



**ENERGY FOR
GROWTH HUB**



**The
ROCKEFELLER
FOUNDATION**

Raising Global Energy Ambitions

The 1,000 kWh Modern Energy Minimum

January 2021¹

Summary: Because energy is fundamental to modern living and economic prosperity, we propose a Modern Energy Minimum of 1,000 kWh per person per year, inclusive of both 300 kWh of household and 700 kWh of non-household electricity consumption. This new metric provides a significantly more ambitious energy target that is better aligned with development aspirations for employment, higher incomes, and economic transformation for emerging economies. The Modern Energy Minimum can be used to track progress against energy poverty — and for the next iteration of SDG7.

Relevance

- The current global crisis has exposed stark inequalities and raised the urgency of providing modern energy for everyone. Energy is a necessary prerequisite to both recovery and to long-term development goals.
- Sustainable Development Goal 7 calls for “access to affordable, reliable, sustainable and modern energy for all.” Yet the principal indicator is the residential electrification rate or a minimum of 50 kilowatt-hours (kWh) per capita per year. This is a bare-bones level of consumption that cannot raise incomes or sustain economic growth.
- To reflect the full ambition of SDG7, we propose a complementary threshold that is both higher than the current definition and wider than household use. This new metric raises the bar on global targets for ending energy poverty and is better aligned with the way that energy drives living standards, livelihoods, and the expansion of industry, commerce, and agriculture.
- The Modern Energy Minimum allows tracking and goal-setting, and can inform policies and the resource allocation to reach SDG7, its successor, and a country’s own development goals.

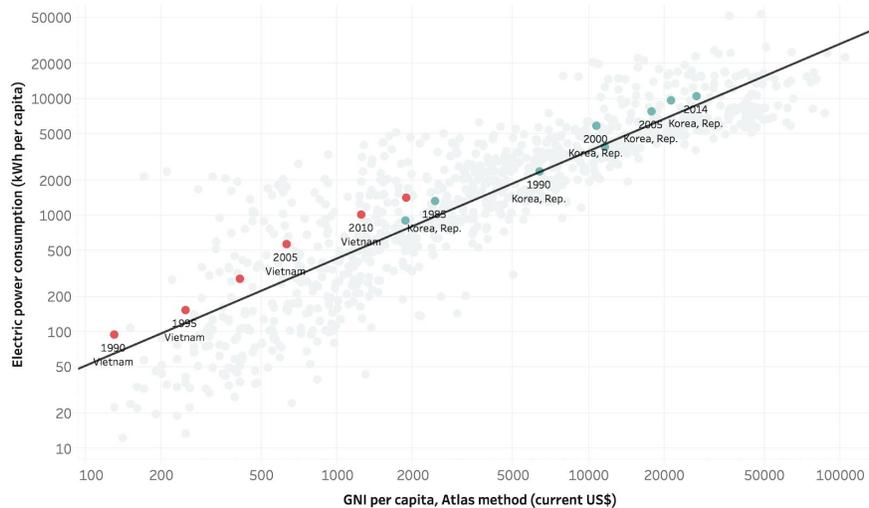
¹ This note is based on [The Modern Energy Minimum: The case for a new global electricity consumption threshold](#), by Todd Moss, Morgan Bazilian, Moussa Blimpo, Lauren Culver, Jacob Kincer, Meera Mahadavan, Vijay Modi, Bob Muhwezi, Rose Mutiso, Varun Sivaram, Jay Taneja, Mark Thurber, Johannes Urpelainen, and Michael Webber, Energy for Growth Hub, January 2021.

Drawing on Evidence & History

The Modern Energy Minimum derives from five empirical facts about electricity and development:

1. *No high income country is low energy.* Every high-income country consumes more than 3,000 kWh per capita annually and the median is 6,720 kWh.
2. *Income and electricity consumption are tightly correlated across all countries and over time.*

FIGURE 1: Income vs. Electricity Consumption, 1980-2014



Source: World Bank. Notes: Axes are logged; R^2 is 0.77; see Moss et al Annex 3 for methodology.

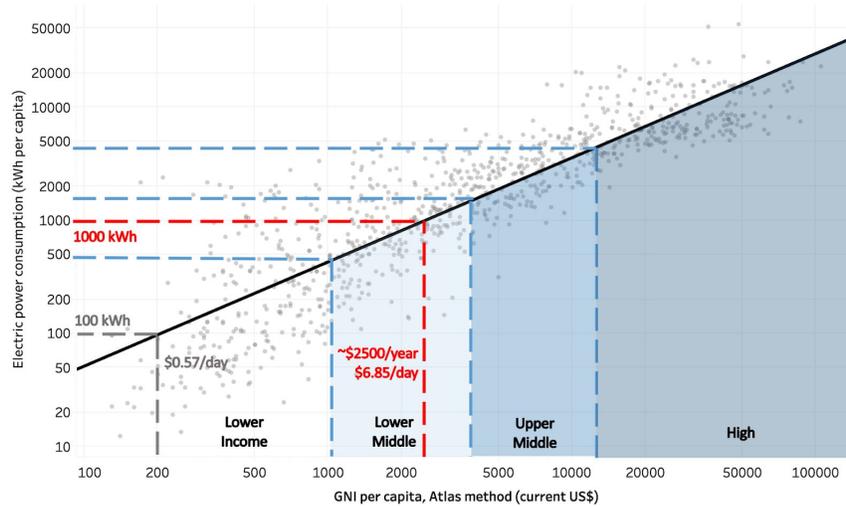
3. *The current definition of modern energy access is too low.* The International Energy Agency (IEA) minimum threshold of 50 kWh in rural areas (and 100 kWh in urban areas) is only enough to power a few lightbulbs for a few hours per day, to charge a mobile phone, and to occasionally run a small fan. This level is better considered an *extreme energy poverty line*, akin to \$1.90 per day for income.
4. *The majority of electricity is used outside the home.* Globally, about 70 percent of electricity consumption is used in industry, commerce, agriculture, transportation, or public services.
5. *Energy outside the home impacts household incomes and employment.* Sufficient energy consumption is a necessary input to economic activity everywhere, while its absence is a binding constraint on income and development in many places.

A New Threshold: the Modern Energy Minimum

A simple new indicator could be used by governments expecting energy infrastructure to drive economic growth, by international development agencies to identify the most impactful investment opportunities, and by the United Nations to track progress against the new goals that will eventually replace the SDGs. An ambitious standard tied more directly to livelihoods, prosperity, and economic transformation would also provide a lodestar for tracking electricity as a contributor to economic recovery. This Modern Energy Minimum is:

- **Higher at 1,000 kWh per capita per year.** We have opted for annual per capita consumption of 1,000 kWh, which correlates with the midpoint for lower-middle income status of approximately \$2,500 per capita/year or about \$6.85 per capita/day (Figure 2).

FIGURE 2: Electricity consumption and income levels



Source: World Bank. Notes: Axes are logged; R^2 is 0.77; see Moss et al Annex 3 for methodology.

- **Wider by covering both household and non-household consumption.** This is a dual threshold that requires consumption of at least 300 kWh at home plus at least 700 kWh in the wider economy. While household use boosts living standards, electricity in industry, commerce, transportation, agriculture, and public services contributes to economic activity and higher income — which in turn enables household consumption. In fact, evidence suggests that household consumption alone does not drive income growth.
- **Practical because headcount estimates are possible.** Tracking requires determining how many people are consuming above each of the two thresholds.
 - The 300 kWh household component can be estimated using current methods such as customer utility data, household surveys, and satellite imagery.
 - Non-residential consumption is trickier because energy is embedded in production, typically shared, and often traded across large geographic spaces. For these reasons, the non-residential electricity component is most sensibly tracked using existing data on national averages.
- **Relevant to countries at different stages.** In countries where non-residential consumption is less than 700 kWh, the headcount will be, by definition, zero. This is a high bar in the short-term for some countries but is consistent with the notion that escaping energy poverty requires living and working in an economy where energy is

not a binding constraint. For these markets, it highlights a need to balance direct household delivery with consumption growth in the industrial, commercial, and agricultural sectors. That may have investment implications and call for greater attention on cost and reliability. For countries with a headcount between zero and 100, the new metric suggests a greater policy focus on equity and inclusion.

Why two threshold conditions for one metric?

Using separate household and non-household consumption more fully captures what it means to live in energy poverty in different contexts.

- *A relatively poor person who consumes very little energy at home, but lives in a high-energy consuming economy, suffers from energy poverty. Egypt, Colombia, Thailand, Mexico, and South Africa will have a headcount ratio below 100%.*
- *A relatively wealthy person who consumes a lot of energy at home, but is living in a low-energy consuming economy, where energy is still a meaningful everyday limitation, also suffers from energy poverty. Nigeria, Angola, Bangladesh, Ghana, and Pakistan will initially have a headcount ratio of zero.*

Benefits and limitations of the new Modern Energy Minimum

This new approach creates a simple single metric, complements the current threshold, establishes an energy floor corresponding to ~\$6-8 per day, incentivizes a balance between electricity's contribution to living standards and productive uses, and allows tracking and goal-setting consistent with historical evidence and wider development objectives.

This new approach does not provide a metric that can immediately be measured precisely using existing data or track progress for non-electricity sources of energy, such as transportation fuels or industrial heat. It also does not create a near term target for countries at extremely low levels of energy consumption or for those already far above the proposed thresholds.

Conclusion: What Next for the Modern Energy Minimum?

An international body could adopt and operationalize this new indicator by collecting and reporting this data. That would enable the Modern Energy Minimum to become an additional standard for progress against energy poverty and our collective efforts to live up to the ambitions of truly providing modern energy for all.