Steps 5 to 7: Core Team review

Successfully screened applications are reviewed, on a regular basis, by the Core Team composed of:

- Program Manager
- Account Manager(s)
- EU-UNDP CEDRO Team
- Optional: Mentor/Experts Feedback

During these review sessions, which can be physical meetings, online gatherings or even automated collaboration forms, the team members examine the applications, discuss the proposed ideas/products/businesses, and assess each one of them according to the selection criteria.

Following this assessment, the Core Team decides whether the examined application should move or not to the next stage of the selection process.

In case an application is not shortlisted, the Account Manager emails the participant in question and informs them that the idea/venture is not ready yet to join the Program. The Account Manager should also provide them, whenever relevant, with the Core Team's feedback.

Steps 8 to 11: Preliminary interview

The Account Manager invites the shortlisted applicants to a (up to) 30-minute online interview with members of the Core Team. The main goals behind this "relatively informal" chat are to:

- Have a first live contact with the founder.
- Verify that the information provided in the application is based on hard facts and sound knowledge and not just wishful thinking.

- Check if the founding team have the required technical & leadership skills, the motivation, the commitment, and the needed resilience to make their startups successful.
- Spot early warning signs of potential problems (e.g., lack of chemistry between the founders, reluctance to accept criticism, etc.)
- Explain the program's requirements and next steps to ensure that the applicants have a proper and comprehensive understanding of what is expected from them in case the applicants are accepted.

If the outcome of the preliminary meeting is not positive, the Account Manager reaches out to the interviewed founder(s) and informs them that the idea/venture is not ready yet to join the Program. He/she also provided them with recommendations based on the feedback of the Core Team members.

In case the approved application is related to an idea-stage venture, it will directly be accepted in the "Explore" phase of the program (step 15) without undergoing the selection committee's examination.

Steps 12 to 14: Selection Committee meeting

Applicants to the "Execute" phase who successfully complete the preliminary interviews will have their application further assessed by technical experts in the Renewable Energy /Energy Efficiency space, apart from the core team review, as well as potential clients and investors feedback, which is vital for a thorough due diligence on the future potential of the start-up project / business.

It is worth highlighting that the committee is not made up of permanent members. In fact, its composition varies depending on the industry and/or the maturity level of the venture(s) to be examined. It generally includes 4 to 6 members from different backgrounds. Possible members can be:

- Representatives of the Program's strategic partners
- Experienced investors
- Industry/Tech experts
- Mentors
- Members of the Program Core Team

As for the frequency of the meetings, it is not predetermined. In fact, the jury functions as a "flying committee" that gathers when needed.

The fluid composition and the flexibility of the committee aim at guaranteeing the agility and the efficiency of the selection process.

The entrepreneurs that are not chosen by the Selection Committee are contacted by the Account Manager who informs them that the idea/venture is not ready yet to join the Program. He/she also provides them with recommendations based on the feedback of the committee.

Step 15: Acceptance and onboarding

The Account Manager gets in touch with successful applicants to welcome them in the program and initiate their onboarding process. The Account manager explains to them the requirements, the objectives and the components of the phase that they are joining. He/she also clarifies the next steps that should be taken to start building their customized journey in the Program.

Following the rigorous selection process, 23 teams were selected to join the Energy Innovation Hub in June 2021.

The selected teams were divided as follows in terms of start-up journey:

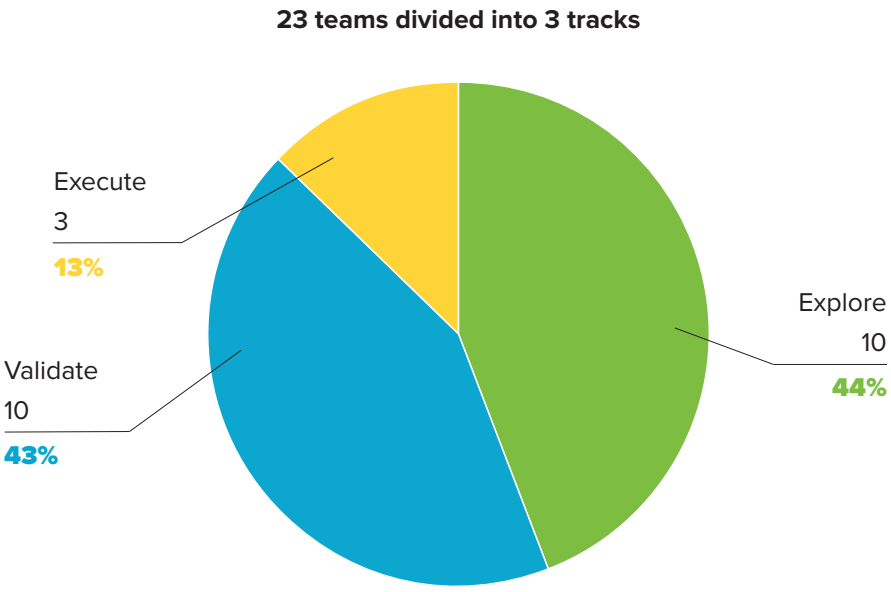


Figure 5 - Dsitribution of Selected Teams Along Admission Phases

The selected teams were divided in terms of gender team composition as follows:

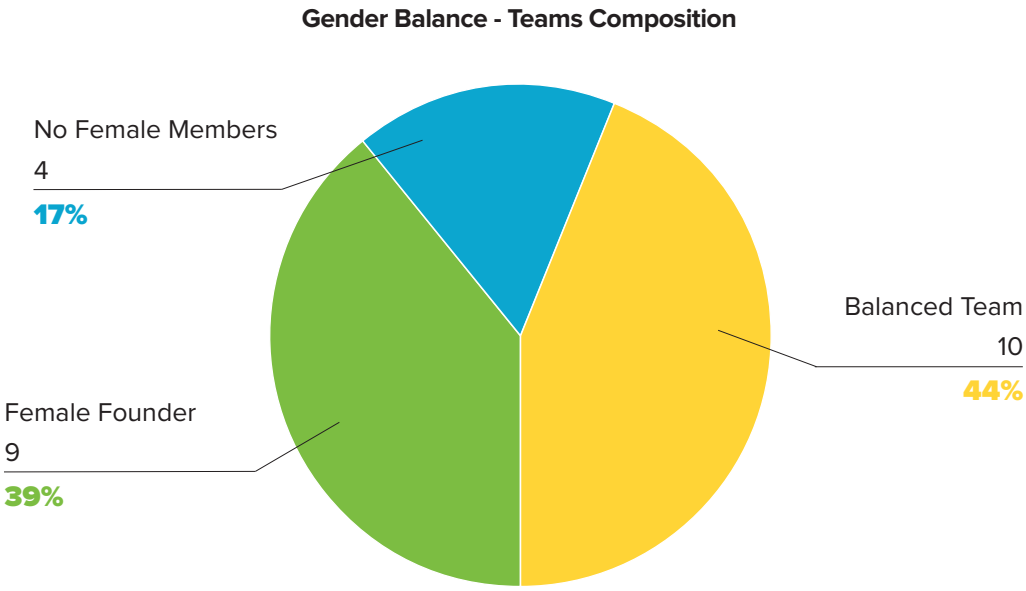
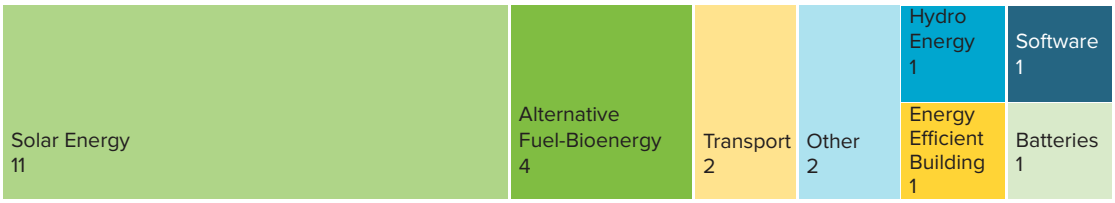


Figure 6 - Gender Composition of Selected Teams

The selected teams were divided in terms of energy sectors as follows:

23 teams per energy sector

- Solar Energy
- Alternative Fuel - Bioenergy
- Batteries
- Hydro Energy
- Software
- Other
- Transport
- Energy Efficient Building



03

INCUBATION PHASE

The incubation program ran for 6 months from (July 2021-January 2022), the Energy Innovation Hub organized a series of workshops, mentorship clinics, and one-on-one sessions to improve startups' outcomes. The incubated startups received up to 100+ hours of support throughout their journey, which was divided as follows:

- 35+ hours of workshops were provided to startups tackling topics on Design Thinking, Value Proposition, Building Business Model, Target Market Analysis, Customer Identification & Verification, Branding & Marketing, Product Development II, Go to Market, Pitch rehearsal, and Brand Canvas.
- A total of 6+ hours of Virtual startup clinics(I-II-III) have been organized that combine mentors from different industries such as Product Development, Legal, Business Model, Marketing
- 30+ hours of mentorship have been given by industry experts and mentors that follow up and advise startups on the best practices to achieve validation.
- 10+ hours bi-weekly calls were scheduled with each startup to follow up and assist their progress.
- Startups received 4 hours "Peer to Peer session" where y networking, brainstorming of solutions, and in person meetings are possible.
- 10+ hours "One on One sessions" were delivered to startups with experts to receive customized feedback in key areas of the business.

In addition to soft skills support, 10 start-ups received between $5,000-10,000 in grant financing to develop solutions, improve products, or expand the businesses, the funding is detailed in the table below:

Start-ups	Grant Amount	Use of Funds
Innergy	$5,000	MVP Development & Testing
Now Energy Hub	$5,000	MVP Development
Pitch Solar	$5,000	Prototype Development Hiring
Necess	$5,000	Product line expansion Digital Marketing
Drive Green	$5,000	MVP Development
Partners with Sun	$10,000	MVP Development
Garbaliser	$5,000	MVP development & iteration Testing
Suncode	$5,000	MVP Development & Iteration
PV Bot Cleaner	$5,000	MVP Development
Plastic to Fuel (PTF)	$5,000	MVP development and iteration Testing

Figure 7 - Funds given and their use

04

ACCELERATION PHASE

The acceleration journey is focused on preparing the startups to become investment ready. The startups will be required to set up a legal entity and present a recruitment plan to secure 5 job opportunities each (1 full time job equals 2 jobs and one part time job equals 1 job). This journey is also focused on securing letters of intent from buyers, with an extended landing customer sprint where the EH organized at least 15 potential client meetups, in addition to an investor roadshow, where startups have one-on-one meetings with interested investors. Based on the above-mentioned milestones, 6 start-ups were chosen to participate in the acceleration phase based on their readiness, and their likelihood of achieving the milestones within the timeframe of the program. The remaining start-ups continued to receive the support of the Energy Innovation Hub program, focused mainly on product development, testing and validation. The objective is to give the opportunity for more startups to conclude the program with a Minimum Viable Product. During this phase, the team focused on the testing element and in cooperation with LAU will facilitate additional lab access hours.

The acceleration program ran for 6 months from January 2022 – June 2022, the Energy Innovation Hub program ran a series of activities of more than 60 hours in monthly progress calls, 30 hours to site visits within all regions in Lebanon for 6 startups, 20 mentorship hours in startup clinics and pitch rehearsals, arranged 3 investor meetups with angel investors and Venture Capitals and 10 hours for workshops including Emotional Intelligence Works, How to Pitch to investors, Legal Advice and more.

The workshops were detailed as follows:

Workshop	Outcome
Testing & Validation	Understand different phases of hardware development & a series of testing & validation methodologies prior to client meetup.
Prototype MVP	Understand the methodologies & steps to turn a prototype into an MVP & develop an MVP.
Business Model	Build a sustainable revenue-generating business model to support the monetization of the startup's idea.
Financial Projections & Investment Readiness	Gain insight into their financial projection as a forecast of future revenues & expenses.
Testing & Validation II	Validate the startups' hardware and software products.
HR Strategies for Startups	Understand HR hiring, employee retention, and employee compensation for small-budget startups.
Meet the Buyer & Customer Acquisition	Get acquainted with a combination of business frameworks and methodologies that help startups acquire customers and understand their buyers.
Growth for Scaleups	Introduce channels and growth techniques for startups to scale their businesses.
Pitching Skills	Learn techniques to master presenting and pitching startup's ideas and businesses.
Pitching Skills II	Practice advanced pitching skills and the proper allocation of content in pitch decks.

Figure 8 - Workshops Given and their Outcomes

The start-ups participating in the acceleration phase received $20,000 in grant financing, detailed as follows:

Start-ups	Grant Amount	Use of Funds
Dox	$20,000	MVP development and iteration Hiring
Wave	$20,000	Hiring Expansion
Garbaliser	$20,000	Production Facility and Electricity Infrastructure installation MVP development and iteration Testing Hiring
Suncode	$20,000	Product Line Expansion Production Facility increase
PV Bot Cleaner	$20,000	MVP Development Testing

Figure 9 - Amounts Allocated and their Usage

05
FINAL ASSESSMENT & EVALUATION

5.1. Demo Day

The Energy Innovation Hub demo day took place on the 14th of July 2022, 13 startups showcased their innovative solutions and pitched their businesses on stage in front of a group of more than 45 industry professionals, mentors, investors, potential adopters, and partners. This demo day brought forward deployment opportunities to all 13 startups including but not limited to investment, business partnerships, early adoption and mentorship opportunities.

5.2. Overview of the progress of active start-ups that participated in the Energy Innovation Hub Program

CMU-PCM

CMU-PCM Tech uses Thermal Energy Storage (TES), a thermal envelope design for buildings, based on a system that relies on sensible or latent energy storage in building materials to reduce the cooling and heating energy loads of residential buildings, while enhancing the thermal comfort of the space.

Journey	Energy Innovation Hub					Upcoming
Research Project and Alpha Testing Phase	Market Validation	Pivoted MVP and Experimental Testing	Conducted Energy Simulations for different climates	Developed sales and marketing strategy	Set up a pilot project	Sell to potential adopters

Figure 10 - CMU-PCM's evolution with the EIH, and their future plans

Dibrace-Venar

Dibrace manufactures budget friendly, and high-efficiency biomass stoves which are used for food cooking and space heaters.

Journey Starts	Energy Innovation Hub				Upcoming	
Basic Prototype	Market Validation	MVP development and accessories	Set wholesale sales and retail sales	Increased sales	Energy study and report	Scale to different countries

Figure 11 - Dibrace-Venar's evolution with the EIH and their future plans

Dox Technologies

Dox technologies is a battery predictive analytics platform, built using a proprietary machine learning algorithm, in an effort to reduce battery waste and failure, while optimizing battery maintenance.

Journey Starts	Energy Innovation Hub				Upcoming		
Initial MVP	Market Validation	MVP development	Secured potential early adopters	Submitted Proposal for first battery testing lab at LAU	Build first battery test lab in MENA	Pilot Project	Secure First Client Deal

Figure 12 - Dox's evolution with the EIH and their future plans

Drive Green

Drive Green is an innovative electric transportation scheme, operating through an electric bike and a solar swapping station.

Journey Starts	Energy Innovation Hub			Upcoming
Research Project and Proof of Concept	Market Validation	Pivoted to battery swapping station and electric motorcycle	Developed of e-motor cycle MVP	Secure LOIs and Clients

Figure 13 - Drive Green's evolution with the EIH and their future plans

Garbaliser

Garbaliser converts organic wastes through the anaerobic digester to locally produced organic high-quality budget friendly fertilizer.

Journey Starts	Energy Innovation Hub					Upcoming	
Fertilizer Alpha Testing	Market Validation	MVP development	Increased product ion capacity to 2 tons/day	Increased sales to 15K liter of fertilizer	Set up electricity infrastructure for production facility	Closing deals with early adopters	Quality Control of Fertilizer

Necess

Necess is an accessible and affordable eco-friendly label that aims to democratize sustainable fashion through eco-friendly innovative garments.

Journey Starts	Energy Innovation Hub				Upcoming	
Soft launch of the lounge wear collection	Market Validation	Expanded product line to swim & baby wear	Increased sales through retailers	Increased sales to 15K liter of fertilizer	Establish Social media presence	Scale locally and regionally

Figure 14 - Necess's evolution with the EIH and their future plans

NOW Energy Hub

Now Energy Hub is an online platform that aims to reduce energy bills, by analyzing existing systems and recommending necessary modification in renewable energy solutions.

Before	Energy Innovation Hub			Upcoming		
Prototype	MVP development	Explored energy auditing and engineering training material	Database compilation	Pilot project with a B2B entity	Land clients	Scale locally

Figure 15 - NOW Energy Hub's evolution with the EIH and their future plans

Partners with Sun

Partners with Sun provides solar boilers, and solar convection ovens, yielding to 80% fuel bill reduction through a parabolic Concentrated Solar Power (CSP) converter system.

Journey Starts	Energy Innovation Hub				Upcoming		
Proof of concept	Market Validation	MVP development	Landed MOUs and LOIs	Piloted and tested	Landed First Customer	Scaling locally and regionally	Manufacture other solar convection ovens

Figure 16 - Partners with Sun's evolution with the EIH and their future plans

Plastic to Fuel

Plastic to Fuel designs and manufacture machines that transform single-use plastic waste into fuel and gas through a pyrolysis circular process.

Journey Starts	Energy Innovation Hub					Upcoming	
Idea Stage with a Proof of Concept	Market Validation	Signed LOIs	Prototype development and testing	MVP development and testing	Tested Bi-Products and Conducted Environmental assessments	Closing deals with early adopters	Scale locally and regionally

Figure 17 - Plastic to Fuel's evolution with the EIH and their future plans

PVBOT Cleaner

PVBOT Cleaner is a fully automated cleaning robot that requires no water at all; it can also detect overheated cells in solar panels. PVBOT Cleaner is targeting medium and large-sized PV farms.

Journey Starts	Energy Innovation Hub				Upcoming	
Proof of concept	Market Validation	Prototype Development	MVP development and beta testing	Landed LOIs	Pilot testing	Scaling regionally and internationally

Figure 18 - PVBOT cleaner's evolution with the EIH and their future plans

Suncode

Suncode is a convective solar drying machine that allows for a safer, faster, and easier method of drying food products.

Journey Starts	Energy Innovation Hub					Upcoming		
Idea Stage with a Product Design	MVP iteration	Increased sales	Expanded product line to different sized solar dryers	Increased production capacity	Developed first solar distiller	ISO 22000 safety certification	Launch Suncode branded dried foods	Scale locally and regionally

Figure 19 - Suncode's evolution with the EIH and their future plans

Wave

Wave offers electric bicycles as a subscription for citizens to commute efficiently, in an attempt to reduce pollution and promote renewable energy solutions in the transportation sector.

Journey Starts	Energy Innovation Hub				Upcoming	
Locally present e-bike startup	Explored battery swapping station collaboration	Scaled to Turkey	Imported more bikes	Explored a B2B business model	Land B2B clients	Scale regionally and internationally

Figure 20 - Wave's evolution with the EIH and their future plans

YY Regen

YY Regen re-energizes the agricultural sector through a mobile solar PV container. YY Regen is the one-stop portal to renewable power via a simple 3 step workflow: Click, Configure, Sustain

Journey Starts	Energy Innovation Hub						Upcoming	
Idea Stage with a Product Design	Market Validation and database compilation	Pivoted Product Design and Analysis	MVP development and testing	Pilot Project	Rented the container to the first customer	Application Development	Launch 3 additional container	Scale locally and regionally

Figure 21 - YY ReGen's evolution with the EIH and their future plans

5.3. E-library

The digital library is a base of recorded entrepreneurial content for the startups to access. It includes lessons with corresponding exercises, relevant templates and additional resources that guide the startups throughout their journey (Airtable - Digital Library).

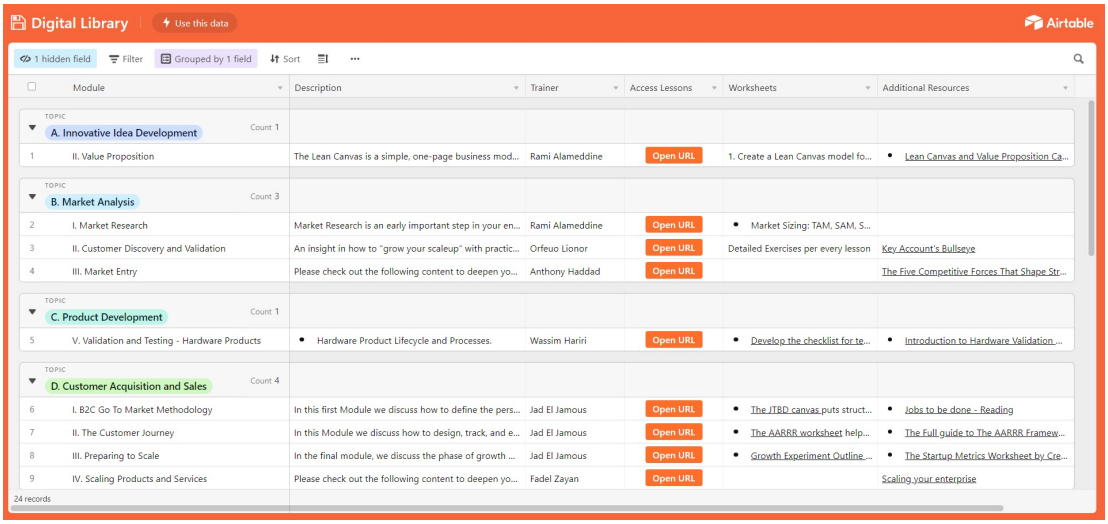


Figure 22 - Overview of the E-library

5.4 Overview of Program Impact

Job Creation within Energy Innovation Hub:

Energy Innovation Hub contributed to the creation of 105 jobs, between direct and indirect jobs in 9 different sectors. Energy Innovation Hub's vision to transform the energy sector was inclusive to all energy sectors and solutions including hydropower, biomass, wind and solar energy and hybrid energy solutions. Our startups offered innovative solutions in solar, biomass and energy efficiency. The Energy Innovation Hub supported the diversification, and the introduction of renewable energy and sustainability solutions to different sectors. The program targeted 9 pillar sectors in Lebanon including: transportation, recycling, heating and cooling systems, food and beverage, fashion, agriculture and fertilizer, construction, and energy efficiency with a primary representation in energy efficiency startups, energy production and agriculture and beverage.

The Energy Innovation Hub and the agricultural sector in Lebanon:

Lebanon's geographic location with its exceptionally moderate climate, fertile soils and availability of water resources makes 64.3% of our land ideal for agriculture, a high percentage of agricultural land within the middle east and neighboring countries. Globally, agriculture plays a key role in economic development and growth while the agricultural sector in Lebanon contributes only 5% to the Gross Domestic Product (GDP) due to the challenges imposed by the infrastructure, increased cost of agricultural plantation (due to the economic crisis and the devaluation of the Lebanese Lira). In an attempt to support the agricultural sector in Lebanon, the Energy Innovation Hub supports 4 startups in the agricultural sector that produce locally produced agricultural fertilizers, organic compost and infrastructure support to Lebanese farmers.

Job Creation in the agricultural sector:

Energy Innovation Hub startups contributed to more than 25 jobs created in the agricultural sector, between direct and indirect jobs created from agricultural engineers, farmers, chemical and mechanical engineers to sales and business development jobs.

The Energy Innovation Hub and the transportation sector in Lebanon:

Lebanon's transportation sector is a combination of private transportation through individual private transportation including cars and motorcycles, taxis, privately owned buses and minivans and public transportation through public buses. Most means of transportation in Lebanon rely on gasoline that was previously heavily subsidized by the Lebanese government. Following the economic crisis and due to the ongoing global gasoline and fuel crisis, the Lebanese government reduced the subsidization on gasoline which contributed to car cues in front of gas stations and a spike in transportation costs. In support of a more sustainable and eco-friendly transportation sector (through renewable energy), the Energy Innovation Hub supported 2 startups that promote alternative transportation solutions such as electric bikes and solar charging stations.

Job creation in the transportation sector:

Energy Innovation Hub startups contributed to more than 15 jobs created in the transportation sector between direct and indirect jobs created, from mechanical engineering, business development and sales backgrounds.

The Energy Innovation Hub and the Energy Efficiency and Energy Production sector:

Lebanon's geographic location presents a mix of possible renewable resources such as abundant sun exposure, water, wind, and greenery. These resources enable Lebanon to benefit from solar energy, hydropower, wind power and biomass that produce energy. Following the economic and energy crisis that Lebanon is witnessing, the country has witnessed an increase in the adoption of renewable energy solutions for energy production and energy efficiency.

Energy Innovation Hub helps spread awareness of the importance and abundance of adopting renewable energy solutions by supporting 9 startups within the energy production and efficiency sectors. These solutions include producing energy through biomass in rural areas, energy auditing recommendation systems to save energy utilizing drones to detect inefficiencies in solar panels to optimize energy production.

Job Creation in the energy production and energy efficiency sector:

The Energy Innovation Hub startups contributed to more than 50 jobs created in the energy production and energy efficiency sectors from direct and indirect jobs created from mechanical engineering, business development and sales backgrounds.

The Energy Innovation Hub and the Food and Beverage Sector:

It is estimated that Lebanon exports around 500,000 tons of fresh fruits and vegetables worth 225 million Euros, and the remaining produce is sold in local markets for consumption, drying, and storing purposes (as "Mouneh"), or unfortunately rots becomes food waste. In an attempt to preserve Lebanese traditions in food drying and hospitality and reducing food waste. Energy Innovation Hub supports 2 startups in the food and beverage sector that introduced renewable energy technologies to the food industry, in order to promote food safety and hygienic practices.

Job Creation in the food and beverage sector:

Energy Innovation Hub startups contributed to more than 25 jobs created in the agricultural sector and food and beverage in rural and urban areas, between direct and indirect jobs created from agricultural engineers, farmers, chemical, and mechanical engineers to sales and business development jobs.

The Energy Innovation Hub and the Fashion Industry:

Fashion in general, and fast fashion in particular, are some of the most polluting industries in the world. The industry relies heavily on water and energy and produce fashion waste and textile waste. One cotton shirt costs earth 3,000 liters of water in comparison to organic cotton that requires 91% less water and contributes to 5x less water pollution. Moreover, fashion factories contribute globally to 8% carbon emission. In support of reducing the environmental implications of fashion on planet Earth, Energy Innovation Hub supports a sustainable, ethically sourced organic cotton fashion brand that reduces the environmental cost of fashion in the industry through a solar power production facility with a textile optimization system offering employability to women in rural areas.

Job Creation in the fashion sector:

The Energy Innovation Hub startups contributed to more than 10 jobs created in the fashion industry, from factory workers, tailors, content creators and operation.

Energy Innovation Hub and the Recycling Industry: Around 5 million plastic bottles are thrown away in the US every hour, putting the figure at around 35 billion plastic bottles annually. Plastic in the ocean is a huge problem with estimates suggesting that 8 million metric tons of plastic end up in the world's oceans annually. Plastic is manufactured from fossil fuels and is becoming more expensive with the global increase in fossil fuel prices. The Energy Innovation Hub is supporting a recycling startup with a pyrolysis concept to convert single use plastic into gasoline and biproducts that are reusable in machines and electricity generators.

Job Creation in the food and beverage sector:

The Energy Innovation Hub startups contributed to more than 5 jobs in the recycling and sorting facilities including blue collar jobs, chemical and mechanical engine.

Direct and Indirect Employment in Energy

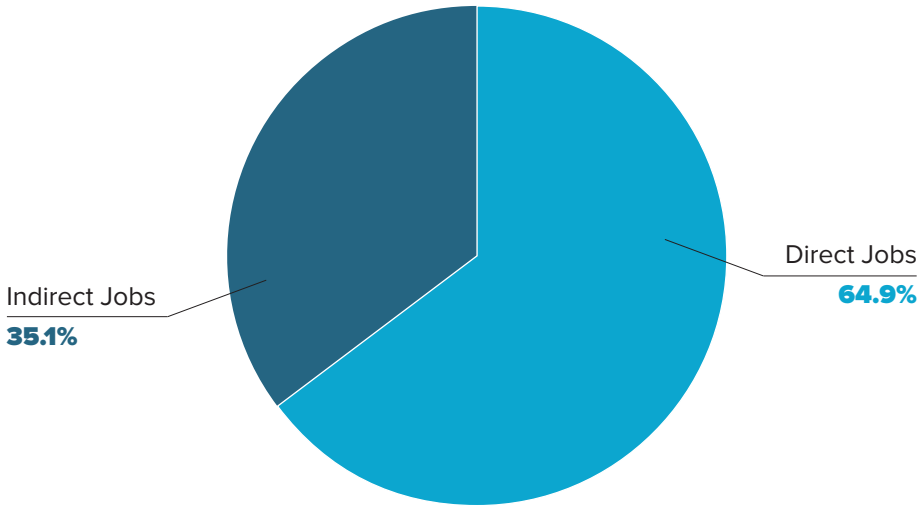


Figure 23 - Direct and Indirect Employment created in the Energy Sector

Direct and Indirect Employment across different sectors

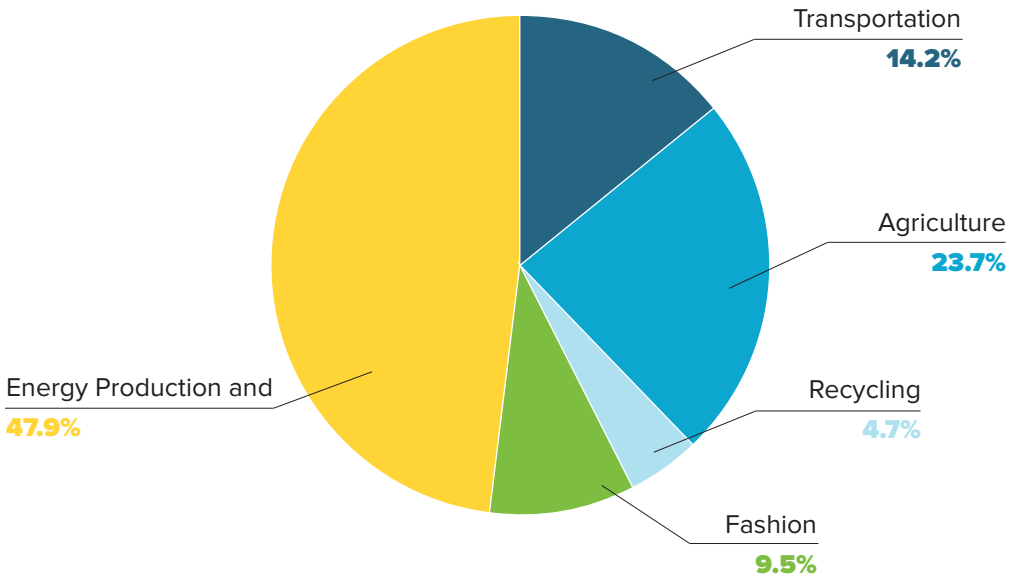


Figure 24 - Direct and Indirect Employment created by the Energy Innovation Hub across various sectors.

06
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