

Smarter Sustainable Energy for the Rural Poor

A GRA Proposal for Delivering Real Change

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1.3 billion people are without access to electricity

Source: World Energy Outlook, 2011, OECD/International Energy Agency

3 billion people rely on wood, coal, charcoal or animal waste for cooking or heating

Source: The United Nations, Sustainable Energy for All (<http://www.sustainableenergyforall.org/about-us>)

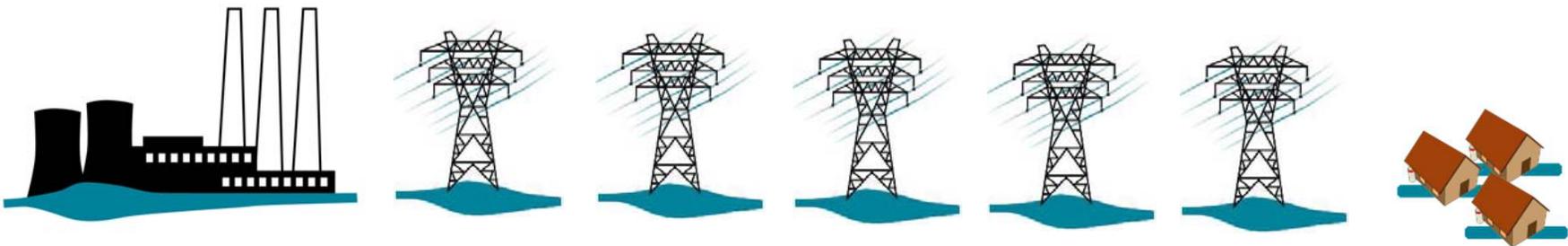
Where are the Energy Poor?

- 95% of all people without access to electricity are in sub-Saharan Africa and Developing Asia
- 84% of all people without access to electricity come from rural regions
- Only 2–5% of people in rural Sub-Saharan Africa have access to electric power, while 500 million people have no access at all

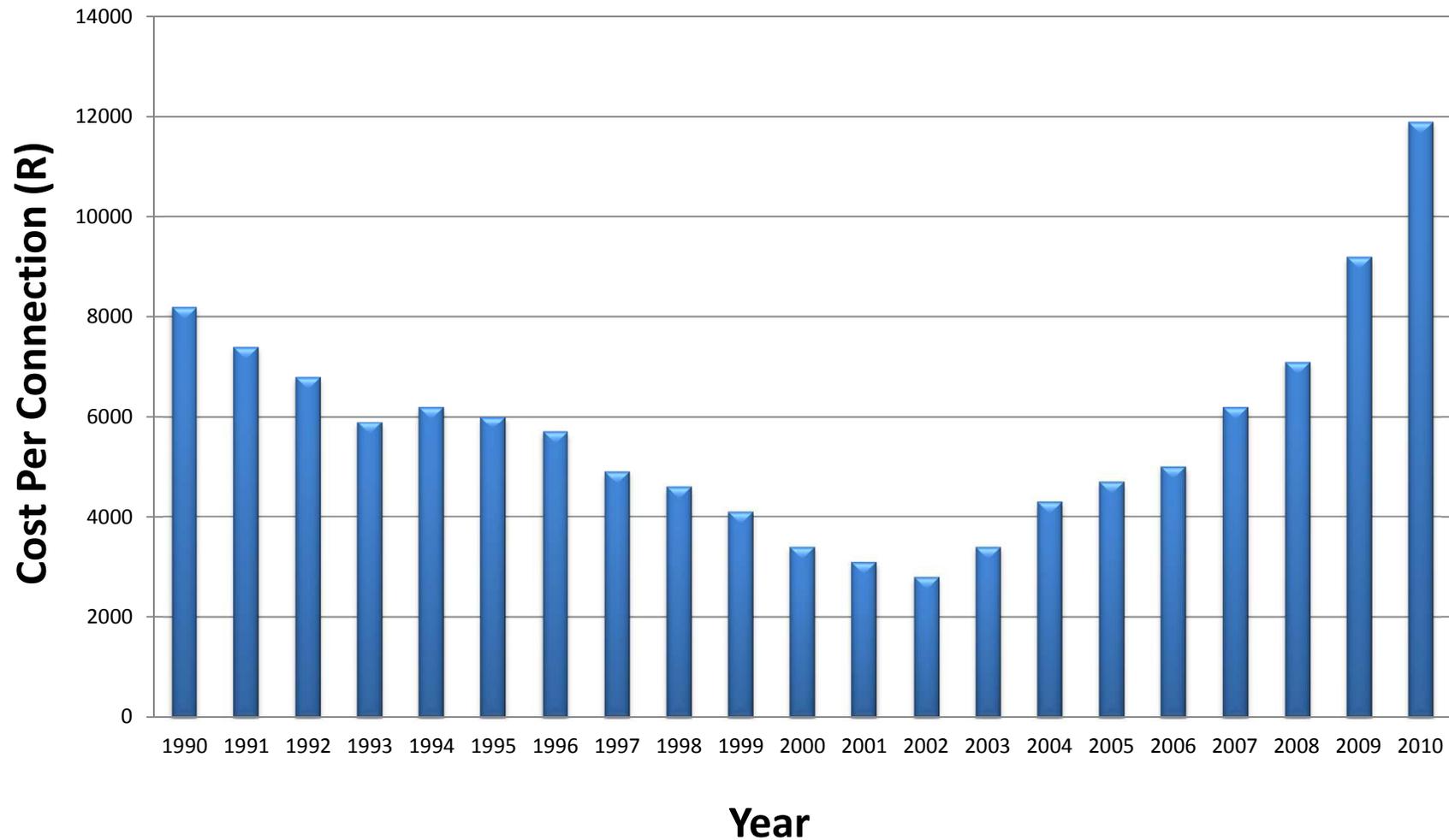
Source: World Energy Outlook, 2011, OECD/International Energy Agency; Humanitarian Technology Challenge, IEEE and United Nations Foundation

The Traditional Solution

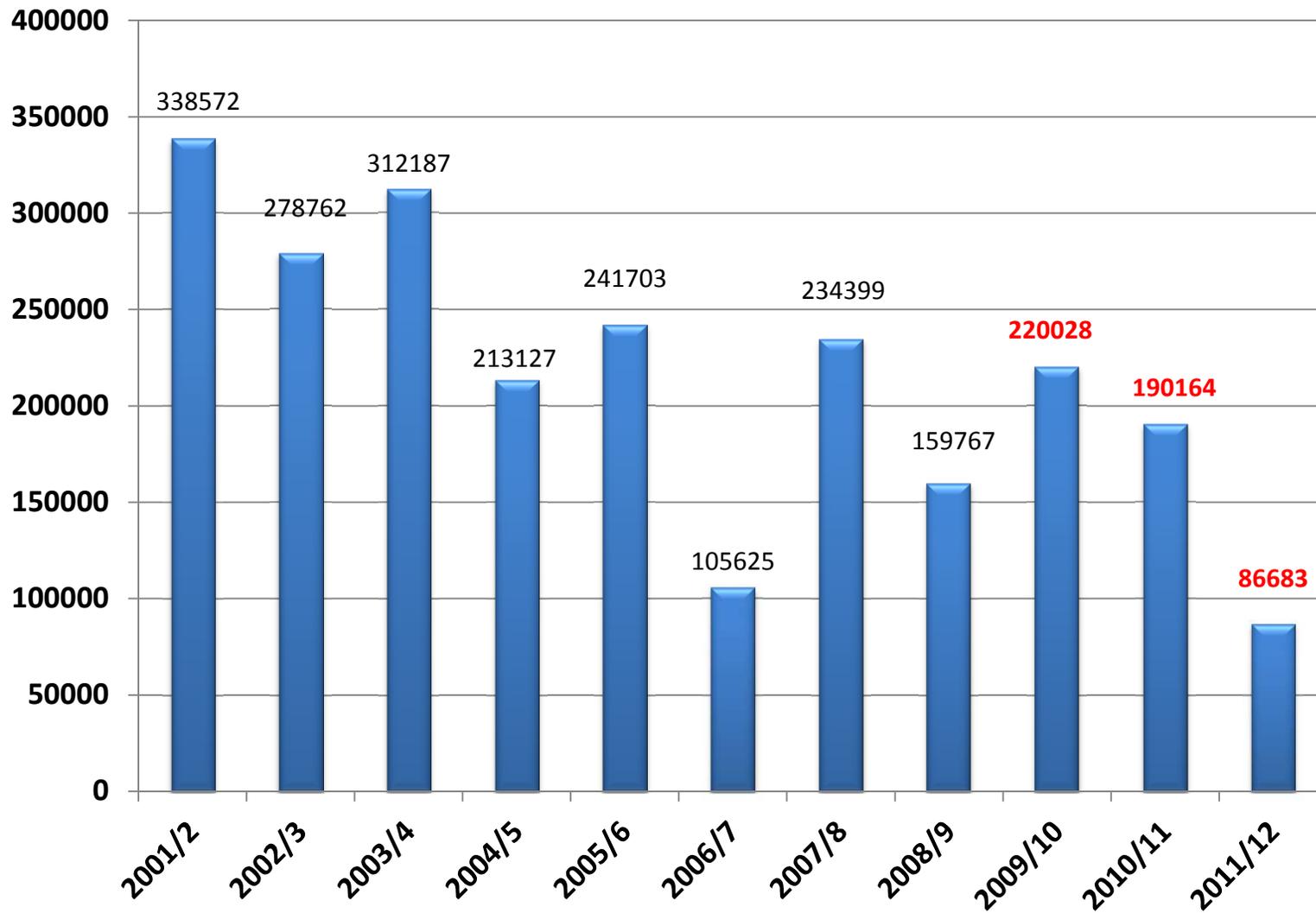
- Connect each small community to the existing electrical network
 - Huge infrastructure overhead to connect remote communities
 - Slow
 - Can be difficult to achieve and motivate
 - Prone to single points of failure
 - Hugely inflexible
 - Typically relies on traditional (non-renewable/polluting) generation sources
 - All or nothing



Average connection costs

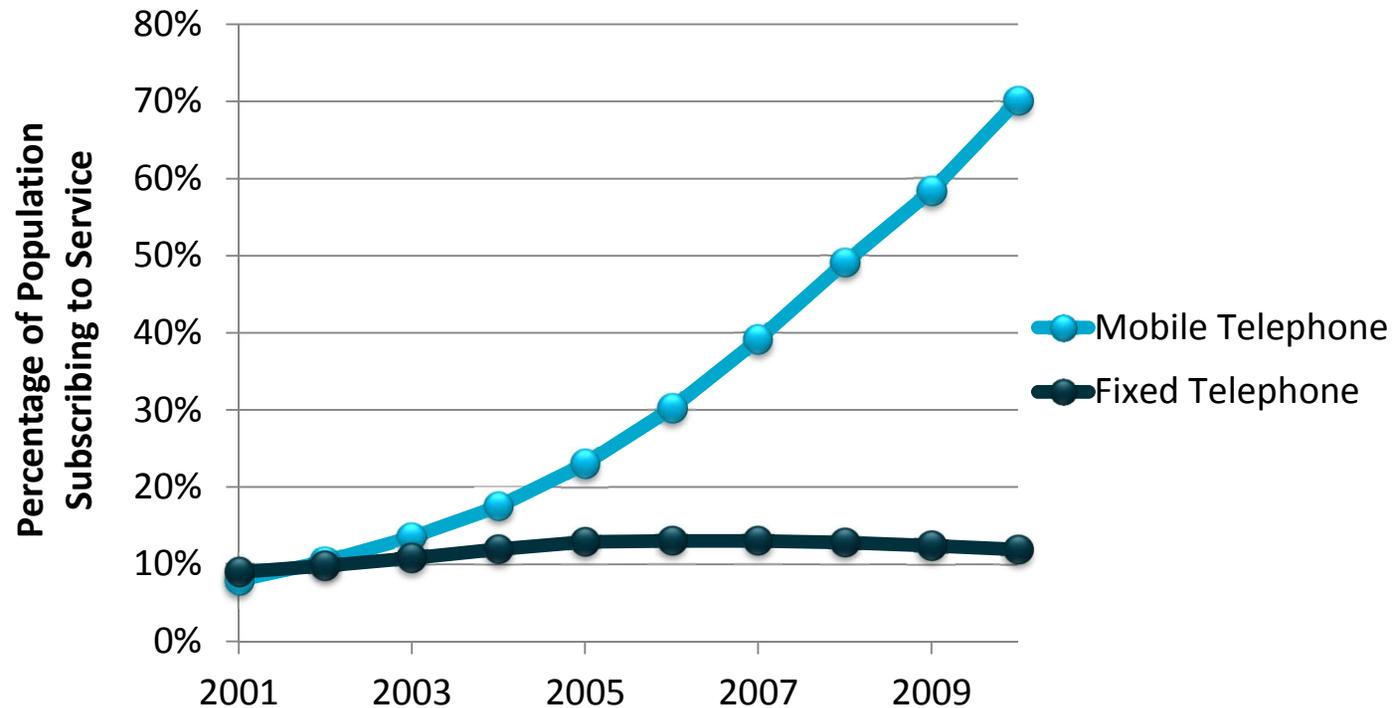


Achieved Connections from 2001 to December 2011



The Leapfrog Effect

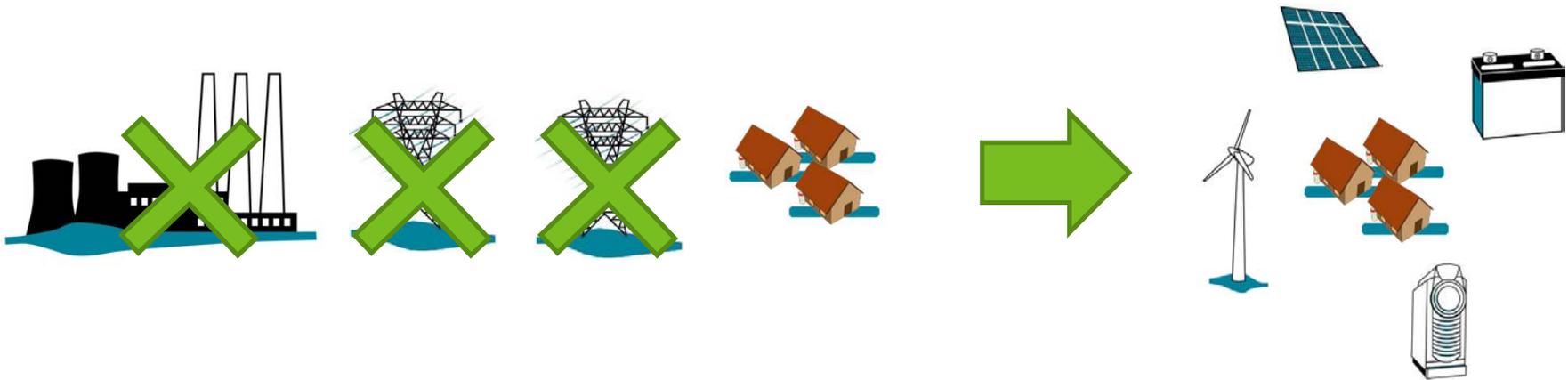
“During my years as a reporter covering the wireless industry, there’s one story I kept revisiting in various ways: while developed nations slowly replaced landline telephones with cell phones, developing countries completely skipped traditional telephone infrastructure and got their first communications via cellular.” (Katie Fehrenbacher)



Source: <http://gigaom.com/cleantech/why-power-generation-will-mirror-cell-phones-in-developing-nations/>; <http://www.itu.int/ict/statistics>

The Leapfrog Effect

- The rural developing world has an opportunity to pursue innovative energy solutions that are not built upon the ideas of last century.



Learning to Leap

- We are approaching that goal but slowly
 - China has approximately 60,000 minigrid schemes
 - Nepal, India, Vietnam and Sri Lanka each have between 100 and 1,000 minigrids
 - The World Bank has increased support for off-grid projects, funding 31 projects between 1995 and 2008 (up from two prior to 1995)
 - Still a reliance on diesel generators in many minigrid systems
 - Challenges exist in finding optimal community fit
 - Assessment of resource availability is difficult
 - Maintenance issues are a concern
 - Few holistic, robust and codified solutions exist

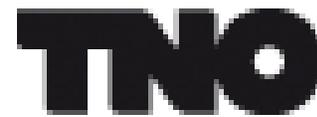
“Despite the opportunities, penetration of minigrid systems remains low in most developing countries” (Global Village Energy Partnerships)

Our Goal

- To create a smarter sustainable energy programme for the remote and rural poor that:
 - Delivers localised generation, storage and distribution systems
 - Features energy efficiency and intelligent demand management at the forefront
 - Offers modularity, community-specificity and flexibility
 - Enables rapid deployment
 - Provides robustness
 - Integrates contemporary smart-grid concepts
 - Enables a sustainable, long-term and green solution to energy access

Why We Will Deliver

- The collaborative partnership between CSIRO, TNO and CSIR South Africa brings expertise in minigrids, smart grids, social sciences, real-world deployment, world-leading experimental facilities and an international network of research, government and industry partners



Why We Will Deliver

- CSIRO
 - Recently completed a three year Asia Pacific Partnership with TERI (India) on smart minigrid technologies
 - Included seven formal reports to the Australian Commonwealth Government on the state and future of minigrids
 - Resulted in the construction of the Renewable Energy Integration Facility (REIF), for the testing and analysis of energy systems in a minigrid environment
 - Leading research into key smart-grid concepts, including
 - Optimal planning of small-scale power networks
 - Automated demand-management and control
 - Commencing work programmes focussed on
 - Advanced solar and load forecasting methodologies
 - Automated fault-detection and diagnosis

Why We Will Deliver

- CSIR South Africa
 - Extensive experience in the development of frameworks and policy and the real-world deployment of South African minigrids
 - Core member of the multi-national Renewable Energy for Rural Electrification project tasked with delivering an integrated energy/economic framework for poverty alleviation and productive energy use in the Eastern Cape of South Africa
 - Developed the implementation plans for Lucingweni and Hluleka minigrids on behalf of the National Electricity Regulator
 - Commencing the multi-national Renewable Energy Technology Integration platform with a focus on rural electrification of eThekweni (Durban)
 - Actively involved in wind resource assessment, a core member of the team responsible for delivering the Wind Atlas for South Africa (WASA)

Why we will deliver



Hluleka Nature Reserve

Lucingweni village



Objective: to demonstrate that the various integrated technologies work.

Also place SA quite far down the innovation cycle

Why We Will Deliver

- TNO
 - Experience in social innovation, including policy, legislation and multi-stakeholder business modelling
 - ICT and Energy focus has delivered PowerMatcher technology for aligning renewable energy outputs and electrical demand, piloted in many projects (e.g. Power Matching City, EcoGrid)
 - Applied technology research in Aruba that will expand renewable energy share to 40%
 - TNO is committed to developing sustainable innovations that boost economic development and create social wealth. TNO's Innovation for Development addresses four topics; Food & Agriculture, Renewable Energy & Climate, Health and ICT.

How We Will Deliver

- A phased approach
 - Phase 0: Project Scoping
 - Phase 1: Development of a Simulation-Based Pilot Collaborative Project
 - Phase 2: Real-world Trialling of Developed Technologies and Methodologies
 - Phase 3: Development of Modular Solutions Suitable for Commercialisation and Large-Scale Deployment

Thank you

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Steve Szewczuk (CSIR South Africa)

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