The Access Merit Order

In order to get the development impact per dollar more explicitly incorporated in electrification strategies, SE4All should influence decision-makers to not only look at lowest cost per Wp and kWh generated, but also the lowest cost per level of access. The attention should go from the "Power Merit Order" towards the ***"Access Merit Order"***

The objective of universal access to sustainable energy is based on the experience that such access is one of the key drivers of poverty alleviation and human development through its enabling role for education, communication and productive use. In an SE4All policy perspective, electrification strategies should be developed with an objective of maximizing the expected development impact per dollar invested. However, most electrification plans do not have this perspective properly incorporated.

Most countries assess the Levelized Cost Of Electricity (LCOE) and prioritize different electrification efforts based primarily on the traditional "power generation merit order" (i.e. lowest cost per installed capacity (Wp) or kWh). However, with LED lighting, LED TVs and other highly energy efficient appliances, a household can now have four lamps, mobile charging, TV/tablet and radio for less than 1 kWh/week (and include fan for just a bit more).

With such an extremely low energy consumption required for these basic services, the power merit order typically fails to reflect the very high development impact of each kWh. With access to the basic services using only 1 kWh per week, the cost per kWh is of less importance. It is the service levels made available to the households (HHs) that are the actual drivers of development – basically irrespective of the number of Wp and kWhs that lie behind them. It is also reasonable to assume that the first few kWhs providing access to basic services like lighting have the highest development impact per kWh. Hence, there should be a framework reflecting **the value of each kWh**, not only one reflecting the cost.

The fact that lighting for a household now can be provided with 80-90% less kWhs through the use of LED lamps instead of incandescent light bulbs does not reduce the development impact from providing light, even if the number of kWhs now is very small.

Universal access to electricity by 2030 **is possible** within the funding expected to be available in the IEA New Policies Scenario (NPS) - it is just a question of which combination of electricity service levels and technological solutions. Spite this fact; we rarely see electrification plans that actually seem to lead towards universal access by 2030.

The IEA's NPS leaves almost 1 billion without any form of sustainable electricity access in 2030, while the Access For All Scenario requires investments five-fold what is expected to be available in terms of financing. However, the most important scenario is not sufficiently in focus: Given the available budget, how do we provide access (to all) in a way that maximizes the development impact?

In order to get the development impact per dollar more explicitly incorporated in electrification strategies, SE4All should influence decision-makers to not only look at lowest cost per Wp and kWh generated, but also the lowest cost per level of access. Below we describe an illustrative example of how the two assessments typically would lead to different prioritizations.

In the example, we compare the traditional "Power generation merit order" with a new "Access merit order" based on the Global Tracking Framework (GTF). The GTF defines six different tiers of access (i.e. electricity service levels) ranging from no access to 24/7 access to run any high power appliance. Each tier assigned is with a separate weight in the overall SE4All Index of access to electricity supply:

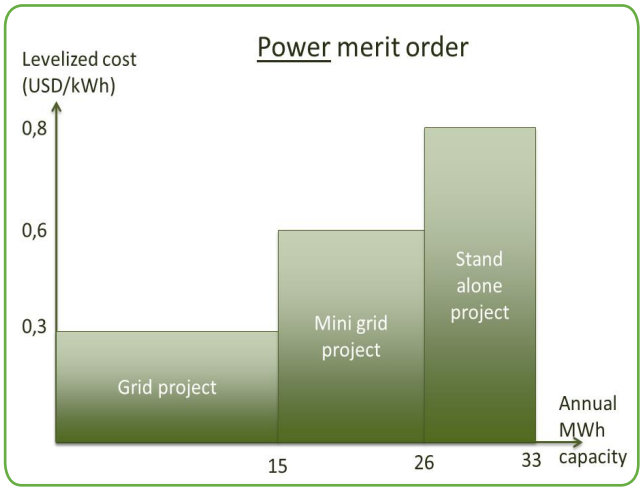
$$\text{Index of Access} = \Sigma\,(P_T \times T)$$

P_T = Proportion of households at tier T
T = tier number {0,1,2,3,4,5}

If we look at three example projects, each project with the same budget of USD 55 mill: one grid extension, one mini grid and one stand Alone (PV SHS) project. The projects deliver different amounts of power to different numbers of households, and have different costs for providing the access and the power to each HH. Based on IEA cost estimates and Differ's estimate of typical investment cost per HH (generation, distribution and transmission), the projects provide access to different numbers of HHs within the project budgets:

Project	Expected kWh/HH/yr	Service Usage Tier	(Overnight) Cost/HH	# of HH within budget
Grid	1500	Tier 4	5,500	10,000
Mini-grid	500	Tier 3	2,500	22,000
Stand-alone	50	Tier 2	400	137,500

A "power merit order" would typically show that the grid project has the lowest cost per kWh generated, see figure below:



However, if we replace the watthours with "units of access" we get a different picture, which we can call the "Access merit order". By multiplying the GTF index weights by the number of HHs that are given access to the different GTF tiers, each project represents a number of access units. The total budget divided by units of access gives the cost per unit of access. For un-electrified areas, you could experience that the "access merit order" reverses the relative attractiveness of the projects compared with the "power merit order", see the illustration below.

All the HHs that receive access to electricity will be able to use this electricity to reduce their spending on kerosene, dry batteries, candles and/or diesel generators. Hence, there is a modest, but significant ability to pay for the electricity received in order to secure a robust electricity service that later can be maintained and scaled.

Taking this perspective into account and allowing e.g. two years of USD 10 per month in customer payments to co-finance the projects, the projects will be able to provide access to an even higher number of HHs over time. Two years of co-finance from the HHs provided with stand-alone solutions would constitute almost USD 1,400,000.

For the grid project, however, this co-finance would only constitute USD 100,000. Hence, the commercial sustainability of the grid project is weak, with a pay-back time per connection of 550 months. The payback time for each stand-alone solution is 40 months.

Behind the SE4All objective of universal access lies an expectation that the share of the population that has access is the key driver of development and poverty alleviation (as the SE4All objective is "universal access"; not e.g. "doubling the global energy generation"). Hence, if the SE4All is correct in assuming that access is a key driver of development, and not only the amount of kWhs generated, the "Access merit order" should also be taken explicitly into account when devising electrification strategies.

You can test yourself as a decision-maker by assuming that you can only afford to finance two of the three projects described above: Which two projects would you prioritize?

This is a simplified example to illustrate the difference between the two approaches, and the final solution obviously needs to be adapted to local context and balance needs of households, community functions and productive uses.

Going forward, it is crucial to continue at full steam with the work aimed at attracting more financing for access. At the same time, however, we hope that the aspect of development impact per dollar should be assessed, alongside number kWh generated per dollar, when electrification strategies are devised and revised.