Energy Sector Innovation Hubs

A Conceptual Model for the Creation and Sustainment of Innovation in the Energy Sector

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AmpUp Program

The Advancing Modern Power through Utility Partnerships (AmpUp) program introduces an innovative performance improvement model centered around peer-to-peer relationships and strong practitioner and stakeholder networks that deploy expertise and establish pathways to implement best practices with measurable and sustainable impacts. This work will take a new approach to building collaborative structures for USAID-assisted utilities. AmpUp leverages the expertise and knowledge of utilities and energy sector experts from around the world, applying lessons learned from 30 years of energy partnership programs, and incorporating new models of energy partnerships.

AmpUp supports and equips local stakeholders on the journey to self-reliance and net-zero energy. This is initiated through traditional means of capacity building and technical assistance, and then transition towards development of locally-led and self-sustaining ecosystems that continue to advance and implement innovations beyond AmpUp's five-year program duration.

We envision the concept of Innovation Hubs that can be implemented by region or country, and tailored for local challenges and needs using a modular set of services and capabilities from the AmpUp program. Each Innovation Hub will be set up to operate as a stand-alone, self-sustaining enterprise with networks, resources, and assistance from other Hubs and global experts. This format will enable each Innovation Hub to synergize with existing development initiatives to make best use of expertise and resources.

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Innovation Hubs Overview

The energy sector faces complex challenges that can only be solved through the collaboration of multiple stakeholders from all facets of the energy ecosystem. Examples of such challenges are increased resilience of the electric power system to natural disasters, decarbonizing energy, enabling energy access and equity to all, facilitating economic development by enhancing grid reliability and power quality, protecting energy security against the effects of global fuel shortages and price spikes, and meeting all these challenges using a viable business model that promotes sustained growth. Such grand challenges cannot be resolved by individual stakeholders, yet often we do not have a systematic means of structuring and fostering collaboration to spur the required cross-sector innovation.

Innovation Hubs provide new ways to understand stakeholder needs and challenges, foster co-creation of ideas to action, develop value propositions that unlock new benefits to all stakeholders, incubate and accelerate ideas, foster policy innovation, design and implement pilots, enhance access to finance, and provide a rigorous process to deliver outcomes. Innovation Hubs provide a collaborative structure for the development and application of entrepreneurship and innovation to the energy sector. Innovation Hubs may include a mix of local and international collaborators, as shown in Figure 1, to address target scope and goals.
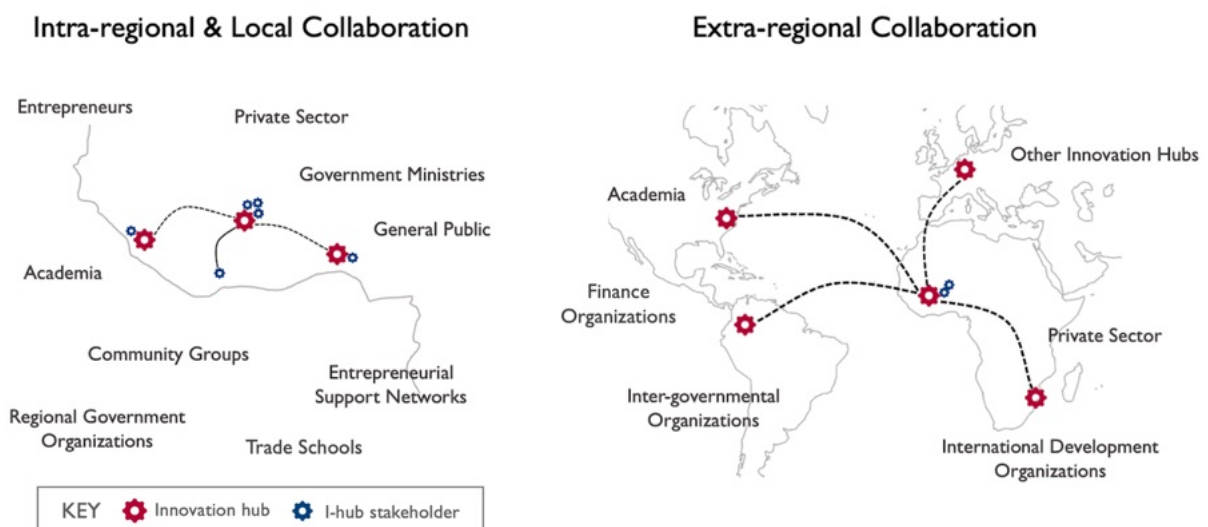

Figure 1: Potential stakeholder networks in an Innovation Hub

Innovation Hubs engage all stakeholders (customer groups, utilities, USAID Missions, developers, technology providers, academia, etc.) to co-create requirements and an action plan for the energy transition that addresses current needs and meets the economic development trajectory of their country or region. This process involves ratepayers as customers that have choices from an increasing amount of energy technologies, and recognizes that customers may require different solutions (e.g., grid connected, solar system, microgrid, mini-grid, and/or mobile power) to access reliable, affordable, and clean energy. This may include peoples that lack electric service altogether (Indigenous communities, refugees, and/or transient populations).

An Innovation Hub can be thought of both as a process and a product. This document provides the process for how to develop an Innovation Hub and promote sustainability and a locally led ecosystem for continued innovation and growth of the energy transition. The establishment of an Innovation Hub as a product will also embed a strong collaborating, learning, and adapting (CLA) processes to iterate

and improve. CLA processes are ideal for the energy transition that will present new needs and challenges over the next few decades.

Innovation Hub Development Process

The Innovation Hub creation process combines elements from the USAID 5Rs framework with business concepts from customer discovery, lean startup, customer development process, and business model creation. A systems thinking approach is taken throughout to characterize specific actors of the sector (e.g., organizations, individuals), the rules governing the sector (e.g., policy, regulation), assets (e.g., natural resources, physical built environment), and their relationships to one another. This allows stakeholders to understand connections that may not otherwise be apparent, and design interventions that create systematic change and unlock latent potential to accelerate the energy transition.

Figure 2 provides an overview of how to get started developing an Innovation Hub. The process has three phases: (1) Discovery, (2) Solution Formation, and (3) Iterate and Improve, with the Innovation Hub being launched before the start of Phase 3. Figure 2 shows the purpose of each phase (objectives), the actions to be completed during the phase (activities), the deliverables from the completion of the phase (outputs), and what the phase should achieve (outcomes).

CLA practices are used throughout to ensure that, "programs are coordinated with others, grounded in a strong evidence base, and iteratively adapted to remain relevant throughout implementation." Complementing details are provided in the USAID CLA Toolkit. This includes monitoring, evaluation, and learning (MEL) for data acquisition on indicators for performance tracking.

PHASE 1: Discovery
The Discovery Phase identifies the "why" and the "who" of the Hub. Why should the Hub exist and who does it involve? The Discovery phase focuses heavily on questioning and *listening* in systems practice. Discovery helps identify and articulate the 5Rs: Results, Roles, Relationships, Rules, and Resources.

Desk research begins to develop a broad, systems-level understanding of the energy sector landscape for the proposed country and/or region.

Ecosystem mapping then follows to identify all energy sector stakeholders, and continues with interviews as one-on-one dialogue or small group discussion to understand the experiences, needs, challenges, and priorities of all stakeholders in the sector. The interview process and questions should be tailored to the individual being interviewed and the scope of their position and sphere of influence. Interviews also identify the *pain points* and *gain points* for each organization and individual that can be addressed by the Hub. In other words, how can the entity's goals or experience be enhanced through participation in the Hub (gain point) or how can the entity's obstacles or challenges be relieved through the Hub (pain point). More information on this step can be found in the "Stakeholders and Value Propositions" section. This interview process will also generate knowledge of local organizations – research centers, training groups, technology developers – that may have the right capacity, infrastructure, and administration to serve as the foundation of the Innovation Hub or join in governance.

Collective discovery sessions are then held, guided by knowledge of the ecosystem mapping and stakeholder analysis. Stakeholder engagement can happen asynchronously through online platforms, synchronously through in person meetings, or a mix of both, however, the key is to facilitate

PHASE 1

Discovery

Objectives
- Identify innovation hub stakeholders
- Bring together all stakeholders
- Identify sector wide primary challenges and priority needs
- Establish culture and process of co-creation

Activities
- Desk research of sector and local contextual challenges and environment
- One-on-one interviews of stakeholders
- Co-develop theory of change
- Complete systems mapping to define scope of the problem(s)

Outputs
- Report of current state of local context
- Theory of change statement
- List of pain points and gain points for each stakeholder
- List of problems with associated scope of systems and actors

Outcomes
- Stakeholders have improved communication vectors
- Stakeholders have prioritized the problems they collectively face
- Stakeholder alignment on problem definition and scope

PHASE 2

Solution Formation

Objectives
- Define services and products that will address priority challenges
- Develop plan for development and implementation of solutions

Activities
- Collaboratively brainstorm and design solutions
- Collaboratively decide upon minimum viable products
- Create governance and economic model of the Hub
- Develop measurements of success for the Hub
- Hire staff, purchase assets, and identify space as needed

Outputs
- Governance model and economic model of Hub
- Define services and products of Hub
- Action plan for developing services and products
- List of success indicators for Hub and data collection and review strategy
- Operating Plan and timeline

Outcomes
- Hub has a long-term sustainable development plan
- Each stakeholder knows their role in the Hub and their individual and collective benefits derived from the Hub

Launch the Innovation Hub

PHASE 3

Iterate & Improve

Objective
- Understand what's not working and improve
- Grow and scale activities of the Hub

Activities
- Engage with stakeholders to identify what's working and what needs improvement
- Monitor success outcomes through regular data collection
- Diversify and address additional priority challenges and needs
- Adapt governance model and economic model

Output
- Updated outputs from Phase 2

Outcomes
- Long term sustainable Innovation Hub and embeddedness in the community
- Increased collaboration in the energy sector
- Improved energy sector as a whole

Collaborating, Learning, and Adapting (CLA) / Monitoring, Evaluation, and Learning (MEL)

FIGURE 2: Phases to develop and sustain an Innovation Hub.

collaboration during this phase. A facilitator will guide stakeholders through conversations to develop prioritized goals that encourage collaboration and benefit many stakeholders, and should avoid situations in which single actors dominate the agenda and issues that are exclusively unidirectional. This co-creation process will yield a Theory of Change (ToC) statement. A ToC statement explains the expected impact of an intervention, in this case the Hub. Below are some example statements.

- *IF* improved preventative maintenance and access to a skilled technician workforce will create reliable access to power in cities *AND* our organizations work together to provide these resources *THEN* local businesses will become more successful and economic development will occur.
- *IF* the cost of electricity is reduced through more efficient business practices *AND* low income households have more access to income generating opportunities*THEN* informal electricity connections and theft will decrease.

Theory of Change statements that connect stakeholders often take a broad view of the system, and do not exclusively look at the problem space for a single actor or discipline (e.g. technology maintenance, monetary shortages). The facilitator helps stakeholders through a process of systems mapping to define the scope of the problem and identify linkages or relationships between system components by using a PESTEL framework – Political, Economic, Social, Technological, Environmental, Legal – to categorize features of the problem space and identify potential intervention points. This ensures stakeholders are not inadvertently focusing on a symptom instead of the underlying problem, and avoids development of partial solutions that may have limited success. If a larger scope is defined than originally expected, the co-creation process can limit scope to those initial stakeholders, or involve more stakeholders from the region who need to be engaged and goals collaboratively developed or iterated once more.

The co-creation process can move onto the Solution Formation Phase following systems mapping and development of prioritized goals, a Theory of Change statement where all stakeholders can see the value and benefits, and a refined list of stakeholders.

PHASE 2: Solution Formation
The Solution Formation phase includes detailed planning to develop the Innovation Hub to address goals defined in the Discovery Phase. Co-creation continues with stakeholders working together to list the services or products the Hub will provide to address prioritized goals. A summary of potential services and products is given in the "Core Activities for an Energy Sector Innovation Hub" section of this document. Hub activities should also reduce a pain point or improve a gain point of one or more stakeholders so that the Hub has clear connections to stakeholder needs.

Definition of Hub activities naturally leads to development of the governance model and economic model, which are needed to deliver and sustain selected activities. An advisory council or board that provides advice, perspectives, and resources is often set up during this step. Formal documentation and frequency for financial reporting and review is also decided upon. This step also defines the role and responsibilities of each stakeholder to the Hub. More information can be found in the "Economic Models" and "Organizational Design and Governance Strategy" sections as a guide for facilitators.

Indicators to measure success are brainstormed to meet stakeholder priorities and the ToC statement, and include USAID indicators, Sustainable Development Goal (SDG) indicators, and government indicators at a minimum. Quantitative targets should be set whenever possible but we should expect some qualitative targets as well. Stakeholders who are not accustomed to involvement in power sector decisions may not have formal indicators, and the facilitator will help those stakeholders identify and/or

refine indicators to address their gain points or pain points. Indicators are then organized and mapped to each Hub activity to draw a clear connection between activities and indicators or outcomes.

MEL processes and a data governance strategy is created to track indicators for long term performance monitoring and evaluation. This includes data type, data source, how often data is collected, which actor(s) collects data, and governance and data privacy.

Solution Formation concludes with development of a formal Innovation Hub Operating Plan that includes all information from Solution Formulation – prioritized goals, Theory of Change, governance model, economic model, activities, stakeholders, indicators, data governance, and MEL plan. A signing ceremony should occur with signatures from all stakeholders agreeing to the Innovation Hub design and plan of action. A timeline for expected steps and activities, including hub launch, should complement the Operating Plan.

HUB LAUNCH
The Innovation Hub can formally launch, both internally to celebrate as a team and maintain strong connections, as well as externally with press releases to inform and engage the public and any key customer segments of the Hub.

PHASE 3: Iterate and Improve
Stakeholders should meet at a minimum frequency of quarterly to review and refine the Hub. Hub activities and collaboration formats will often be adapted through MEL processes, and this dialogue is facilitated by the culture of co-creation established during Discovery and Solution Formulation phases. Regular collaborative engagement also leads to development of self-correcting processes and a feedback loop that measures outcomes and benefits and adjusts activities accordingly to meet changing or emerging interests of stakeholders.

Annual or bi-annual meetings of the advisory council or board will take place to review financial statements, internal policies, and overall strategy for growth and continuous improvement.

Example I-Hub: Smart Grid Knowledge Center
A smart grid benefits power sector stakeholders through improving efficiency, decreasing costs, and increasing visibility. The Government of India has set out to modernize its national power grid through developing the National Smart Grid Mission (NSGM) within the Ministry of Power.

Since 2018, NSGM has been home to the Smart Grid Knowledge Center that, "aims to be one of the leading Centers of Excellence globally to foster partnerships, innovation and entrepreneurship in smart grid technologies and create capacities in the power sector." The Center offers testing facilities for smart grid technologies such as microgrids, advanced metering infrastructure, and building energy management systems. It also provides a space for training and capacity building on smart grid technologies. Innovations developed and lessons learned within the Smart Grid Knowledge Center benefit from the Ministry's country wide influence on the energy sector that are strengthened through engaging with other actors via the Center. The Ministry and USAID have developed a strategic vision that is a great example of how a Hub iterates and improves after launch.

Energy Sector Stakeholders and Value Propositions

Stakeholder engagement not only outlines the most immediate beneficiaries — the "who" — but engaging at the stakeholder level also strategically aligns and guides the "why". What impacts will an Innovation Hub have and why does that impact matter to each stakeholder?

The stakeholder overview shown in Table 1 describes the most common stakeholder types that would be relevant to an energy sector Innovation Hub and the potential benefits to stakeholders involved in the respective design, programming, and end-user areas of the Innovation Hub. This overview also serves as a framework for creating a customized, location-specific stakeholder engagement plan.

Table 1: Stakeholder Categories and Value Propositions

Stakeholder Type	Description of Stakeholder	Potential Value Propositions of the Innovation Hub to the Stakeholder
Power Providers & Producers • Local utilities • Independent power producers • Transmission companies/organizations • Generation companies • Distribution companies • Retailing companies • Energy services providers • Energy technology providers	Current and emerging power providers and producers that service or plan to service the needs of the locale, including urban, peri-urban, and rural communities. Include stakeholders that provide energy service (e.g. traditional utility) or energy products (e.g. solar home system).	• Better understanding of customer's needs and wants through effective engagement • Opportunity to engage directly with rate payers to understand current and changing needs and issues • Improved knowledge of innovative technologies that will improve or disrupt utility business model • Access to subject matter expertise on unique challenges facing the sector • Physical location and space for evaluating new technologies • Grid access for piloting new technologies • Workforce needs and definition of workforce pipeline • Space to convene with other stakeholders in workshops and meetings • Access to financial resources • Access to grid data and aggregated customer data
Customers & End Users • Customer advocacy groups • Local private industry • Small businesses & entrepreneurs • Schools, healthcare, and other public services • Household customers • Government	Customers and end users are people and entities that will benefit from the Innovation Hub directly as energy consumers or through participation in energy-related services of the Innovation Hub.	• Direct, first-hand information on customer gain points and pain points • Better understanding of electricity tariffs and policies, and how they affect customer behavior and economic development intentions • Increase awareness for how to improve power access, reliability, affordability, or quality • Ability to more easily communicate with power provider and local officials about energy concerns • Cost savings from energy efficiency understanding • Improved understanding of benefits of and ways to monetize productive uses of energy • Physical space to operate productive uses of energy • Potential location to pay electricity bill

Women & Youth ● Women energy professionals ● Youth & young adults	Women, youth and young adults with a curiosity, interest, or desired profession in energy.	● Credentialing on power and energy topics ● Access to career services for energy sector such as resume review, networking, or computers ● Resources for developing new businesses ● Space to network and engage with other stakeholders ● Improved awareness of job opportunities ● Improved understanding of energy sector career pathways ● Support services for relevant community development or community outreach campaigns ● Improved leadership skills through leadership training or mentorship programs
Education and Research ● Local universities ● Research institutes ● Primary and secondary schools ● Vocational schools ● Local think tanks	Organizations that educate people, produce thought leadership, conduct research, and credential professionals.	● Means to pilot research projects ● Increased revenue through offering educational services ● Improved awareness of education offered by local institutions ● Increased knowledge and understanding of power and energy by students ● Support to identify research collaborators and develop public-private partnerships to evaluate technologies ● Transition of research products out of the university to reach scale ● Development of testing procedures and metrics for technologies undergoing laboratory or on-grid evaluation
Policy & Regulation ● Government officials ● Ministry of economy ● Ministries of energy ● Rural electrification authorities ● Energy regulatory authorities ● Professional industry associations (e.g., IEEE)	Leaders, policymakers, and associations who set formal and informal rule systems and requirements that affect the energy sector.	● Hub advising of governing policies and regulation for the energy sector ● Buy-in and involvement of top officials to broad changes ● Improved understanding of energy policy and regulation ● Means to easily communicate with and collaborate with all energy sector stakeholders ● Improved energy sector planning
Entrepreneurs ● Emerging and future utilities ● Entrepreneurial individuals ● Small business Corporate ventures	Organizations or individuals looking to provide a product or service.	● Testing space for new technologies ● Access to expertise for new business ideas ● Business accelerators for improved knowledge and coaching of how to start a business and business practices, and how to grow ideas to scale ● Access to financing and banking resources
Development Practitioners ● Community interest groups ● Local NGOs ● International aid organizations	Organizations interested in community, regional, or national social, environmental, or economic development	● Attain development goals more quickly through increased cooperation of stakeholders ● Better understandings of primary needs of their stakeholders ● Potential liaison to communities or community groups ● Assistance with facilitating productive uses of energy ● Awareness of funding sources

Funders and Financiers • Underwriters (e.g., Development Finance Corp) • Financial institutions • Investors • Donor agencies • Community savings groups	Funders, financiers, and investors interested in clean energy projects and sustainable economic and community development anchored by modern power advancement.	• Funding source for Hub activities and/or governance • Awareness of new energy businesses to invest in • Improved results of investments by leveraging activities offered by the Hub • Lower-risk investments through services offered at the Hub • Greater customer awareness of banking services and practices • Awareness of community development projects seeking funding

Stakeholders may be both a Hub design partner and an end user. For many this is expected. For example, a utility may inform design and programming for a workforce development program and later utilize the Innovation Hub's training program to intake skilled new personnel or retrain existing personnel.

Core Activities for an Energy Sector Innovation Hub

Core activities of an Innovation Hub are outlined in Table 2 below. The list is not exhaustive but rather is illustrative of potential services and products provided by an Energy Sector Innovation Hub.

Table 2: Core Activities of an Innovation Hub

Core Activity	Potential Deliverables	Potential Assets Needed	Outcomes & Impacts
Workforce development and capacity building	• Certifications for the transitioning workforce • Vocational training • Improved university curricula • New university or vocational degree programs • Credentialing	• Hands-on physical power system equipment training • Hands-on simulation-based training • Certifying institution • Wifi uplink for continual education through webinar and online education • Computers • Trainers • Subject matter experts	• Workforce pipeline with talent acquisition for utility, regulator, and other energy business occupations • Engaged youth with a broadened horizon of possibilities • Trained personnel for safety and quality control
Research, development, and demonstration (RD&D)	• Innovation developed from basic ideation to minimum viable product • Pilot project design & development • Mechanism to support economic development powered by sustainable energy • Emergent clean and sustainable technology • Pipeline of ideas that are pre-evaluated before on-grid pilot study	• Testing lab or maker space • Grid connection • Subject matter experts • Wifi uplink for continual education through webinar and online education • Computers	• Innovative solutions to challenges • Faster translation of ideas to implementation • Empowered stakeholders who feel needs are met through action • Disrupting technologies for improvement of sector

Incubators and accelerators	- Minimum viable product transferred to industry - Entrepreneurship and small business preparation and coaching to facilitate innovation - International ideas into the local economy and utility context - Nurturing the life cycle of new utility models emerging after knowledge transfer - Services for acceleration of uptake of innovation and change in sector	- Wifi uplink for remote incubation - International experts with business accelerator knowledge - Local entrepreneurs - Network of risk capital investors - Business coaches	- Increased consumer choice - Alternative ways to optimize energy usage - Resources for modernization - Scaling successful pilots to improve local or regional energy sector
Energy sector strategic planning	- Develop reports on medium to long-term integrated energy sector plan - Hold collaborative events to strategize goals - Advise on implementation of strategic plan	- Wifi uplink to collaborate with remote experts and access online resources - Physical space to hold events - Computers	- Increased integration and cohesion in sector planning - Improved understanding of how to meet net-zero goals
Local and international expert access	- Holistic needs assessment - Playbooks and lessons for sustainability, self-reliance, innovation and development - Policy review and support - Review and revision of national and local plans for resource planning and renewables integration - Location-specific regulatory primer - Technical advisors and reviewers - Contract review - Digitalization roadmaps, cybersecurity, and actions plan - Access for emerging scientists and engineers	- Wifi uplink for connecting with international expertise - Programmatic approach to knowledge transfer - Team of committed international subject matter experts	- Technical vetting and due-diligence - Organizational reform - Resources for modernization - Strengthened international ties
Women and minority engagement	- Targeted workforce development for women and marginalized populations - Leadership programs - Mentorship programs - Facilitating input from underrepresented	- Engagement program - Physical or virtual meeting space - Program staff for facilitation of activities - Local or international subject matter experts	- Increased diversity in leadership positions - Increased representation in energy sector decision making - Increased diversity in energy sector

		● Peer model for knowledge exchange and shared experiences	
	populations, including those from rural communities and low engagement due to socioeconomic factors		
Hardware training and testbed	● Builds awareness of sustainable solutions with hands-on experiences for managers, engineers, operators, and technicians ● Engages youth in career exploration ● Gives exposure to people exploring a career change ● Safety training for power system installation and maintenance ● Community energy source when hardware is idle ● Hardware-in-the-loop testing of new technologies	● Mini-grid or micro-grid ● Water filtration system ● Variety of energy generation systems, distributed energy resources, and load control ● Protection and coordination equipment ● Personal Protective Equipment (PPE) ● Experimental equipment (e.g. power supply, load bank, grid emulator) ● Remote monitoring devices ● Grid connection ● Staff for training, experiments, operation, and maintenance ● Wifi uplink for data sharing and data monitoring ● Training curricula	● Informed policy makers, community leaders, economic and community developers, and energy managers and engineers ● Diversified power generation ● Accessible and affordable energy storage ● Certified power system installation and operation technicians
Public outreach campaigns	● Industry and consumer energy usage reports ● Community engagement and program awareness	● Wifi connectivity ● Printer and copier for summary reports and marketing ● Network of local community leaders and community groups	● Behavioral changes for energy efficiency that also make clear to consumers what institutions are doing ● Consumer literacy on financial implications of energy utilities, infrastructure, and rate setting
Project financing services	● Financial match-making roundtable event ● Entrepreneurial coaching for seeking funding ● Online resource platform for energy project financing	● Wifi connectivity ● Financing experts ● Business coaches	● Strengthened financeability of projects ● Lower-cost financing options
Policy innovation and advocacy	● Advising on rate cases ● Policy analyses and recommendations ● Refinement of regulation on sector participation and ownership models ● Policy reports based of studies conducted by the Hub	● Local advisor familiar with energy policy and regulation processes ● Network of local political leaders ● Experts with knowledge and expertise of energy sector policy and law reform	● Tariff changes to benefit consumers ● Better representation of customer groups in policy decision making ● Market restructuring to permit improved participation

Physical space for hosting events, collaborations, and meetings	• Host working groups, task forces, and learning cohorts • Convene local universities and local energy sector • Hosting mapathons and student-professional groups to digitize electric grid information	• Physical space (permanent or rented for events) - may leverage unused or underutilized physical space of Innovation Hub	• Integration of and/or bridges across disciplines and sectors to accelerate and advance modern power • Peer learning and partnership networks
Consulting services	• Ad-hoc consulting on energy sector topics	• Wifi connectivity • Network of experts on diverse topics	• Faster and more nimble response to energy sector challenges

Example I-Hub: Co-Creation Hub

The [Co-Creation Hub](), established in Nigeria in 2011, offers a unique perspective to how an innovation hub may take shape. CcHUB is a stand-alone organization that focuses on three primary work areas: healthcare solution development, educational ICT tools, and governance and digital security. For each area, the Hub provides innovation consulting and start-up funding along with other services such as capacity building through hosting career fairs, knowledge sharing through webinars, and local community engagement.

CcHUB is a great example of an Innovation Hub that engages stakeholders across multiple sectors. It has collaborated with local businesses and entrepreneurs, government ministries or state officials, large private sector corporations such as Microsoft or Facebook, international research groups like MIT Governance Lab, and even aid organizations such as the Bill and Melinda Gates Foundation. CcHUB is a catalyst of innovation in healthcare, education, and good governance across the African continent with offices in three countries to date.

Economic Models

The economic model for an Innovation Hub will rely on an initial period of investment for scoping research, stakeholder engagement, facilitating workshops, establishing problem areas and desired outcomes, planning the services model, milestone and timeline establishment, and preparing the governance and long-term economic model. Regular and coordinated stakeholder engagement is valuable to iterate processes, procedures, and gain alignment of inputs to outputs, and outputs to impacts. This initial period can also dedicate effort for capacity development of individuals and organizations to grow and connect collaboratively as one team and one purpose.

After the initial planning period, the Innovation Hub can continue to operate informally with a set of common goals or opt to formally organize as a consortium, membership organization, joint venture, or other format with governance guidelines and financial support that match the intended services and organizational design.

Revenue Sources

Financial support can be cash or in-kind. Examples of in-kind support include personnel time, space utilization, travel funding, equipment or equipment use, data access, materials and supplies, scholarships, certifications, and more. Revenue-generating activities should match the core services and goals of the Innovation Hub, with examples including:

- Grant funding for projects, governance, physical space, operating expenses
- Fees for membership
- Fees for testing and evaluating technology
- Fees for training or credentialing, exams, and certifications
- Charges for services (e.g. business advising, community engagement and outreach, technology pilots, energy strategy)
- Earnings for hosting events or conferences
- Leasing of space for meetings and events
- Leasing of space and equipment for technology evaluation

Expense Categories

Expenses for the Innovation Hub are differentiated as start-up costs before launch, recurring costs for Governance and Administration, and incremental costs for Core Activities.

- **Start-up:** Expenses for the Innovation Hub Discovery and Solution Formulation phases (Figure 2) will involve a series of stakeholder engagement sessions, collaborative workshops, desk research and analysis, document preparation for the Innovation Hub plan, and reviews with advisors and stakeholders. This is primarily personnel time. Travel is expected for local engagement in the country, and some international meetings or visits could also occur to a regional event depending on the scope of countries in the Innovation Hub.
- **Governance and Administration:** Expenses for the Iterate and Improve phase (Figure 2) are recurring costs that fall under Governance and Administration. This is essential as a core function of the Governance structure, and also ensures that the processes of CLA and MEL are financially supported. Expenses primarily include personnel time and will also involve document preparation and meetings/events with stakeholders, virtual or in person. Further Governance and Administrative expenses should include strategic leadership, program management of the Core Activities, legal fees, accounting, marketing and communications, reporting, materials and

supplies costs, associated travel for Governance, and any fees for facilities use, utilities, or memberships and licenses. Governance and Administration costs should be commensurate with the size and scale of the Core Activities, and may appear in budgets as a percentage of costs for Core Activities or budgeted separately from Core Activities. A blended approach is often preferred with a baseline budget for Governance and Administration activities that is funded directly and incremental budget added from Core Activities revenue to support growing operational needs.

- **Core Activities:** Expenses for Core Activities follow directly from the activities performed by the Innovation Hub (Table 2). Separate budgets and timelines are created for each activity undertaken, permitting fiscal transparency for reporting purposes and also flexibility to adapt to changing and evolving needs. This also helps standardize costs and budget preparation processes, thereby reducing administrative time and increasing external confidence in the Innovation Hub by providing same/similar costs of services to all parties or being explicit when differences in costs arise. Core Activities could include a mix of personnel time, materials and supplies, equipment or equipment use fees, external services (e.g., permitting, integration), software licenses, certifications and licensing, travel, and more.

Example I-Hub: Power Systems Engineering Research Center

The Power Systems Engineering Research Center (PSERC) was established in 1996 to facilitate and fund public-private partnerships that work on challenging problems in power markets, power systems, and transmission and distribution technologies. Initially seeded with funding from the U.S. National Science Foundation, continued financial support for governance and core activities are obtained through a mix of annual membership feeds, competitive grants, and cost-share.

PSERC provides three core activities: (1) efficient access to experienced university researchers in an array of relevant disciplines and geographically located across the U.S., (2) leading-edge research in cost-effective projects jointly developed by industry leaders and university experts, and (3) high quality education of future power engineers.

Led by Arizona State University, the PSERC collaboration includes 13 universities and 36 industries. Each member contributes knowledge and opportunities that advance the energy sector, and those experiences allow all collaborating members to advance their organization's goals. The three technical themes are guided by a Director, Deputy Director, Executive Committee, and Industrial Advisory Board.
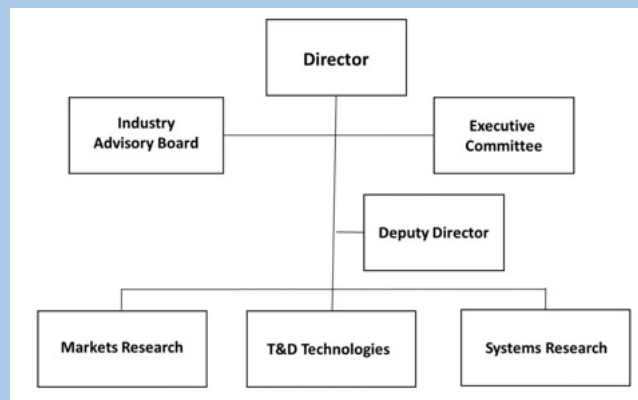
Facilities and use fees arise if the Innovation Hub has a physical location for employees, meetings, events, trainings, or equipment testing and evaluation. Organizations may have limitations on funding facilities ownership or facilities use fees.

If the Innovation Hub chooses to adopt an advocacy position without being engaged in direct services delivery, the commensurate financial model would be simplified to connect and convene stakeholders, share information, guide and facilitate synergistic activities between stakeholders, and prepare public documentation and publications that advance Innovation Hub stakeholder goals and activities.

Oversight and Reporting

Guidelines and decision-making practices are needed for fiscal monitoring, excess revenue, budget shortfalls, expense distribution and reinvestment, and fiscal reporting. Fiscal reporting should be tracked internally no less than quarterly, and reported to the governance group (e.g. Advisory Board) no less than annually. This will ensure the team meets tracking and accountability requirements for revenue sources and members, and applicable local and international laws for purchasing and funds utilization.

Organizational Design and Governance Strategy

Selection of the appropriate organization design and governance strategy is aided through knowledge of geographic scope, local and regional contexts, stakeholder involvement, Hub activities, and the economic model to create and sustain Hub activities as identified through Phases 1 and 2 of the Innovation Hub Development Process.

Geographic Scope

The geographical breadth of the Innovation Hub will follow naturally from selection of the energy sector scope, stakeholders, and activities. For example, to address issues concerning trans-national transmission-level energy trading, a regional Innovation Hub should engage stakeholders from several countries. On the other hand, to address electricity theft within an urban informal settlement, a community based Innovation Hub may be best, or one with an urban focus. Innovation Hubs can also have multiple geographical focus areas through formats such a "hub-and-spoke" model that share information and resources to address common goals or challenges, but act locally to execute in their regions of focus. Examples include productive uses of electricity or mini-grids to enhance rural electrification efforts, topics that have broad global interest with significant need for local leadership and action to implement.

Situated Context of Local Stakeholders

Situated context guidelines describe how the Innovation Hub will be driven and guided by local needs, parameters, and be responsive to the specific cultural, regulatory, and policy environment the Innovation Hub operates within. Some situated and thus specifically customizable aspects to consider for the Hub organizational design may include:

- Identification of stakeholders - who each are, what their needs and wants may be and what role they play in the ecosystem from influencing to being key decision makers. Additionally, stakeholders can be locally situated based on an understanding of who may be considered underrepresented, marginalized, and least able to have a voice.
- Decision making - examination of inputs, specifically how and in what ways are inputs received from stakeholders and how do the processes enable or hinder the ability of all stakeholders to

have a role in decision making processes? How might the Innovation Hub facilitate a more equitable process to ensure broader engagement in inputs as well as outcomes?

- Cultural awareness - the Innovation Hub facilitates a deliberate process to better understand cultural factors including traditions and perceptions around ethnic minority people, gender-aware roles, and other culturally driven parameters that may influence both the processes undertaken by the Innovation Hub, the norms around leadership and decision making and both respecting and overcoming them in certain situations to allow for broader and more equitable outcomes.
- Information sharing - identifying and utilizing both informal and formal means and modes of communication including developing an understanding of normative, most accessible, and most credible forms of communication. Information sharing may rely on person to person, digitally mediated, and at varying levels of written and verbal literacy.

Example I-Hub: National Grid Deeside Centre for Innovation

National Grid is an international electricity and gas utility that is the largest power distribution and transmission business in the United Kingdom. As one of the largest investor-owned utility companies in the world, National Grid strives for innovation in all of its businesses to meet its strategic priorities.

The Deeside Centre for Innovation was developed by National Grid to be the first European off-grid, high-voltage testing environment. Other than serving the internal company needs, the Centre employs a fee-for-service model for outside entities to (a) develop and validate new technologies, (b) develop and trial new maintenance practices, (c) evaluate technologies under extreme conditions, and (d) demonstration, training, and education. These long-term characteristics are reflected in short-term projects that make the organization suitable for adopting a functional or project-based organizational design.

The Deeside Centre for Innovation exemplifies a private sector based energy Innovation Hub model that primarily serves organization specific needs but also offers services to the industry at large to test hardware for safety, efficiency, and performance in more real-world conditions that were previously unavailable in Europe.

Organizational Design

Organizational design will likely originate from one of four general categories below, and adapted to meet the needs of stakeholders, economic model, activities, and situated contexts. Hubs with smaller scope and scale will likely begin with one of the first two organizational designs, and may evolve into becoming a matrixed or geographical based design with larger scope or more locations of focus. Many "grassroots" efforts start as a project based organization and then expand into structures that require more components and sophistication as their scope and scale grows.

1. Functional / hierarchical: organized based on an entity's long-term key functions or activities (e.g., administration and human resources, business development, project financing)
2. Activity based: organized based on an entity's key product or activity outputs (e.g., training program, technical pilots, policy research, consulting)
3. Geographical based: organized based on separate geographies with same/similar activities and structure that report up to a regional/global overseeing body, or alternatively, an organization with a common functional structure that exists at the global level and is instantiated by regional and local representatives for delivery (e.g., global knowledge repository on line technician training that is delivered and credentialed across multiple countries)
4. Matrixed: a combination of functional and project based in which administrative units are organized by functional hierarchy, with connecting elements or efforts across the functional units to deliver on specific projects or efforts (e.g., same outreach team serves all projects)

Organizations may also be loosely structured or have no structure, though this is not expected for the Innovation Hub, and is a separate concept from having a "flat" organizational *culture* that facilitates involvement and sharing. An organization can have a flat *culture* while also having procedural and administrative clarity.
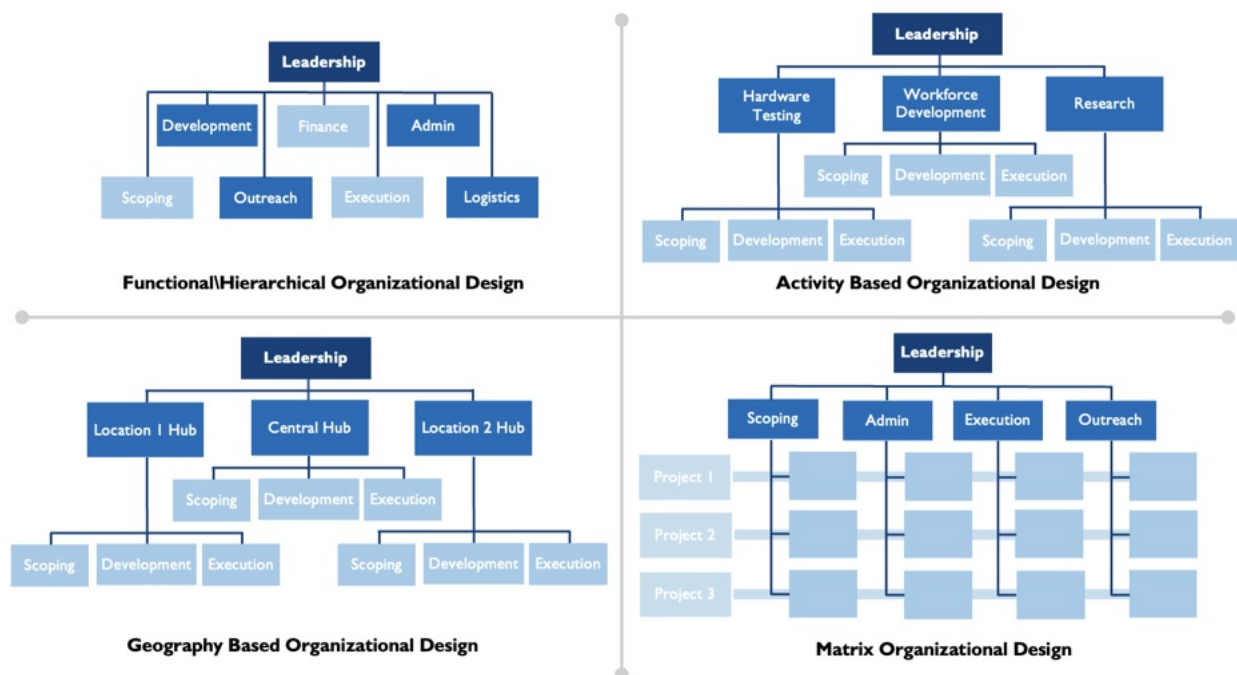

FIGURE 3: Example Innovation Hub organizational designs (adapted from AIHR).

Governance Model

Governance is the collection of organizational structure, policies, systems, and procedures that allows an organization to set strategy and take action with accountability. Responsibility is also defined by the governance model and organizational structure. Definition of the governance model occurs in parallel to selection of organizational design.

While certain governance models may be applicable to either for-profit and nonprofit organizations, the Innovation Hub is expected to rely more heavily on nonprofit governance models that are paired with a sustainable economic model to meet Hub goals and outcomes. Governance for a nonprofit entity typically follows one of five models.

1. <u>Advisory board model</u> - advisors have established expertise, talents, and networks that are provided at no cost to the organization, and deliver advice to organizational leadership often in areas such as strategy, operational review, and scaling
2. <u>Patron model</u> - this is similar to the advisory model but comes with a fundraising expectation
3. <u>Cooperative model</u> - a cooperative model operates without a single point of organizational leadership (CEO or Director) and makes consensus-based decisions as a group of peers, and while no individual member has authority over another, each member does take responsibility and actions on behalf of the whole cooperative
4. <u>Management team model</u> - similar to an advisory board model except that board members are assigned specific duties that relate to the functions or administrative needs of the organization
5. <u>Policy board model</u> - board has a more direct role and involvement in organizational structure and activities, and this includes a bi-directional expectation that board members learn and grow with the organization as a demonstration of their commitment

Development of a governance model should also clearly delineate roles of all stakeholders, even if those stakeholders are not in Hub leadership or operations. A RACI chart can be an easily referenceable document to show who is Responsible, Accountable, Consulted, and Informed for each decision or activity of the Hub.

Conclusion

The scope and scale of energy challenges today requires new approaches to collaboration, partnerships, and networks to facilitate knowledge sharing and rapid action. At minimum, the global scope of climate change means actors from around the world must work together to attain goals, and further, such collaboration enhances the outcomes and capability of each individual entity. Other examples of grand challenges include resilience to natural disasters, decarbonizing energy, energy access and equity to all, just energy transition, energy security, and more. Such grand challenges cannot be resolved by individual stakeholders, and Innovation Hubs provide a structured process and product to enable, empower, and accelerate collaboration within localities and across regions to solve complex, multi-sectoral challenges.

Example I-Hub: Center for Teaching, Learning, and Innovation (CTLI)

The [Center for Teaching and Learning, and Innovation](#) provides an example of an academic based innovation hub focused on a single sector. Housed within the University of Liberia College of Health Sciences, "CTLI is a public-private-academic hub for research utilization, innovation, inter-professional training, and knowledge generation."

The hub brings together stakeholders across the health sector to improve health outcomes in Liberia. CTLI originated from the Bringing Research to Impact for Development, Global Engagement, and Utilization (BRIDGE-U): Liberia USAID program to advance national health development goals and health science education and research and now provides a long term institutional home for the program. In addition to providing a space for actors to collaborate, CTLI helps bring research innovations to the private sector and generate evidence-based research findings for policy makers.