



Issues Paper

# Securing Capital Investment in Ukraine's Grid: The Road to the Future

by  
Ariel Cohen, Ph.D.  
Dr. Vladislav Inozemtsev

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## Authors

**Dr. Ariel Cohen** is a Senior Fellow at the International Tax and Investment Center (ITIC) where he heads the Energy, Growth, and Security Program (EGS). He is also a non-resident Senior Fellow at the Atlantic Council Eurasia Center and a member of the Council of Foreign Relations. He is a recognized authority on international security and energy policy, and a leading expert in Russia, Eurasia, and the Middle East. Dr. Cohen is the Founding Principal of International Market Analysis Ltd., a boutique political risk advisory.

For over 20 years Dr. Cohen served as a Senior Research Fellow in Russian and Eurasian Studies and International Energy Policy at the Heritage Foundation. He directed Heritage's energy war games and worked closely with Members of Congress and Congressional staff members as well as cabinet-level and sub-cabinet domestic and foreign decision-makers. Dr. Cohen is the author of six books, 30 book chapters, and over 1,000 articles. Dr. Cohen is a regular commentator on Voice of America and Newsweek, as well as a weekly Forbes energy columnist.

**Dr. Vladislav Inozemtsev** is an economist and a leading supporter of the new industrialization of Russia. He is the director and founder of the Center for Post-Industrial Studies in Moscow, a nonprofit institution that specializes in organizing conferences on global economic issues and publishing books. He is a professor and the chair at the Department of World Economy, Faculty of Public Governance, Moscow State Lomonosov University and previously resided in Vienna as a senior visiting fellow at the Institute für die Wissenschaften vom Menschen (IWM). He has also taught at various universities, including MGIMO (the University of International Relations) and at the Higher School of Economics in Moscow.

From 2002 to 2009, he was head of the Scientific Advisory Board of the journal *Russia in Global Affairs*. In 2011, he was managing director of the Global Political Forum, organized in Yaroslavl under the authority of then-President Dmitry Medvedev. Dr. Inozemtsev is the author of over 600 printed works published in Russia, France, the United Kingdom, and the United States, including 15 monographs, 4 of which have been translated into English. He has never been affiliated with the Russian government or any other foreign government and has never served as an elected official at any level.

## Executive Summary

Today Ukraine's electricity sector faces acute and diverse challenges. Privatized or still under the state's control, power plants and distribution lines are obsolete and under-invested. Most experts estimate that \$17.5 billion is needed to fix existing troubles and undertake a moderate modernization of the grid. The price for electricity is still low: it costs 30 percent below the European average for industrial consumers and is roughly four times cheaper for household end-users.

How can Ukraine succeed in building a modern power production and distribution system and to catch-up with its Central European neighbors? The answer is clear: market liberalization. The market reforms of 2019 demonstrated that energy production in Ukraine actually reacts in a proper way to ordinary market signals and economic stimulus – as reforms were introduced competition increased and wholesale prices fell. As the Government of Ukraine (GOU) introduced a high 'green tariff' for renewables, renewable energy investment flooded the local market. In the spring of 2020, the share of 'green' energy shot up to an impressive 8 percent of total electricity production. However, further development of this sector is constrained by a number of factors, perhaps the most significant of which is the extreme deterioration of electric networks and distribution lines.

Therefore, the Government should undertake several next steps in the electricity sector reform. At the moment, grids are the weakest link in the Ukrainian energy system. Their deterioration is an obstacle to both the further development of renewable energy sources and the planned integration of the Ukrainian energy system with the European energy system (ENTSO-E). In other words, the adoption of regulation, which will create incentives for network modernization, is essential.

One such critical regulatory reform is the so-called RAB (Regulatory Asset Base tariff) which offers incentives for energy distributors to invest in grid maintenance and modernization. This system has proven itself in many countries, providing power generating and distributing companies a secure payback and return on investment sufficient to service loans and to generate profits. RAB regulation will create attractive conditions for future investments in grids, ensuring their modernization in the foreseeable future.

The measure has been under consideration by the Government and the Regulator – the National Energy and Utilities Regulatory Commission of Ukraine (NEURC) – for more than ten years, and today the main issue is whether the entire value of assets should be taken into account (as it was elsewhere in Europe), or just recent/future investment. With distribution costs constituting only 17 percent of the electricity price in Ukraine compared to 36 percent in Poland and 53 percent in Germany, the authors argue for adopting a classical European scheme with a non-differentiated rate of return; for fixing it at a relatively high level to compensate for the existing exchange rates and their fluctuations, and for interest rates risks; and for applying the RAB-based approach both to the private and state-controlled assets, thus creating additional incentive for another round of privatization.

The authors present both the challenges of introducing the RAB-based regulation in Ukraine's electricity sector and the benefits it may bring to the industry, consumers, and the public finances of Ukraine.

## 1. General Overview of Ukrainian Electricity Market

For decades Ukraine was an industrial powerhouse of the Soviet Union, in its final years accounting for around 17 percent of USSR industrial production<sup>1</sup> and 17.6 percent of electricity generation,<sup>2</sup> including 38.3 percent of electricity produced by nuclear power plants.<sup>3</sup> As the Soviet Union collapsed, so did its huge market for Ukrainian goods that were otherwise uncompetitive and in low demand in the global markets. Subsequently, Ukraine suffered an unprecedented economic crisis. By 1998 its PPP GDP fell by around 65 percent compared to 1990<sup>4</sup> while electricity generation dropped by almost 42 percent.<sup>5</sup>

During the period of economic revitalization, between 2000 and 2012 the electricity generation in Ukraine grew by around 15 percent but there was very little incentive to modernize both the power plants and the grid. Ukraine's five largest thermal power stations – Vuglehirska, Zaporizska, Burshtynska, Kryvorizska and Zmiyvska – were built between 1960 and 1977, and their effectiveness saw declines each year.<sup>6</sup>

The same might be said about the nation's Soviet-designed nuclear power plants, the most recent of which – second reactor at Khmel'nitskaya NPP – started to produce power back in 2004.<sup>7</sup> Since 2010 the state company *Energoatom* has owned and operated all 4 nuclear power stations with their 15 nuclear reactors, which together are responsible for producing 53.9 percent of all Ukrainian electricity (as of 2019).<sup>8</sup> *Energoatom* has worked to extend the reactors' lifetime beyond the Soviet-planned 30-year-shelf life without significant repairs. The Ukrainian government forecasts that these aging plants are will not be decommissioned until the late 2020s (and even this date should not be considered as firmly fixed).<sup>9</sup>

The grid is also aging fast, causing numerous disruptions in energy supply to Ukrainian customers. The majority of the country's high-voltage lines were built in the 1960s and 1970s and became outdated in the early 2000s. They have not been significantly modernized since the time of construction; therefore an average consumer in Ukraine gets disconnected from their power supply for up to 700 minutes per year while in Poland the figure is 180 minutes in the Czech Republic – 73 minutes and in Denmark – only 15 minutes.<sup>10</sup>

Another problem with Ukraine's electricity generation is caused by economic imbalances inherited from Soviet times. For decades both the industrial sector and the household consumption of energy have been so inefficient that Ukraine now seems to be the most energy intensive economy in Europe, lagging behind even Russia with its much more inclement and energy-demanding climate.

Ukraine consumes on average 2.8 times more energy per \$1 of its PPP GDP than Poland, so power consumption will definitely decline as the country becomes more integrated into the European economic area.<sup>11</sup> Since its export capabilities remain limited, there is little chance for Ukrainian producers to expand their share in the European market (in 2019 Ukraine exported 6.47 TWh of electricity compared to 9.90 TWh in 2013<sup>12</sup> with the dollar value of exports declining from \$580.2m to \$378.8m).<sup>13</sup> Overall electricity production declined during the same period from 194.4 to 159.4 TWh,<sup>14</sup> while the latest forecast for 2020 estimates the annual production at around 138 TWh, or roughly a half of the figure for 1991 when Ukraine became an independent nation.<sup>15</sup>

Another important peculiarity of the Ukrainian electricity market is the low market price for energy. From 2000 till 2020 electricity prices for households rose from 0.156 to 1.68 hryvnya per kWh,<sup>16</sup> or by 10.8 times (one should be reminded that 1.68 hryvnya is the elevated cost paid for the consumption exceeding 100kWh/month while the lower amount is billed at 0.9 hryvnya per kWh)<sup>17</sup> – but during these 20 years the hryvnya depreciated to the US dollar by 4.86 times, and the nominal wages rose quite significantly.<sup>18</sup>

Yet not all is bleak: due to the government's efforts to promote the electricity production from renewable sources through feed-in tariff, the installed capacity of renewable electricity facilities to which the 'green' tariff was applied increased from 0.1 GW to 7 GW between 2009 and 2019 while the renewables' share in electricity consumption increased by 2.4 times – from 2.9 to 7.0 percent.<sup>19</sup> Installed capacity for biofuels saw the most dramatic increase, growing 49 times to 0.17 GW. Small hydropower plants saw the smallest growth, increasing 2.3 times to 0.1 GW. But this overall growth decelerated significantly in Q1 2020 as the total capacity of renewable electricity facilities enjoying the 'green' tariff increased by just 11 percent. This relatively slow growth was due to mounting debt in the wholesale market, uncertainty about government models of renewable sector support, and the introduction of quarantine measures.

Excluding the slowdown in Q1 of 2020, the recent development of the renewables sector outperformed the National Plan by 25 percent mainly due to extraordinary growth in solar generation (solar installed capacity is now two times larger than planned) while both wind and biogas generation lagged behind with just 48 and 79 percent of the installed capacity of what was previously planned.<sup>20</sup> Today, there are 881 companies and enterprises in Ukraine producing the electric power under 'green' tariffs.

Since 2014 the favorable investment conditions caused by the government's support for the renewable energy sector attracted more than €6.1 billion in overall investment. Out of this €6.1 billion the FDI's share accounted for €2.5 billion which makes it one of the most spectacular examples of attraction of foreign investment in Ukraine's economy since the country gained its independence back in 1991. Starting from April 1, 2020 both the 'green' tariffs and the surcharges granted for compliance with the requirements for using Ukrainian-made equipment were set by the regulator between 2.19 and 15.8 hryvnya per kWh compared to the average cost of 'green' power in the European Union nations of around just 4.15 hryvnya per kWh. However, it should be kept in mind that 'green' tariffs in Ukraine have already been cut three times, and investment risks in Ukraine are much higher than in the EU.

By the end of 2019, alternative energy producers contributed 19.8 billion hryvnias to Ukraine's national and local budgets – three times more the coal producers have paid. Since 2009, the overall budget contributions by renewables operators amounted to 93.6 billion hryvnias. With solar and wind installations contribution reaching 8 percent of Ukraine's electricity generation in May 2020<sup>21</sup> the recent announcement by the Energy Minister hoping to achieve 70 percent electricity production mix by 2050 may become a reality.<sup>22</sup>

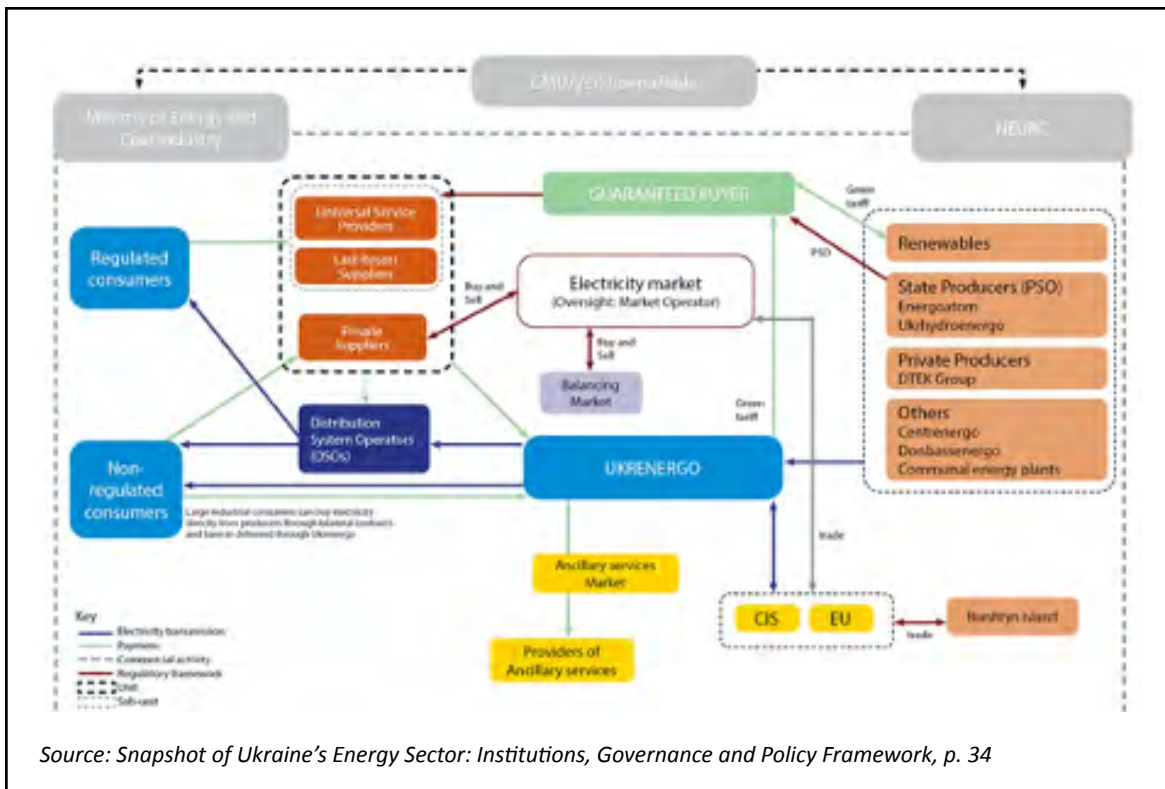
To summarize, the main challenges facing the Ukrainian energy sector are: first, the aging infrastructure of both power plants and the grid; secondly, the limited demand from the industrial sector along with rising demand from the subsidized households; and, thirdly, an unfinished market reform with constant attempts of manual regulation. All of these are significant obstacles to sectoral investment. To overcome them, additional reforms should be implemented as soon as possible.

Under the Energy Community Treaty Ukraine made an obligation to implement the Third Energy Package and launch a new electricity market model instead of the outdated model of 'Single Buyer.' The Electricity Market Law was adopted in 2017 and came into effect in two phases from January 1 and July 1, 2019.<sup>23</sup>

One of the elements of the reform was also the unbundling of oblenegos (regional energy distributors) into supply companies and distribution system operators: the latter are responsible for dispatching electricity to end users, while suppliers buy electricity from producers and sell it to end users. There are two major different types of suppliers to meet consumer needs: private suppliers and universal service providers. Non-regulated consumers may select private suppliers freely, and prices are set based on the

agreements with electricity producers and suppliers. Universal service providers sell electricity only to residential and small non-residential consumers at regulated rates (and must acquire a license authorizing them to serve a given region).

As of July 2019, there have been 32 distribution system operators and 528 entities have been licensed to sell electricity, of which 25 now serve as universal service providers.<sup>24</sup>



Source: *Snapshot of Ukraine's Energy Sector: Institutions, Governance and Policy Framework, p. 34*

Most Ukrainian experts praised the new market model although there were concerns that this would lead to an increase of wholesale price of electricity by 25 to 50 percent.<sup>25</sup> The Ukrainian Institute for the Future put the numbers at 135 percent in 2019-2020 for households and at least 45 percent for industrial enterprises).<sup>26</sup> But the result of the reforms was surprising: by the end of 2019 wholesale prices fell by 14.5 percent (the only expert center predicting their decline was Ukrainian Economic Outlook)<sup>27</sup> and after new trading rules were introduced on November 26, 2019, the market crashed with daily prices falling to less than a half of the break-even point of the energy system operation (which might well be expected since electricity oversupply was obvious even before the reform, and electricity exports are currently close to zero due to economic standstill in the Central Europe caused by coronavirus).

Importantly, these price fluctuations did not affect tariffs for regulated grids. As mentioned, the current state of the grid is extremely poor – more than 86 percent of it has been in service for 30 years or more,<sup>28</sup> and distribution losses account for up to at least 10 percent of all the power produced in the country.<sup>29</sup> The current regulatory framework does not stimulate grid development, the condition of infrastructure only worsens from year to year.

Meanwhile, the Ukrainian energy system is still synchronized with the systems of Russia, Belarus and Moldova, but is preparing for integration with the European energy system ENTSO-E scheduled for 2023. This will not only contribute to the further economic integration of Ukraine and the EU, but will also be a



serious political step. However, synchronization is unlikely to be possible if serious efforts are not made in the near future to change the situation with the state of the networks.

In addition, the current plight of grids is already an obstacle to the development of renewable energy. Fulfillment of the obligations that Ukraine assumes within the framework of the EU Green Deal will simply be impossible if the state of grids does not improve.

A mechanism should be found which allows the distribution system operators to increase their tariffs in a way that would channel additional money into funds dedicated to grid modernization efforts and repairs, otherwise massive failures can be expected in the near future. European practices are a possible solution.

## 2. European Regulations and Its Effectiveness

Since Ukraine is accustoming to the European business regulation it is natural to borrow from the EU's rich and diversified experience. Until the mid-1990s the energy supply in Europe was largely organized through nationwide companies, some of which belonged to the state. Tariffs were usually set based on the costs of electricity production and distribution with some added profit (the latter in most cases was limited by the government). This system worked quite well in Western Europe but did have the negative externality of reducing competition and limiting incentives for additional investments into the new generation and the grid. Europe's reforms started in 1996 and gradually turned the continent into a patchwork of different regulatory models all in some extent based on what is now called Regulatory Asset Base approach (RAB).<sup>30</sup> The main rationale behind the scheme is to establish a correlation between electricity price and the amount of funds invested into fixed assets, thereby giving operators a fair return on their investment in the business.

The RAB approach can be viewed as an overarching concept with three pillars of RAB-based systems implementation across Europe: incentive-based, revenue cap and mixed.<sup>31</sup> All three aim to encourage network owners to invest in the grid's modernization and expansion by a certain set of incentives which are in the end determined by the state. In many cases, a private (or corporatized state-owned) company acts as the infrastructure manager in the grid: it owns, invests in and operates infrastructure assets. The infrastructure manager receives revenues from users and/or subsidies to fund its operations and recoup investment costs. In the absence of regulation these infrastructure owners can act much like natural monopolies – setting prices too high in an attempt to earn “super normal” profits. A state-managed regulator under the RAB model, however, provides efficiency incentives and caps prices, revenue or rates of return received by the infrastructure manager to improve social welfare. The efficiency gains in this case arise primarily through the interaction between the state-appointed regulator and the infrastructure manager during some set period of time determined by a contract usually struck from a term of five to seven years.<sup>32</sup>

According to two crucial principles of the RAB-based approach, the entire investment – the value of assets, either already in place or increasing through additional investments – is taken as the basis for the calculation of return and the regulated rate of return is linked to the current cost of capital (of course it must be significantly higher than the risk free rates for making the investment into the energy infrastructure attractive). The resulting figure is called the weighted average cost of capital (WACC) that incorporates both the cost of equity and debt as well as the current tax rate; the WACC is determined by authorities mirroring local financial and tax conditions and is usually set for a rather long period of time (in most cases five years or more). Today for the EU countries electricity distribution system operators



are set in between 6.9-9.7 percent per annum in Germany and France (which are main pillars of the Eurozone) and 7.8 percent in Poland and 10.3 percent in Czech Republic (which are still out of the bloc).<sup>33</sup> Ukraine, with its high interest rates, definitely needs to have the initial WACCs being fixed at a higher level.

For assessing the attractiveness of this regulation concept for Ukraine it is instructive to address the experience of some post-Communist and post-Soviet countries, most notably Hungary, Romania and Georgia. In the first two, the new regulatory model was introduced in the early 2000s, while Georgia appeared to be a newcomer to the club with RAB-based approach adopted in 2015.<sup>34</sup> The results in all three cases were quite promising with two significant consequences. On the one hand, operators started to channel additional profits into the reconstruction and modernization of the grid. In Romania during the first ten years after the implementation of the RAB-based approach the investments into the grid grew up to \$985/km compared to Ukraine's figure of less than \$250/km. Disconnection times for consumers known as the System Average Interruption Duration index (or SAIDI) was brought down from 1025 minutes per year to 474.<sup>35</sup> Furthermore, the power generation and distribution companies became interested in providing complex reorganizations of the network, including the introduction of the Smart Grid, based on more efficient power use through implementation of digital technologies for automated consumption regulation (in the most EU countries, this kind of technology is to be implemented by the end of 2020).<sup>36</sup>

The post-Communist and post-Soviet countries' experience was based on a single rate of return equal to WACC that was applied to both the existing assets and to those created by the future investment. The main purpose of such an approach was to grant the electricity providers an opportunity to increase their tariffs while channeling the earned money into the modernization of the network. The initial WACCs were fixed at incredibly high levels compared to the EU-15 nations: in Romania the figure was 12 percent per annum, in Bulgaria even higher, 16 percent (Georgia started the reform with 13.5 percent rate) but since 2005 Romania's WACC decreased to 5.8 percent and Bulgaria's to 6.7 percent as local economics matured.<sup>37</sup> No one can accurately predict how the rate will change over time in Ukraine as no other European country, including Georgia, has experienced the same level of inflation or interest rates over the past 15 years: since 2005 Ukraine saw average inflation over 10 percent per annum and central bank rates never exceeded 12.5 percent<sup>38</sup> while the peak figures for Ukraine reached an astounding 30 and 43.3 percent, respectively, in 2015.<sup>39</sup>

The RAB-based approach has proved to be so effective and business-friendly it was adopted not only in pro-Western post-Soviet states like the Baltic republics and Georgia, but in Russia as well. In November 2009, President Medvedev signed the Law №261-ФЗ 'On Energy Use Effectiveness' ordering to enact the RAB-based approach to all the companies subordinate to the MRSK Holding Corporation (Inter-regional Distribution Network Co.). As a result, the market capitalization of this holding company skyrocketed by 3.5 times between October 2009 and October 2011 while the MICEX index' advance was limited to just 67 percent.<sup>40</sup> Unfortunately, the reform was stopped after President Putin returned to the Kremlin and reintroduced marginal tariffs in late 2012.

To summarize, the RAB-based approach has a history of proven effectiveness when applied to both electricity generation and distribution. The most praised feature of this scheme is that it can be used by state-owned and managed entities, private electricity producing companies, and by any state-owned companies operating by private firms under concession agreements.

The most important factors to securing the success of the reform are, on the one hand, application of the

scheme to the entire book value of company assets (in some cases adjusted to its market capitalization) without using a different approach to already made and still planned investments; and, on the other hand, the consistent, transparent, and well-grounded calculation and adjustments of the WACC which should be predictable and based on real monetary market trends.

### 3. The Current Debate Around RAB-Focused Approach

The plan for reforming Ukraine's grid through introducing an RAB-based tariffs approach has been debated for at least seven years. Back in 2013 the National Energy and Utility Regulatory Commission adopted two consecutive resolutions: №1009 "On Establishing Long-Term Regulatory Parameters for the Purposes of Incentive Regulation" (of July 23) and №1029 "On the Application of Incentive Regulation in the Field of Electricity Distribution by Local Electricity Networks" (of July 26).<sup>41</sup> The reform was to be debated by both government officials, experts and entrepreneurs, but already in October 2013 then-Prime Minister Azarov issued a request for 'stabilizing' the natural monopolies' tariffs for both industrial consumers and households 'till the upcoming elections.'<sup>42</sup> Later, the electoral process was disrupted by the political crisis and Revolution of Dignity, and the war with Russia overshadowed all other developments. Moreover, the economic crisis that followed the active phase of the war forced the government to be especially sensitive to any kind of reform that was able to endanger the wellbeing of the people – and at the time the dominant feeling was that new tariffs may provoke hikes in utility tariffs and consumer goods prices, as well as household electric bills. So, while the regulatory framework was completed by 2017 with WACC fixed at 12.5 percent per annum, president Poroshenko's consecutive cabinets have not yet sanctioned the reforms, and to this day Ukraine still utilizes the outdated Cost+ model.<sup>43</sup>

The new attempt to install the RAB-based tariff started in 2018 alongside reforms aimed at the creation of a new wholesale electricity market, but later the two became disassociated, so the National Energy and Utility Regulatory Commission announced its proposals only by the end of April, 2020. In general, the outline of the reform resembles that drafted in 2013. Since the main declared purpose is to encourage investments into new electricity network and into 'smart grid' predominantly based on new meters in major cities, the regulator proposed to apply the RAB-based tariff almost entirely to the new installations, reducing the value of the existing grid: under the model, new investments will be rewarded by fixed return of 15 percent per annum, while the 'old' assets will earn its owner a mere 1 percent per annum (this breaks with 2017 frameworks and goes back to 2013 plan where the idea was the same while the WACCs were set at 14.79 and 0-2 percent per annum).<sup>44</sup>

The proposed principle differs substantially from the European practice and has at least two shortcomings. First, it will motivate the owners of the grid to build new lines and interconnectors and to invest primarily into newly designed 'smart grid' elements. Of course, this may benefit the system since it can help to reduce power losses and to optimize the electricity consumption. But the major problem facing the national grid is aging Soviet-built infrastructure (more than 14.7 out of 23.0 thousand km of distribution lines have been in operation for more than 40 years,<sup>45</sup> while at least 50 percent of the low-voltage distribution lines and 45 percent of transforming stations need to be replaced immediately).<sup>46</sup>

If the legacy infrastructure starts to fail, new facilities will not resolve the problem. Second, the very idea of dividing the grid into the 'old' and 'new' elements is problematic since no one exactly knows what portion of investment goes into the construction of new lines versus what is used for repair and modernization of the existing infrastructure. Issues with defining installation as either 'old' or 'new' would

be greatly confusing to investors and would disincentivize funding of existing infrastructure as those investments would not count towards premium calculations.

RAB-based tariffs are even more needed today due to the rapid development of renewable energy production. As the share of renewables in overall generation approaches 10 percent, two new problems emerge. On the one hand, the Ukrainian legislature makes it obligatory for the Guaranteed Buyer to acquire the power produced by the solar or wind generation – but for doing this additional high- and low-voltage networks should be build all over the country.

The current trends in renewable power generation points to strong growth of mid- and small-size, decentralized facilities that makes the task of distribution even more complicated. Second, the development of green energy creates the need to expand ancillary facilities that might be used for storage of the already produced electricity as well as buffers for balancing the energy flows – both of which are fundamentally new for Ukraine's power distribution system. The needs gap cannot be bridged without a surge of new investment into the grid. In fact, recent estimates show the current investment needs that might lead just to fixing the existing problems accounts at least for \$17.5 billion.<sup>47</sup>

The major point of contention in the policy discussion is retail electricity prices. As debated in the previous reform propositions of 2017 and 2018, RAB critics argued that asset-based tariffs, if implemented, could spike electricity prices by at least 18 billion hryvnias or \$670 million per year.<sup>48</sup> Supporters of the RAB responded that Ukrainian electricity distribution networks need an additional \$25 billion investment in the coming ten years, so proposed price hikes would actually fall short of securing needed infrastructure investments.<sup>49</sup> Moreover, those supporting the reform argue that the distribution is an artificially low 17 percent of electricity prices compared to 36 percent in Poland and 53 percent in Germany so if the reform is approved the retail prices will not go up by more than 10 percent.<sup>50</sup> Furthermore, considering the share of power in overall costs of consumer goods, rates will effectively increase by an estimated 0.4 to 3.3 percent. But in a country like Ukraine where electricity, as a legacy of the Soviet era, is still perceived not as a commodity but as a social good, even a slight rise can cause fierce critique by populist parties and the press.

Another important point of concern is the perspectives of those energy assets that are still owned by the state. Privatization of large swathes of these assets are long overdue, and privatization may in fact be the best starting point for creation of a modern Ukrainian stock market.

Among distribution service operators (DSOs) the state controls Zaporizhiaoblenergo (60.25%), Kharkivoblenergo (65%), Odesaoblenergo (25%), Cherkasyoblenergo (46%), Mykolaivoblenergo (70%), Khmelnytskoblenergo (70%), Sumyoblenergo (25%), and Ternopiloblenergo (50.99%). Additional companies under state ownership (executed via State Property Fund if Ukraine) involved in electricity generation include Centrenergo (78.29%), Donbasenergo (25%), Severodonetsk thermal power plant (100%), Kherson Thermal Power Plant (99.83%), Dneprovskaya teploelektrotsentral (99.93%), Odessa TPP (99.99%), and Mykolaiv Thermal Power Plant (99.91%) which all can constitute a healthy basis for the newly created private cornerstone of Ukraine's economy.<sup>51</sup> In past years the government announced different plans for auctioning these assets and many experts believe that there are sufficient potential bidders who back reform. However, the WACC applied to 'old' assets will discourage foreign companies from competing for this segment of Ukrainian energy sector. If RAB-based tariffs are adopted with two different rates, these assets may not only remain in state ownership for decades but also need huge government subsidies. It is therefore critical that one universal rate of return equal to WACC be applied to the entire grid.

Summarizing the current debate, the fight for introducing RAB-based tariffs in Ukraine is far from over, with consequences of reforms at risk of being utilized for political purposes. Ukrainian politics have significant influence on the business, and important changes in the infrastructure projects might be used for manipulation of sensitive issues like utility prices. There is a likelihood that reform may be adopted in some form that simply consolidates current conditions and excludes any chance to develop a European-inspired business model in Ukraine.

## 4. RAB-Based Tariff in Ukraine: Implementation

In assessing the challenges and opportunities of introducing RAB-based tariffs in Ukraine, aging Soviet-build infrastructure – of both power stations and of distribution networks – form the core of the issue. Today Ukraine is on track to face a short term electricity glut: by early 2020 the overall installed capacity of power generation is estimated at 52.5 GW<sup>52</sup> while the consumption has been decreasing since at least 2013 and it may drop further if Ukraine boosts effectiveness of energy use.<sup>53</sup> However, the vast majority of this power is generated by obsolete capacities that may soon need to be decommissioned. Thermal power plants may encounter operational issues due to environmental restrictions. Nuclear units, with the exception of one, are also outmoded. They may be retired by the end of the decade.

The development of 'smart grids' and industrial modernization look inevitable, so the main issue is not to secure a huge increase in electricity production and distribution capacity but rather to improve the quality of the existing facilities and to minimize distribution losses that now are, as previously mentioned, close to 10 percent of the overall generation.<sup>54</sup>

For these purposes RAB-based regulation looks to be an essential instrument for securing the investment needed for grid modernization. This approach should be applied to all the existing assets since if the current proposal made by the National Energy and Utility Regulatory Commission is realized the entrepreneurs would be able to claim rewards only from the investment they make in 2020 or later, which does not solve the immediate issue of Ukraine's dilapidated infrastructure.

The construction or modernization of generation and distribution facilities takes time, so the initial earnings from new investments will not appear until earliest 2022. It is for this reason that WACC should be set on the same level for all the assets either they are private or state-owned.

Moreover, neither 12.5 percent nor even 15 percent rate of return seem to be sufficient for channeling necessary investment flows into Ukraine's grid. When Bulgaria introduced its RAB-based tariffs back in 2005 fixing the WACC at 15 percent per annum the official Narodna Bank refinancing rate stood at 2.04 percent;<sup>55</sup> the WACC has since decreased to 6.7 percent while the Narodna Bank rate is currently fixed at 0 percent.<sup>56</sup> In Ukraine today the National Bank official rate is as high as 6.0 percent – it follows that the starting figures for RAB-based tariffs in Ukraine should be around three times higher, i.e. not less than 18 percent per annum.<sup>57</sup> Moreover, during these 15 years the Ukrainian hryvnya lost 80 percent of its value to the euro,<sup>58</sup> while the Bulgarian lev was pegged and the Romanian leu depreciated only by 24 percent.<sup>59</sup> In this case it is not only necessary to set a relatively high rate of return for making the RAB-based tariffs in Ukraine successful, but to build-in a hedge for investors against currency risks. An initial WACC of 18 percent per annum with the establishment of some hedging mechanism (for example, during the first three years after the introduction of RAB-based tariffs the government will correct the tariff for at least a half of hryvnya's depreciation to the euro if it happens, during the next period the rate can be decreased to 25 percent, and after 6-8 years the currency risk can be neglected altogether). Such a measure should

encourage both the Ukrainian and European companies to invest heavily in Ukraine's electricity sector.

Another policy suggestion is to introduce tailored schemes of RAB-based tariffs differentiating electricity production and distribution. Since Ukraine is poised for integration with European networks and regulations, the country will necessarily continue to develop its 'green energy' projects. The main purpose of RAB-based regulation should be to promote the modernization of the grid and to implement smart uses of power both by the industrial sector and households. The major aim for Ukraine is to minimize electricity losses and to advance its energy intensity – if the first can be cut by 60 percent and the latter improved by 20 percent the country would economize around 18 percent of current output.

Another important issue is that the introduction of RAB-based tariffs can facilitate the privatization of six state-owned oblenenergos and would contribute to the development and credibility of a modern stock market in Ukraine, which it severely lacks. Ukraine's combined capitalization is a mere 3.38 percent of GDP compared to Poland's 27.4 percent.<sup>60</sup>

There is no other way out of Ukraine's electricity distribution crisis other than via the introduction of RAB-based tariffs which in Ukraine's case is long overdue. To ensure effective reforms, three points should be addressed: first, the RAB-based regulation must be applied to all kinds of assets, both already in place or just under construction; second, the rate must be at least as high as the current banking credit rates, i.e. not lower than 18 percent per annum. Third, investors in renewable energy must have transparency and predictability with regards to feeding tariffs they can count on.

The overall conditions for reform are quite favorable today. Falling demand and low market prices – exacerbated by the economic conditions post-Covid-19 – means that the introduction of RAB-based tariffs will not be as painful as critics suggest. In fact, the projected 7-10 percent increase in tariffs will actually reinforce rather than disrupt the market equilibrium.

## Conclusion: Main Effects of RAB-Focused Reform

If the Ukrainian government and Regulator move ahead with introducing RAB-based tariffs in 2020, it would be a very significant energy sector reform. The main thrust of this policy change would be the treatment of energy not as a 'basic public good' as it was considered in the Soviet era, but rather as a commodity produced under free market conditions possessing its intrinsic value and sold at a price that covers costs and encourages the investors to continue the modernization of the grid. The introduction of RAB-based tariffs may be the only viable answer to the mounting problems of a chronically underinvested grid suffered since Ukraine's independence. The new regulation should encourage entrepreneurs to invest into the grid, attract more foreign investment and foreign technological solutions into the Ukrainian energy sector, and increase value of Ukrainian assets that, in turn, will become an instrument for acquiring new investment and new loans via selling shares in electrical utilities and using its stock as collateral.

The basis for the RAB-based tariffs should be a rather high rate of WACC that would be able to generate the funds necessary for network modernization and maintenance. It is critical the WACC will not be differentiated for 'old' and 'new' assets as this approach undermines the entire concept of the reform. There are three main indicators of a successful reform process:

First, energy supply to the final consumer should be more reliable and consistent. Reconstruction of the grid must push losses down from year to year, annual aggregate disconnection times (under the SAIDI

index) must constantly decrease. Ukraine should aim to achieve Polish SAIDI figures by the end of 2020s.

Second, the state budget should profit from the reform in different ways: through the increase of taxes caused by growing grids profits; via additional proceeds from the privatization of state-controlled assets in the energy sector; and through the economizing on subsidies and cross-subsidization of electricity consumption.

Third, the introduction of the new model will push electricity prices up in the short- to medium-term but taking into account the relatively small share (17%) of electricity transportation price in the tariffs for the end consumers, this growth will not be significant and may reach about 10%. This should also lead to the promotion of long-awaited rise in energy efficiency which should be made the most ambitious economic goal for 2020 as it will increase both Ukraine's energy independence and lead to the overall economic modernization.

Looking on the negative aspects of the introduction of RAB-based tariffs there are no significant drawbacks on the national level while the reform might hurt some of the interest groups inside the Ukrainian elite – first of all owners of energy intensive and inefficient enterprises and the populist politicians interested in postponing market reforms supposedly in the name of 'ordinary people'. Continuing to bow to these groups, however, is the largest obstacle to Ukraine's integrations into the European economy.



## Endnotes

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- <sup>3</sup> See: Луконин, Николай. 'Атомная энергетика СССР' [Lukonin, Nikolay. 'Atomic Energy Complex of the USSR'] in Atomic Energy [in Russian], 1987, vol. 63, issue 5, p. 291.
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- <sup>6</sup> See: 'Список тепловых электростанций Украины [List of Ukraine's Thermal Power Stations]' at Wikipedia website [in Russian]: [https://ru.wikipedia.org/wiki/Список\\_тепловых\\_электростанций\\_Украины](https://ru.wikipedia.org/wiki/Список_тепловых_электростанций_Украины) (web-site accessed June 12, 2020).
- <sup>7</sup> See: 'Атомная энергетика Украины [Nuclear Power in Ukraine]' at Wikipedia website [in Russian]: [https://ru.wikipedia.org/wiki/Атомная\\_энергетика\\_Украины](https://ru.wikipedia.org/wiki/Атомная_энергетика_Украины) (website accessed June 12, 2020).
- <sup>8</sup> See: 'Производство электроэнергии в Украине: у ВИЭ значительный прирост [Electricity Production in Ukraine: The Renewables Show Strong Growth]' at Kosatka Media website [in Russian]: <https://kosatka.media/en/category/elektroenergiya/analytics/proizvodstvo-elektroenergi-v-ukraine-u-vie-znachitelnyy-prirost> (website accessed June 18, 2020).
- <sup>9</sup> See: 'Эксплуатация ядерных энергоблоков в сверхпроектный срок: мировая практика и особенно-сти процесса в Украине [Nuclear Power Stations Operation Above the Normative Lifespan: International Standards and Ukrainian Peculiarities]' at Atom.org website [in Russian]: [https://atom.org.ua/wp-content/lifetime\\_extension\\_rus.pdf](https://atom.org.ua/wp-content/lifetime_extension_rus.pdf) (website accessed June 18, 2020).
- <sup>10</sup> See: 'Стимулирующий тариф и будущее электроэнергии в Украине [Stimulating Tariffs and the Future of Electric Energy in Ukraine]' at RBC Ukraine website [in Russian]: <https://rabortariff.rbc.ua/ru/> (web-site accessed June 14, 2020).
- <sup>11</sup> Calculated according to the data provided by World Energy Statistics and Balances Database, available at OECD website: [https://www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances/word-indicators\\_data-00514-en](https://www.oecd-ilibrary.org/energy/data/iea-world-energy-statistics-and-balances/word-indicators_data-00514-en) (website accessed June 12, 2020).
- <sup>12</sup> See: 'Украина в 2019 г. увеличила экспорт электроэнергии на 4,9% [Ukraine Increases Electricity Ex-ports by 4.9 Percent in 2019]' at Business Sensor website [in Russian]: [https://biz.censor.net.ua/news/3170942/ukraina\\_v\\_2019\\_godu\\_uvelichila\\_eksport\\_elektroenerгии\\_na\\_49](https://biz.censor.net.ua/news/3170942/ukraina_v_2019_godu_uvelichila_eksport_elektroenerгии_na_49) (website accessed June 12, 2020).
- <sup>13</sup> See: 'Украина в 2019 году увеличила выручку от экспорта электроэнергии на 14,1% [Ukraine Increases Proceeds from Electricity Exports by 14.1 Percent in 2019]' at Terminal website [in Russian]: <http://oilreview.kiev.ua/2020/01/27/ukraina-v-2019-godu-uvelichila-vyruchku-ot-eksporta-elektroenerгии-na-141/> (website accessed June 12, 2020).
- <sup>14</sup> Calculated according to data provided by Statistical Review of World Energy 2019, available at British Petroleum website: <https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2019-all-data.xlsx> (website accessed June 12, 2020).
- <sup>15</sup> See: 'Минэнерго разработало новый энергетический баланс для преодоления кризиса в энергетике [Energy Ministry Drafts a New Energy Balance Sheet for Combatting the Energy Crisis]' at LB.ua website [in Russian]: [https://lb.ua/economics/2020/04/29/456423\\_minenergo\\_razrabotalo\\_noviy.html](https://lb.ua/economics/2020/04/29/456423_minenergo_razrabotalo_noviy.html) (website accessed June 12, 2020).
- <sup>16</sup> See: 'Рост тарифов на ЖКУ за годы независимости Украины: электроэнергия [Communal Tariffs Rise Since Ukraine's Independence: Electricity]' at Slovo i Dilo website [in Russian]: <https://ru.slovodilo.ua/2017/06/26/infografika/obshhestvo/rost-tarifov-zhkh-gody-nezavisimosti-ukrainy-elektroenergiya> (website accessed June 12, 2020).
- <sup>17</sup> See: 'Регулятор предлагает повысить тарифы на электроэнергию для населения [The Regulator Proposes to Increase Electricity Tariff for the Households]' at Ekonomicheskaya Pravda website [in Russian]: <https://www.epravda.com.ua/rus/news/2020/05/5/660151/> (website accessed June 12, 2020).
- <sup>18</sup> See: 'Communal Tariffs Rise Since Ukraine's Independence: Electricity'.
- <sup>19</sup> In accordance to Directive 2009/28/EU for energy balances. <https://eur-lex.europa.eu/eli/dir/2009/28/oj> (accessed June 24, 2020)
- <sup>20</sup> Національний план дій з відновлюваної енергетики на період до 2020 року (затверджений Розпорядженням Кабінету Міністрів



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<sup>21</sup> See: '«Зеленые» электростанции производят уже 8% энергии: на них приходится 26% денежных рас-четов [‘green’ Power Stations Produce 8 percent of Ukraine’s Electricity, Earn 26 Percent of Money]’ at HromadskeTV website [in Russian]: <https://hromadske.ua/ru/posts/zelenye-elektrostantsii-proizvodyat-uzhe-8-energii-na-nih-prihoditsya-26-denezhnyh-raschetov> (website accessed June 18, 2020).

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<sup>23</sup> See: 'Что означает принятие Закона «О рынке электроэнергии» [What Does the Adoption of the Electricity Market Law Mean]’ at Delo.ua website [in Russian]: <https://delo.ua/business/chto-oznachaet-prinjatie-zakona-o-rynke-elektroenergii-otrazitsj-330088/> (website accessed June 18, 2020).

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<sup>25</sup> See: Голубева, Елена. 'Рост цен на товары и услуги: что нужно знать о новом рынке электроэнергии [Golubeva, Elena. Goods and Services’ Price Rise: What You Should Know About the New Power Market]’ at 112.ua website [in Russian]: <https://112.ua/statji/rost-cen-na-tovary-i-uslugi-chto-nuzhno-znat-o-novom-rynke-elektroenergii-497923.html> (website accessed June 20, 2020).

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<sup>27</sup> For more detail see: Rudyk, Anna. 'Ukraine Economic Outlook Presents the Most Precise Forecast for Electricity Price After Market Reform Launch [Рудык, Анна. 'Ukraine Economic Outlook оказалась наиболее точной в прогнозе цен на электроэнергию с введением рынка']’ at Ukranews website [in Russian]: <https://ukranews.com/news/662047-ukraine-economic-outlook-okazalas-naibolee-tochnoj-v-prognoze-tsen-ne-elektroenergiyu-s-vvedeniem> (website accessed June 14, 2020).

<sup>28</sup> See: Electricity Market Reforms in Ukraine: Challenges and Opportunities, Kyiv: Ukrainian Institute for the Future, 2018, p. 22.

<sup>29</sup> See: Вышинский, Андрей. 'Украинские энергосети хронически недофинансируют, что приводит к их критической изношенности' [Vyshinsky, Andey. 'Ukraine’s Grid, Chronically Underinvested, Suffers from Critical Depreciation'] at 368.media website [in Russian] (available at: <https://368.media/2020/06/13/ukrainskie-elektroseti-hronicheski-ne-finansiruyut-chto-privodit-k-ih-kriticheskoy-iznoshennosti/>, website accessed June 14, 2020).

<sup>30</sup> See for more detail, Cruciani, Michel. Electric Networks and Energy Transition in Europe, Paris: Institut français des relations internationales, 2015 (Note de l’IFRI Energie), pp. 8–14.

<sup>31</sup> See: Mapping Power and Utilities Regulation in Europe, Paris: Ernst&Young, 2013, pp. 7–8.

<sup>32</sup> For more details see: Makovšek, Dejan and Veryard, Daniel. 'The Regulatory Asset Base and Project Finance Models: An Analysis of Incentives for Efficiency', Paris: International Transport Forum, 2016, p. 6 (available at: [https://www.itf-oecd.org/sites/default/files/dp\\_2016-01\\_makovsek\\_and\\_veryard.pdf](https://www.itf-oecd.org/sites/default/files/dp_2016-01_makovsek_and_veryard.pdf), website accessed June 14, 2020).

<sup>33</sup> See: Incentive Regulation and Benchmarking Work Stream, Brussels: Council of European Energy Regulators, CEER Report of January 18, 2019, pp. 18, 36, 39 and 86.

<sup>34</sup> See: A Review of Energy Tariffs in INOGATE Partner Countries, Brussels: European Commission, Directorate-General for European Neighbourhood and Enlargement Negotiations, 2015, pp. 77-80.

<sup>35</sup> See: 'Stimulating Tariffs and the Future of Electric Energy in Ukraine [Стимулирующий тариф и будущее электроэнергии в Украине]’ at RBC Ukraine website [in Russian]: <https://rabortariff.rbc.ua/ru/> (website accessed June 20, 2020).

<sup>36</sup> See: 'Smart Grids and Meters' at European Commission official website: [https://ec.europa.eu/energy/topics/markets-and-consumers/smart-grids-and-meters/overview\\_en](https://ec.europa.eu/energy/topics/markets-and-consumers/smart-grids-and-meters/overview_en) (website accessed June 20, 2020).

<sup>37</sup> See: 'Stimulating Tariffs and the Future of Electric Energy in Ukraine'.

<sup>38</sup> See for the annual inflation: <https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG> and for the central banks’ interest rates: <https://www.global-rates.com/interest-rates/central-banks/central-banks.aspx> (websites accessed June 18, 2020).

<sup>39</sup> See for National Bank of Ukraine’s interest rate: <https://bank.gov.ua/ua/monetary/stages/archive-rish> and for the annual inflation: [https://www.prostobank.ua/spravochniki/indikatory\\_rynka/inflation\\_index](https://www.prostobank.ua/spravochniki/indikatory_rynka/inflation_index) (websites accessed June 18, 2020).

<sup>40</sup> See: Shvets, Nikolay and Demidov, Alexei. 'A Case for RAB-based Regulation Implementation in Electricity Distribution' [Швец, Николай и

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<sup>42</sup> See: 'Подождем до выборов: Янукович запретил повышать тарифы естественных монополий в 2013 и 2014 годах [Should We Wait Until the Elections: Yanukovich Forbids to Raise Natural Monopolies' Tariffs in 2013 and 2014]' at Korrespondent.net website [in Russian]: <https://korrespondent.net/business/economics/1617985-podozhdem-do-vyborov-yanukovich-zapretil-povyshat-tarify-estestvennyh-monopolij-v-2013-m-i-2014-m-goda> (website accessed June 16, 2020).

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<sup>44</sup> See: 'Stimulating Tariffs and the Future of Electric Energy in Ukraine'.

<sup>45</sup> See: Electricity Market Reforms in Ukraine: Challenges and Opportunities, p. 22.

<sup>46</sup> See: Vyshinsky, Andey. 'Ukraine's Grid, Chronically Underinvested, Suffers from Critical Depreciation'.

<sup>47</sup> See: 'Недоинвестированность сетей – 17,5 млрд. долларов [The Underinvestment Into Ukrainian Grid Estimated at \$17.5 Billion]' at RBC Ukraine website [in Russian]: <https://www.rbc.ua/rus/news/nedoinvestirovanost-elektrosetey-17-5-mlrd-1591975124.html> (website accessed June 14, 2020).

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<sup>54</sup> See: Vyshinsky, Andey. 'Ukraine's Grid, Chronically Underinvested, Suffers from Critical Depreciation'.

<sup>55</sup> See the official refinancing rate statistic at the Българската народна банка website [in Bulgarian]: <https://www.bnb.bg/Statistics/StBIRAndIndices/StBIBaseInterestRate/index.htm> (website accessed June 17, 2020).

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