

# Towards Universal Energy Access by 2030

Areas requiring further research



Image source: World Bank, 2011

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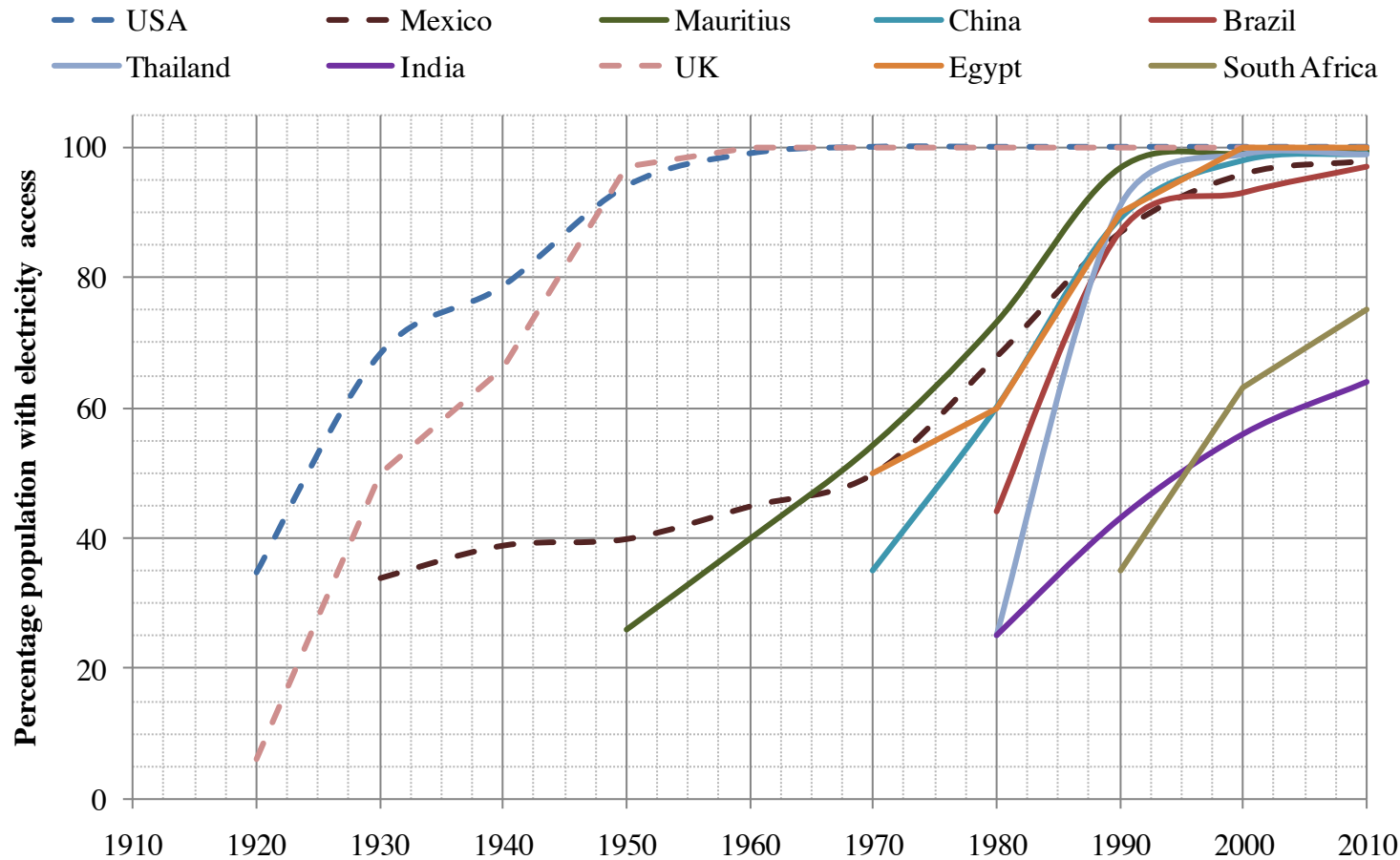
Joint Institute for Strategic Energy Analysis, NREL

Center for Science and Technology Policy Research, February 2013

# (No) Equity

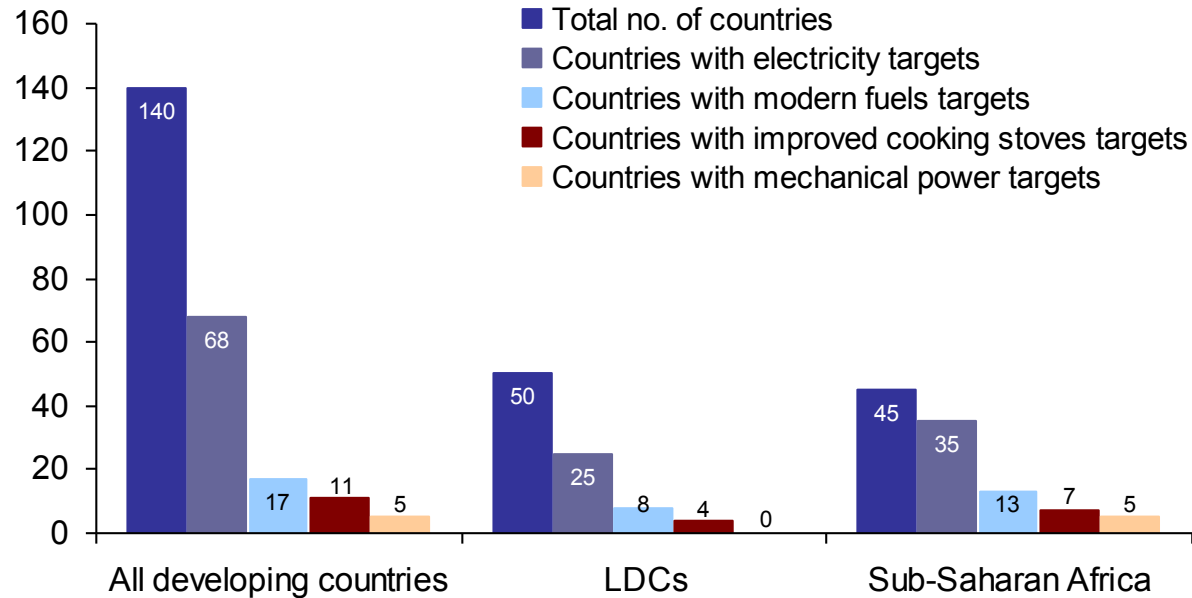
- Roughly 600m without access in SSA now: projected to be 700m in 2030 (IEA). Only region going up in absolute terms.
- Without South Africa, the total SSA capacity is a mere 28 GW, equivalent to the installed capacity of Argentina.
- As much as 25 percent of these 28 GW of installed capacity are not currently available for generation.
- Per capita consumption without South Africa is 124 KWh (Consumption in the developing world is 1,155 KWh and 10,198 kWh in high-income countries.)
- Manufacturing enterprises experience power outages on an average of 56 days per year. (USA uses cumulative MINUTES lost). Costs 6-16% of GDP.

# Precedent of household electrification



Source: Pachauri, S., A. Brew-Hammond, D.F. Barnes, D.H. Bouille, S. Gitonga, V. Modi, G. Prasad, A.Rath, and H. Zerriffi. 2011: Energy Access for Development. In: The Global Energy Assessment: Toward a More Sustainable Future. IIASA, Laxenburg, Austria and Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

# National Targets Exist (so do plans)



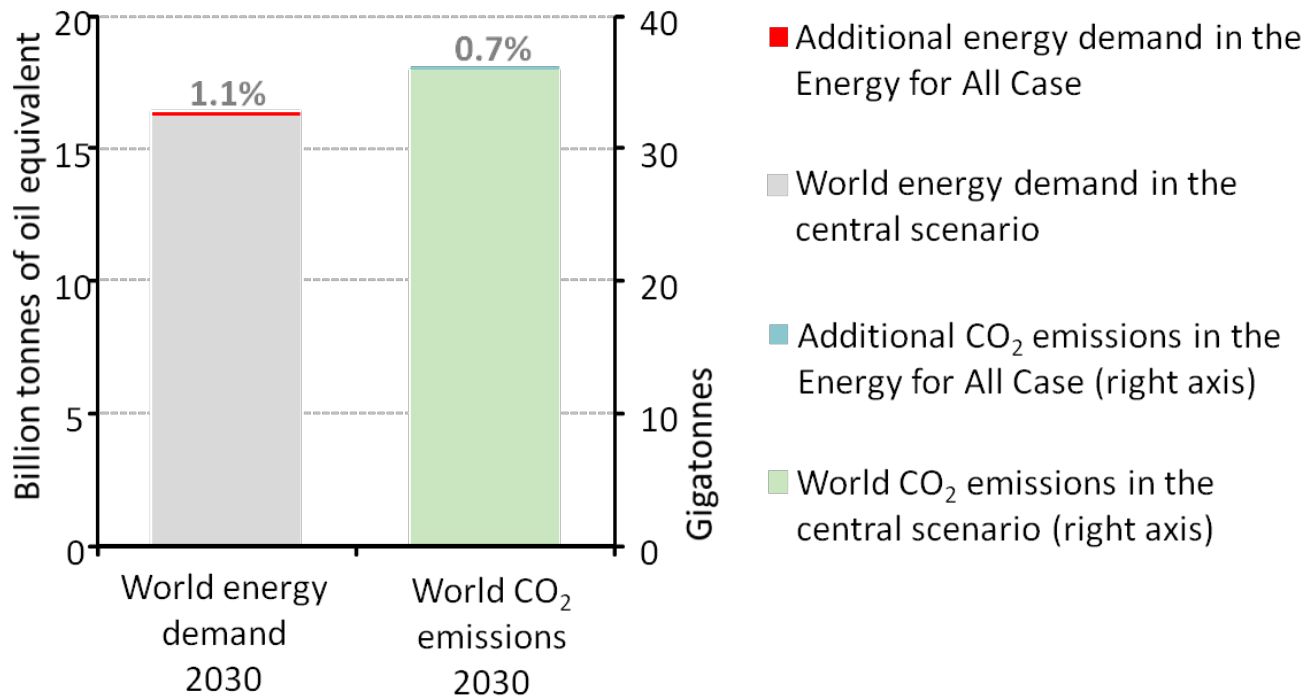
Source: UNDP/WHO

Almost half of developing countries (68 of 140) have targets for access to electricity

# Impacts

International Energy Agency (IEA):

*“Universal modern energy access does not have any significant impact on energy or climate security”*

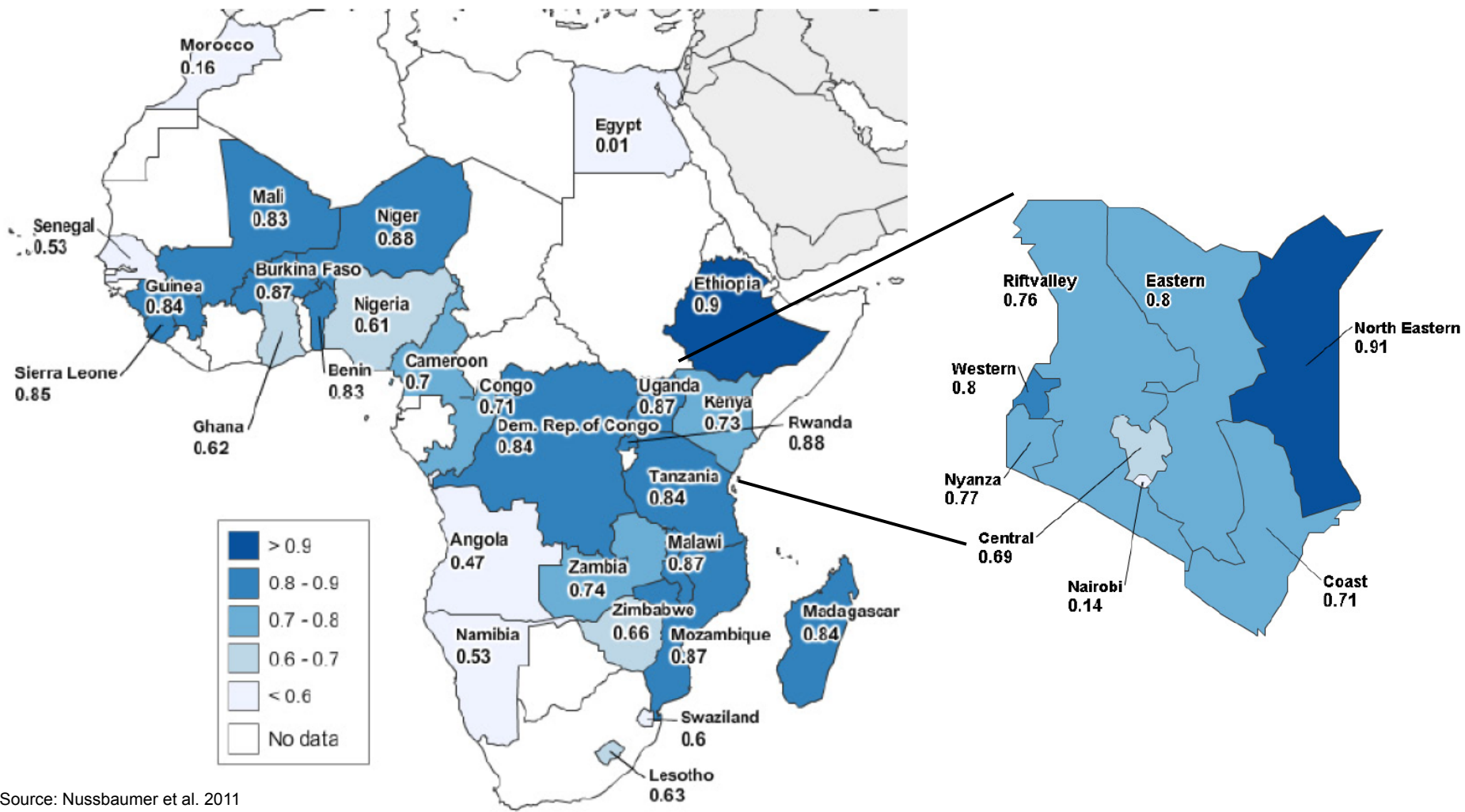


Depends...cookstoves or modern ovens and dishwashers...

# Multi-dimensional Energy Poverty Index

- Captures the set of **energy deprivations**
- Originally composed on **5 dimensions** (basic energy services) and 6 indicators
  - Cooking
  - Lighting
  - Services from household appliances (e.g., refrigerator)
  - Entertainment/education (e.g., tv)
  - Communication (e.g., mobile)
- Based on pre-defined, adjustable energy poverty thresholds
- Allows weighting of criteria
- Theoretically driven, data constrained

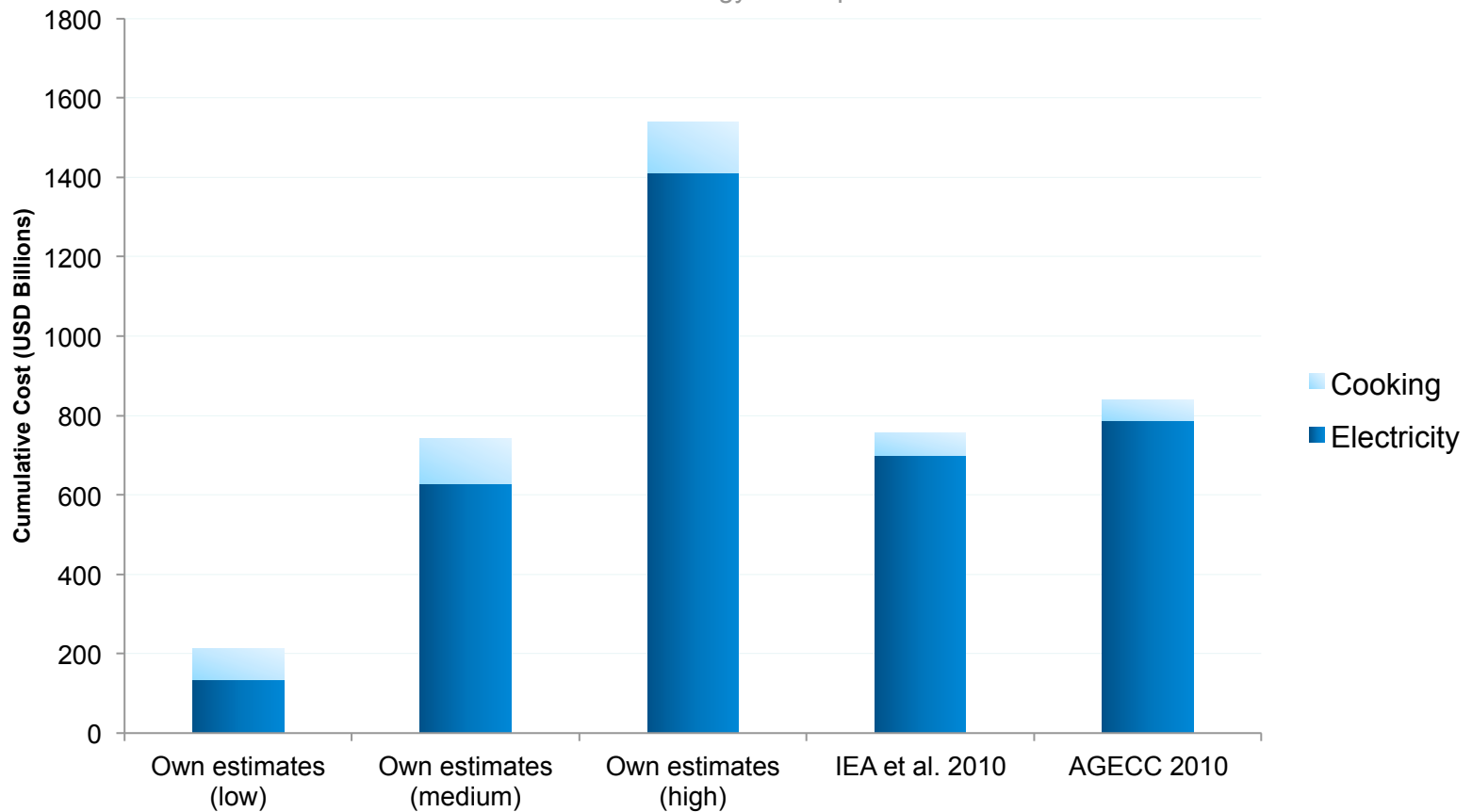
# MEPI Results



Source: Nussbaumer et al. 2011

# The Scale of Investment

- Most estimates focus on electricity access only
- Little attention to recurrent costs (fuel costs, O&M)
- Different demand levels as development occurs
  - Different technology assumptions





# Developing Projects is Costly

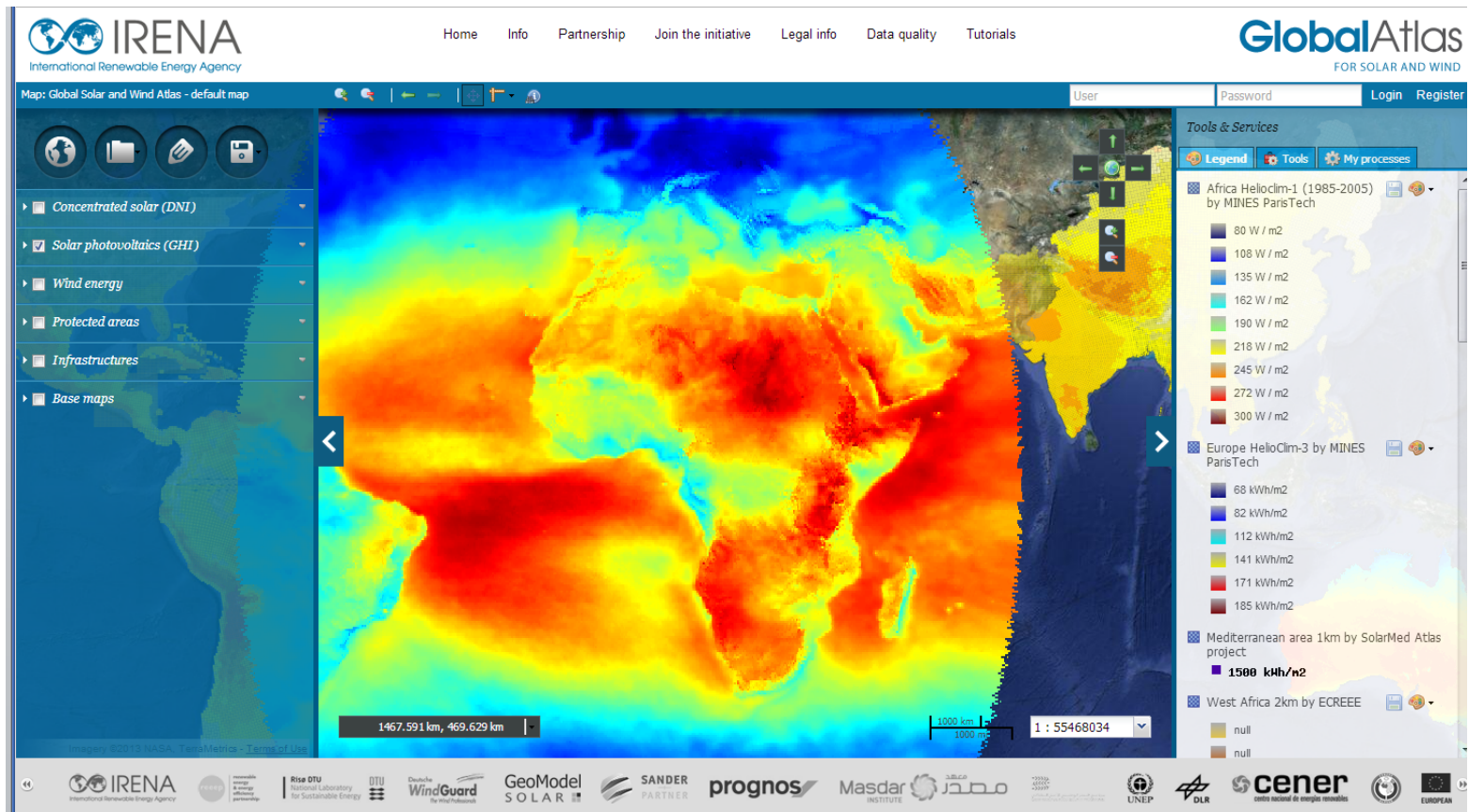
	Overall project costs (US\$ ml. )	Cost of project preparation (US\$ ml. )	%
<i>Implemented</i>			
Bujagali	780	<b>15</b>	2%
Nam Theun 2	1, 400	<b>124</b>	9%
<i>Under preparation</i>			
Inga 3	>5,000	<b>100</b>	2%
Cahora Bassa Nth	1,000	<b>60</b>	6%

Source: World Bank, 2011

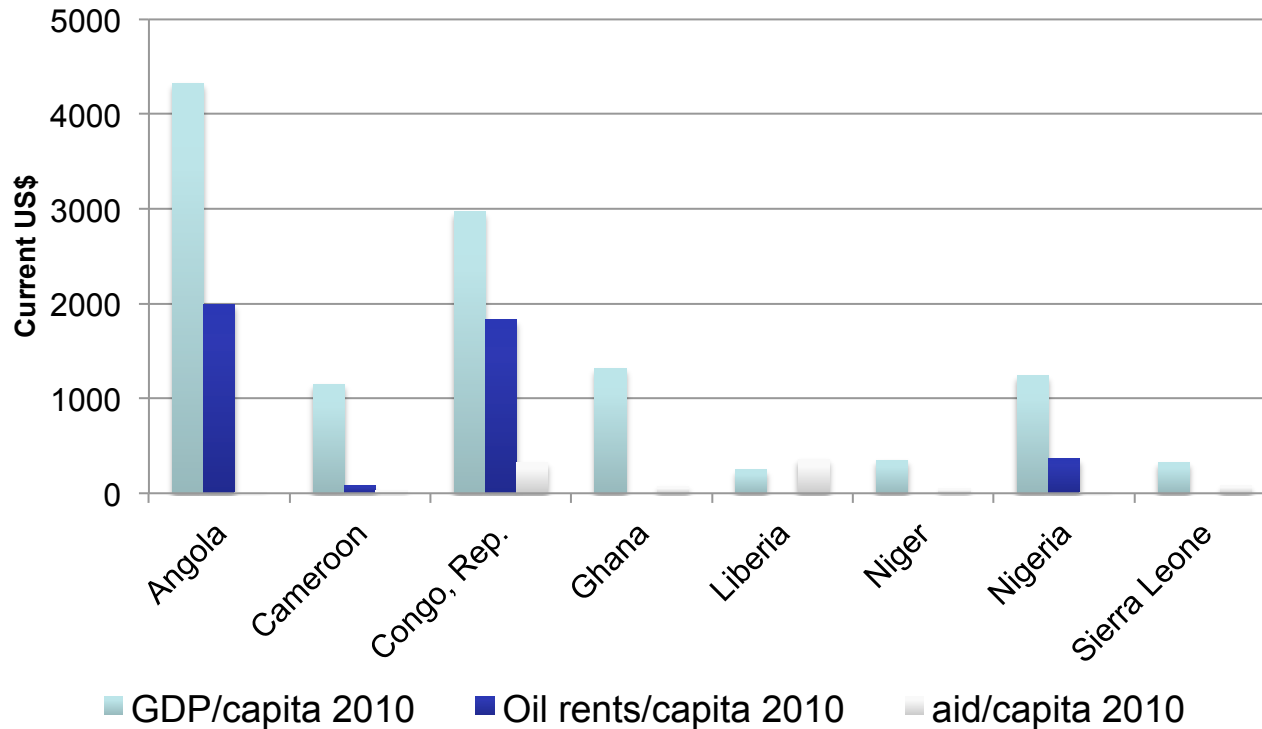
## Non-linear growth needed (more than a light)

Level of access	2010 [GW]	2030 [GW]	Implied average annual growth rate 2010-2030	Scenario Name
Population - electricity poor, million	573	638	0.5%	
Population - non electricity-poor, million	240	615	4.8%	
electricity poor: 0 MW/mln non electricity-poor: 129 MW/mln <sup>38</sup>	31	79	4.8%	<i>Business As Usual</i>
electricity poor: 200 MW/mln non electricity-poor: 400 MW/mln		374	13.3%	<i>Moderate Access</i>
full population: 400 MW/mln		501	14.9%	<i>Full Access</i>
full population: 800 MW/mln		1,002	19.0%	<i>Full Enhanced Access</i>

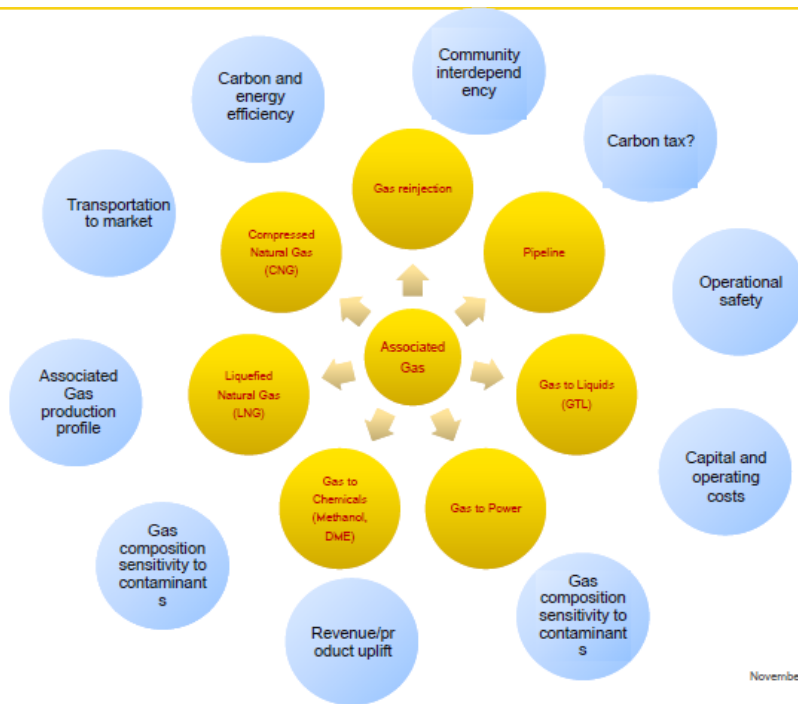
# African Renewable Energy Potentials



# Oil, Governance, Aid, and Access (an evolving story)



# Gas Flaring & Oil Governance



November 2011 3



# Smart and JUST Grids

- The way future power systems are planned, designed, constructed, financed and operated will have a significant impact on how effectively these aspirations are delivered.
- Some of the well known and emerging concepts, systems and technologies of Smart Grids may offer an important contribution to universal access to electricity in sub-Saharan Africa.
- We argue that these Smart Grid advances may enable sub-Saharan African countries to leapfrog elements of traditional power systems in terms of both technology and regulation.
- We introduce the notion of *Just* Grids to reflect the need for power systems to contribute towards equitable and inclusive global, economic and social development. *Just* Grids will help guarantee access to modern energy services without marginalizing the poor.





# 2012 INTERNATIONAL YEAR OF SUSTAINABLE ENERGY FOR ALL

## Objectives to be achieved by 2030:

- Ensuring universal access to modern energy services.
- Doubling the global rate of improvement in energy efficiency.
- Doubling the share of renewable energy in the global energy mix.

# International Leadership

- Empower and Implement National and Regional Action Plans
- Massively scale-up useful business, regulatory and policy models
- Establish risk finance instruments at scale
- Address power system design and distributed generation in parallel
- Train/educate people and build good institutions
- Take advantage of political momentum
- **Use the Clean Energy Solutions Center!**



*The Joint Institute for Strategic Energy Analysis conducts leading-edge interdisciplinary research and provides objective and credible data, tools, and analysis to guide global energy investment and policy decisions.*

