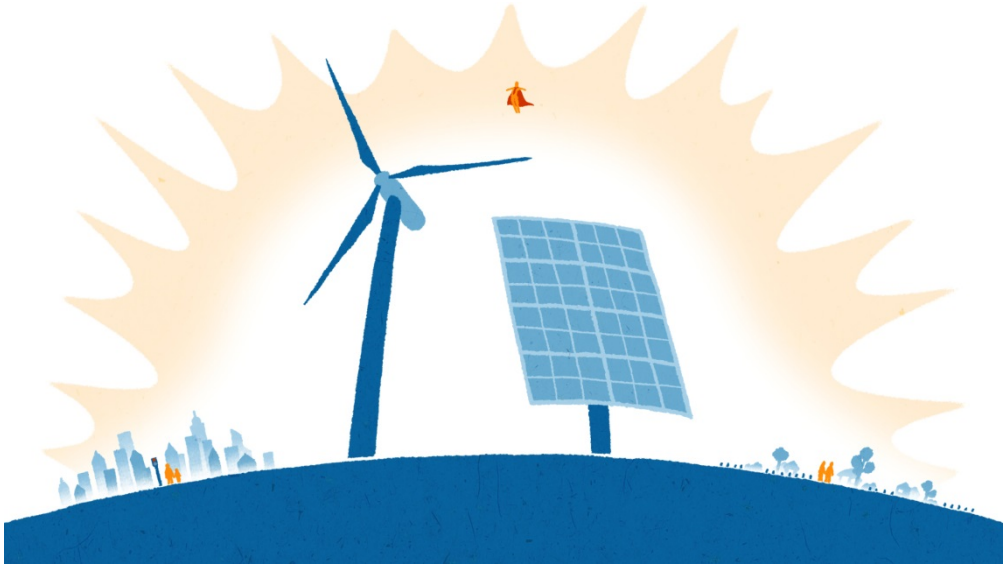
COBENEFITS FOR VIETNAM

ELECTRICITY ACCESS AND LOCAL VALUE CREATION FOR THE UN-ELECTRIFIED POPULATION IN VIETNAM



SOCIOECONOMIC COBENEFITS OF RENEWABLE ENERGY AND CLIMATE ACTION IN VIETNAM

FINAL RESULTS 2019 (Executive Briefing)

STUDY BACKGROUND

- The government of Vietnam has a plan to electrify the “rural” areas in the country completely (100%) by the year 2020.
- However, the challenge remains how to effectively and affordably electrify areas which cannot be reached easily through grid extension; this accounts for about 2% of the country’s households especially in the North West mountain area and central highlands.
- Hence, aligning these electrification objectives and the socio-economic development of the un-electrified areas is key to understand the best approach to make energy access affordable and reliable.

STUDY APPROACH

This study applied a socio-technical approach to analyse the benefits of providing electricity to the remaining 2% un-electrified population in Vietnam through the use of decentralised electrification options. To achieve this, the following assessments were conducted:

- Firstly, a quantitative optimisation was adopted to determine the least-cost options to generate and deliver electricity to representative case study areas in Vietnam with little or no access to energy using renewable energy sources.
- Secondly, a qualitative analysis was conducted on households in the case study areas in order to determine the value-added benefits of off-grid renewable electrification options to the people in the area.

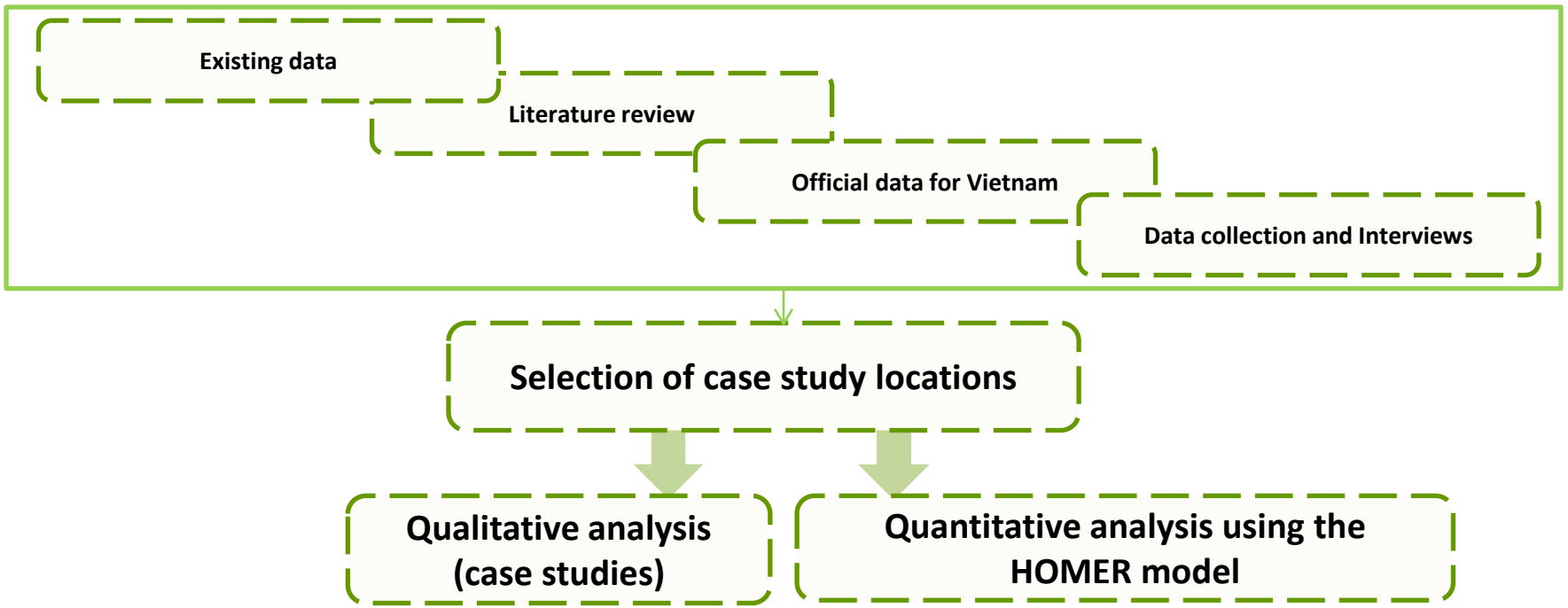
The provinces Ha Giang and Quang Binh have been chosen as the case-study locations for both assessments.

KEY FINDINGS

COBENEFITS

- Communities in Vietnam that are far (> 5km) away from the nearest medium voltage distribution system **are best served with off-grid renewable energy technologies**. Grid extension is only viable at rural communities with high clusters of households per area.
- **Small wind (locally manufactured) turbines** were obtained to be the most cost–efficient means of electrifying most un-electrified rural households in Vietnam. Stand-alone solar PV is cost-competitive at areas with low energy or demand density.
- With electricity access, **households in rural areas benefit financially** as a result of more **opportunities to generate additional incomes** from value-added services as well as productivity gains on the farmland..
- Additionally, due to **improved lighting conditions** at home, students enjoy **increased study hours** which in turn improves the educational outcomes of the students.

METHODOLOGICAL APPROACH

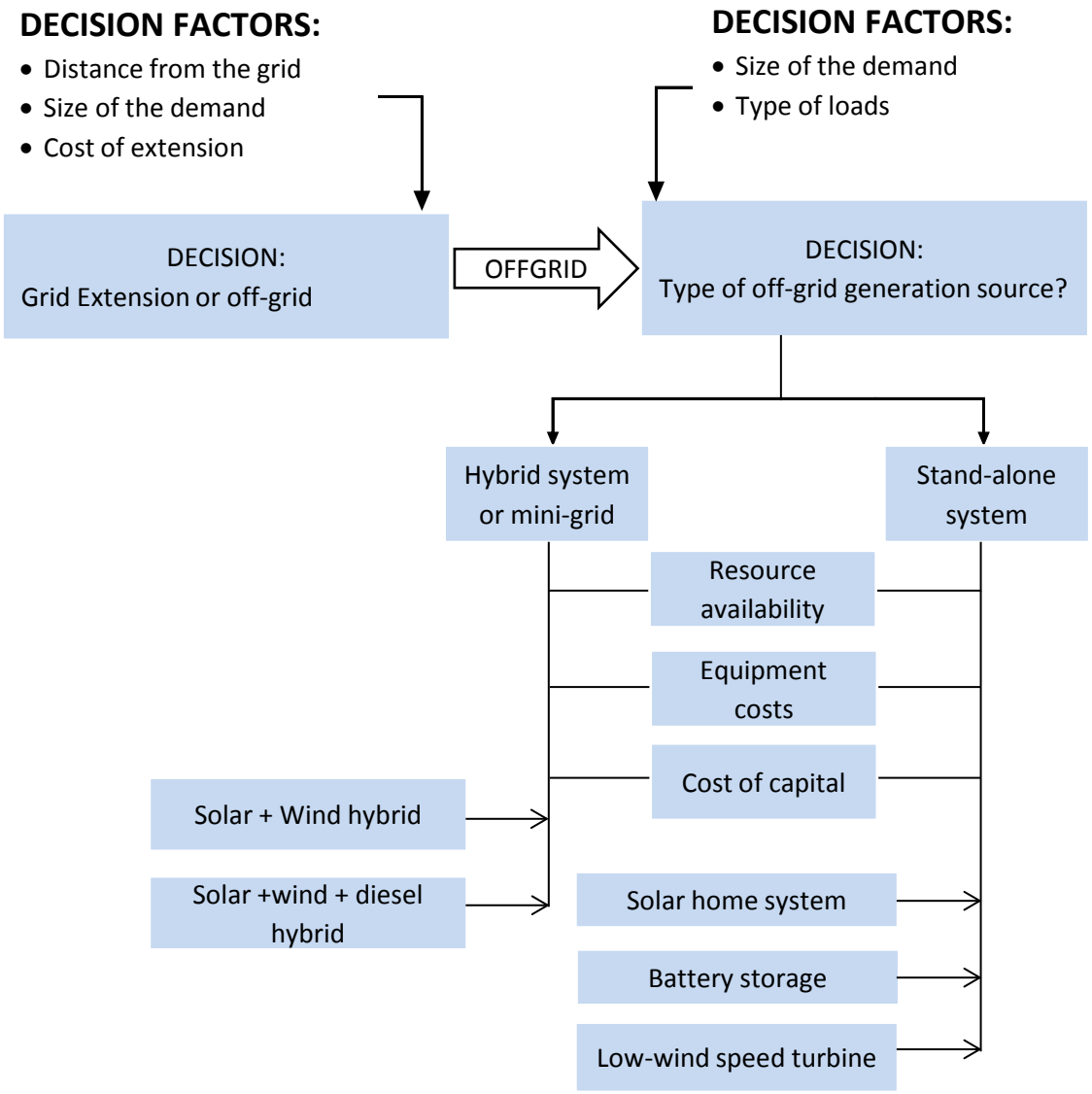


- Will access to electricity for the population in remote areas of Vietnam increase income levels and the standard of living, as well as improve the access to education?
- Does off-grid RE have a competitive advantage over grid-extension to speedily electrify "these" population and improve the standard of living?

A least-cost distributed electrification analysis conducted allowed the following comparison:

- Off-grid RE based electrification options vs grid extension
- Viability of RE stand-alone systems vs Hybrid electrification options

DECISION TREE ADOPTED



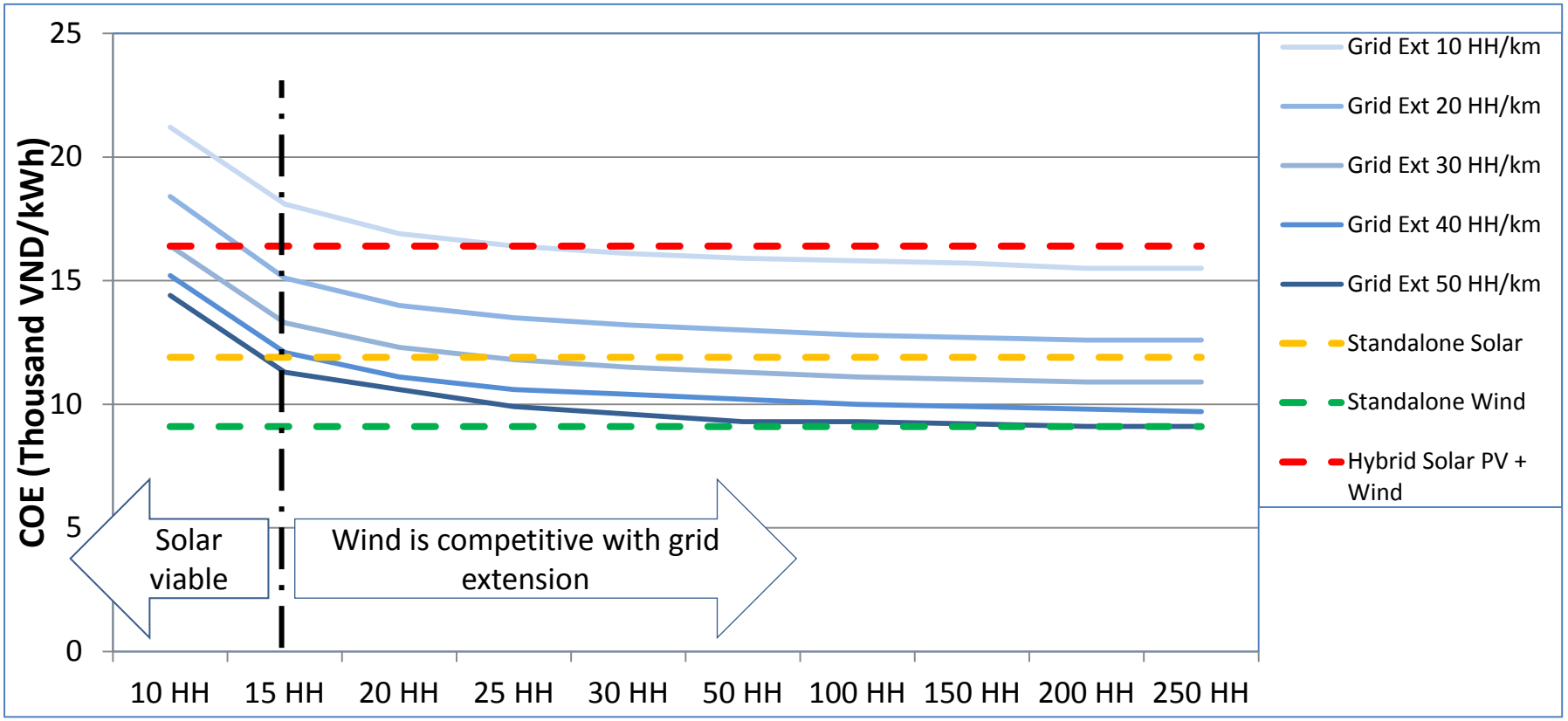
Source:
https://energypedia.info/wiki/File:Decision_tree_off_vs_on_grid_norad09.jpg

KEY STUDY TERMINOLOGIES

- **Grid extension** refers to electricity supply which is fed from the national central power supply infrastructure and extended to the un-electrified areas (which are some kilometres away) through a medium and low voltage distribution grid system.
- **Off-grid electrification** refers to onsite power generation in a village, rural or un-electrified area, such as a solar home system, a low–wind speed turbine or a hybrid combination of both (supported by a diesel generator for backup supply).
- **Household density (household cluster):** This is the number of households located per unit square kilometre in a remote location. It is used to identify the cost requirements for grid extension over a specified distance.
- **Cost of electricity (COE):** The COE is used to compare the cost of energy supply from the different sources over a 20 year lifetime (this does not account for fuel or other variable cost changes during the lifetime of the system).

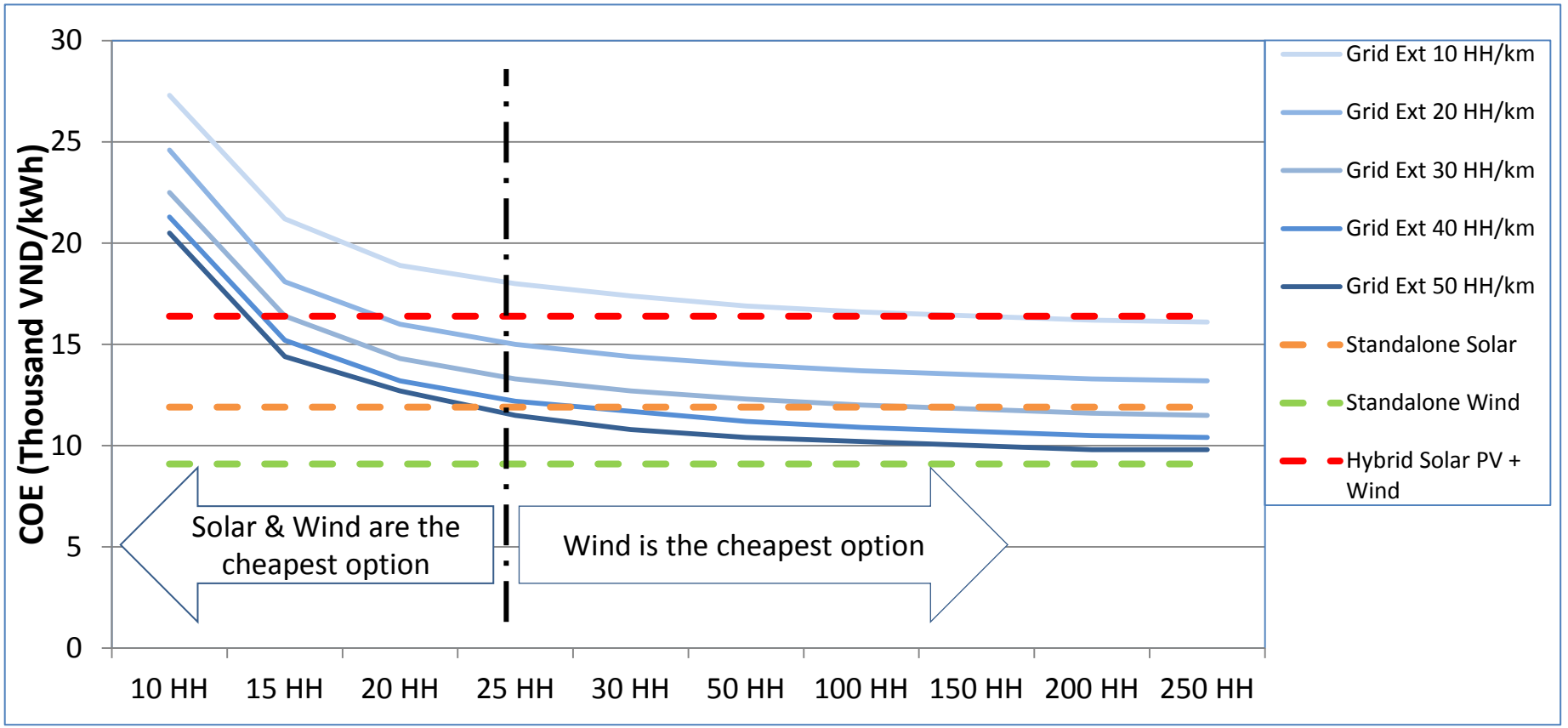
KEY RESULTS ON THE COST COMPETITIVENESS OF DIFFERENT OFF-GRID RENEWABLE SYSTEMS AGAINST GRID EXTENSION

GRID EXTENSION IS THE CHEAPEST MEANS TO ELECTRIFY AREAS 5KM AWAY FROM THE NEAREST MEDIUM VOLTAGE STATION. SOLAR IS VIABLE ONLY WHEN <15 HOUSEHOLDS ARE TO BE ELECTRIFIED. WIND POWER IS STILL COST COMPETITIVE WITH GRID EXTENSION AT HIGH HOUSEHOLD CLUSTERS



HH = Household
km = kilometer
VND = Vietnamese Dong

SOLAR PV & WIND ARE CHEAPER TO PROVIDE ELECTRICITY TO COMMUNITIES WITH LOW HOUSEHOLD CLUSTERS >10 KM AWAY FROM THE NEAREST MEDIUM VOLTAGE STATION. WIND POWER REMAINS THE CHEAPEST EVEN AT HIGHER HOUSEHOLD DENSITIES



HH = Household
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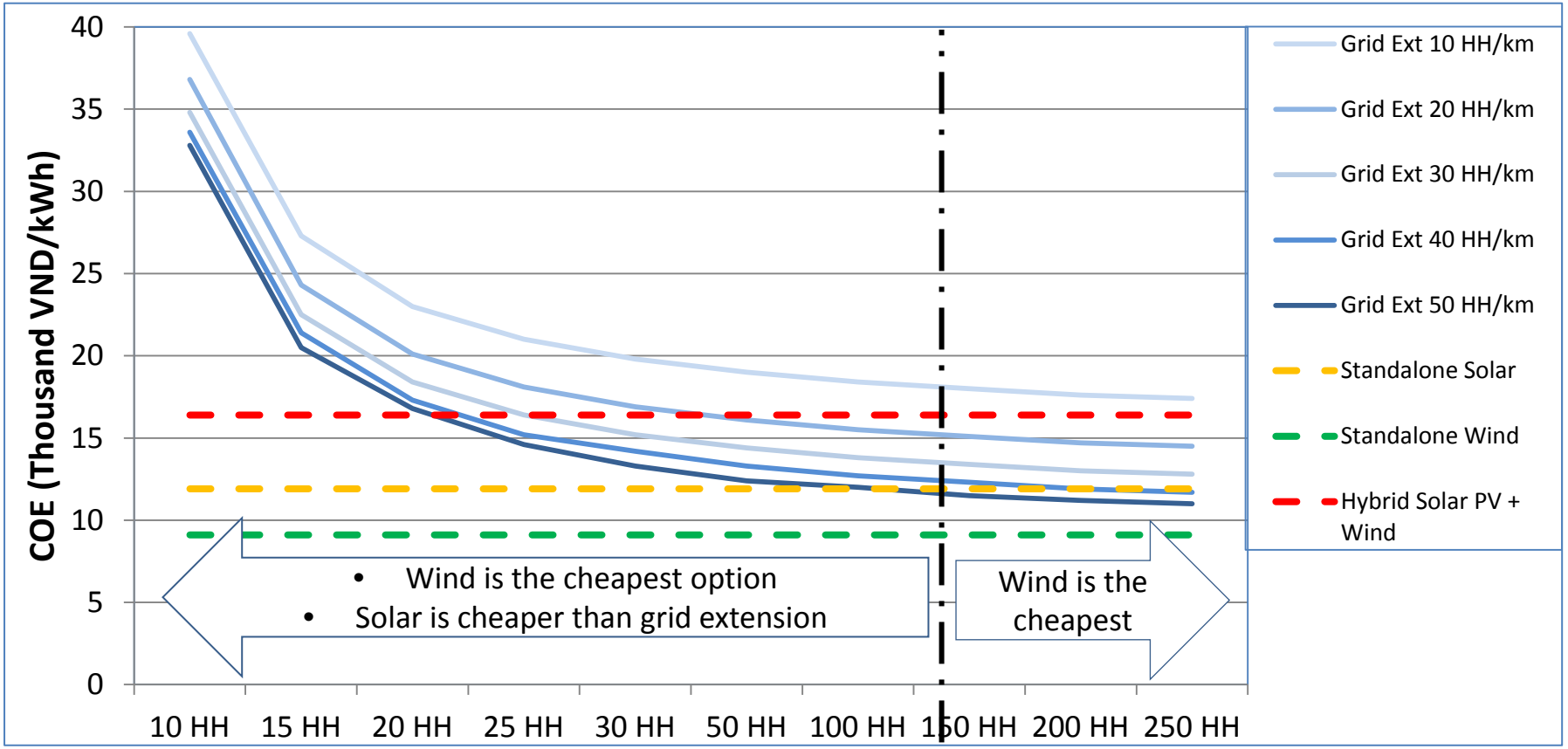
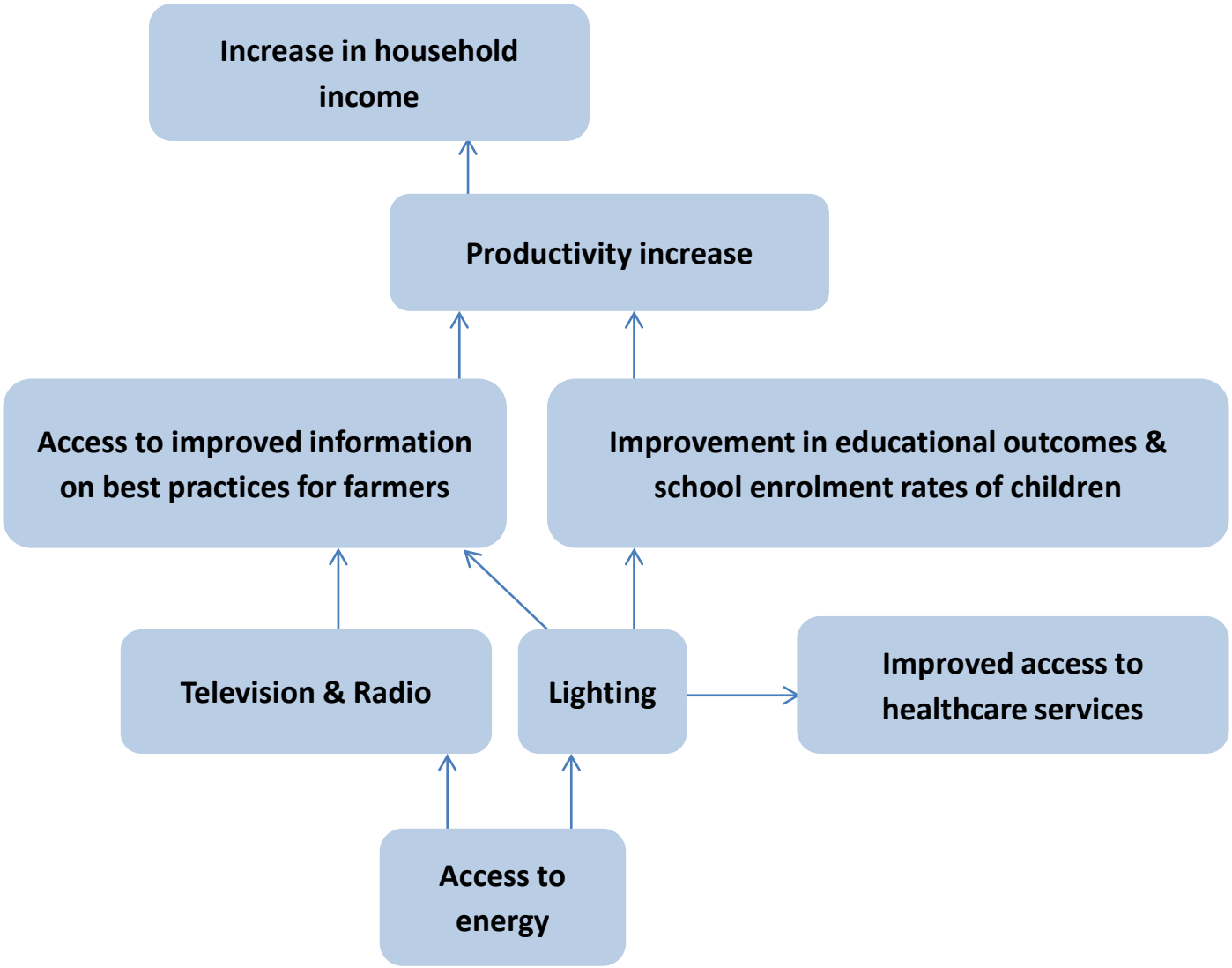
THE FARTHER AWAY THE MEDIUM VOLTAGE STATION IS FROM THE COMMUNITY, THE CHEAPER IT IS TO PROVIDE ELECTRICITY TO THE HOUSEHOLDS THROUGH OFF-GRID RENEWABLE ENERGY OPTIONS, ESPECIALLY SOLAR PV & WIND. AT LOW POPULATION AREAS < 20 HHs, HYBRID SYSTEMS BECOME CHEAPER THAN GRID EXTENSION



MAPPING OUT LOCAL VALUE CREATION OPTIONS IN THE CASE STUDY LOCATIONS FOR OFF-GRID RENEWABLE ENEERGY SYSTEMS



KEY RECOMMENDATIONS

- Quick measures such as the creation of dedicated funds for mini-grid and standalone solar adoption (in collaboration with developmental partners) are needed to drive the adoption of off-grid renewable energy technologies in rural areas of Vietnam.
- The government of Vietnam **needs to explore the value chain potentials of small-wind turbines** to provide energy for rural areas with favorable wind speed conditions and also improve the technical skills of locals.
- The **nexus of wind energy and agriculture productivity** for farmers in rural areas needs to be explored further by the government.
- More focus should be placed on **improving the school enrolment rates** for children in low income rural areas of Vietnam through off-grid renewable energy solutions that help deliver and improve lighting and information access.

KEY STUDY LIMITATIONS

- Other decision factors, such as the value chain and the local availability of renewable energy equipment or materials were not analysed in this study.
- This study did not focus on the questions of „willingness to pay“, and „the ability to pay“ of consumers, issues often associated with off-grid electrification in rural areas.
- The data gathered from the case study areas may not be the same for all un-electrified communities in Vietnam, but can be viewed as representative indicators.
- This study is based on economic assumptions, technology cost, and other parameters that could change over the assessment horizon; this could affect approximation and should be taken into account for decision making.

Suggestion for reference:

COBENEFITS Vietnam 2019. Electricity access and local value creation for the un-electrified population in Vietnam: Executive briefing. Prepared by: IE (Vietnam) Revised & Edited by: IASS (Germany).

This assessment has been developed in the context of the project **Social & Economic Co-Benefits of Renewable Energy and Climate Change Mitigation (COBENEFITS)**. The COBENEFITS project is conducted by the Institute for Advanced Sustainability Studies (IASS, Lead) in partnership with Renewables Academy AG (RENAC), Independent Institute for Environmental Issues (UfU) and IET - International Energy Transition GmbH.

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