Cooking up an electric revolution

A briefing paper for comment

Author: Peter Newell* and Freddie Daley

University of Sussex

The multiple benefits of moving towards cooking with electricity are increasingly well known. For years there have been successful drives towards electrification on the one hand and clean cooking on the other, but e-cooking has not yet taken off at the scale or space hoped for. Why?

In search of an answer, in this policy briefing we explore the political economy of e-cooking: the actors, institutions and relations of power that are holding back as well as those seeking to bring about an electric revolution in cooking. Such an approach helps to fill gaps in our understanding of why, given its potential (see box 2), e-cooking is still at such an embryonic stage, and helps identify key intervention points for accelerating the transition to e-cooking.

Box 1: What is e-cooking?

E-cooking here refers to cooking with electricity using pressure cookers, stoves and hotplates. It can use energy from a battery or via direct connection to the grid. It seeks to displace the dominant and unsustainable reliance on biomass to meeting cooking needs.

1 Background

There is nothing new about electric cooking. In 1893 the Chicago World Fair showcased a futuristic all-electric kitchen with an electric oven as the centrepiece. But it took a further thirty to forty years before electricity grids became sufficiently widespread and robust for the technology to be widely adopted. *Thermo-Electrical Cooking Made Easy*, the world's first book on how to cook electrically, was published in March 1907. The first mass use devices used resistive heating coils to heat iron hotplates on which the pans were placed. By the 1970s these started to be replaced by glass-ceramic tops. The current need to move beyond using gas for cooking and heating as part of ambitious decarbonisation plans has brought renewed interest in electric cooking in the global North. But until recently in the Global South, cooking transitions have been fragmented, siloed and set apart from discussions around the broader transitions towards modern energy services.

Until recently the idea of electric cooking powered by on-grid or off-grid renewable electricity looked like a fanciful proposition for reasons to do with cost, poor grid connectivity and ingrained cultural and social attachments to cooking with biomass, especially in rural areas and among older generations. A series of technical and economic shifts have radically changed that landscape, however. There is now a lot going for

electric cooking. Battery-supported electric cooking can be cost competitive with current expenditures on cooking fuels and battery costs are coming down. Energy storage, ICT-enabled payment systems, new business and service models from utility companies, as well as cost and efficiency improvements in manufacturing technologies, such as solar photovoltaics (solar PV), should make e-cooking an ever more attractive proposition. These technologies can be adapted to different geographies, energy needs and levels of energy access, as Solar-battery-eCook technologies working in regions where no grid infrastructure exists such as rural off-grid households.

Efforts to raise awareness about these innovations, their affordability and co-benefits are being led by actors like SE4ALL through their clean cooking data platform and co-benefits toolkits working alongside the WHO. Yet while considerable progress is being made in electricity access through grid extension, mini-grids and Solar Home Systems, in many cases these are designed to only be able to deliver lower power end-uses (lighting, radio, mobile phone charging) and often overlook the role of cooking as a source of consistent demand for electricity, both now and in future energy forecasting and planning.

This is the puzzle regarding the electrification of cooking. While important advances have been made in the provision of clean cooking on the one hand, and there have been heightened efforts to increase rates of electrification throughout the world on the other, the two policy objectives are often not integrated, despite the overlapping health, environmental and economic benefits of doing so. Energy policy often overlooks electric cooking as part of broader electrification strategies and forecasts, while clean cooking advocates often omit electrification from their initiatives. So, what's holding back progress on the electrification of cooking?

Box 2: Why e-cooking?

- Electric cooking can contribute to an enabling environment for achieving the entire Agenda 2030 and directly deliver across 10 of the 17 SDGs
- There is significant potential to manufacture stoves locally by building a valuable production base
- Helps to reduce the 2.5 million premature deaths each year are attributable to the household air pollution caused by biomass, most of which are women and children
- Reducing the unsustainable harvesting of wood biomass which contributes to forest degradation, deforestation and climate change
- Time saving benefits from not having to collect biomass

2 The political economy of e-cooking

Political economy analysis might not seem an obvious place to start when so many structural, financial and technical barriers seem to afford all the necessary explanations of the under-development of e-cooking to date: from the cost of buying e-cooking equipment (when biomass is free, despite incurring human and environmental costs), and the corresponding lack of finance to make the purchase of a stove or cooker, to the unreliable and often insufficient supply of electricity through the grid (and its high cost in many contexts) and a lack of grid connectivity in many parts of sub-Saharan Africa.

But political economy analysis can help inform analysis of issues of emulation, diffusion and scaling: why uptake has been more positive in some contexts (such as Nepal) and not others (Uganda, Tanzania and Kenya) by looking at the political and social barriers to change and opportunities for realignment. E-cooking introduces competition between different providers of energy cooking services that seek to use their market and political power to protect their preferred energy pathway. Electricity competes with several other modern energy carriers that can be used for cooking, such as liquified petroleum gas (LPG), ethanol and biogas, upon which business models and infrastructures are based and livelihoods depend, both formally and informally, especially charcoal production and use in the case of the latter. Research on the political economy of energy transitions on incumbency and regime resistance[i] can shed light on the dynamics of resistance to e-cooking interventions and the mutual neglect between electrification and e-cooking agendas.

In transition terms, political economy analysis can shed light on 'landscape' factors (the role of donors and MDBs in supporting (or not) the electrification of cooking), the persistence of dominant 'regimes' for cooking by looking at incumbent power, as well as the scope for 'niche' penetration by actors seeking to engineer a wider transition to electric cooking. Here the use of electrification for modern energy cooking is seen as a niche intervention competing with dominant regimes around cooking with international organisations and donors operating as landscape actors that can create openings for disruptive and accelerated change by applying pressure to - and ultimately disrupting - the regime. Broader political economy accounts can also help us to understand the cultural practices and behaviours associated with dominant energy cultures and cooking practices as they are laden with uneven power relations and often heavily gendered. A political economy analysis can help to:

(1) **Understand how and why the mutual neglect of electric cooking has occurred** by analysing and explaining existing configurations of institutions, ideas, power and influence.

(2) **Explore alternative political pathways** to their uptake and support that might be possible in the future by exploring strategies for realising the potential of electrification for MECS.

2.1 The global governance of e-cooking

Firstly, such an approach draws attention to the global governance of e-cooking. There are a range of different global actors and agencies that have a role to play and exercise influence in governing MECS. They include MDBs (World Bank, ESMAP, SE4All, IEA, WHO, UNEP, UNDP, GEF), donors (FCDO, GIZ, USAID etc), bilaterals and partnerships (Energising Development Programme (EnDEV), SNV, BFZ, and the Africa-EU Renewable Energy Cooperation Programme (RECP), Africa-European Union Energy Partnership), private actors (financiers, philanthropic organisations, offset providers doing cook stoves such as Climate Care and the Shell Foundation), and NGOs such as Clean Cooking Alliance, Climate and Clean Air Coalition and Practical Action. Once it also becomes a problem of electrification the range of actors and interests broaden, and the level of politicisation intensifies in the space where the political economies of clean cooking and electrification encounter one another.

Key governance functions of these actors include:

(i) **Coordinating activities and interventions** of donors and agencies
(ii) **Making markets:** establishing markets for niche technologies and solutions and building the infrastructure that supports low carbon electrification
(iii) **Mobilising and steering investment:** having to connect to microfinance provision through M-Pesa and mobile money as well as blends of IDA loans and results-based financing

(iv) **Enabling technology transfer and accelerating adoption** of the electrification of cooking
(v) **Supporting and sharing 'best practice'**, which may or may not reinforce the mutual neglect of electric cooking.

In this regard, the lack of integration to date is a function of cooking and electrification being on 'divergent' tracks, with the latter progressing much faster than the former. There has been a dearth of financing for clean cooking, whereas there has been much more momentum around electrification. The stakeholders in each sector are also very different. With electrification, there are fewer key actors, but they are located in Ministries of Power or Energy, for example, which historically wield more political influence; whereas with cooking there are a multitude of actors, spread over a range of different institutions and offices and a lack of coordination between them over matters of technologies and diffusion. It is also the case that the e-cooking sector is at a more embryonic stage of development and so it is to be expected that, as a coherent set of actors and interest groups, it enjoys less institutional embeddedness and visibility in energy policy and planning discussions than other actors with a clear stake in gaining market access or preserving market share for existing energy technologies and their associated pathways.

The clean cooking sector, of which e-cooking is a part of, is characterised as 'fragmented and dispersed', in part because it cuts across many departments (health, environment, gender, energy etc). One of the roles of initiatives such as SE4ALL, therefore, is to 'build bridges' between them by, for example, building a common tool and platform for cooking and electrification. Other informants expressed a concern that, as one donor put it, e-cooking 'falls between the cracks'. It is often seen as a local environmental, health, gender or climate issue whereas in reality it is all of those things. There have been attempts to improve coordination between actors, but with limited results to date.

Garnering a deeper understanding of how these organisations engage with e-cooking as a niche intervention, and how these organisations interact with one another, is crucial for informing interventions which seek to address the mutual neglect between electrification and clean cooking. Since each of these actors - EnDev, ESMAP, CCA, SE4ALL - compete with one another for resources from the same pool, this leads to fragmentation and ultimately creates parallel pathways, strategies and initiatives that actors pursue to further e-cooking, creating distinct silos and workstreams with limited crossover or alignment.

2.2 National governance of e-cooking

Governments also have a key role to play in supporting e-cooking transitions. Firstly, we need to look within the state for clues about the origins of the mutual neglect between cooking and electrification. Political scientists often analyse bureaucratic turf-wars: how positions on policies and pathways often reflect which part of government you represent, the different mandates they have and the constituencies they purport to serve. As Batchelor notes, 'one of the reasons that there has been so little investment in the enduring problem of cooking with biomass, is that it is a women's issue. The national planning of energy access falls under the Ministry of Energy or the equivalent, while the issues of gender equality and the well being of women (may) fall under a Ministry responsible for "Gender and Women's Affairs" such that 'the technical infrastructure of energy access is often discussed and planned without due consideration of gender issues.'[ii] E-cooking requires 'national level champions' for clean cooking that have been missing to date, where responsibility has instead been spread across government ministries and civil society organisations.

Secondly, incumbent interests in the cooking sector resist systemic change. Dominant actors in the current cooking and broader energy regime seek to protect their power (and market share) by shaping policy and seeking to restrict opportunities for new market entrants by both adding to and creating novel barriers to

entry. Proposals to redirect existing expenditures on biomass fuels into payments for cooking services threaten incumbents that benefit from those support mechanisms. One latent incumbent actor in this regard is the charcoal industry. The charcoal industry employs large numbers of people in many African countries: with estimates ranging from 900,000 people in Kenya, contributing $1.6bn to the Kenyan economy, while in Mozambique, the number of people involved in the production, trade and sale of charcoal could be as high as 3 million: around 15% of the total population.[iii] Unsurprising perhaps, some government officials are reported to fear the social fallout of livelihood loss in the charcoal sector. These concerns are compounded by observations that e-cooking products, and complementary technologies such as SHS, are manufactured overseas and then imported, limiting the e-cooking sector's ability to significantly engage with the charcoal industry's value chain to replace the jobs that could be displaced.

Thirdly, there is a less visible political economy at play. Alongside ministries and institutions with formal mandates and responsibilities making official policy, there is often an informal political economy of cooking service provision: delivery and installation of stoves, repair and upkeep and the 'murky' political economy of deal brokering and rent extraction at work which is often neglected but which shapes outcomes and questions of access in important ways.

2.3 The everyday political economy of cooking

Political economy analysis is useful for understanding other key dimensions of a clean cooking transition including financing and production, technological innovation and uptake, and questions of social acceptance and behaviour change. Cultural political economy analysis with its attention to norms, behaviours, production of desire, aspiration, when combined with sociological work on practice theory,[iv] provides a useful entry point for understanding why moves towards e-cooking may achieve limited success.

Energy needs and practices are not linear, especially around cooking. So even for those that have access to electricity of some form, many continue to cook with traditional fuels such as wood and other solid biomass for reasons of tradition, ritual, ease of access, price or taste. One informant for this research put it as follows: 'The interaction between the technology and the end-user is key. Otherwise it will remain a donor-led solution unless you fix that'. A behavioural approach to cooking transitions must therefore consider the choice architecture, complementing infrastructures and the provision of services that enable behaviours and practices - all of which are susceptible to power dynamics.

3 Intervention points for accelerating e-cooking

1. **Building a better narrative** about the costs, benefits and possibilities of different pathways. These need not just focus narrowly on cost, but also emphasise human benefits and engage with the actual practices and social and cultural contexts of cooking.

One of the key issues confronting advocates of electric cooking is the perception that other near term solutions and transition fuels are preferable politically and more socially acceptable than electric cooking, which depends on longer time frames for grid extension and connection, even if off-grid options are viable. The MECS programme has a central role to play in reclaiming the narrative around electrification and e-cooking and, in the process, could be instrumental in addressing their mutual neglect. Focusing on the role that e-cooking can play in future energy scenarios, either as a predictable demand load that fosters grid stability, or as a 'trojan horse' for scaling up the modern manufacturing base necessary for broader socio-technical transitions, will challenge enduring narratives that cooking is a fringe issue, or a 'women's issue',

and instead highlight the co-benefits that will be accrued from a more integrated agenda around electrification and e-cooking.

2. **Delivering proof of concept** – Showcasing viable business models for e-cooking is vital to their success. There is potential for utility companies and private businesses to provide a suite of clean technologies, or a 'clean stack', to meet different needs at a range of price points.

There's also scope to bundle products together to target a variety of end users and decision makers in what's known as a 'clean stack', which could be as part of a 'portfolio' approach leveraged by utilities with excess generating capacity to stimulate demand. Getting all elements of the business ecosystem right (financing, supply chains, enabling policy environment etc) is crucial and financial institutions need to provide finance solutions and mechanisms to offset the potentially prohibitively high up-front costs of this 'clean stack' and support the development of the value chain.

Building innovation networks is also key to supporting transitions around e-cooking and building momentum behind different business and service models.[v] Clearly in some instances it is a case of connecting to actors already in the e-cooking space: the improved cookstove (ICS) sector and its associated networks, capabilities and infrastructure at the local level. But this connective function could also be fulfilled by transition intermediaries, serving as go-betweens within the wider clean cooking sector with a specific focus on catalysing innovation within the e-cooking space and fostering a more comprehensive understanding of end-users' needs.

3. **Supporting the beneficiaries:** There is a need to build coalitions of the 'winning and the willing' behind an e-cooking transition to challenge and overcome issues of incumbency within the cooking space.

This might include getting trade unions behind proposals to build jobs and industrial capacity behind solar cooking, resourcing and amplifying the voice of the beneficiaries of solar cooking, such as manufacturers and retailers of e-cooking appliances, and crafting targeted consumer messages to engage the diverse demographics required to stimulate e-cooking transitions.

At the moment, many e-cooking interventions and initiatives are 'solo-runs' from private businesses and manufacturers active in this space, rather than cohesive sector-wide pushes. Clean cooking associations are not very engaged in e-cooking so far. Yet support for e-cooking creates beneficiaries and winners by enabling access to modern energy for households while simultaneously increasing revenues for utilities, mini-grid developers and solar home system companies alike, as well as creating employment opportunities along the value and supply chains.

Building alliances and coalitions based on an appreciation of these shared interests will be crucial to advancing e-cooking. Cultivating and encouraging the creation of transition intermediaries within the e-cooking sector could also help garner new collaborations, facilitate technology transfer (especially to the poorest households) and overcome the fragmented and siloed nature of the e-cooking sector. Providing finance and support for business associations to amplify their voice, activity and presence in energy policy debates will be crucial to slowly building a different energy future and a more accommodating policy landscape. This is crucial at what is still an early stage of development of e-cooking in many contexts when plans, policies and business models are still being designed and assembled. At the same time, it also means building support among user groups across civil society.

4. **Advancing a more holistic account of behaviour change:** This means going beyond individual and household 'choices' to re-shaping 'infrastructures of choice' and engaging with matters of agency.

Decisions about cooking are not isolated and based on atomised individual choices. They take place within social and cultural contexts and an economy characterised by sharp inequalities of energy access, income and ability to diversify cooking practices.[vi] This raises questions about how far household behaviours can be changed 'from above' by policy or donor interventions alone, especially with regard to food as it is very personal, strongly influenced by family, community and culture, as well as being heavily gendered. There are cultural patterns of cooking and eating, including religious connotations about how food is prepared such that transitions 'from above' are harder to accelerate. Nudge approaches are unlikely to be successful in this area over long periods of time, unless they engage with a fuller appreciation of the actual circumstance in which people make deeply habitual and social choices about cooking.

5. **Using levers of state policy**: We know that ambitious policy goals that set the direction of travel can serve to catalyse innovation and finance.

The Nepal Electricity Authority (NEA) has developed a dedicated electricity tariff designed to incentivise electric cooking with a 20% discount for consumption above 150 kWh/month. Tanzania has also made a national commitment to support clean cookstoves and fuels. The work that SE4ALL and others are doing on 'integrated energy plans' and 'Integrated electrification pathways' which includes stronger commitments to clean cooking, including e-cooking, can play an important role in building policy capacity which integrates the two agendas.

Policies which support access to affordable electricity are also key for enabling e-cooking transitions to meet poorer peoples' needs. For example, the existence of the Free Basic Electricity programme in South Africa is seen as vital to the successful uptake of electric cooking in South Africa. Industrial policy needs to support a base of local manufacturing and training for building, installing and repairing e-cooking systems. This can ride on the back of an expanding solar production base in some African economies, such as Kenya and Uganda, where within 10 years the sector has expanded from a handful of solar companies to over 30 enterprises in the sector. This means building demand for e-cooking while addressing the supply side of the equation: the value chains, supply chains and industrial capacity that requires a supportive policy environment, including the use of subsidies, tax breaks, looser Intellectual Property rights and grants.

Transitions, including around cooking, need to be *just transitions* attentive to issues of labour and challenges of social displacement that might arise from a shift in service provision. In areas of unemployment, low levels of investment and widespread poverty, building a local industrial base for e-cooking provides a key intervention point for accelerating the transition to e-cooking. This can be supported with national and local state level industrial policy (through the use of tax, VAT regimes, subsidies and innovation grants) and the proactive design of regional development plans which seek to support an industrial cluster in an area. Likewise, in many contexts, regulation of standards and quality assurance for e-cooking appliances is lacking and to be effective might need to be adapted to regional and local contexts given uneven grid stability. There is also a key role for changes to tax regimes, tackling incumbent control of policy and redressing imbalances between ministries regarding who sets policy for whom in this space.

6. **Improving coordination among international actors.** Attempts in this space have borne few fruits so far. But as more actors engage with e-cooking, there is a need to coordinate efforts, pool funds, minimise duplication and establish divisions of labour that play to respective strengths.

Donors have a key role to play here in supporting infrastructures, as well as providing and levering further finance and supporting policy innovations around renewable energy and e-cooking, and most importantly connecting and integrating these two policy objectives. Examples include the World Bank's 'Energy for Rural Transformation' programme and SE4ALL's work on 'Integrated electrification pathways' for universal access to electricity and 'Integrated Energy Plans'.

Finally

The e-cooking transition may never be total as households often combine fuel and energy sources to meet different and evolving needs as part of energy or fuel stacking strategies: the parallel use of multiple fuels for various purposes such as cooking, lighting and heating, according to factors such as availability, cost and even perceived differences in taste. But significant progress is possible by mobilising the intervention points outlined here.

It is also worth recalling that rapid transitions in cooking are possible despite entrenched inertia in the sector. We know this because they have happened before.[vii] In Brazil, for example, LPG penetration went from 18 percent of households in 1960 to 98 percent in 2004, while in the period 1960–85, penetration of fuelwood and kerosene fell from 61 and 20 percent, respectively, to 28 and 7 percent. This gives grounds for hope about the prospects of e-cooking transitions.

Drawing on different strands of political economy analysis, we highlight where we are now in the e-cooking transition and why and what could change in terms of the prospects for developing an alternative strategy for MECS driven by electrification. We need realignments in governance (around financing, coordination, policy support, stakeholder engagement) to close the gap at every level of governance. Bridging policy responses and better aligning the (global and regional) governance of electrification on the one hand and clean cooking on the other represents a critical first step.

Ultimately, however, it is less a question of governance and more one of power. In this regard, power shifts associated with more decentralized systems of energy provision, including the democratisation of energy systems to both improve energy access and autonomy through self-generation by 'prosumers'. It is not just a question of localising measures for the electrification of cooking or moving power and authority from one level to another, but rather challenging power at various sites simultaneously and building support for an alternative through multiple arenas of power.

4 Key organisations working on e-cooking

MECS

ESMAP

BURN

CCA

SE4ALL

5 Further reading

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