Abstract

The inefficiency of Kenya’s fuel market, and its consequences are obvious. What are not obvious are the bases of the diagnoses of the problems, or the market niches and the feasible profitable approaches that these may create. Any examination based on Kenya’s desire for energy self-sufficiency and supply autarky will lead to blind alleys, given the absence of indigenous resources, limited viable substitutes, and market disconnectedness. Kenyan energy aspirations need reframing from illusions of supply autarky to working on feasible solutions. Such feasible approaches and the opportunities that they create lie in these areas: infrastructure that will enhance market connectivity and improve efficiency in logistics; the creation of institutions that will facilitate the operations of functional competitive markets; and open borders to facilitate trade within East Africa, with Kenya playing the role of an energy trading hub.

Keywords: Energy; Fuel; Kenya; Logistics

* This is an updated version of the working paper WP-1171-E published previously under the names of Ahmad Rahnema, George Njenga and Geoffrey Ronoh. The new list of authors reflects the actual contribution of each of the authors to the paper.
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1. Introduction

Kenya’s fuel industry\(^3\) suffers from decrepit infrastructure, which impairs the economy’s energy security and competitiveness. The country is bereft of significant indigenous oil and gas resources and it has limited storage facilities. It also has limited sugar production to support large-scale conversion to bioethanol. These factors mean that Kenya’s aspiration to achieve fuel self-sufficiency requires reframing and a serious rethink. The poorly maintained pipelines for refined oil products operate at best at 75% of their stated capacity and connect only the major centers of demand, leaving Kenya’s peripheral areas with limited access to fuel. Inefficient refining results in lower yields and increasing costs, conspiring to perpetuate the lack of competitiveness that led Kenya’s sole refinery to close in 2013.

Inefficiency breeds its own market niches, from which agile entrepreneurs may benefit. The inefficient use of pipelines has given rise to trucks being used to transport refined oil products. However, trucks are more susceptible to theft and informal taxation (for road access), thus adding to costs. In theory, as price differences increase with distance (from Nairobi), financial arbitrage becomes more attractive but the costs of securing the goods often make exploiting financial arbitrage unviable. To make supplies available, fuel merchants often resort to adding extra costs above what the officially set prices prescribed. This practice is resorted to recoup any costs associated with bureaucratic leakages and inefficient logistics.

Gasoline is seen as fuel for the rich so it is taxed more heavily. Kerosene is regarded as the poor person’s fuel and lower taxes are levied on it to make it more affordable. Previously, ethanol was taxed heavily, apparently in line with the so-called sin tax on food-grade alcohol (such as that used in wines and spirits). Recognizing its social use, such as fuel for cooking in poor households, ethanol’s tax was eliminated.

The tax differences encourage illicit practices such as gasoline being adulterated with low-taxed kerosene and then sold at the higher gasoline prices. Ethanol may be similarly adulterated, albeit on a smaller scale given the limited supply. On a more positive note, with monitoring and the application of quality standards, legitimate ethanol and gasoline blends could flourish.

In addition, Kenya’s geographic location offers the prospect of its deep-water ports being transformed to make it into an East African energy hub, similar to Singapore in Southeast Asia.

These realities could influence how Kenya could address their energy dilemmas:

1. All refined petroleum products are imported, in the near absence of indigenous Kenyan oil and gas supplies and refining capacity.
2. Poor infrastructure and logistics create cost differences for fuels among counties, allowing niche markets for petroleum substitutes such as ethanol to emerge.
3. Degraded pipelines are placed under greater strain as demand grows, which could pave the way for professionally operated logistics firms to flourish.
4. Market-friendly policy actions, including improved security, may lead to bureaucratic leakages being minimized, potentially encouraging private capital inflows.

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Kenya’s Imperfect Fuel Market: Tackling Real Problems with Real Solutions

Kenya Vision 2030, a development program launched in 2008, aspires to turn Kenya into a middle-income industrialized market by 2030. These aspirations remain the cornerstone of the Third Medium-Term Plan 2018-2022. While market principles guide the program’s paths to prosperity, it is far from obvious how private entrepreneurial contributions could be harnessed. The tensions in the plans alternate back and forth between statist interventions and limited market opening. For a clearer strategic approach that is connected with policy actions, there would need to be a shared understanding of the role of Kenya’s government and its governance.

In the 2013-2017 and 2018-2022 plans, supply autarky was equated with affordable and secure access to energy, while equality was seen erroneously as equal distribution of output. Throughout this working paper, the authors subscribe to Amartya Sen’s conception of what is just and equitable. In an imperfect market economy, “what moves us, reasonably enough, is not the realization that the world falls short of being completely just – which few of us expect – but that there are clearly remediable injustices around us which we want to eliminate.”

Under Sen’s formulation, as applied to energy systems, justness manifests itself in equal access rather than a futile desire to distribute the output equally. Through competition over capabilities, functional markets arbitrate between the consumers’ needs and the economic incentives of suppliers, Kenyan or foreign, so that market frictions are minimized.

In line with this premise, Kenya could regard its limited oil and gas resources as an advantage. It has been spared from a resource curse that plagues some resource-rich countries, spawning income inequality and social injustice that can spark social unrest such as Nigeria experienced. As a fuel-importing country, Kenya can harness trade to gain access to affordable and secure sources of fuel from a pool of global supplies. Paradoxically, open trade is more likely to achieve an affordable and secure supply when home-grown energy resources and productive capacity are limited.

In this paper, we examine the following approaches:

1. Trade broadens Kenya’s choices by widening its access to competitive fuels, including ethanol, as viable complements for petroleum products.

2. Market-friendly policies seek to strengthen competition by liberalizing fuel pricing and making regulations supportive of the operations of a functional market.

This departs from Kenya’s statist policy stance, which relies on a seemingly omniscient government as a purveyor of resources and as an arbiter for the allocation of public good that often fails. Kenya’s advantage as East Africa’s largest market can be used to turn it into a trading hub that combines sizable local demand with access to reexport markets. With good infrastructure, the market would be enabled to do its work in allocating resources, and firms would be offered the prospect of reaping the fruits (or penalties) of risk taking.

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2. Failed Approaches, Consequences, and Possible Remedies

When lumping Kenya with its neighbors Tanzania and Uganda, policy sees homogeneity in a heterogenous market as indicated in official development plans. Both Tanzania and Uganda are rich in oil and gas and well-endowed with minerals and have a sizable sugar industry. In contrast, Kenya has more in common with East Asian countries, where endogenous oil and gas resources hardly exist, and it has a small and struggling sugar industry. While Tanzania and Uganda, in theory, could be self-sufficient in energy resources, the supply autarky to which Kenya aspires may prove challenging. In addition, fiscal and operational mismanagement manifests itself in continual underinvestment, which worsens the energy industry’s productive capacity. The state-owned monopoly Kenya Petroleum Refineries Ltd. (KPRL) is a case in point. Shielded from competition, KPRL was the country’s sole importer and refiner of crude oil. It sold its refined petroleum products at prices higher than those of imported products that had been refined elsewhere. Kept alive through subsidies, KPRL joined its heavily coddled state-enterprise peers by going into oblivion in 2013 when its refinery was finally mothballed.

The refining monopolist’s financial failure happened in the context of two distinct sets of market contexts.

First, transport and household consumption continued to grow, with 3,176 metric tons of petroleum products valued at 333 billion shillings (US$3.8 billion) being imported in 2014. Transport accounted for 71% of total petroleum demand and the industrial and commercial segments for 14%. The volume of petroleum consumed started to take off in 2003 as incomes rose, with demand growing at a compound rate of 9% between then and 2014.

The Updated Least Cost Power Development Plan – 2013 to 2033⁹ for power generation reduced fossil fuel’s share of the supply. Consistent with European aspirations for achieving low carbon economies, Kenya’s development planners aim to increase the share of hydro, geothermal and renewables, at the expense of fossil fuels. Over the planning period, this would imply a 75% reduction in fuel usage. This is undertaken in the context of Kenya’s rapid electrification, which expanded from 25% to 46%¹⁰ from 2007 to 2017.

The shift in demand implies a lightening of the crude slate or the mix of petroleum products. The transport, industrial and commercial sectors use light diesel, kerosene and gasoline, while power generation consumes heavier fuels such as bunker fuel and diesel.

The changing crude slate implies that major upgrades are needed to adapt the production process. A shortage of cash, inefficiency and underinvestment conspire to create a mismatch between supply (or what is produced), catering disproportionately to power generation, and demand, which is increasingly shifting to lighter fuels. The consequences are evident: lighter petroleum products are in short supply, while there is an excess of heavier diesel. This mismatch results in a classic squeeze on returns for fuel suppliers, despite a growing energy market.

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The structure of demand and its dispersion suggest that supply autarky may not lead to greater energy security. While infrastructure upgrades will remain essential, at least to connect supplies with the market, Kenya may achieve supply security through open markets, trade, and making competitive energy markets work.

**Figure 1**

*East African Community: Income, Literacy, and Population, 2017*


Kenya’s economic prospects and its strategic role are made apparent in the context of the East African Community (EAC). Kenya has the highest literacy rate and income of the EAC member states. Its large domestic market, when integrated with those of Tanzania and Uganda, means that Kenya is an attractive base as tariffs and trade barriers are dismantled. By 2017 Kenya have reduced its tariffs from a high 35% to the EAC rates of 10% for intermediate products, 25% for finished goods, and zero for raw materials. The fears that protected firms might flounder did not materialize. While EAC integration has proceeded more slowly than expected, investors can still benefit from the complementarities of the Kenyan, Tanzanian and Ugandan economies. This view is summed up in the idea that “Kenya wants to export its excess capital, Uganda wants to export its excess labor, and Tanzania wants to realize its pan-African aspirations”.

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11 The community comprises Burundi, Kenya, Rwanda, South Sudan, Tanzania, and Uganda. Collectively, the community aspires to form a free-trade area that would eventually evolve into a customs union with a common currency.

2.1. Market Structure, Regulated Pricing, and Security Costs

With 97 oil marketing companies licensed to import and 659 companies licensed to market petroleum products as of December 2018\(^\text{13}\), Kenya could have been mistaken for a highly competitive retail market. The reality is that 68.5% of the volume was controlled by Vivo (28% share), Total (23%), Kenolkobil (10%) and NOCK\(^\text{14}\) (7.5%). The second-tier firms had a share of less than 5% each (Libya Oil, Gulf and Hashi), followed by the rest with less than 2% each.

The oligopolistic structure allows for some competition. With no dominant local suppliers, Kenya’s energy market is more open than its peers in East Africa. This difference is of great importance. Independent, multinational oil companies and state-owned importers compete, with the independents (largely Kenyan-owned) holding their ground against well-funded competitors, particularly the state-owned NOCK.

Petroleum pricing has been regulated by the Energy Regulatory Commission (ERC)\(^\text{15}\) since December 2010. The regulator sets the maximum monthly wholesale and retail prices of petroleum products for each location, such as wholesale depots or retail sites, on the 15th of each month. To arrive at a price, the cost components and an allowable margin are added:

- The costs of imported refined-petroleum products set under the open tender system
- Excise duty and levies (petroleum regulation, petroleum development and road-maintenance levies) estimated at 30 shillings per liter
- Inland transportation costs through the pipeline and on the road
- The costs of allowable losses in the pipeline and depot
- The permitted gross margin

The regulations apply to wholesale and retail businesses for the following products: super petrol, regular petrol, kerosene and automotive diesel. The makeup of maximum pump prices for the period from January 15 to February 14, 2019, for diesel and super petrol in Kenya’s five major cities is shown in Figure 2 by way of illustration.

\(^{13}\) Energy Regulatory Commission Published schedules of Licensed Petroleum Dealers, accessed on 12 March 2019, https://www.erc.go.ke/services/petroleum/petroleum-licence-register/

\(^{14}\) The National Oil Corporation of Kenya, a state-owned company.

Figure 2
Maximum Pump Prices for January 15 to February 14, 2019


Distributors’ margins are secured by the regulated gross margin, given that commodity and transport costs in theory are recovered in full. This approach encourages the index linking of costs, while consumers are largely exposed to commodity price volatilities. Under this formula, the hedging of commodity price risks is of limited economic value to distributors because consumers underwrite most of the price deviations (or risks).

We now examine how this works in practice, using the period January 15, 2019 to February 14, 2019 in Figure 3, as an example. We can observe the following:

- ERC published regulated prices for 72 cities or towns, less than a quarter of more than 300 urban centers. “Market” prices prevail outside these 72 areas.
- Urban-rural price differences widen with the distance from Nairobi, with isolated and generally poorer areas bearing higher fuel costs, such as northern regions (Lokichogio, Wajir, Liboi and Marsabit).
2.2. Land-Based Logistics, Inefficiency, and Niche

A pipeline network, when operated efficiently, reduces costs and theft. In Kenya’s case, two states of affairs prevent it from enjoying these benefits: funding constraints limit the extent to which the pipeline can be extended into rural areas not readily covered, and underinvestment has led to the existing network’s capacity and efficiency getting worse.
In 2017 the Mombasa – Nairobi pipeline capacity for petroleum products had a rated throughput of 880 m$^3$ per hour, with less than 610 m$^3$ per hour actually being usable. As of June 30, 2017, out of 5,170,000 m$^3$ being consumed in the domestic market, only 3,463,003 m$^3$ could be transported by pipeline. This inefficiency meant there was a logistics market for trucks for 33% of the cargoes.

Land-based logistics faced two constraints as a result of past managerial decisions and policy actions—namely:

1. **False economy**: To save on initial cash outlays, fleet owners would purchase preowned trucks that required frequent maintenance, so the average fleet age was at least 10 years.

2. **Poor roads**: Underinvestment, poor maintenance, and bureaucratic leakages of funds led to unpaved roads, poor connectivity, and inadequate quality.

Kenya’s transportation companies have struggled with the poor quality of their trucks, which has resulted in frequent breakdowns, increased delays, and unplanned repair costs. Finances are stretched and sometimes this prevent investment in fleet renewals to achieve lower costs through greater efficiency. As a result, there is a vicious circle in which high costs lead to low profitability, which in turn hampers reinvestment. This perpetuates inefficiency and makes land transportation even less cost-effective.

Poor road quality leads to increased travel time and is punishing for the aging fleet. The Ministry of Transport and Infrastructure reported in 2015 that only 7% of Kenya’s roads were paved, with less than half in an adequate state to ensure efficient transportation. This has hardly changed by 2018.

The low quality of roads leads to many forced stops due to traffic congestion, lower speed limits, and an increased number of accidents, among other consequences. Local logistics firms that we interviewed estimated that poor roads could add 11 hours to the time needed to travel 430 km, excluding delays at police checkpoints and weighing stations. The relatively short distance from Mombasa to Nairobi could take as much as 29.8 hours, compared to six hours to cover a similar distance in North America.

### 2.3. Vehicle Pools, Fuel Usage, and Taxation

High import duties, low incomes, and poor road infrastructure dissuade owners from purchasing new vehicles. This logic predominates, especially when new cars depreciate so quickly on Kenya’s poor roads. When people purchase preowned vehicles, the lower costs make the vehicles affordable while the depreciation is less noticeable. Vehicle assembly scarcely exists in Kenya. In this context, it is hardly surprising that 90% of vehicles are imported and used, being mostly Japanese models and to a lesser extent German.

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The legal age limit for imported vehicles is eight years from the date of first registration. The Kenya Motor Industry Association has estimated that the average age of vehicles in the country is around 15 years.\textsuperscript{18} The total number of motorcycles and other vehicles registered from 2000 to 2014 amounted to 1.7 million. By 2017, another 742,000 was added in new registrations. Prior to 2007, the predominant form of motorized transport in Kenya consisted of motor vehicles other than motorcycles.

From 2000 to 2006, the annual number of registered motor vehicles (other than motorcycles) increased from 19,165 units to 51,327 units. The number of motor vehicles registered then more than doubled to 120,000 by the end of 2008. This could be attributed to the enactment of a decree stating that all imported motor vehicles should be registered before leaving the point of entry (Kenya Gazette Supplement No. 105 (Acts No. 9)). This directive also applied to the existing stock of unregistered vehicles held by motor-vehicle dealers. The growth continued in 2017. (See Figure 4.)

Station wagons (such as the Toyota Probox, Toyota Wish, Nissan Wingroad, and Subaru Impreza) have seen a sharp increase in new registrations, making up a total of 61\% of all motor vehicles registered in 2017. Sedans follow, with 12\%.

Another interesting trend is the number of registered motorcycles, which, by 2009, had overtaken the number of registered motor vehicles of other types by 25\% (70,000 units compared with 90,000 units), as shown in Figure 4.

The number of registered motorcycles grew exponentially from 16,781 units in 2007 to a high of 142,355 units in 2011. A decline of 33\% to 93,000 units, registered from 2011 to 2012, was attributed to the reintroduction of a 16\% VAT rate in 2012. The growth trend reasserted itself, as consumers adjusted, with 2017 new registrations doubling from the 2012 trough.

The Excise Duty Act of 2015 was enacted on December 1 of that year, changing the excise duty on motor vehicles from a rate of 25\% of the free-on-board (FOB) value to a flat sum of 150,000 shillings for any imported motor vehicle that was first registered no more than three years previously and 200,000 shillings for vehicles first registered more than three years previously. In addition, a flat rate of 10,000 shillings per motorcycle was introduced to replace the previous excise duty of 10\% to 25\% calculated using the FOB value of the motorcycle.

### Figure 4
New Registrations of Motor Vehicles (Including Motorcycles), 2000–2017

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<td>172,539</td>
<td>161,813</td>
<td>196,456</td>
<td>205,841</td>
<td>173,044</td>
<td>222,178</td>
<td>218,057</td>
<td>247,181</td>
<td>213,715</td>
<td>282,672</td>
</tr>
</tbody>
</table>

3. Ethanol: A Left-Field Solution?

The economics of ethanol as a fuel involves four essential factors that determine its economic viability, as follows:

1. **Production costs**: These include the costs of raw materials, which vary seasonally (e.g., sugar, molasses and corn syrup), conversion, and financing insofar as this influence capacity-cost recovery and the carrying costs of inventory and other working capital.

2. **Logistics costs**: Raw materials and finished products are transported from source to plant and from plant to end users. Distribution networks may vary significantly in cost depending on whether existing assets can be used or new systems have to be deployed.

3. **Vehicle-engine conversion costs**: The extent to which vehicle engines can be converted and the corresponding costs determine the pace of adoption and the switching from gasoline to ethanol.

4. **Taxes and import tariffs**: Ethanol is heavily taxed in a number of countries, while import tariffs are used to erect trade barriers to support local production.

Kenya’s record as a competitive producer of ethanol as a fuel has yet to be established. Its existing capacity is limited and it does not produce fuel-grade ethanol. The scale of the potential ethanol business can be examined by framing the opportunity as follows:

1. **Size of the ethanol market**: The exact size may vary significantly but initial estimates can be made by relating the volume to the potential for using ethanol to displace gasoline. The eventual size depends on the blend of ethanol and gasoline.

2. **Supply sources**: Locally produced and globally sourced ethanol involve differences in costs and market access, particularly when trade protection is a factor to contend with.

Let us examine these questions by looking at the vehicle pool in Kenya, relating this to our previous discussion on how fuels are distributed and priced.

### 3.1. Engine Tolerance to Ethanol

Ethanol requires the engines of existing vehicles to be adapted to accommodate the fuel’s greater corrosiveness and flow rates compared to gasoline. The degree of adaptation will vary according to the blend of ethanol and gasoline (usually 10% ethanol and 90% gasoline).

In un-adapted engines, parts that come into contact with ethanol corrode more quickly. This could result in fuel leaks, an inadequate fuel flow that impairs the vehicle performance, cause engine malfunctions, or damage to the catalyst and metal fuel tanks. Other parts that could require replacement include the filler neck, seals, fuel pump, flame arrester, vapor sensor, fuel injectors, valves and valve seals, and piston rings.

Vehicles need to calibrate the ethanol in the fuel blend, given the differences in density between gasoline and ethanol, with ethanol exhibiting an increased flow rate. To accommodate this, a larger fuel pump and injectors are needed, with software added to enable the engine to calibrate the ethanol intake.
The age of a vehicle determines how much adaptation is required. Vehicles assembled after 2000 have built-in diagnostics, with major standards including the onboard diagnostics II (OBD-II) system in the United States and European onboard diagnostics (EOBD). Potentially, such vehicles could accommodate a blend with 10% to 20% ethanol, or a blend with up to 85% ethanol for flex-fuel vehicles available in the United States.

As Kenya’s vehicle pool consists overwhelmingly of imported, preowned vehicles and has an average age of 15 years, this would imply that most would require a relatively large amount of adaptation. The conversion costs, the availability of qualified technicians, and any savings from the use of blended fuels (if any) would affect the pace of ethanol adoption.

### 3.2. Ethanol Supplies: Producing or Trading?

Kenya’s ethanol and sugar production are insufficient to fulfill the country’s aspirations for biofuel blends. The Energy (Blending of Power Alcohol with Motor Gasoline) Regulations of 2010 mandated the Kenya Pipeline Company to blend ethanol and gasoline at its depots.19 The objective was to cut the volume of fuel imports by 25%. With a total import volume of 4.84 million tons in 2017,20 this would imply making new annual ethanol supplies of 1.21 million metric tons of oil equivalent (MTOE) available in Kenya.

Kenya’s alcohol production is mostly limited to food-grade alcohol destined for heavily taxed alcoholic spirits. The Excise Duty Act of 2015 eliminated the tax of Sh175 per liter for all alcohol, with denatured spirits for gasohol (a mixture of 10% ethanol and 90% gasoline) and heating fuel exempt from excise duty. The tax rebalancing could favor gasohol production as a form of tax arbitrage, assuming supplies could be made available in sufficient quantities in Kenya.

Kenya’s production of sugarcane, the main ingredient of ethanol,21 is concentrated in the western counties and the coastal areas of the east. Cane production increased from 4.2 million metric tons in 2000 to 6.5 million tons in 2014. Prolonged drought cut this production to less than 4.0 million tons by 2017, impacting the financial health of private sugar mills22. Better rainfall is expected to bring better yields in 2018.23 The good news notwithstanding, the fundamental inefficiency of the sugar mills may prove a more permanent hurdle than the changing fortunes that weather brings.

At an average cane-to-sugar conversion rate of 10%,24 sugar production grew from 450,000 tons in 2000 to 592,000 tons in 2014, with 2017 sugar output seeing a sharp decline to 376,000 tonnes. Mumias Sugar Company achieved a 6.2% conversion rate for the year ending

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19 The company had depots in Nakuru, Kisumu and Eldoret, and a new blending facility was constructed in Kisumu.
21 The ethanol conversion process involves four steps. First, the sugarcane is cut and milled with water, and a juice is extracted (the extraction step). Then the juice is heated and treated to avoid sugar inversion (the clarification step). Next, the juice and molasses are mixed through fermentation to obtain a sucrose solution (the fermentation step). Finally, the ethanol obtained from the fermented sucrose is removed through a distillation process, which yields a solution of ethanol at 95.6% and water (the distillation step).
22 https://www.the-star.co.ke/news/2018/07/14/the-poor-status-of-kenyas-sugar-industry_c1786091
23 https://af.reuters.com/article/investingNews/idAFKBN1HQ23L-OZABS.
24 The rest of the sugarcane results in agricultural by-products such as bagasse. In sugar-producing countries such as Brazil, Australia and the Philippines, bagasse is used as fuel for sugar mills, among other uses.
on June 30, 2016, a performance that paled in comparison with companies in globally competitive producers such as Brazil, Thailand and Australia. The prolonged drought, and sharp losses from sugar production, encouraged farmers in the Mumias area to shift to other crops, farther squeezing sugarcane supplies by 2017.

Three Kenyan alcohol distilleries have a combined annual capacity of 70,000 m³, the equivalent of 34.2 MTOE or 70 million liters. The whole output is destined for industrial use such as beverages, disinfectants, and pharmaceuticals. The challenge of meeting Kenya’s ethanol target for supply autarky appears insurmountable when there are obstacles all around: limited local resources, a small market, and virtually nonexistent fuel grade ethanol production.

This is where Kenya could learn from Brazil’s ethanol micro-distillery (EMD) concept. With rescaling to ethanol production of 1,000 to 10,000 liters per day, small-scale supplies could achieve the flexibility that would make it financially viable to serve small-scale local demand. Capital expenditure is estimated at $750,000 for an ethanol plant producing 3,500 liters per day, requiring 54 tons of cane per day at 90% capacity utilization. The annual rated ethanol output is equivalent to 1.1 million liters or 563 MTOE. To meet Kenya’s desired ethanol target, an estimated 2,238 new ethanol plants would have to be built, based on the petroleum-product import volume of 2017. Conservatively, this would require an outlay of no less than $1.7 billion, if EMD were adopted to meet this policy-created market.

Sugar production will have to increase significantly. Kenya’s cane output fell sharply from 639,700 metric tons in 2016 to 376,000 tons in 2017 because of drought, which was expected to dampen the prospects of achieving ethanol self-sufficiency. To support an autarkic ethanol program, around 40 million tons of cane would be needed (i.e. 54 tons per day × 365 days × 2,238 plants × 90%), on top of food consumption in excess of 700,000 tons.

Given these estimates, there is little prospect of Kenya achieving supply autarky for fuels and ethanol. This realization leads us to alternative pathways, with open trade in ethanol at its core. In particular:

1. With next to no indigenous resources to protect, zero import tariffs on petroleum fuels and ethanol could reduce costs to consumers while improving economic competitiveness.

2. Initially, an open market for ethanol could build demand, allowing ethanol to gain traction as a fuel complement to gasoline and progressively reducing the import volumes of petroleum products.

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25 Mumias Sugar Company annual report for the year ending June 30, 2016. From more than 1.2 million metric tons of cane, 75,073 tons of sugar was produced, achieving a 6.2% cane-to-sugar conversion rate.

26 A liter is 0.00049 MTOE.

27 Industrial alcohol is distilled alcohol (C₂H₅OH), normally of high proof, produced and sold for purposes other than for beverages. It is usually distributed in the form of pure ethyl alcohol, completely denatured alcohol, specially denatured alcohol and proprietary solvent blends. Pure ethyl alcohol is used in laboratories and in industry for its sanitizing, cleaning and solvent properties.

28 The companies are Spectre International with an annual production capacity of 30,000 m³ or 14.7 MTOE, Agro-Chemical and Food Company with a capacity 18,000 m³ or 8.8 MTOE, and Mumias Sugar Company with a capacity of 22,000 m³ or 10.7 MTOE (of which 6.1 tons is ethanol).

3. With open borders, in line with the EAC framework, cane production in Tanzania and Uganda could supply ethanol production in Kenya, where complementation would drive decisions on the locations of new ethanol plants.

4. The phased expansion of ethanol would be driven by market conditions, using the evolution of demand and competition to inform investment decisions rather than relying on protective tariffs that would make cheaper imports artificially expensive.

The EAC has limited access to deep-water ports, making Mombasa a lifeline for trade, particularly for Kenya and Uganda. As well as Kenya, Tanzania offers the other sea access to a community whose other member states are landlocked. While the politics of economic integration is problematic, Kenya’s economic and geographic circumstances put it in a good position to be an energy or trading hub.

4. Conclusions and Next Steps

Kenya’s inefficient energy infrastructure, wide price differences, and its aspiration to achieve ethanol and fuel autarky have been described repeatedly. Some commentators have prescribed greater investment in new capacity, while demanding greater protection from the government to safeguard returns. These approaches are more likely to fail. Investments that struggle to deliver competitive goods and services are unlikely to become better by virtue of government protection. Consumers suffer and bear the brunt of excess costs.

Paradoxically, Kenya could achieve fuel security by employing market-friendly policies. Protectionist and statist governance imply an omniscient bureaucracy, with bureaucrats endowed with foresight that they do not possess in reality. Hence, demanding clear guidance from policy is tantamount to letting managers abdicate their responsibility for managing risks as rewards for investing, and letting them depend on the government to secure their returns. The weight of historical evidence is against this. Kenya’s failed state-owned enterprises offer compelling lessons.

Opportunities in Kenya’s imperfect fuel market lie in areas that are far from obvious. With policy focusing on instituting rules-based regulations rather than intervening to repair the system, competition in functional markets may create more efficient capital allocation and a greater ability to correctly appropriate returns for risk-takers.

Managers respond by taking risks and they reap their rewards (or suffer penalties) according to the outcomes of their investment decisions. By reframing the country’s aspiration to achieve supply autarky and recognizing the EAC’s broader opportunities, in line with open trade and open borders for energy, Kenya could flourish economically by taking advantage of its geography to form the genesis of an energy trading hub.

Through open trade, Kenya could access the global pool of energy resources, particularly petroleum products and ethanol, to quench its thirst for energy. Hence, entrepreneurs should focus on creating expertise and a presence in core areas as described below.

1. Managing the supply chain and logistics, including making land-based transport truly professional, is a realistic alternative to fuel pipelines, storage, and distribution.

2. Rescaled ethanol potentially opens new markets in which the combination of available sugarcane feedstock, access to markets, and the high fuel prices of underserved segments could support investment in small-scale ethanol micro distilleries.
3. Investment should be encouraged in ethanol trading, marketing and distribution, and technical services, in order to blaze the way for ethanol’s uptake. Professionalizing services for vehicle conversions, to adapt motors so they can use ethanol, may prove essential to create a market niche.

4. Agricultural productivity, particularly for sugarcane production, could benefit from the incorporation of advanced technologies and management practices. With open borders, the complementation of Kenya’s sugar industry with those of Tanzania and Uganda may prove lucrative to investors.

With the government’s elimination of the ethanol tax, regulators may now turn their attention to reducing the average age of vehicles on Kenyan roads on safety and efficiency grounds. With newer vehicles on the road, less engine adaptation would be required, so there might be an inadvertent increase in ethanol use, provided that the economics worked.