2nd Africa-EU Renewable Energy Research & Innovation Symposium

Assessment of decentralized hybrid mini-grids in Sub-Saharan Africa: Market analysis, Least-cost modelling, and Job creation analysis

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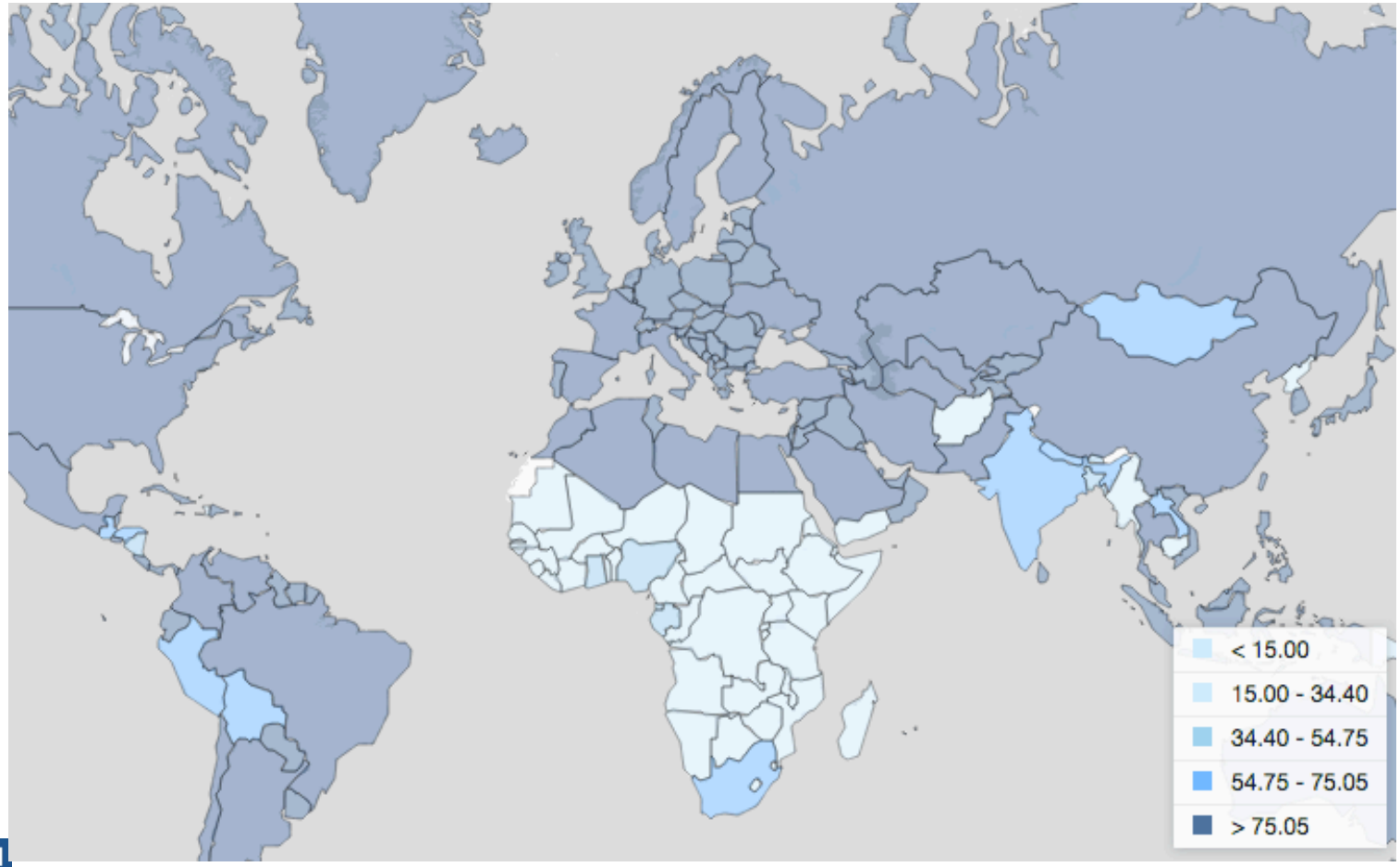
THE KNOWN REALITY

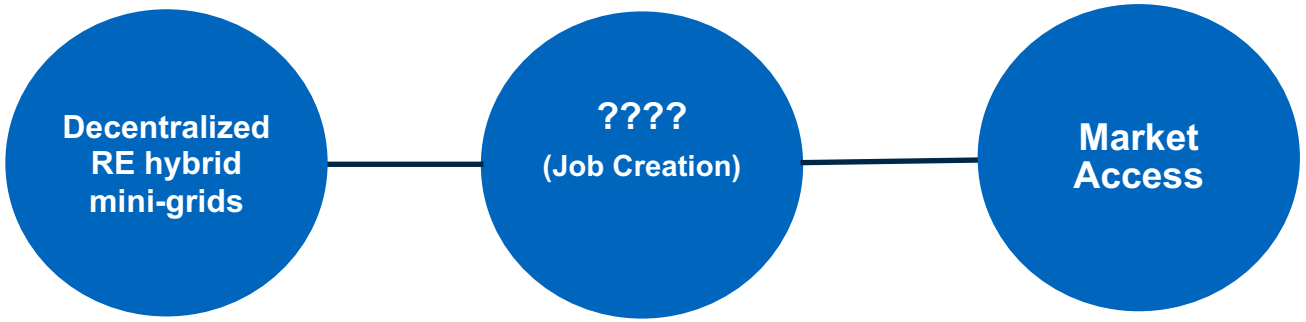
GLOBAL ELECTRIFCATION RATES



Source: World Bank (2016)

MAJOR CHALLENGE

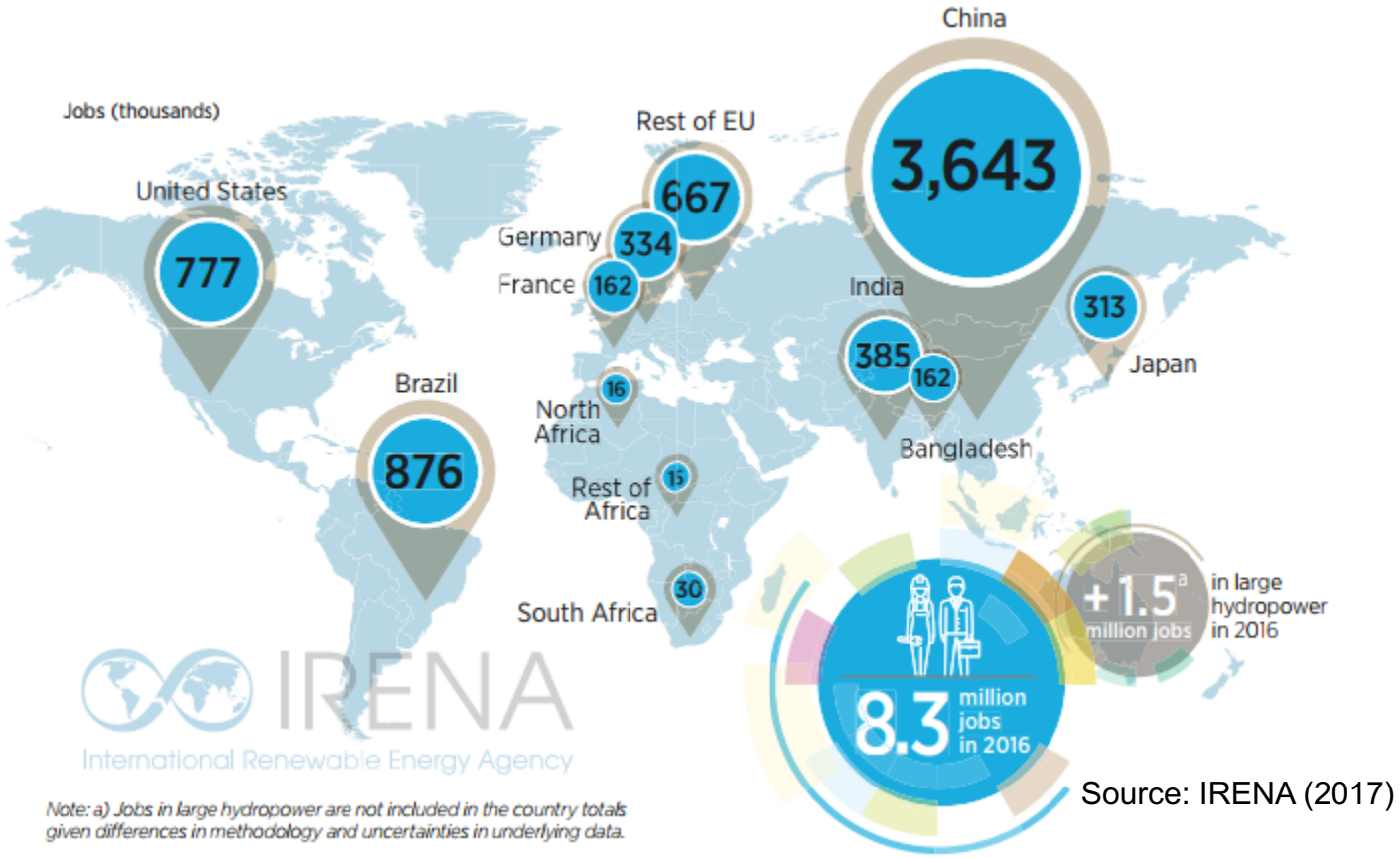
CREATING A SYNERGY BETWEEN RE MINI-GRIDS & MARKET ACCESS IN SSA



Addressing this question serves as the key research objective

JOBS!!

RENEWABLE ENERGY CENTERED JOBS CREATED IN 2016



Source: IRENA (2017)

MINIMAL CONCENTRATION IN AFRICA: SSA STILL LAGGING

JOBS!!

ZOOMING CLOSER INTO FIGURES FOR AFRICA

2015

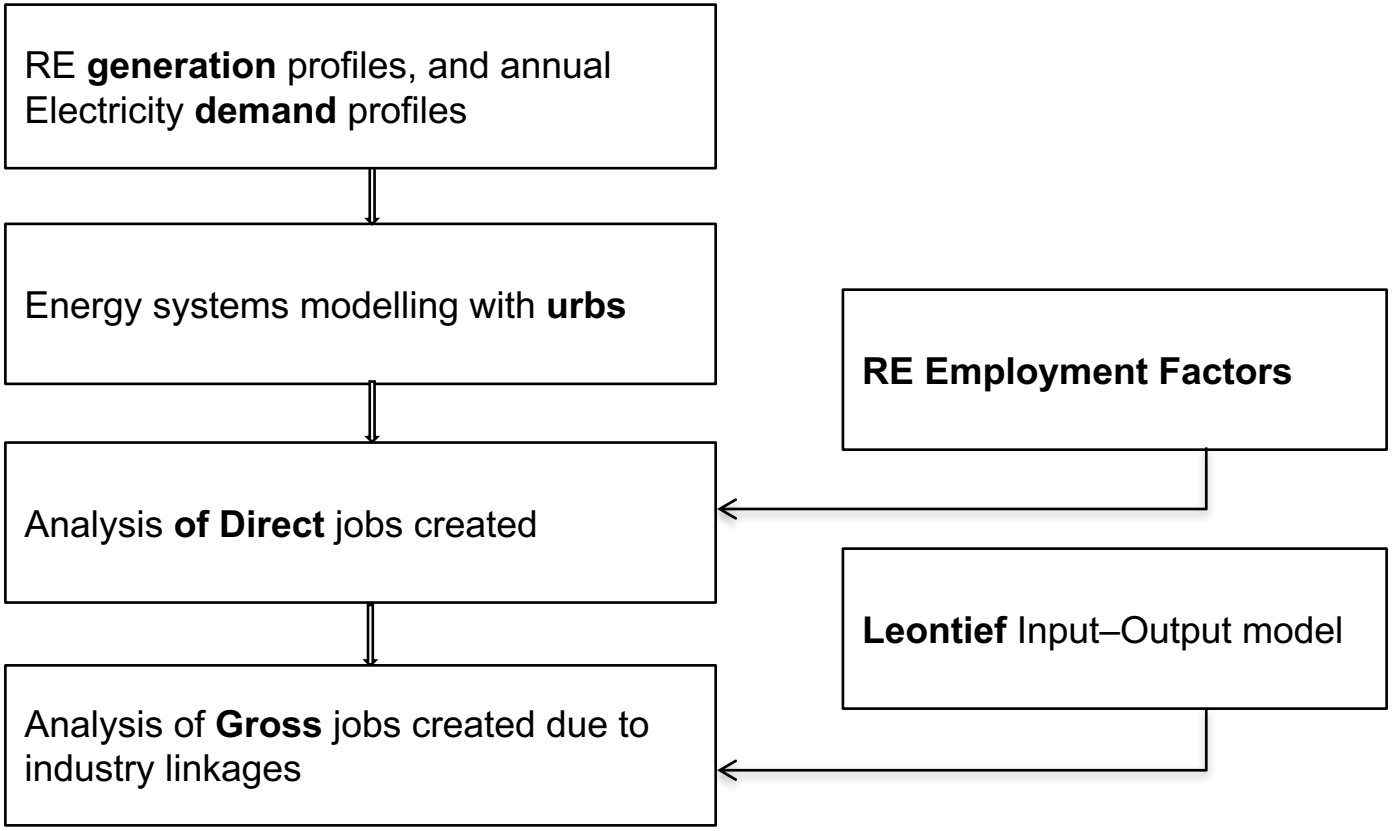
2016

NO IMPROVEMENT IN JOBS CREATED BETWEEN 2015 AND 2016

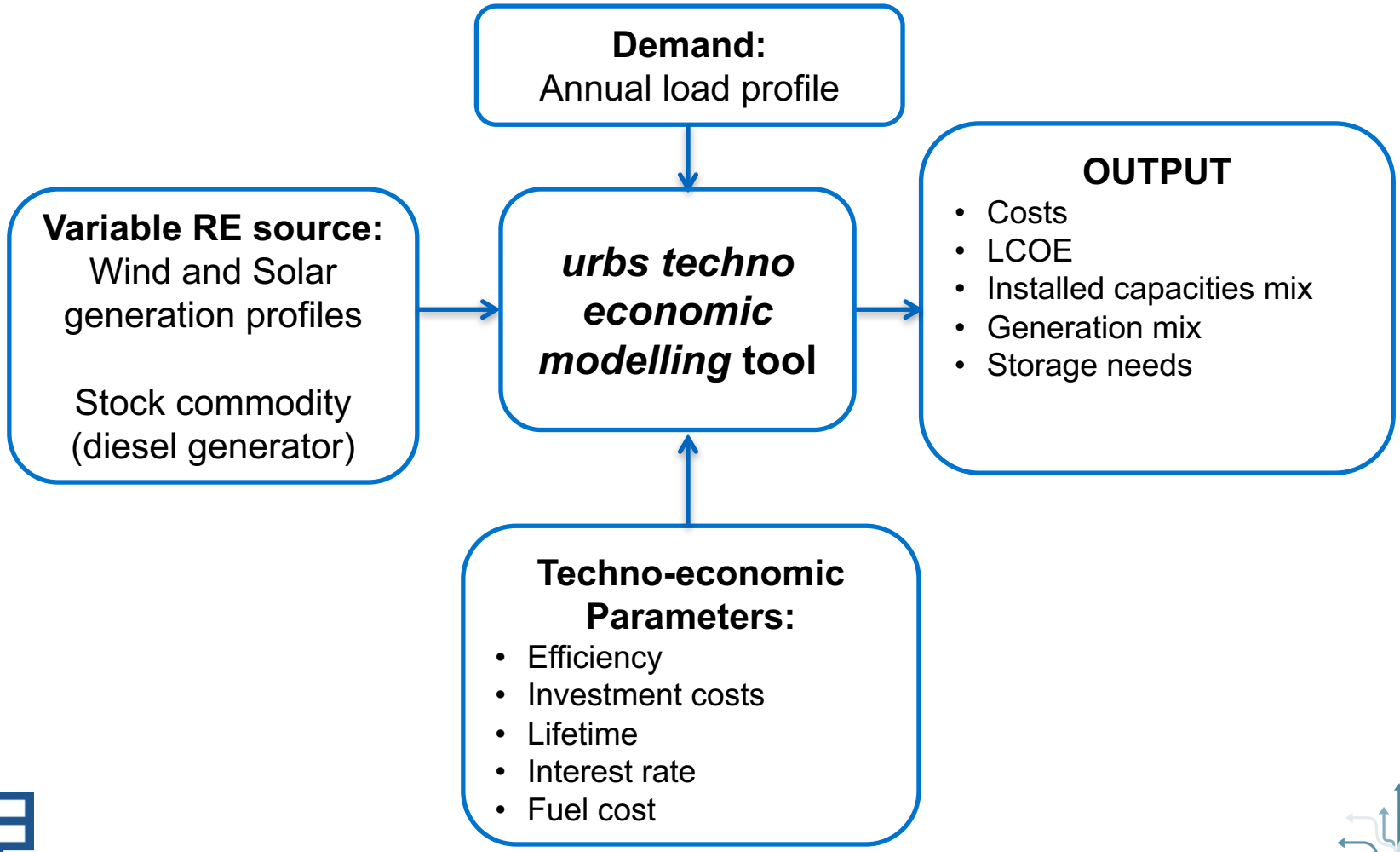
METHODOLOGY:

SYSTEM MODELLING and EMPLOYMENT IMPACT

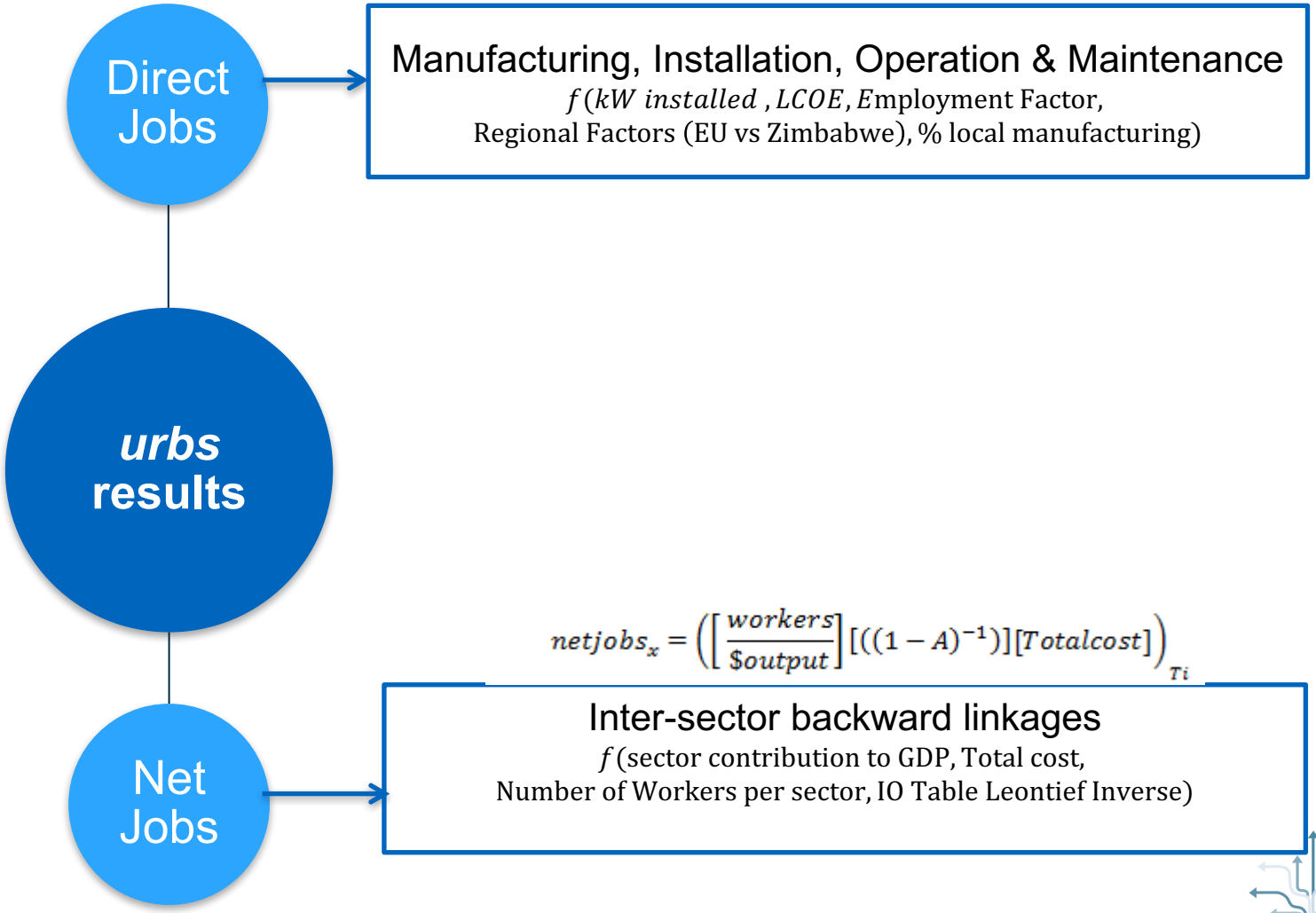
ASSESSMENT MODEL



LEAST-COST MODELLING - *urbs* framework

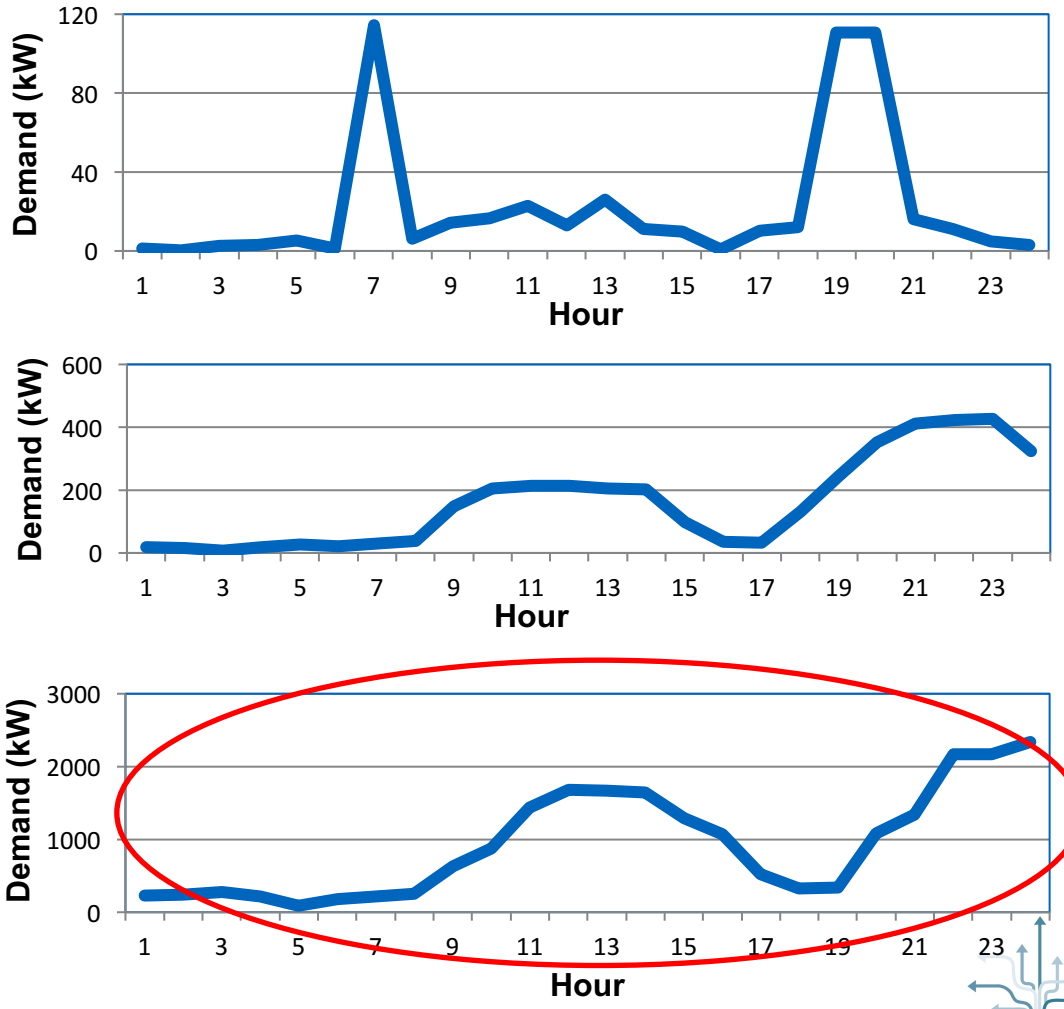


JOB CREATION ASSESSMENT



ENERGY DEMAND: DEMAND PROFILES ANALYSED

- Questionnaire
- Monte-carlo prediction (Time-of-use & Appliance demographics)

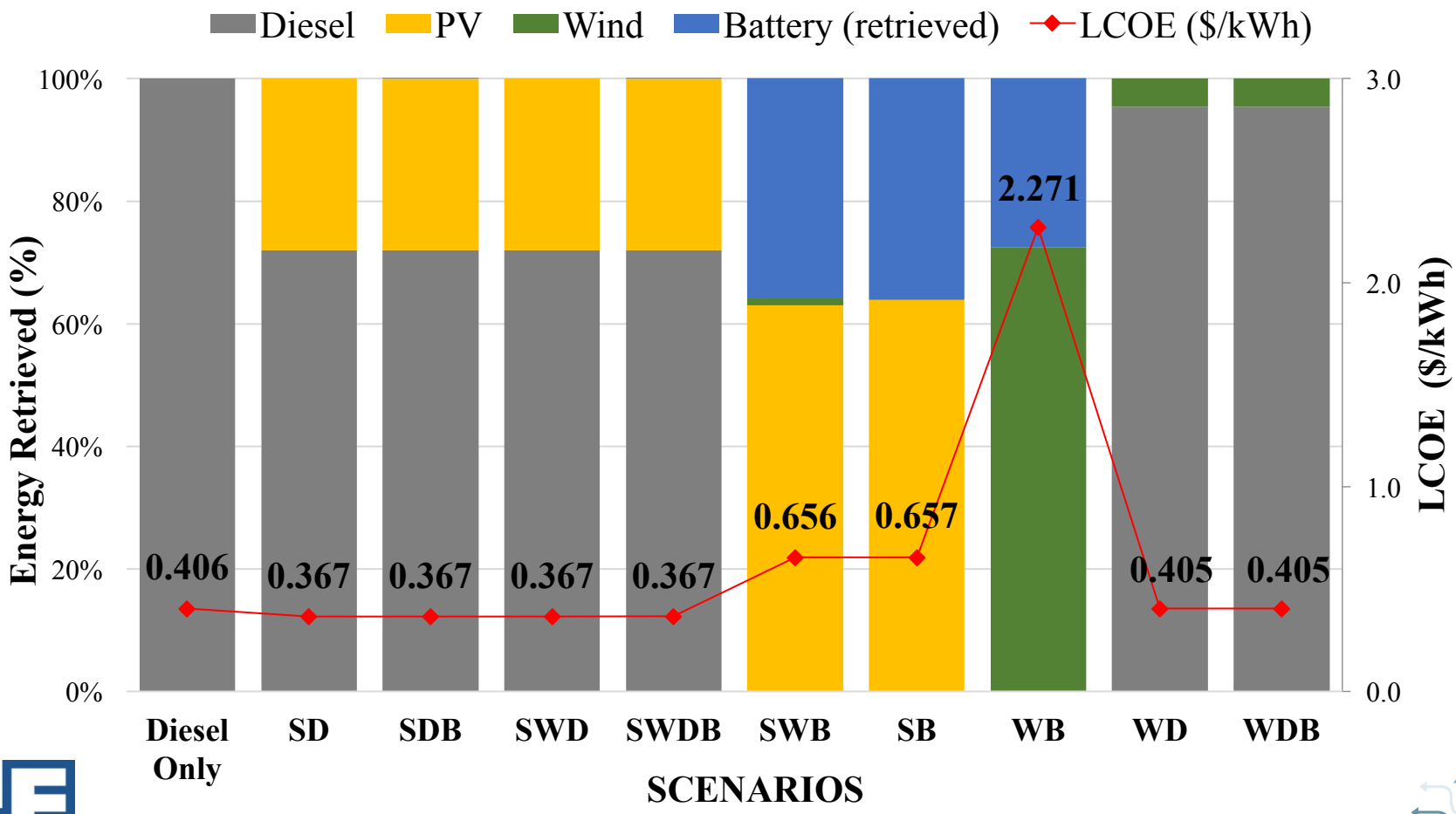


RESULTS

Mini-grid scenarios considered	
Base Scenario	Diesel Only
SD	Solar Diesel
SDB	Solar + Diesel + Battery
SWD	Solar + Wind + Diesel
SWDB	Solar + Wind + Diesel + Battery
SWB	Solar + Wind + Battery
SB	Solar + Battery
WB	Wind + Battery
WD	Wind + Diesel
WDB	Wind + Diesel + Battery

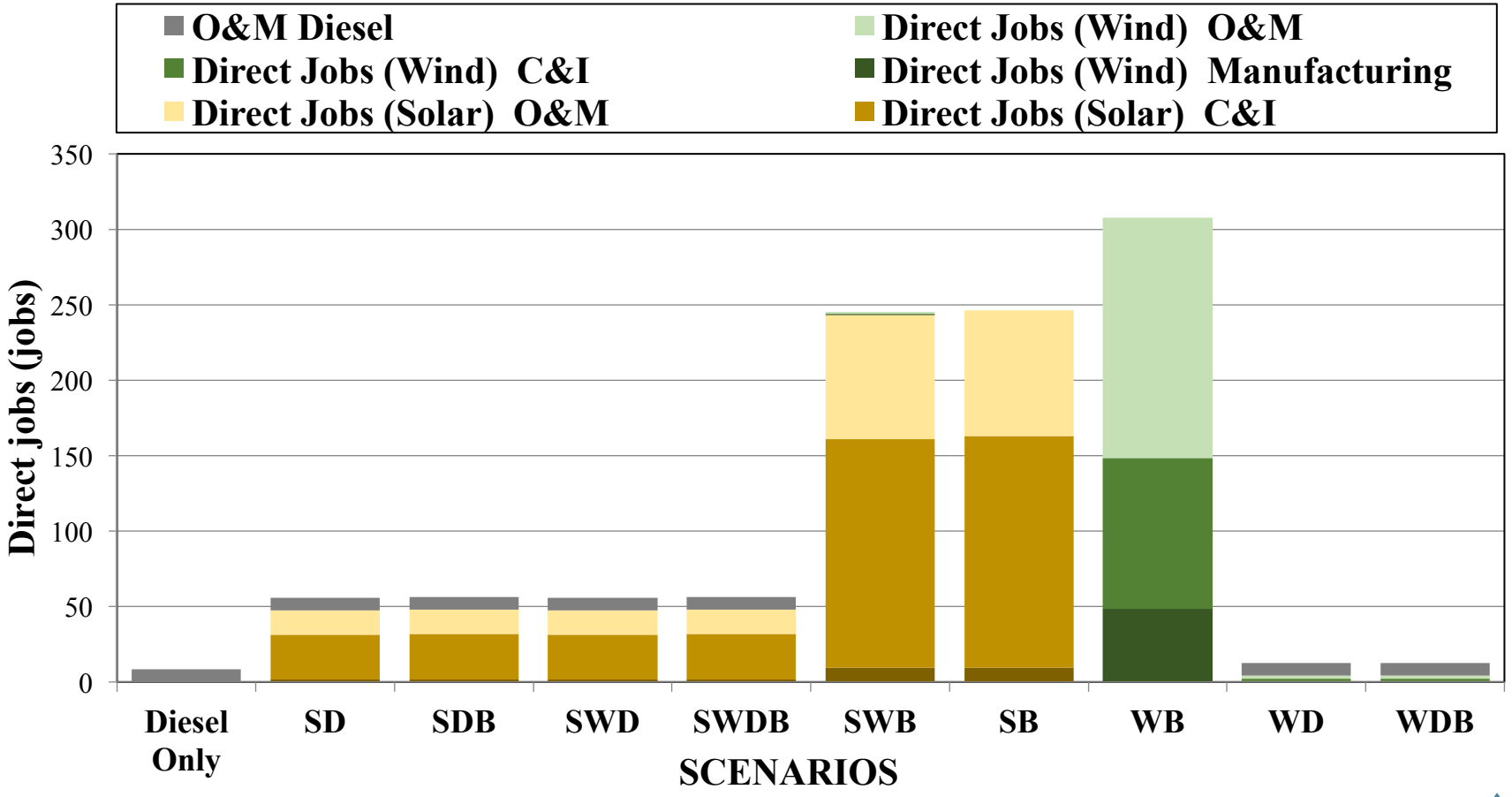
RESULTS

TECHNO-ECONOMIC



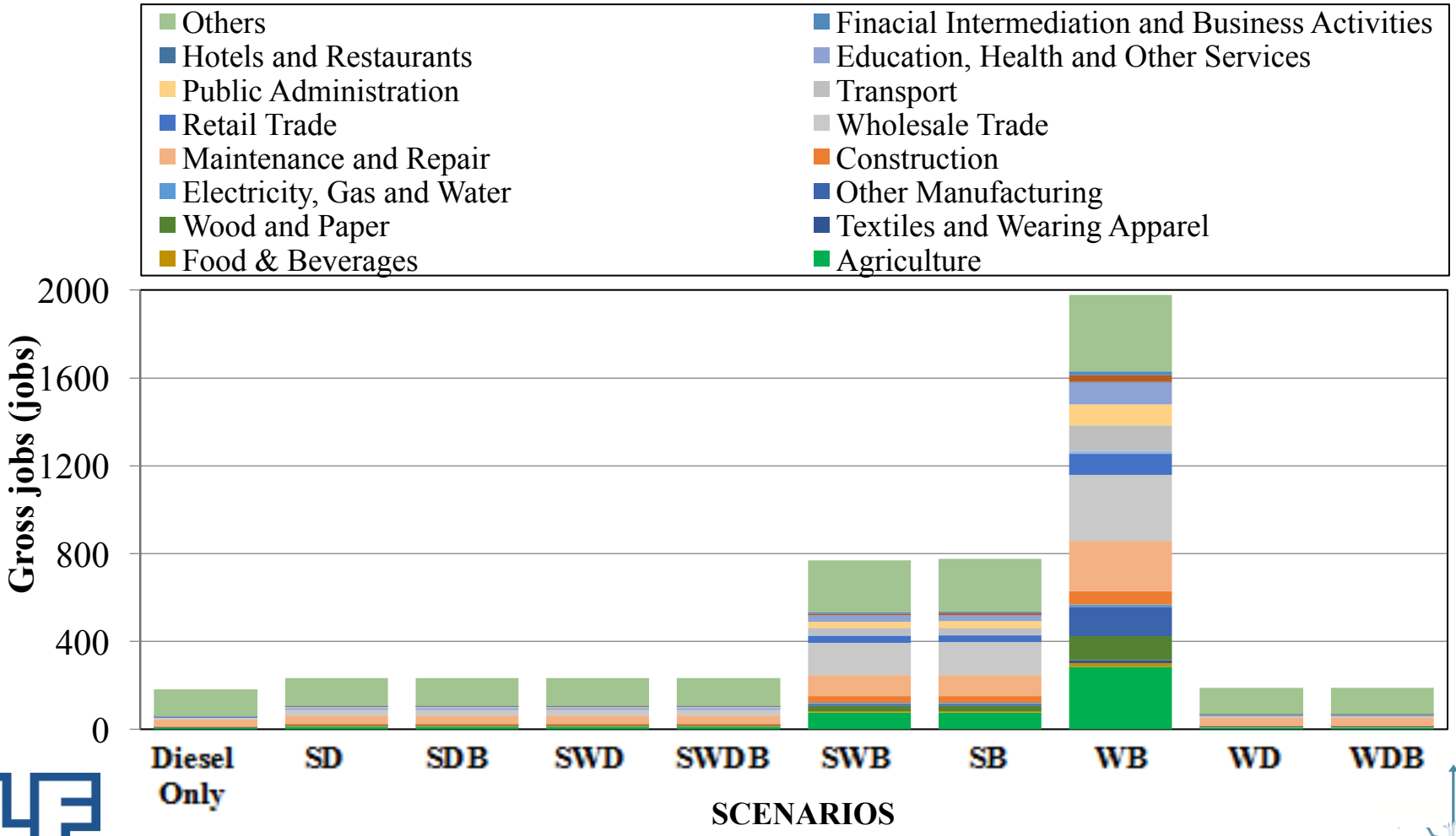
RESULTS

DIRECT JOBS CREATED



RESULTS

BACK-WARD LINKAGE (GROSS) JOBS CREATED



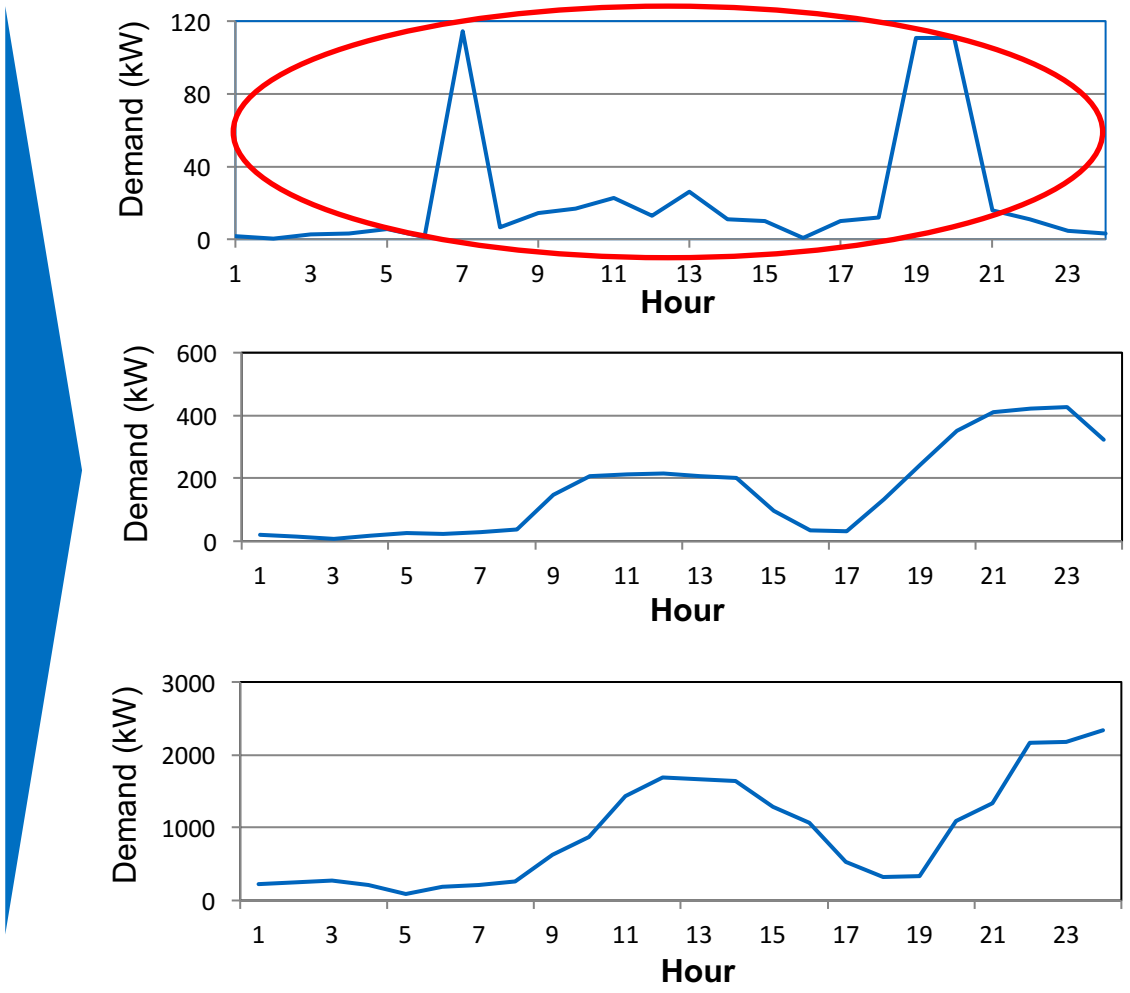
SENSITIVITY ANALYSIS: SWDB

ALTERED COMPONENT- WIND TURBINE & DEMAND TYPE

Wind Turbines	Cut–in & Rated wind speed	Power coefficient (Cp)	In-country manufacturing
DIY (Low Wind)	2 m/s & 9m/s	0.29	90%
Commercial	3m/s & 11m/s	0.33	20%

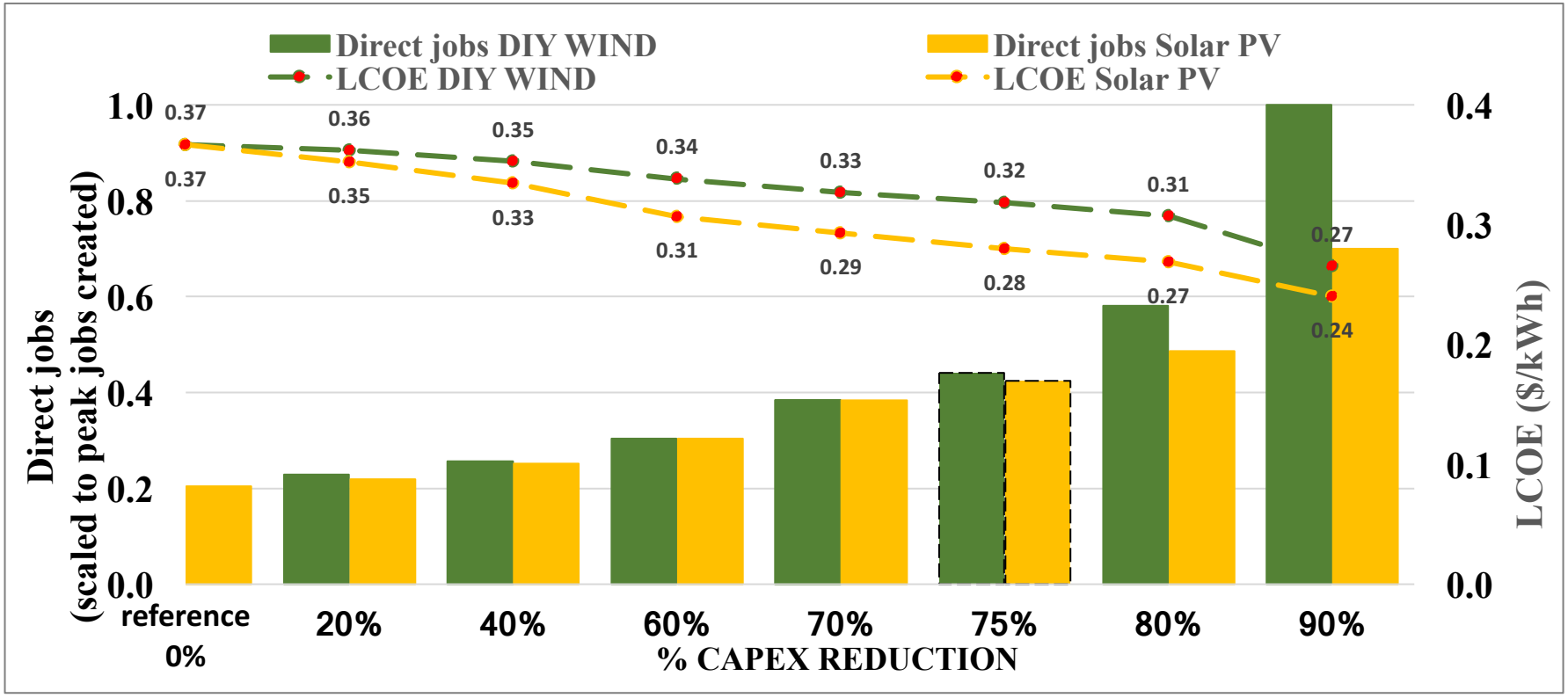
SENSITIVITY ANALYSIS: SWDB

ALTERED COMPONENT- WIND TURBINE & DEMAND TYPE



SENSITIVITY RESULTS

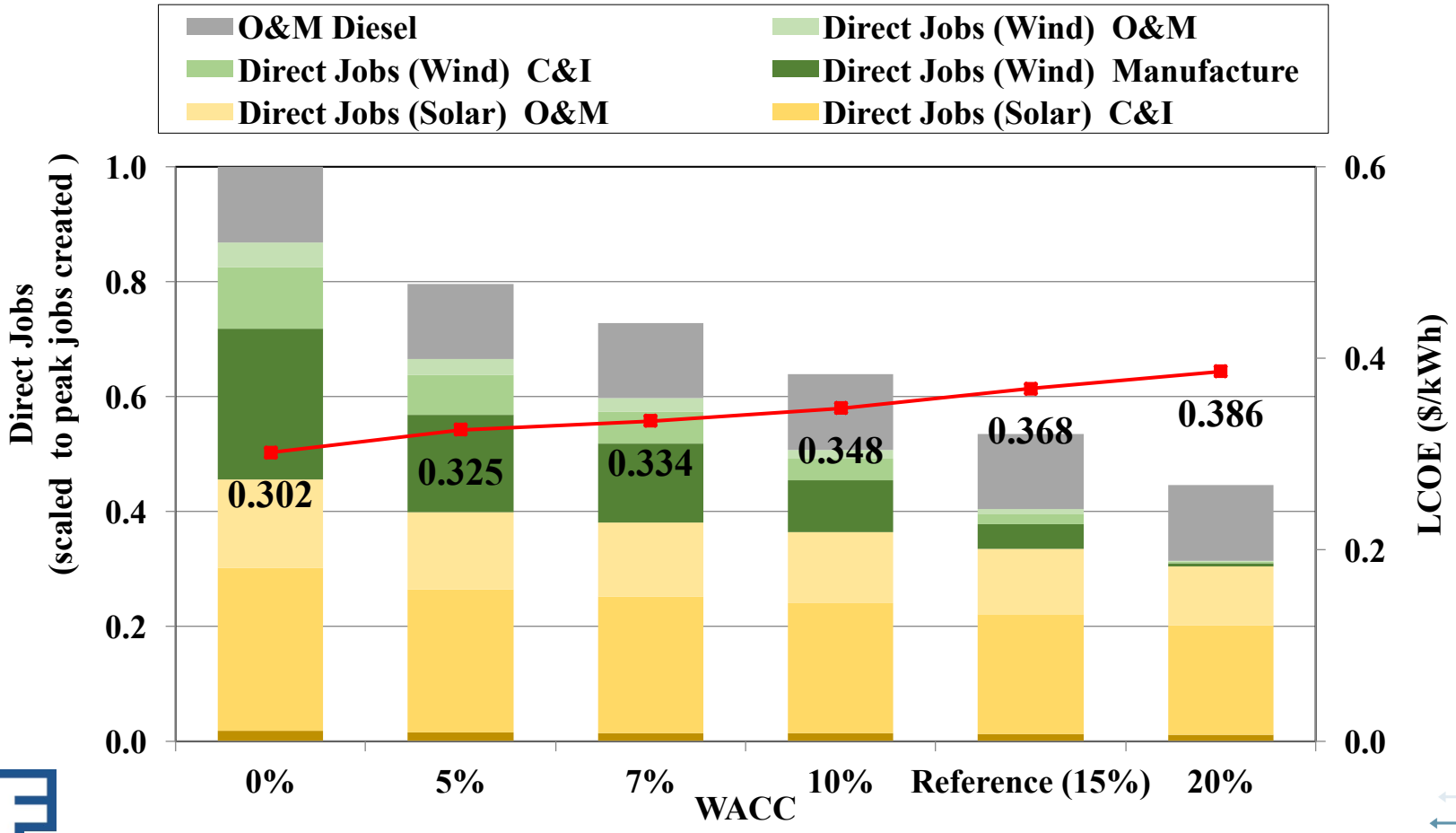
CAPEX REDUCTION EFFECT on LCOE & Direct Job creation



- Solar provides cheaper LCOE but lower employment impact against DIY wind turbine
- Effect of in-country manufacturing enhances DIY wind turbine job impact

SENSITIVITY RESULTS

IMPACT OF WEIGHTED COST OF CAPITAL (WACC)



KEY CONCLUSIONS

De-risking economic factors such as **discount rates** can improve market access for decentralized RE mini-grids in SSA.

Reducing the **cost** & **duration** of wind-resource assessment reduces **project development costs** for the wind technology which improves the market access for wind based hybrid systems.

Manufacturing & **Agriculture** industries still provide the highest productive **back-ward effects** of mini-grid electrification.

Trade-off between **lower LCOE** and **high job creation** to drive growth of decentralized hybrid mini-grid in sub-Saharan Africa is essential.

Thank you.

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