



Energy Consulting Services

At Deloitte, our experts deeply understand the role that power, utilities, and renewables needs to play in other sectors to accelerate the world toward a low-carbon future.

Consulting ●

Energy Consulting Services at a Glance



Overview of Consulting Service

Core Business Operations & Energy Consulting
Enterprise Technology & Performance
Strategy, Customer & Marketing
Human Capital



Energy Consulting

Energy Efficiency
Power Sector Digitalization
Power Sector Support
Capacity building
Sustainability and Climate Change



Deloitte Economic Advisory

Deloitte Economic Advisory and modelling
Deloitte's European power system model DEEM
Deloitte's energy system model DARE



Least Cost Geospatial Analysis For Achieving Universal Electrification Access



Deloitte Global

No. 1 & largest
professional services network
in the world

175 years
existence and rich experience

150+ countries

US\$59.3bn
FY22 Global revenue

411,951
Professionals

90,540
new hires

Serving 80%
of the Fortune Global 500® Companies

Delivering quality Service to
6000+ Clients
private and middle market companies

6 universities
educating over 90,585 students
from over 70 countries

US\$1.23bn
Societal Impact Investments



Deloitte in Africa

In Africa, Deloitte is organized along regional clusters to better facilitate service delivery to clients. Thus, our Ghana member firm shares insights and expertise across the Anglophone, Francophone and Lusophone countries to grow strong regional firms. This promotes dynamic international connections that make Deloitte well placed to offer exceptional service to all our clients.



Anglophone Africa

17 countries serviced
27 offices

Botswana
Egypt
Ethiopia
Ghana
Kenya
Libya
Malawi
Mozambique
Namibia
Nigeria
South Africa
Tanzania
Uganda
Zambia
Zimbabwe

Francophone Africa

19 countries serviced
16 offices

Algeria
Benin
Cameroon
Chad
Congo
Côte d'Ivoire
DRC
Equatorial Guinea
Gabon
Morocco
Senegal
Togo
Tunisia

Lusophone Africa

3 countries serviced
2 offices

Angola

Middle East Africa

4 countries serviced
3 offices

South Sudan

Deloitte in Ghana

Formerly
J.D. Barnes & Co.
Chartered Accountants

390+ Professionals
with external support from
Deloitte Africa and Deloitte Global

More than 75 years
existence and rich experience

Headed by
Daniel Kwadwo Owusu
Country Managing Partner

12 Partners
and able managers assuring
the best of quality delivery

Delivering quality service to
500+ Clients
in Ghana and the Sub-region

Service lines

Our service approach is focused on meeting your needs. Thus the services we provide flow from your business goals and objectives. Deloitte – Ghana has six main service lines namely



Deloitte
Academy

Deloitte Academy has been established to train and support executives, from all kinds of organisations, to stay on the top of market trends and best practices and thus well ahead of competition.

Overview of our Consulting Service



Core Business Operations & Energy Consulting

- Government & Public Services (IAD-focus)
- Energy, Resources & Industrials
- Financial Services



Enterprise Technology & Performance

- Telecom, Media & Technology
- Financial Services Government &
- Public Services



Strategy, Customer & Marketing

- Financial Services
- Consumer - FMCGs
- Life Sciences & Healthcare



Human Capital

- Government & Public Services
- Energy, Resources & Industrials
- Telecom, Media & Technology
- Consumer

Targeted Service Offerings

- Public Financial Management
- Fund Management
- Program Management
- Business Transformation Services
- Capacity Building
- Energy Efficiency & Renewable Energy
- Sustainability & Climate Change
- Power Sector Digitalization
- Energy Transition, Electricity
- Regulation & Power Sector Support

- Bespoke Software Development
- ERP Deployment (SAP + others)
- QA Testing
- Salary Survey Platform (SaaS)
- Deloitte Digital Academy
- Cloud Migration (Hyperscale Partnerships)
- Operate (explore): delivering end-to-end services.

- Strategy Development & Implementation Support
- Market Research & Feasibility Studies
- Strategic Cost Transformation
- Monitoring & Evaluation
- Strategic Sensing & Insight Services
- Digital Customer Transformation
- Customer Experience
- ESG Strategy & Implementation

- Skills Assessment & Development
- Organisational Design & Restructuring
- HR Technology Implementation
- HR Process Optimisation
- HR Analytics & Data-driven Decision Making
- HR Policies and Compliance
- Talent Acquisition and Retention
- Rewards & Compensation Management
- Performance & Change Management



Energy Consulting





Energy Solutions

This offering transforms the way industries and establishment use energy and are efficient with it, it enables the use of energy audits of various industries and commercial buildings to develop specific energy consumption norms. The aim of the audit service is to identify technology gaps and areas of energy loss in process and utilities systems and facilitate the implementation of recommended energy efficient technology for improved performance and cost saving designs.



Energy Efficiency and Renewable Energy

This offering assists clients incorporate renewable energy technology into their energy mix. We help with the design, implementation, and administration of renewable energy systems, such as solar photovoltaic (PV) arrays, wind turbines, and biomass facilities. We also examine the viability of renewable energy projects, aid in technology selection, review financial viability, and evaluate financial viability.



Energy Transition and Electricity Regulation and Climate Change policy

Under this offering, we aim to provide guidance and support to organizations in navigating the transition towards sustainable energy systems. We help develop comprehensive energy transition plans, evaluate renewable energy options, and assess the feasibility of integrating new technologies. Additionally, consultants assist with electricity regulation, ensuring compliance with regulatory frameworks, and optimizing market structures to promote fair competition, reliable supply, and sustainability.



Power Sector Digitalization

Power sector support provide specialized knowledge to help several facets of the power industry. Distribution, generation, and transmission are all included in this. For distribution utilities, there is the need to help improve operational effectiveness, grid reliability, and customer service. We support our clients with the integration of renewable energy for power production purposes and analyze new projects and optimize power generation assets. The development, growth, and optimization of transmission networks are integrations of additional services to support system operators.



Capacity Building

With this offering, our team of consultants provide services for developing capacity to equip businesses and people with the information and abilities needed to successfully navigate the rapidly changing energy landscape. This involves offering training courses, seminars, and educational activities centered on energy conservation, renewable energy sources, sustainable living methods, and climate change mitigation. Initiatives to create capacity are designed to encourage an energy-conscious culture, spread best practices, and increase knowledge within communities and organizations.



Sustainability and Climate Change

In today's business environment, where organizations are beginning to realize the utmost importance of finding the right balance between financial, social, and environmental priorities, a carefully orchestrated Deloitte Sustainability strategy is vital to long-term success. We assist our clients in managing the business and environmental impacts of natural resources consumption (such as water), energy, waste, and emissions by translating analytical insights into actionable cost savings, risk mitigation opportunities, and economic value. Our clients can address sustainability and climate change issues. We develop and implement sustainability strategies, including carbon footprint analysis and management. We support clients in adapting to the impacts of climate change, mitigating greenhouse gas emissions, and promoting renewable energy adoption. We also assist with sustainability reporting, environmental impact assessments, and advocating for sustainable energy policies.



Environmental, Social, and Governance (ESG)

Sustainability/ESG Dimensions

Accountability today for a sustainable tomorrow

For more than 175 years, companies have counted on Deloitte professionals to help them adapt to changing business environments, build stakeholder trust, and thrive long term. As ESG (environmental, social, and governance) expectations reshape today's economic landscape, let us help you transform your sustainability objectives into measurable impact.

Deloitte's Sustainability and ESG Services team helps organizations make immediate, significant progress in ESG integration, reporting, and accountability, transforming their sustainability objectives into measurable impact.



With decades of building trust through rigorous transparency, we help businesses create confidence and credibility with stakeholders. We're here to help you intentionally deliver the information internal and external stakeholders need.

- Assurance readiness — Provide advice and recommendations to clients for assurance over ESG metrics.
- Governance — Ideate and develop improved board and ESG program governance systems and procedures.
- Materiality assessment — Identify and engage stakeholders to provide a foundation for future ESG aspirations.
- Data management and controls — Inventory and assess current process for ESG measurement, disclosure, and reporting to gain improvements.
- Disclosure and reporting advisory — Assess current public or drafted disclosure, and provide analysis and feedback on approach and content.
- ESG strategy/target setting and business goal alignment — Define and operationalize cross-functional ESG strategy, aligned to business objectives and grounded in accountability through meaningful science-based targets.
- Gap analysis — Tailor an intentional analysis to identify gaps in key areas of ESG through a variety of lenses (e.g., people, process, management systems, technology).
- ESG education and workshops — Keep leadership informed on the dynamic ESG landscape, and educate and upskill your workforce and future ESG stakeholders (CPE-eligible sessions available).

A full-page background image featuring a Black man, likely a construction worker, wearing a yellow hard hat and a high-visibility green vest over a blue shirt. He has his arms crossed and is looking directly at the camera. The background shows the skeletal steel framework of a building under construction.

Deloitte Economic Advisory

Within Deloitte Economic Advisory, a team of 15 economists and engineers specialized in economic analysis and modelling applied to energy markets and with strong ties with academia

1

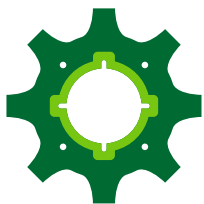
Our team provides leading expertise in economic analysis applied to business development and strategy formulation. We use the most advanced modelling and data analytics techniques to support your decisions and strategic choices.

2

We are composed of seasoned economists and engineers whose work revolves around decarbonisation, forecasting and energy policy. We bring forward our profound understanding of the energy markets and their transition to net-zero.

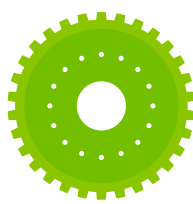
3

We develop bespoke models to analyze, simulate and predict trends in energy markets. Our inhouse models help assess the current and future markets for power, hydrogen and other low-carbon solutions.



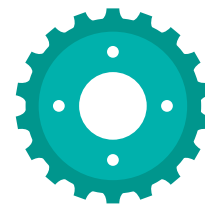
Business model and project feasibility

- Optimization and feasibility assessment of investment strategy
- Assistance to bidding strategies
- Demand analysis



Market outlook and analysis

- Pathway exploration: comprehensive outlooks of the energy transition and the development of the energy markets, based on a modelling, scenario-based approach
- Modelling-based techniques for tackling research problematics



Assisting on policy, market designs and regulatory frameworks

- Economic assessment of policy and regulatory options
- Using robust quantitative figures to feed into negotiations or discussions on need for further political action



We use our in-depth expertise and in-house quantitative models to deliver critical insights and analytical support to strategies, negotiations and decisions around energy systems

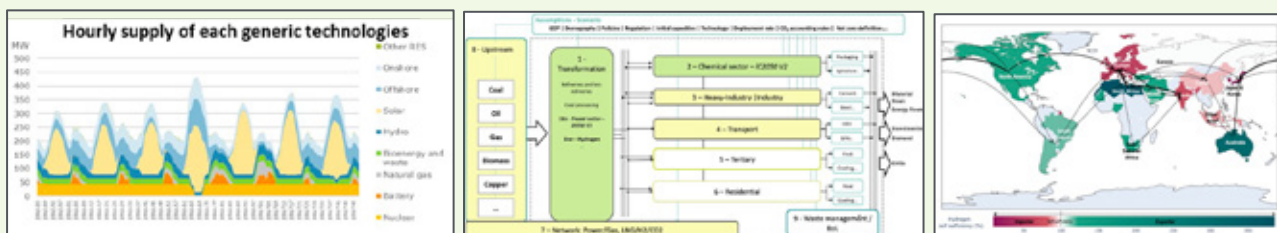


DEEM is a tailor-made optimization model of the European electricity system that allows assessing the impact of fundamental shifts (policy change, technological breakthroughs, etc.) on power prices, asset values, investments and company strategies. The strength of our model lies in its exhaustive and continuously updated data layer, a fully transparent and flexible modelling architecture combined with powerful hardware, and interactive visualization.

We have developed a model of the European energy system that allows us to study the European energy transition in detail.

The model considers installed capacities of the different supply, storage and transformation technologies in the different economic sectors (buildings, industry, transport, etc.) as well as the infrastructure needs by 2050.

HyPE is a powerful model that has been developed by Deloitte to assess hydrogen production and export opportunities at the world scale, considering an extensive set of techno-economic drivers, to obtain sound insights on potential hydrogen (and derivatives) production pathways, trade flows and technology routes. Its modular setup allows focus on individual regions and easy addition of regional specificities.



DEEM is a tailor-made optimisation model of the European power system that allows assessing the impact of fundamental shifts (policy change, technological breakthroughs etc.) on power prices, asset values, investments and company strategies.

What For?



- Model complex scenarios to better prepare for the future
- Evaluate assets such as power plants or interconnectors
- Assess the economic implications of energy policy decisions
- Test business models of new technologies

For whom?



- **Lenders & investors**
Documented and cross-checked input data for evaluation and business modeling of assets, due diligence, transaction analysis and pricing
- **Utilities & energy companies**
Stress-testing business models, support the strategy process with scenarios
Decarbonization pathways and the implications for business strategies
- **Policy-makers, companies & interest groups**
Assess the effectiveness and efficiency of energy policy
Develop scenario-based outlooks
- **Law firms & dispute resolution**
Analysis of counterfactuals and scenarios, calculation of damages (past and future)
- **Audit services**
Evaluation of assets, impairment testing

Key results



- **Electricity prices**
Hourly prices for any given year
Annual baseload prices to 2050
Capture prices for all technologies
- **Asset operations**
Income of any power plant on an hourly basis
Detailed dispatching schedule
Full representation of flexibility of power plants
- **Investments**
Optimal capacity expansion plans
Adequacy and reliability studies
Capacity market revenue/missing money
- **Power market**
Installed capacities and generation mix
Power flows between countries
CO2 emissions and fuel use



Our DEEM model is at the core of Deloitte's Future of Power scenarios



The aim of the study

Exploring possible futures for the European power market

in order to spark a discussion with market participants and better inform their strategic choices...

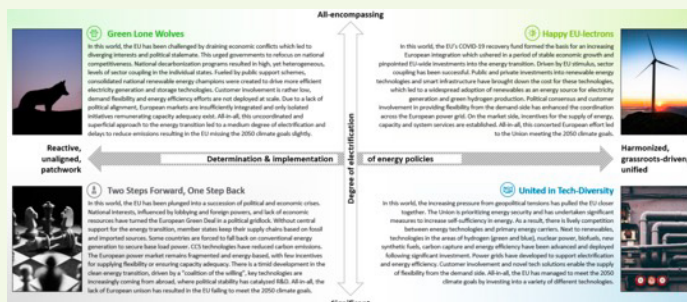
by qualitatively anticipating future scenarios for the entire power system ushered-in by:

- Policy-makers,
 - Energy producers,
 - Power utilities,
 - network operators,
 - Utility providers,
 - Equipment manufacturers, and consumers
- and enriching these scenarios with a quantitative market model... CO2 emissions and fuel use



The methodology

Four stories for the future of the European Power Market in 2050



Narrative elements

- Degree of climate policy ambition
- Technological advancements
- Grid interconnection
- Macroeconomic situation

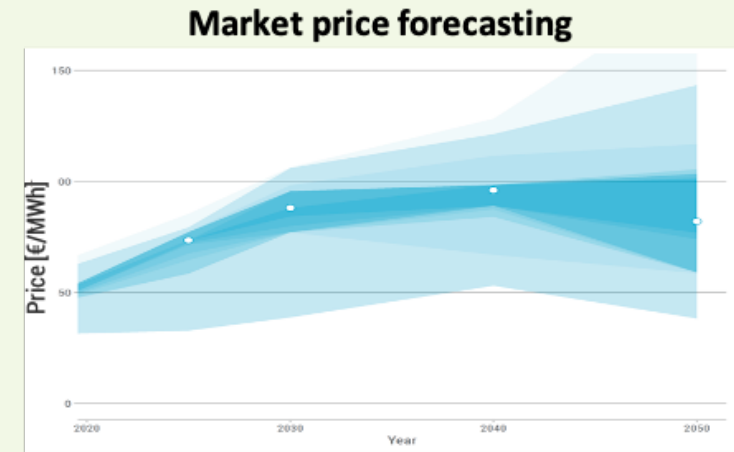
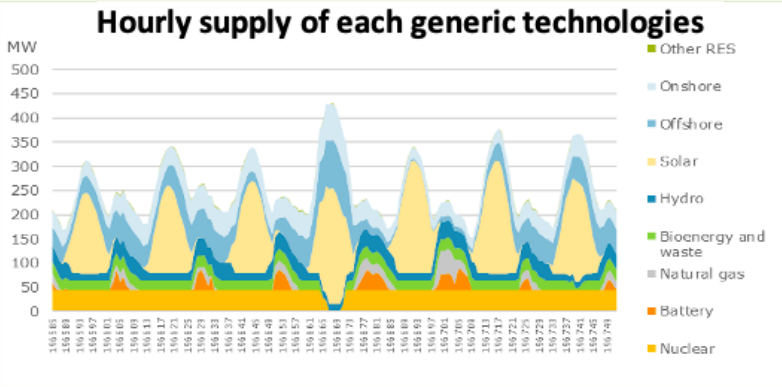
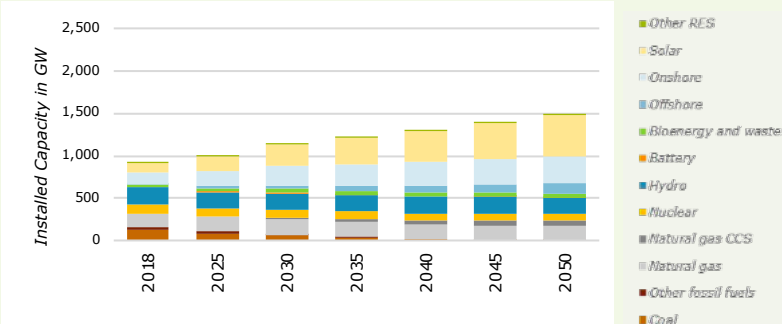
Model outputs

- Power demand
- Electricity prices
- CO2 emissions
- Investment
- Load factors
- Power flows
- System costs



The Output

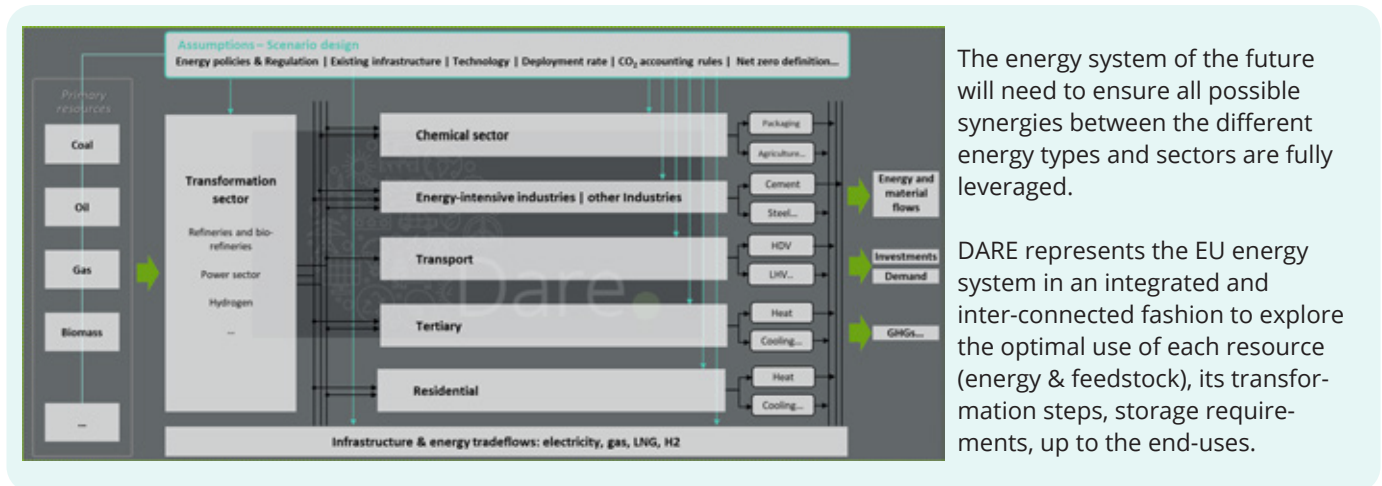
Exploring possible futures for the European power market



Deloitte's energy system model DARE

DARE is Deloitte's in-house EU27+ energy system optimisation model. It enables technoeconomic modelling of the entire energy system, from primary resources supply to end-uses by sector.

Our model is particularly suited to deliver quantitative insights on main uncertainties along the energy transition journey. It provides energy transition pathways of key sectors in the coming years, considering a wide range of economic activities and for each of the EU27 countries.



DARE includes an exhaustive database of technologies and deploys powerful built-in visualizations for fast analyses

DARE builds upon its detailed techno-economic database developed and maintained by our experts in close collaboration with academia and industry practitioners. It contains more than 120 technologies relevant for the energy transition. Users can access current data on cost projections, efficiencies, material flow yields as well as GHG emissions, country-specific targets, among other, from the interface directly or can edit assumptions with alternative estimates to easily run sensitivity analyses.



DARE capabilities

The climate targets are ambitious and require unprecedented investments to transform the current energy landscape. Assessing where to start, the desirable/feasible pace of transformation, the type of investments, among others, require advanced quantitative tools. DARE capabilities include:

Large coverage with fine spatial granularity to deliver relevant insights: running scenarios for the EU27+ on a country-by-country level.

A detailed supply chain representation: industries, end-uses, energy and resource types allows to get a detailed view on what investments are required, by when, as well as the resulting costs and prices trends of commodities and services.

Country-specific balances: the evolution of associated energy and material flows, CO₂ emissions, among other, are also obtained from the model.

Flexibility/scalability: Model's flexibility makes it capable to be easily deployed in other geographies (e.g., Canada, US, MENA, global, etc.).



What For?



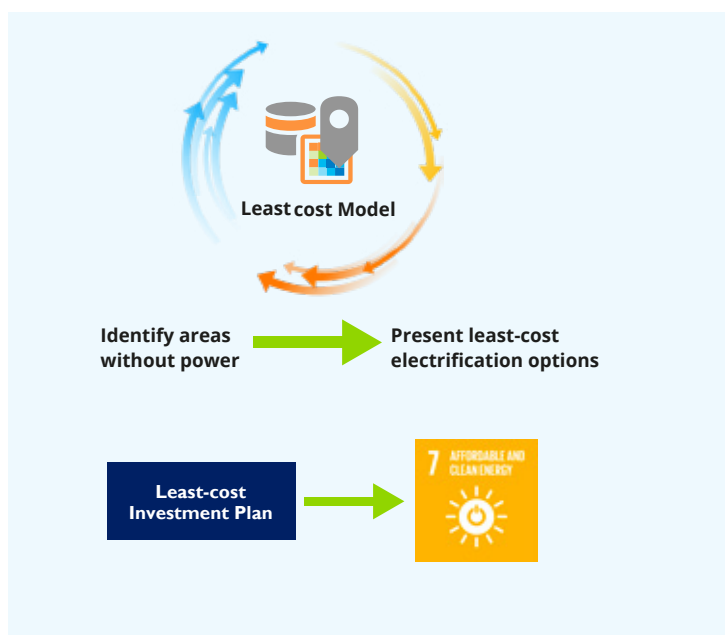
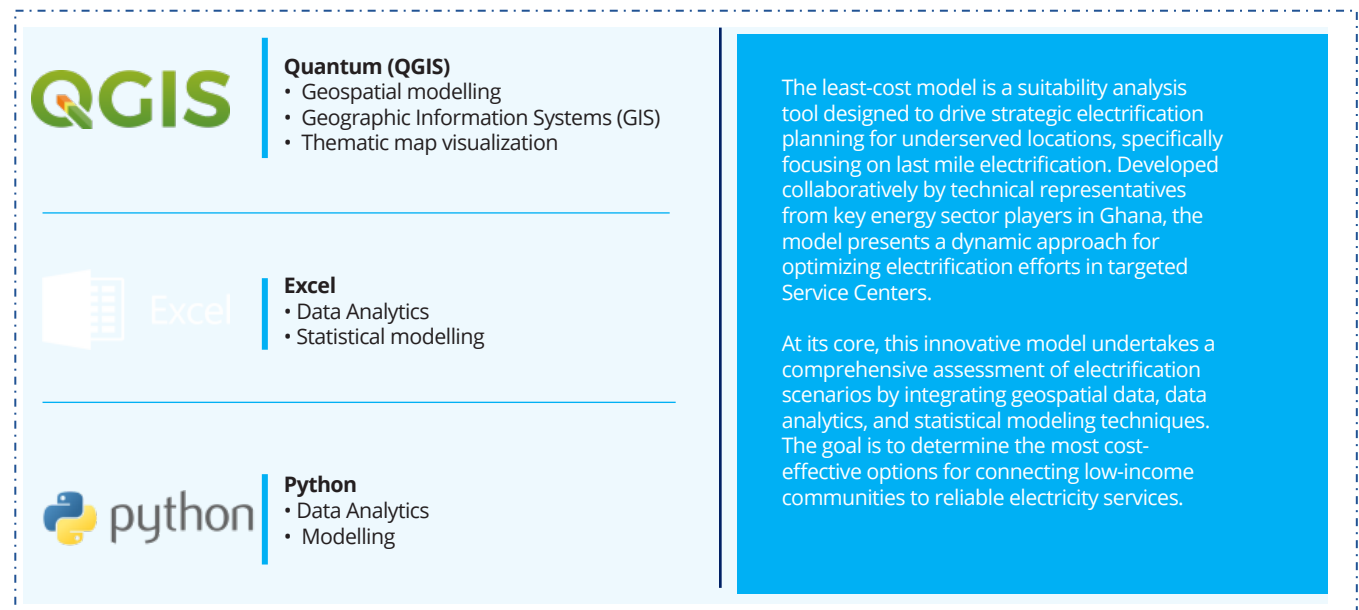
- Developing forward-looking scenarios to inform stakeholders on pathways towards a net-zero energy future and their implications.
- Assessing the technologies of the future energy value chain and the impact over existing assets (supply options, clean technologies, T&D, end-use technologies, energy storage, hard-to-abate sectors, hydrogen, etc.)
- Guidance to the energy policy and regulatory debate.
- Stress-testing current business models of energy companies and track new sustainable opportunities in a rapidly evolving and complex environment.



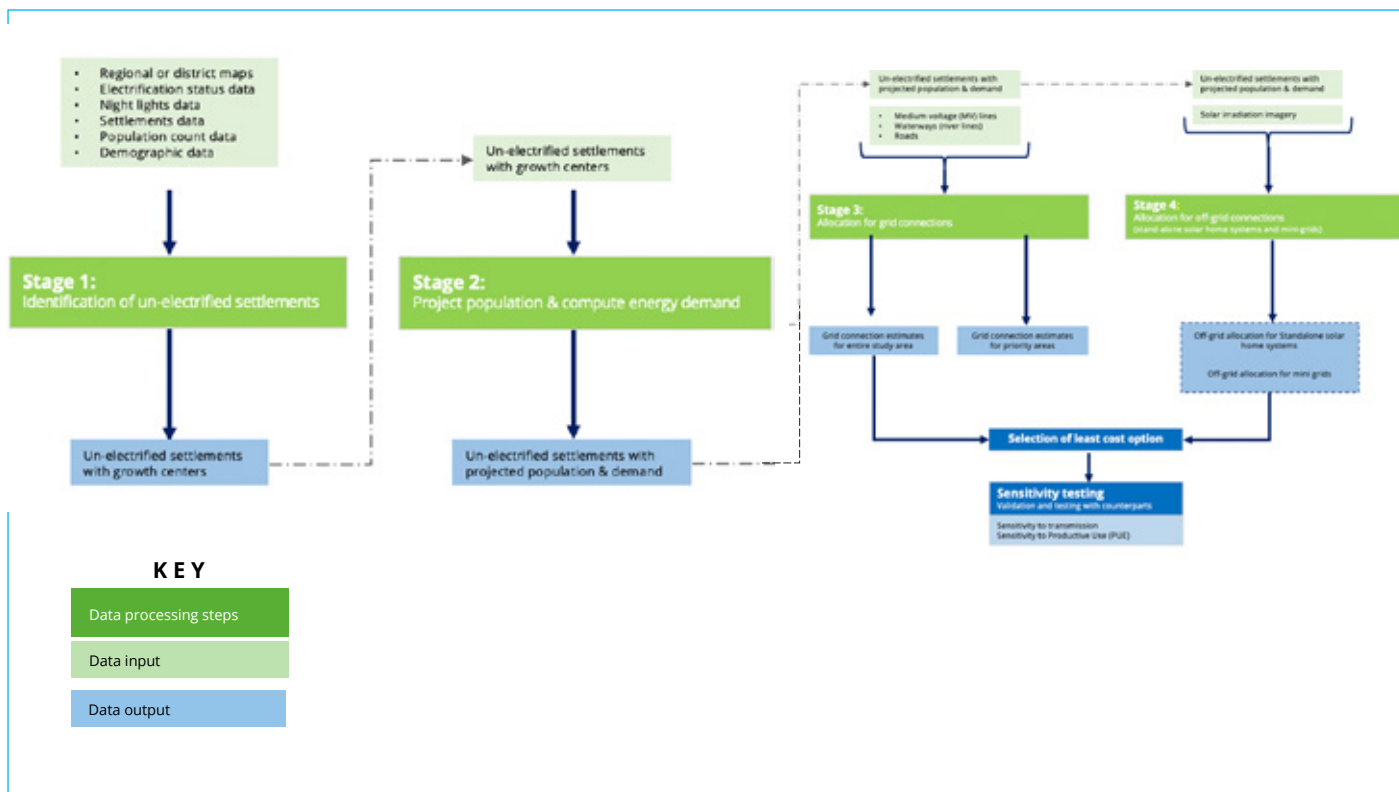
Least Cost Geospatial Analysis For Achieving Universal Electrification Access

The least-cost geospatial model aims to enhance last-mile electrification planning by providing electrification scenarios for the grid, standalone solar home systems (SHS), and solar minigrids. Least-cost options are tested and presented through GIS maps, from an implementation point of view, by exploring cost scenarios for medium voltage line extensions and off-grid allocations based on generation capacity, deduced from projected demand and solar irradiation intensities. Where necessary, the model provides mixed cases for off-grid options, to ensure that implementation is at optimal cost as much as possible.

The model was developed based on an open-source mindset to ensure that it is sustainable, easy to maintain, and scalable.

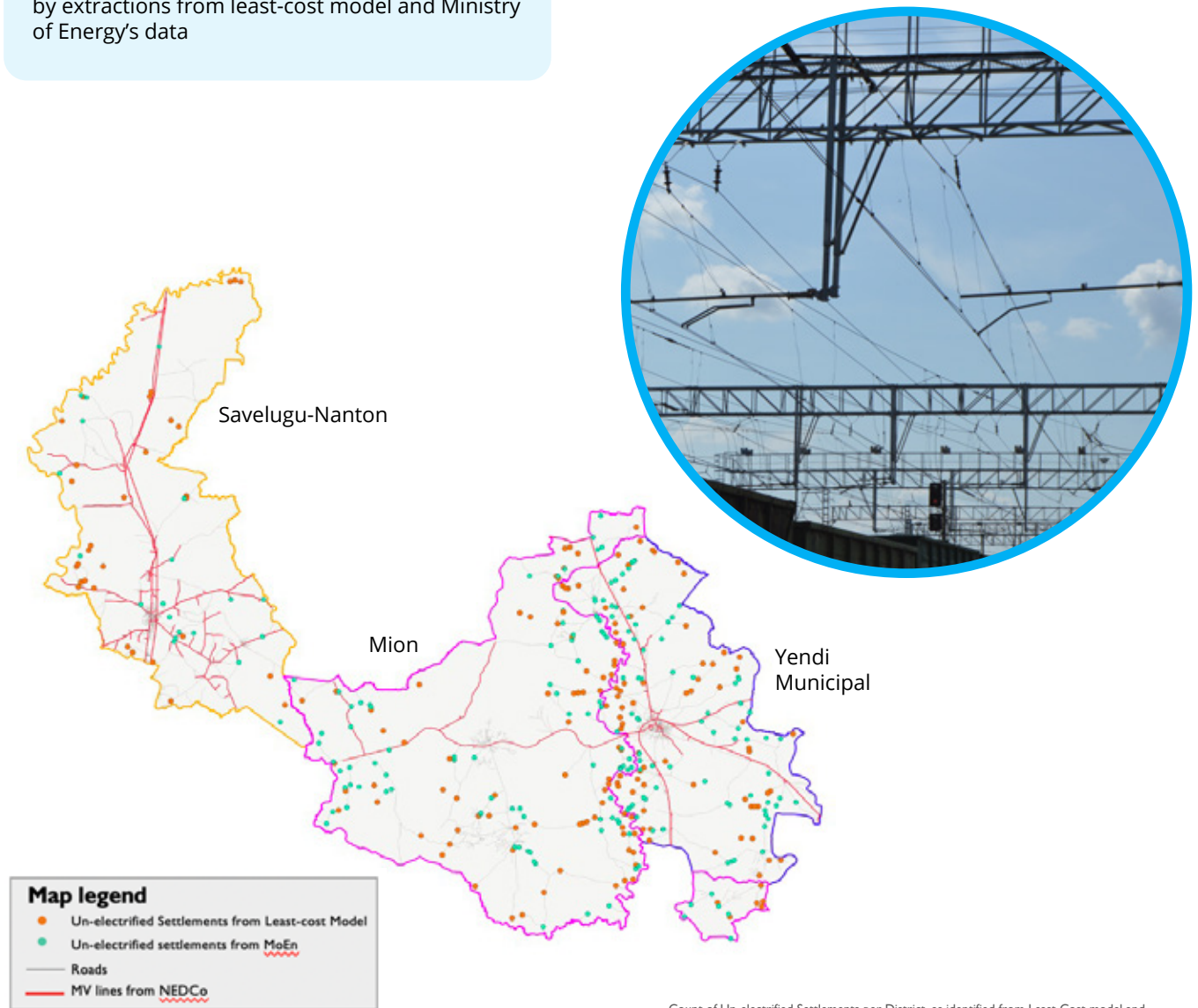


The Least-cost Model Process Flow

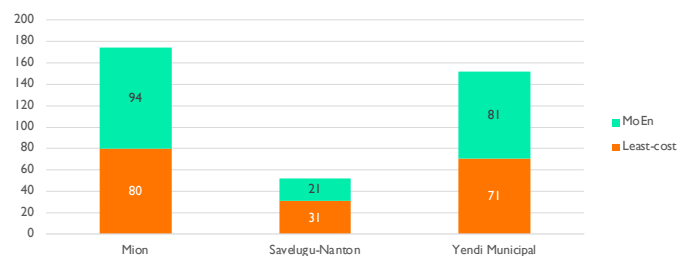


Stage 1: Identification Of Un-electrified Settlements

A map of un-electrified settlements categorized by extractions from least-cost model and Ministry of Energy's data



Count of Un-electrified Settlements per District, as identified from Least Cost model and Ministry of Energy's data

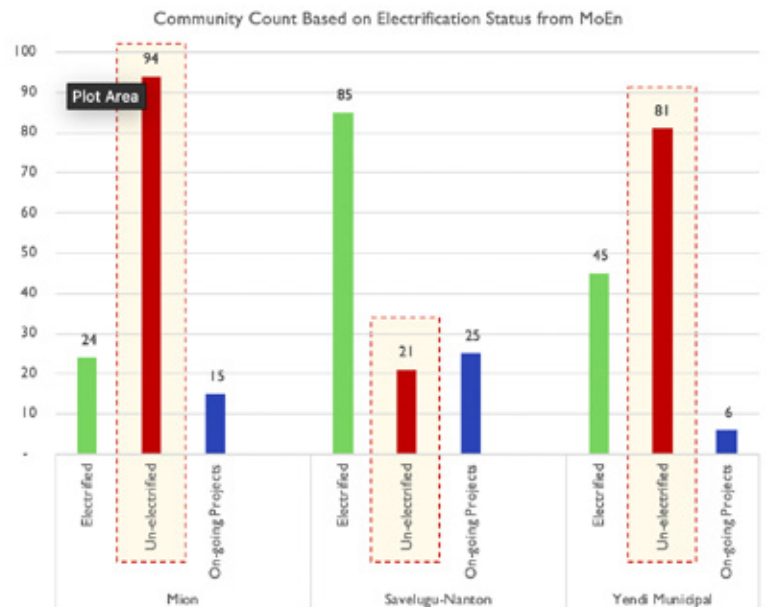
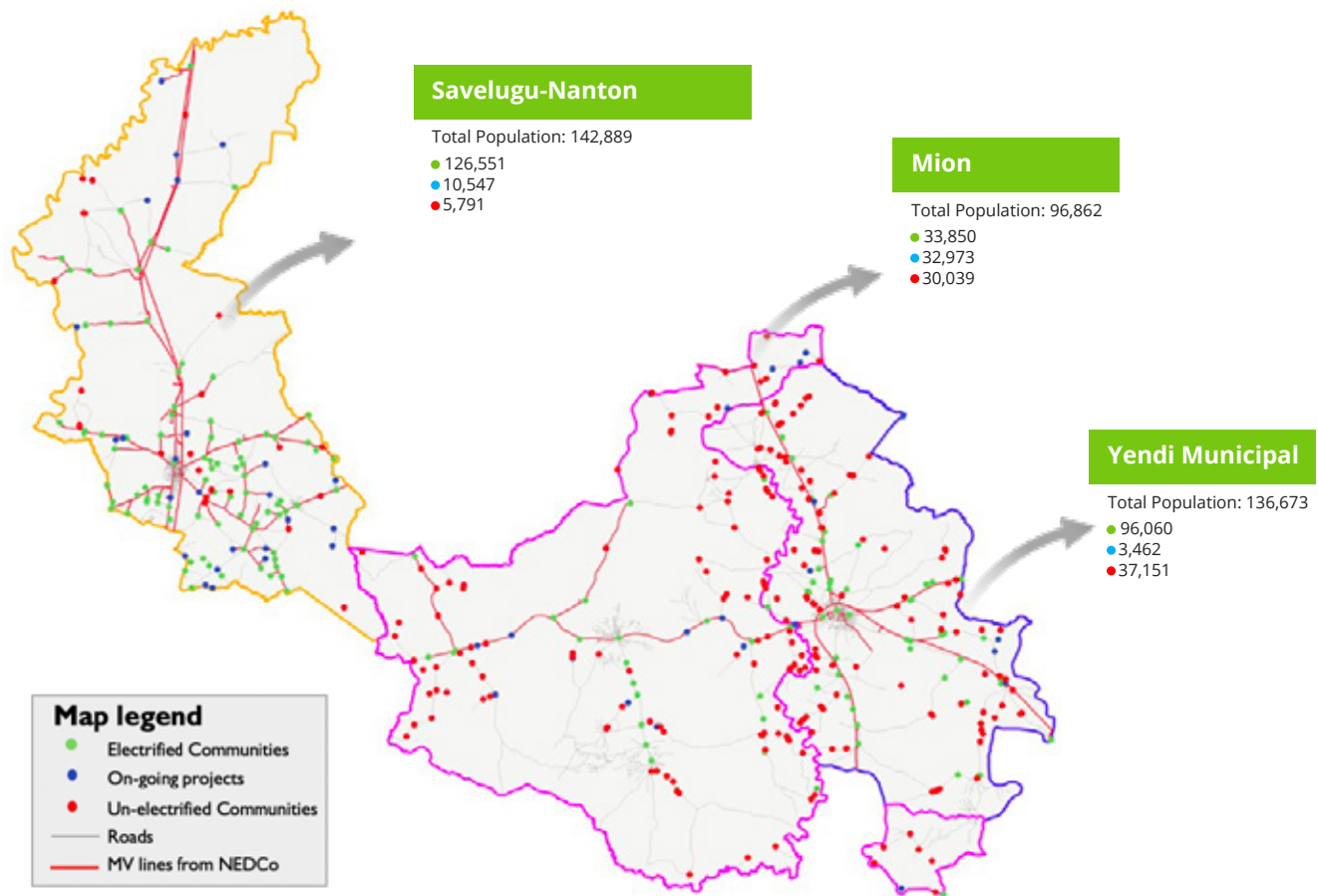


Percentage of un-electrified settlement population	41%	6%	31%
Number of un-electrified settlements:	174	52	152
Un-electrified Settlements Population:	42,183	7,601	46,549
District Population:	103,202	116,975	148,567

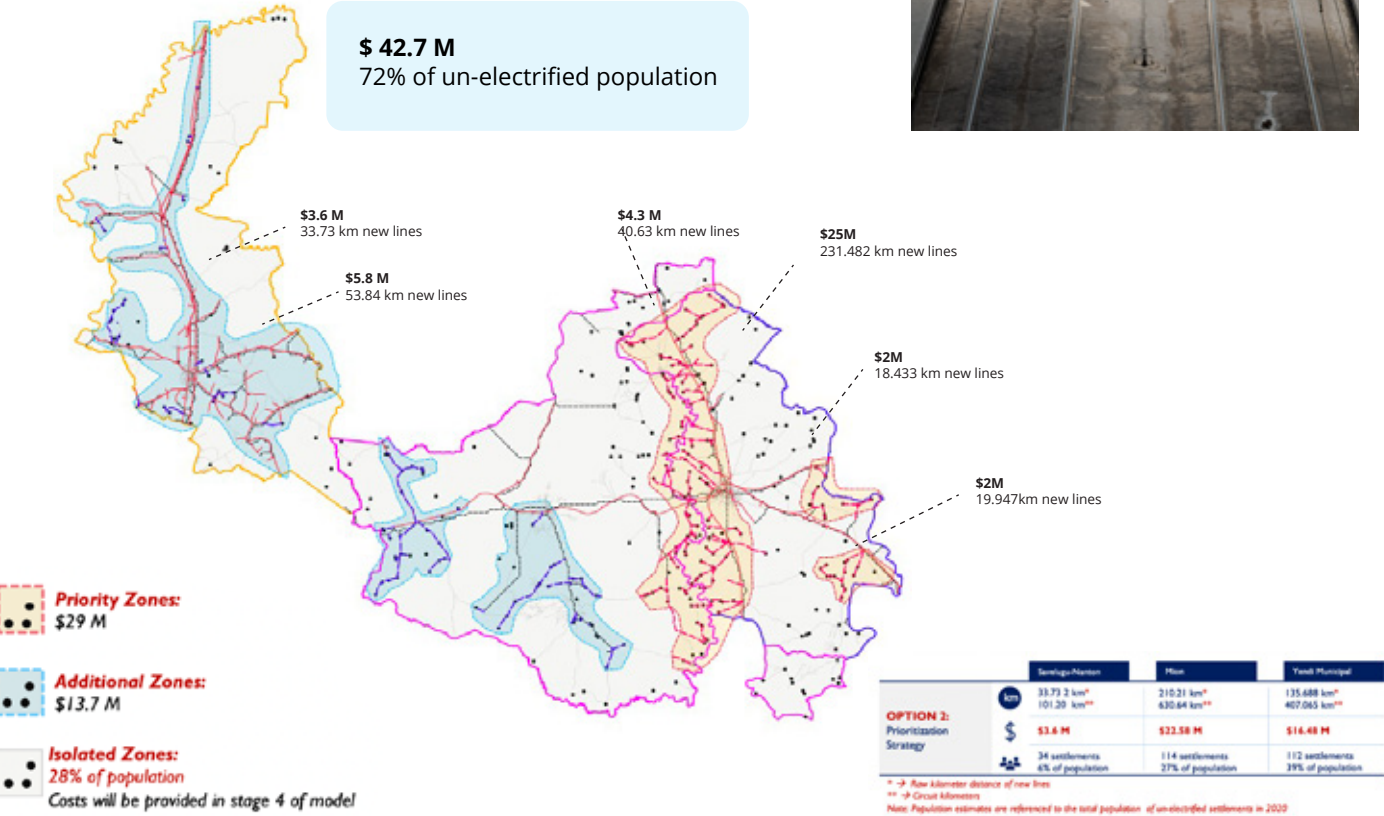
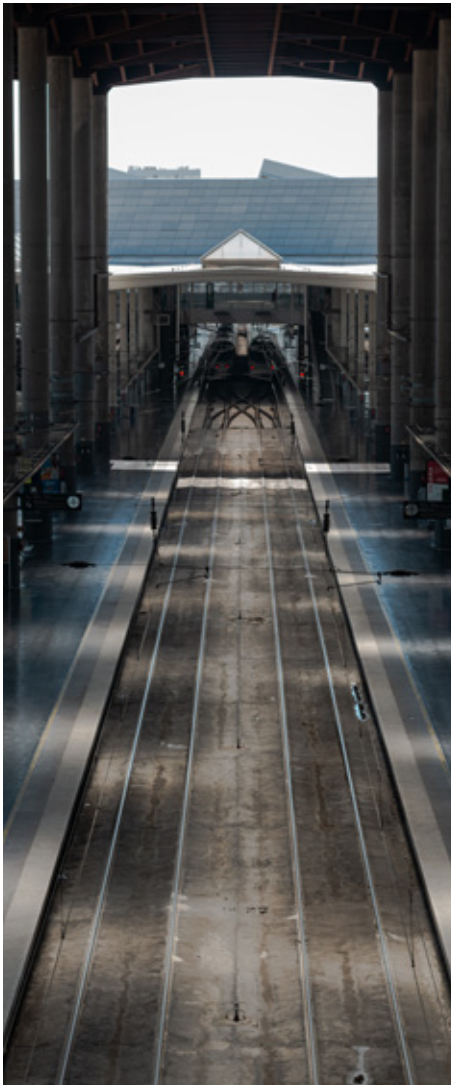
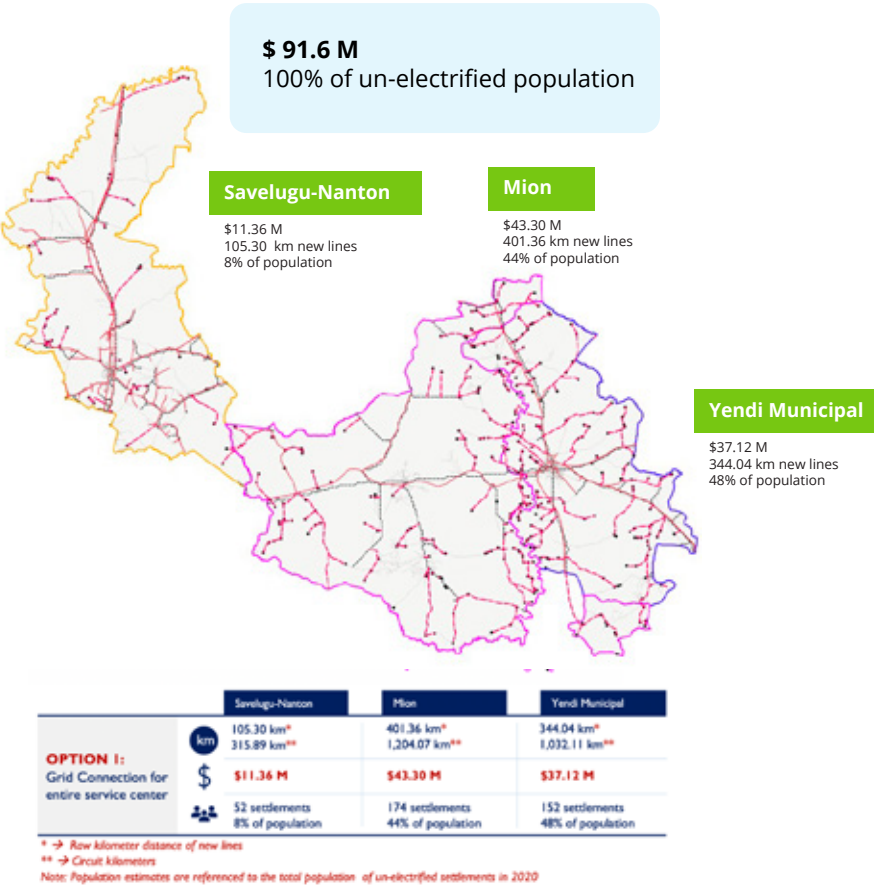
Population based on 2020 projections from Ghana Statistical Services (GSS)

Electrification status data electrification status data from the ministry of energy (2020)

A map of electrification status data from Ministry of Energy



Stage 3: allocation for grid connections



Highlights Of Results

Least-cost Implementation Strategy in order of priority

Using Least Cost Geospatial Electrification planning reduces this cost by 21.72 percent from \$ 91.6 million to \$ 71.7 million to also achieve 100 percent universal electrification access by 2030 from mixed technologies (Mini-grids and standalone solar home systems)

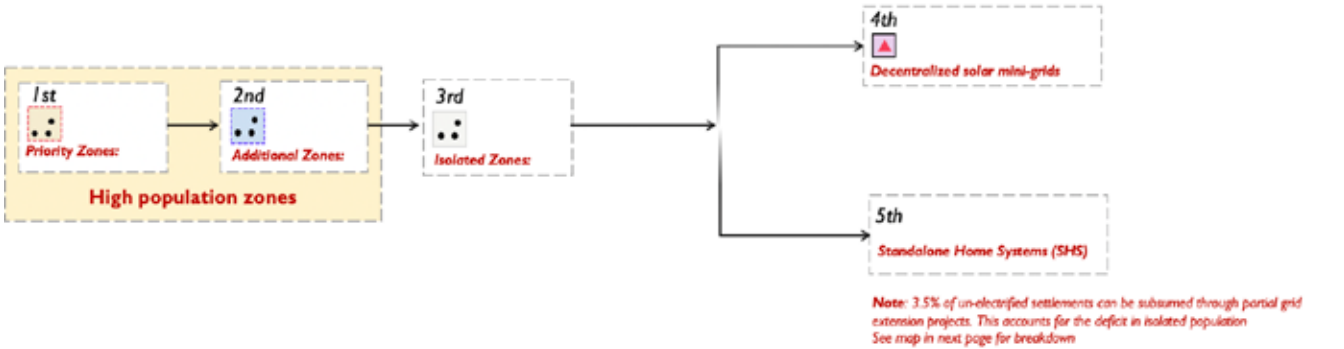
\$ 91.6 M

100% access through full grid extensions

\$ 71.7 M

100% access through mixed technologies guided by a geospatial implementation strategy (see below for breakdown)

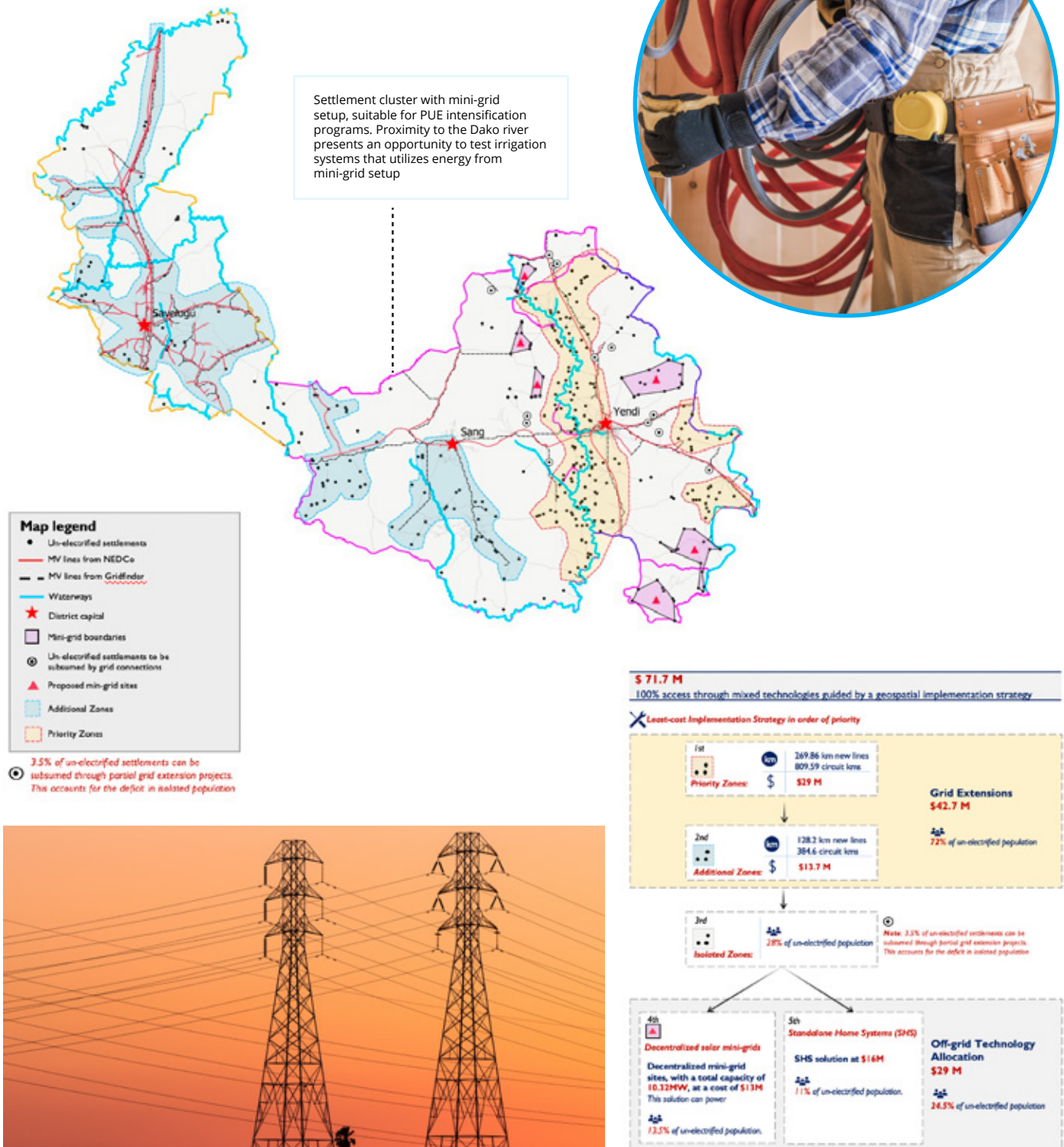
Grid Extensions	Off-grid Technology Allocation
<div>\$ 42.7 M</div> <div>72% of un-electrified population</div>	<div>\$ 29 M</div> <div>28% of un-electrified population</div> <div>Decentralized mini-grid sites, with a total capacity of 10.32MW, at a cost of \$13M This solution can power 13.5% of un-electrified population.</div> <div>SHS solution at \$16M This solution can power 11% of un-electrified population.</div>



Least-cost investment strategy

Results – map view summary of least-cost investment strategy to universal access to electricity

A map of un-electrified settlements with grid extension and off-grid technology allocations



Contacts

**Roland Teye**

Partner, Consulting
Deloitte Ghana
Consulting
rteye@deloitte.com.gh
+233 (0)501 576 056

**Serwa Dzugbenuku Atiase**

Partner, Consulting
Deloitte Ghana
satiasedzugbenuku@deloitte.com.gh
+233 (0)208 110 302

**Eunice Biritwum**

Associate Director, Consulting
Deloitte Ghana
ebiritwum@deloitte.com.gh
+233 (0)501 291 093

**Daniel Ababio**

Associate Director, Consulting
Deloitte Ghana
dababio@deloitte.com.gh
+233 (0)243 482 716

**Ekow Kwofie**

Senior Manager, Consulting
Deloitte Ghana
ekwofie@deloitte.com.gh
+233 (0)501 495 983

**Yahan Prah**

Senior Manager, Consulting
Deloitte Ghana
ayahanprah@deloitte.com.gh
+233 (0)501 320 934

**Edward Aikins**

Senior Manager, Consulting
Deloitte Ghana
eaikins@deloitte.com.gh
+233 (0)202 007 805



Deloitte Ghana



Deloitte



www2.deloitte.com/gh

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee ("DTTL"), its network of member firms, and their related entities. DTTL and each of its member firms are legally separate and independent entities. DTTL (also referred to as "Deloitte Global") does not provide services to clients. Please see www.deloitte.com/about for a more detailed description of DTTL and its member firms.

Deloitte provides audit, consulting, financial advisory, risk advisory, tax and related services to public and private clients spanning multiple industries. Deloitte serves four out of five Fortune Global 500® companies through a globally connected network of member firms in more than 150 countries and territories bringing world-class capabilities, insights, and high-quality service to address clients' most complex business challenges. To learn more about how Deloitte's approximately 245,000 professionals make an impact that matters, please connect with us on Facebook, LinkedIn, or Twitter.

This communication contains general information only, and none of Deloitte Touche Tohmatsu Limited, its member firms, or their related entities (collectively, the "Deloitte network") is, by means of this communication, rendering professional advice or services. Before making any decision or taking any action that may affect your finances or your business, you should consult a qualified professional adviser. No entity in the Deloitte network shall be responsible for any loss whatsoever sustained by any person who relies on this communication.

© 2023. For more information, contact Deloitte Touche Tohmatsu Limited.