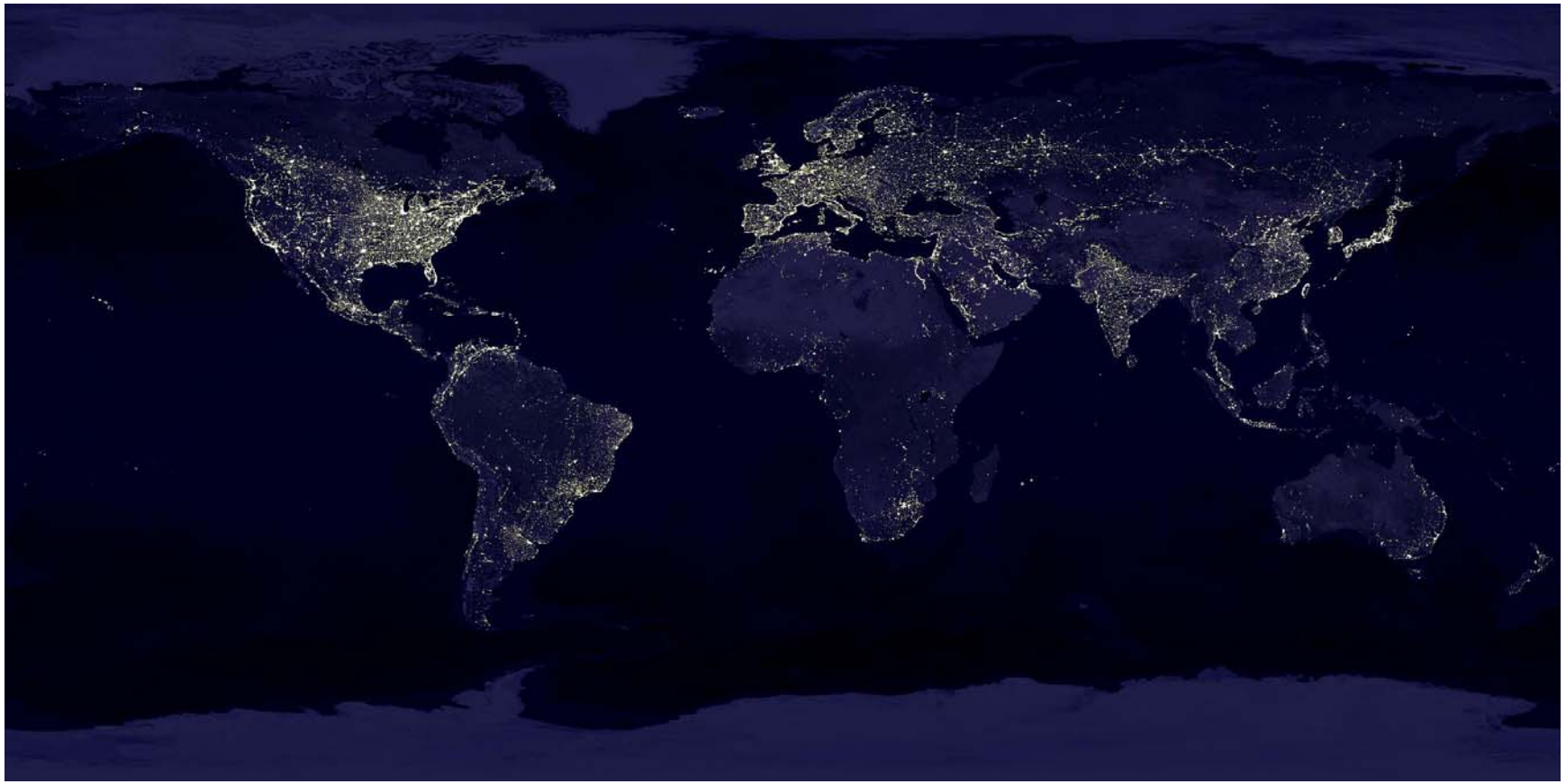
Green Power for Mobile Working Group Landscape

19 November 2008
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Energy as an Enabler – Extending Reach in...



Source: NASA GSFC

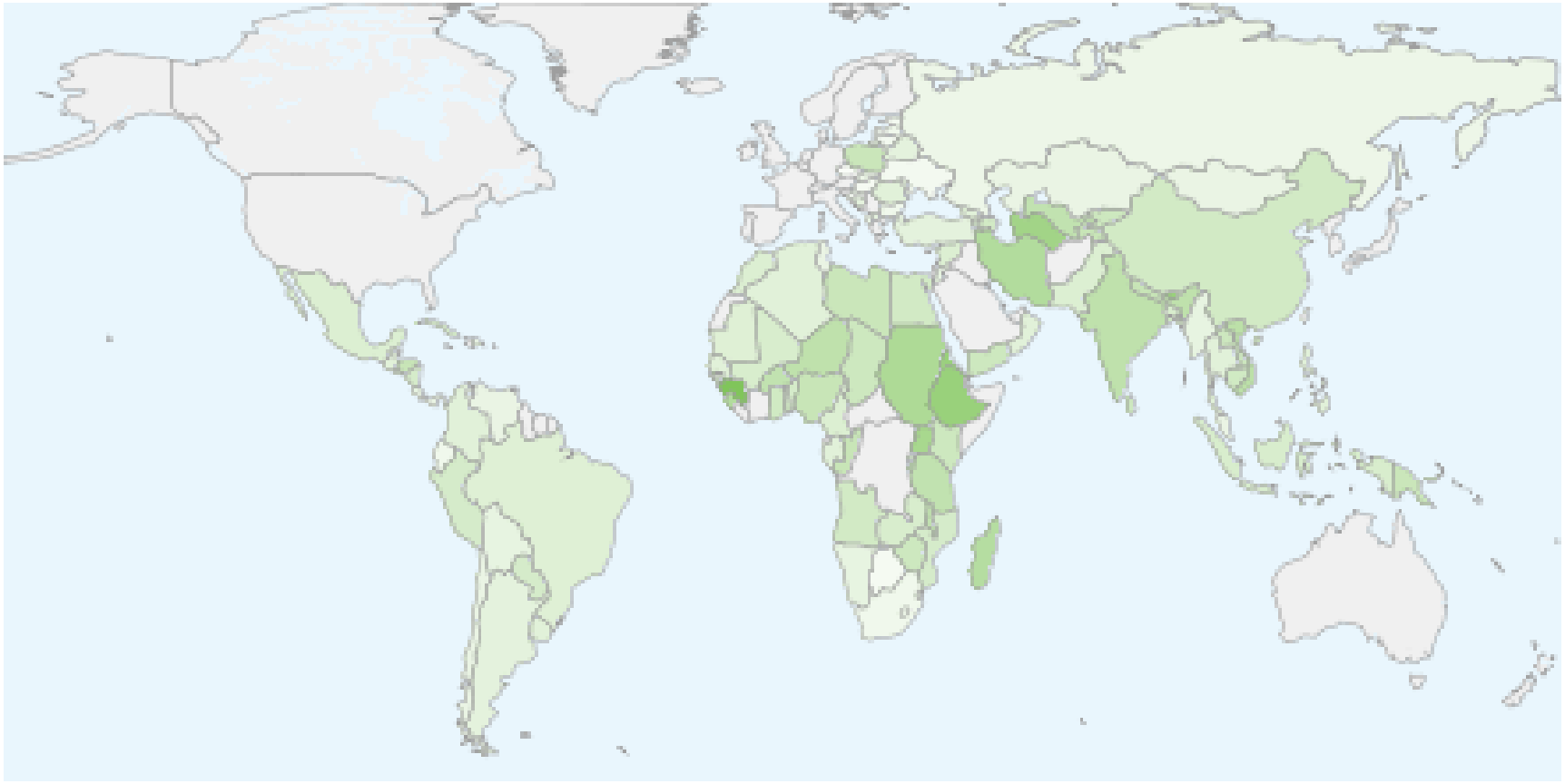
- **1.6bn people without access to grid electricity,** and 1bn people with unreliable supply

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Energy as an Enabler – Growth Markets

CAGR% IN CONNECTIONS 2007-'12

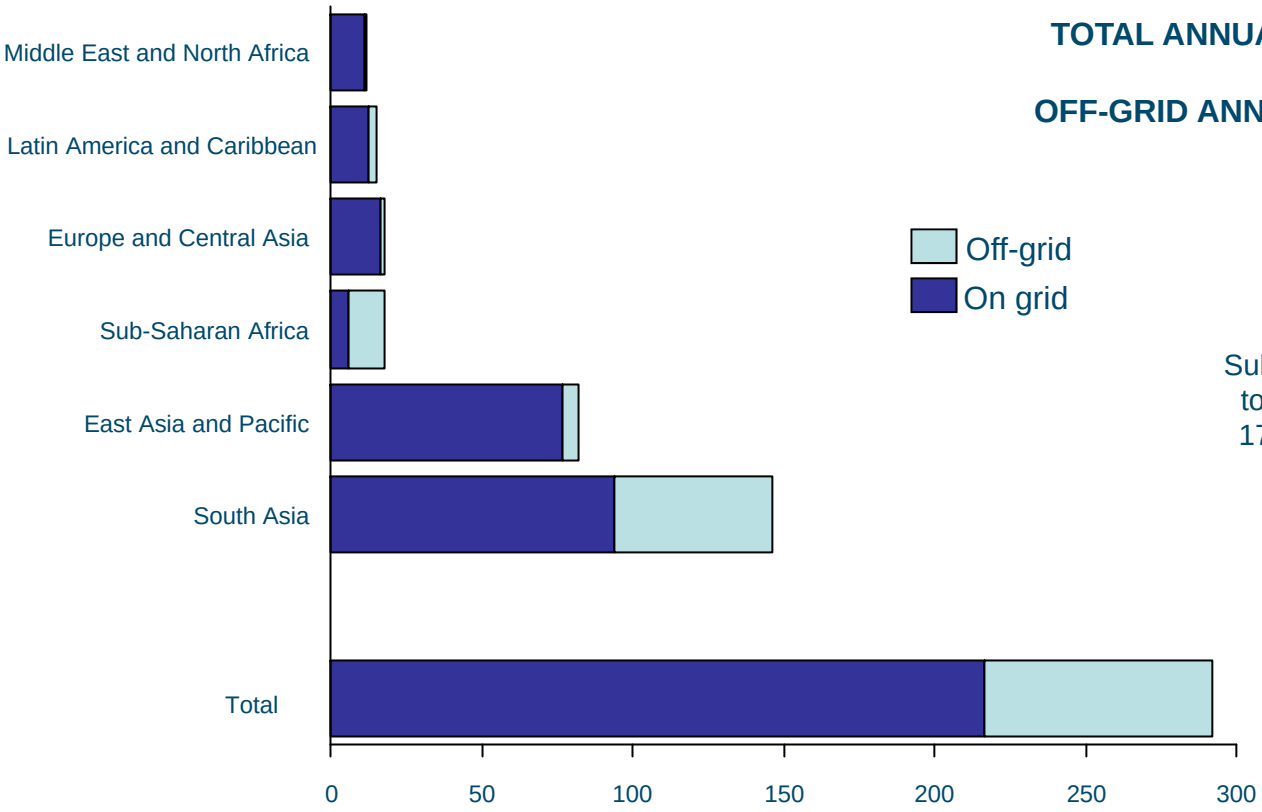


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Energy as an Enabler – Growth Markets

ANNUAL GROWTH IN BTS IN DEVELOPING REGIONS 2007-'12



TOTAL ANNUAL BTS GROWTH: 290k

OFF-GRID ANNUAL BTS GROWTH: 75k

Sub-Saharan Africa is expected to see year on year growth of 17%, with 70% of this coming from off-grid BTS

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Energy as an Enabler - Scenarios

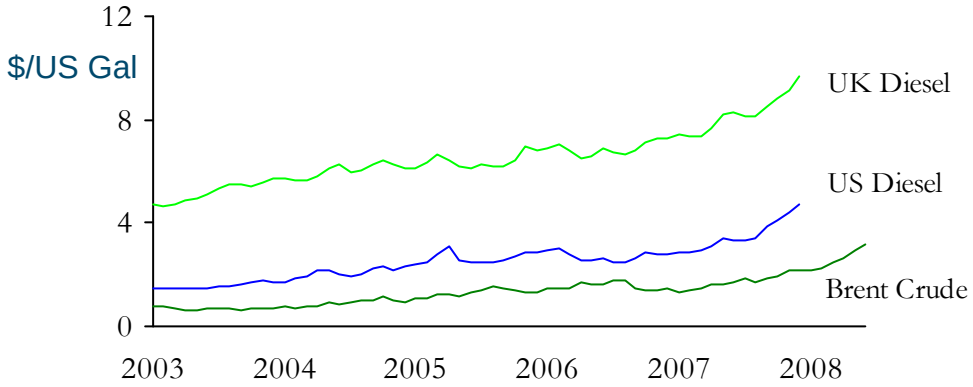
- Off Grid
  - Grid not available in region
  - Connectivity is cost or time prohibitive (what are your connection costs?)
- Unreliable Grid
  - Intermittent *short term* outages
  - Sustained outages
- To date, diesel generators have been the *default* power source for off grid or backup applications
- What is your tolerance for continued dependence on diesel price and volatility (typically well in excess of US$1/L)?

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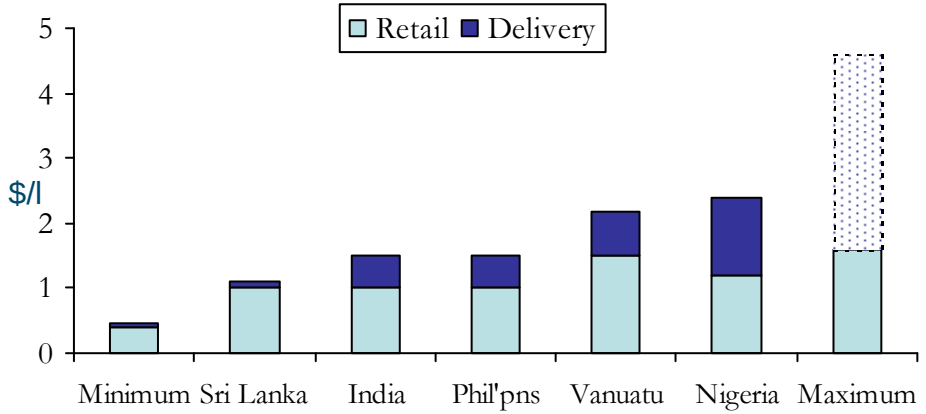
Energy as an Enabler - Scenarios

HISTORICAL RETAIL DIESEL AND CRUDE PRICES



Source: EIA

BUILD UP OF DELIVERED DIESEL PRICE



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Energy as an Enabler - Challenges

- What kinds of challenges does diesel present?
  - Environmental (carbon credit content on day 2)
  - Availability/Distribution
    - *"There is a problem with the supply of diesel in Sumatra – we have to get away from diesel." – Axis*
    - *"The pain of distributing the diesel is a key problem that we would like to solve." – MTN Nigeria*
  - Cost (fuel, maintenance)
    - *"The main drivers for using solar were considerable opex savings vs. diesel." – Roshan*

- What portion of your network expansion requires non-grid power? What limitation does diesel place on your potential expansion? What has been the mitigation to date?

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Energy as an Enabler - Challenges

- To what extent have operators been building internal capabilities to explore and develop alternatives? Parallel efforts?

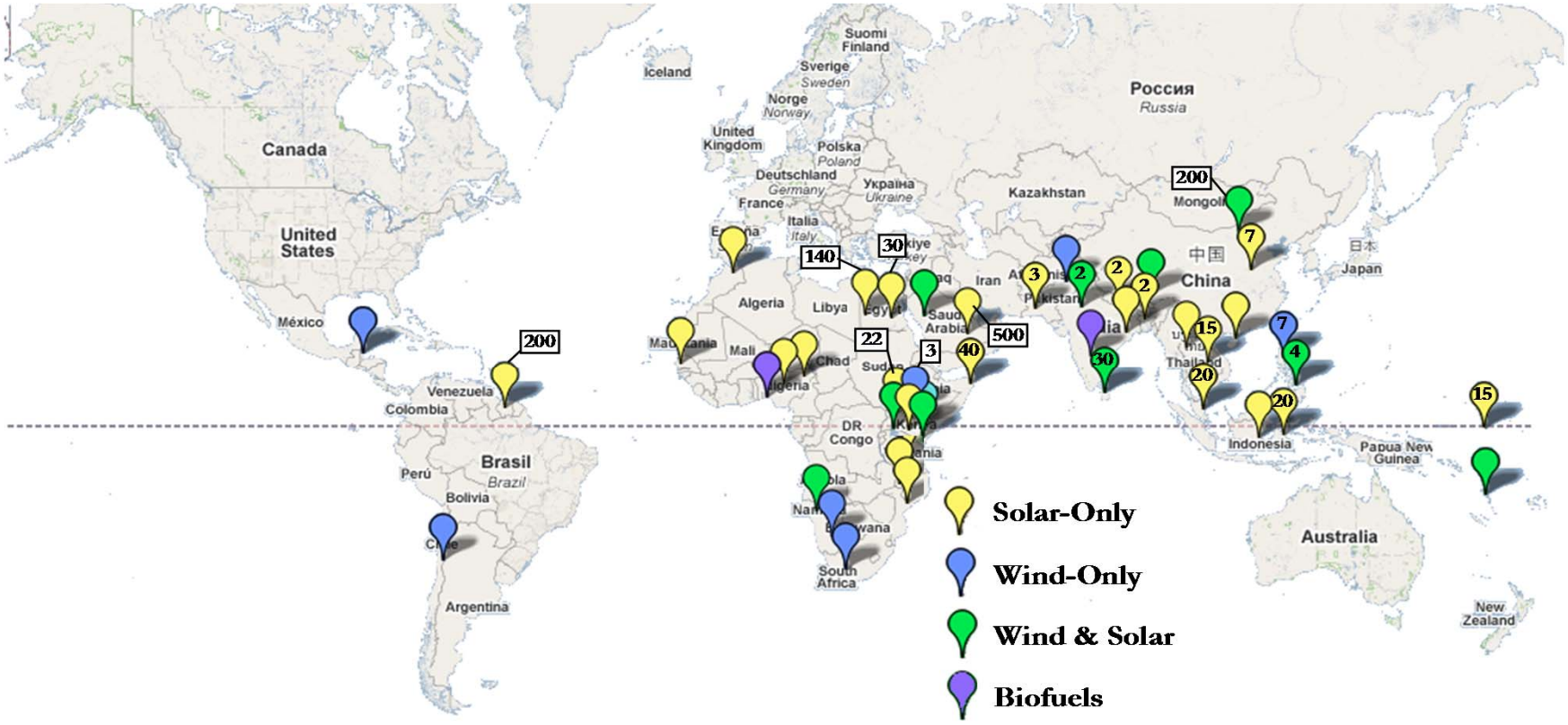
- What kinds of challenges have you encountered?
  - Information and familiarity?
  - Financing?
  - Reliability (specifications)?
  - Security (theft, vandalism)?

- Decreasing costs of alternative energy creates an *opportunity*
  - Silicon suppliers entering market
  - Wind turbine supplier start ups
  - Continued development of technologies (e.g. fuel cells)

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Energy as an Enabler - Momentum



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Energy as an Enabler - Momentum

- Operators have been developing a number of solutions:
  - Battery backup (grid power or green power) – short power outages
  - Battery backup (+ diesel) – long (> 1 day) power outages
  - Solar (off grid with or w/o battery backup)
  - Wind (off grid with or w/o battery backup)
  - Hybrid (solar & wind, off grid with or w/o battery backup)
  - Emerging technologies (fuel cells, others?)

- What have you found the most promising? Most problematic? Why?

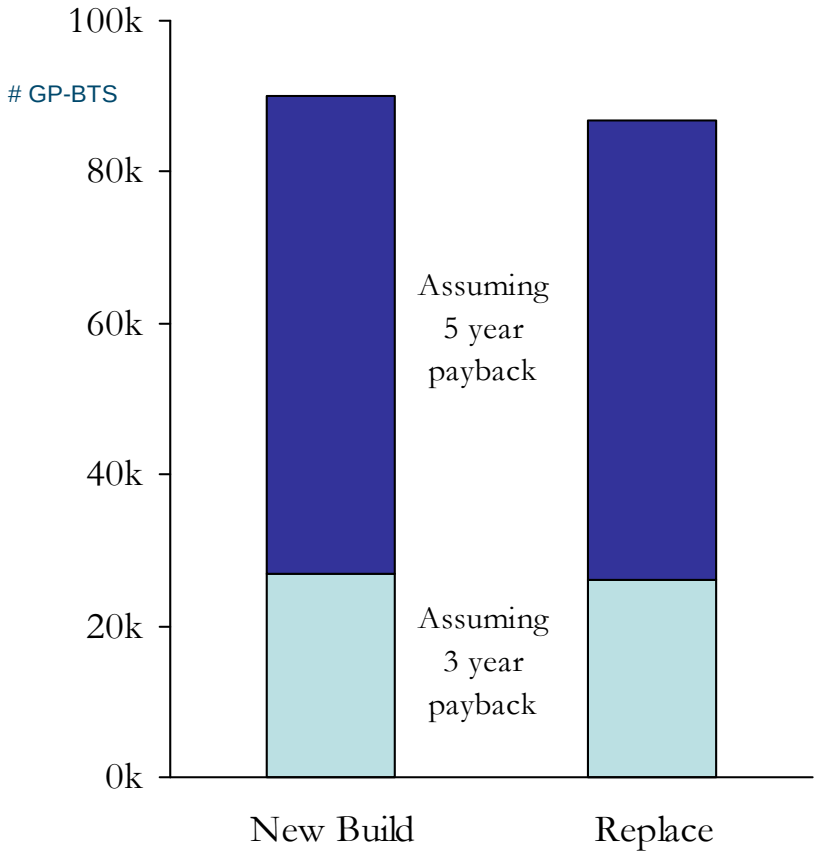
- The potential is significant
  - Existing technology
  - Commercially viable

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Energy as an Enabler - Momentum

POTENTIAL OFF-GRID GP-BTS IN DEVELOPING COUNTRIES BY 2012



	3 year Payback	5 year Payback
% off-grid BTS sites viable for green energy*	9%	30%
# green BTS by 2012	53k	176k
Reduced diesel consumption / yr	1.1bn ltrs	3.5bn ltrs
Fuel savings / yr	$1.3bn	$4.2bn
CO_2 emission reductions / yr	2.8m T CO_2	9.6m T CO_2

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Energy as an Enabler - Momentum

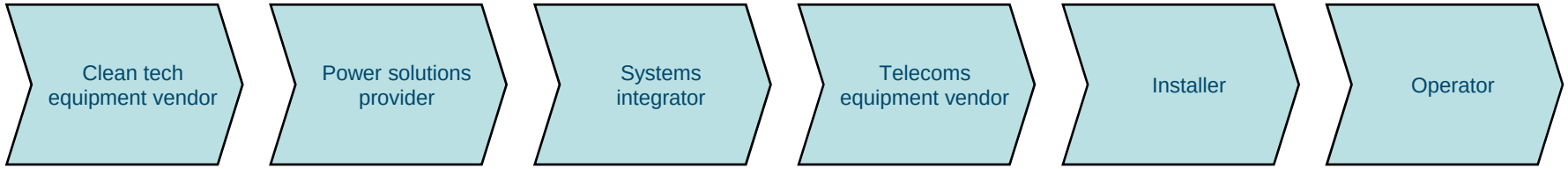
- A shift in ***Paradigm*** (not “what” or “how”, but rather “why”).
  - New markets
  - Sustainable energy
  - Shift in network planning approach

- Green Power for Mobile hopes to bring together a *community*
  - Operators (of course!)
  - Green power suppliers and solution integrators
  - Telecom vendors
  - Financing organizations

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Energy as an Enabler - Landscape



Clean tech equipment vendor	Power solutions provider	Systems integrator	Telecoms equipment vendor	Installer	Operator
e.g. Tenesol, BP Solar, Bergey, Proven Can help with site dimensioning Limited telecoms expertise	e.g. Emerson Optimise power requirements for site	e.g. Flexenclosure, PowerOasis, Winafrique Specialists provide complete solution	e.g. Ericsson, Motorola, Huawei Expertise in Telecoms Relatively new to integrating renewable energy solutions	Local companies install gensets and carry out civil works Could potentially install solar and wind No expertise in dimensioning or optimising site	e.g. MTN, Zain, Telenor... Varying experience Insource vs. Outsource

Collaborations and new opportunities:

- Partnerships, e.g. BP Solar and Ericsson, Huawei and Winafrique
- Specialist one-stop-shop providers, e.g. PowerOasis, Flexenclosure

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