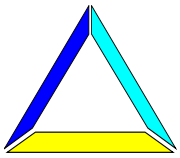
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Regulatory scheme for utilities: proposal for Ukraine

Executive summary

Unprofitable frame conditions in Ukraine's utilities sector, frequent political interventions into price setting as well as the lack of strong political will to implement structural reforms diminish significantly the attractiveness of the sector for investments. To solve these problems it is necessary to ensure transparent and reliable conditions for economic activities in the sector. Ukrainian policy makers have increasingly realized that this can best be achieved by introducing an independent regulatory scheme. The construction of an appropriate regulatory scheme is not a trivial task. In fact, answering the question of "how to regulate?" appears to be much more important than solving the issue of "who regulates?", on which the current political debate tends to focus.

For the case of the utility sector in Ukraine we believe that regulation should simultaneously achieve three important goals. It should ensure that prices are cost-covering, it should give incentives to reduce costs, and it should stimulate (and, if necessary, force) firms to improve management and factor productivity. Against this background, we propose Yardstick competition as the appropriate regulatory mechanism. As this scheme is rather complex to introduce, we also outline a strategy for its gradual introduction over a 3-5 years period. Moreover, based on a unique data set on Ukrainian Vodokanals we demonstrate the methodology that the regulator should use and show how this approach can be made operational for the case of Ukraine. Although our analysis is rather preliminary in nature, it already provides robust and meaningful results. This should be used as a basis for additional and more sophisticated quantitative work.

Outline

1. Introduction: What is effective regulation?
2. Who regulates?
3. What to Regulate and How?
4. Proposal for regulatory scheme in water supply
5. Conclusion

1 Introduction: What is effective regulation?

Providing utility services is very costly since it needs substantial infrastructure and resources. Thus, service providers seek high enough prices since they need profits that are sufficient for paying their own obligations and attracting capital for necessary investments. On the other hand, consumers want utility prices to be as low as possible. On competitive markets the task of balancing opposite interests of consumers and producers is left to market forces. On utility markets, unfortunately, competition cannot perform this task because the markets are locally separated and limited availability and access rights to the necessary infrastructure create several bottlenecks. Thus public utility providers are in a monopoly position and regulation of tariff setting is necessary to prevent abuse of market power.

The role of independent regulation in such markets is very important. It balances the interests of all stakeholders in the particular sector and guarantees sustainable development of the sector. Thus, it intents to protect consumers from monopoly prices while ensuring that the service provider remains viable and has incentives to perform efficiently. Using its regulatory powers the regulator maximizes total welfare, which consists of the benefits of consumers and producers plus externalities. As a result of well-performing regulation, consumers achieve high quality of services at low prices, while producers earn sufficient profits and have incentives to make investments for sustainable development.

In Ukraine the discussions about regulatory reform in the industry of public utilities has already continued for several years. A new strategy of regulatory reform in the sector is currently disputed among stakeholders. Creation of a regulatory body for the utilities is also considered. Recently policy makers commenced speculating on the issue 'what executive body is going to be empowered with new regulatory functions'[1]. In this paper we want to highlight that instead of discussing who the regulator will be it is more important to think about how to regulate. Chapter 2 is devoted to the institution of a regulator; Chapter 3 discusses parameters and methods of regulation. Chapter 4 provides a proposal of a regulatory scheme that is aimed to solve current problems of Ukrainian public utilities sector. Chapter 5 concludes.

2 Who regulates?

The regulatory power is usually vested in a separate authority, called independent regulator. This institution has to be endowed with the legal power necessary to balance the interests of consumers and service providers. There are six criteria of an effective regulatory system: coherence, predictability, capacity, independence, accountability and transparency[2]. **Coherence** implies that regulatory policies are based on laws, which are consistently implemented. In particular, there must be a clear division among national and municipal regulators and government ministries. **Predictability** means that there will not be sudden changes in regulatory framework or in the way a regulator makes decisions. Predictability is particularly important for investors. **Capacity** requires that a regulatory agency is staffed with qualified people and has the authority and appropriate levels of funding to implement their mandate effectively. Coherence, predictability and capacity are general prerequisites for effective regulation. The other three criteria are more specific for each sector.

To perform effectively, the regulator must be **independent** from political interference (both from central Ministries, local governments and other authorities) as well as from decisive influence of industry, investors or customers. To ensure this, the institution needs financial autonomy, fixed term of office, pre-specified appointment criteria, and sufficient resources. The

[1] Among candidates to do regulatory work are the National Electricity Regulation Commissions (NERC), the State Committee On Utilities and Housing or the Anti-Monopoly Committee.

[2] ' Transition Report 2004: Infrastructure', EBRD publication, November 2004

regulator's activities must also be **accountable,** which means that it enforces rules fairly while protecting the legal rights and economic interests of the state, operators and users. **Transparency** covers several issues. It involves the right of all stakeholders to be informed about decisions affecting them, and also relates to the scope for corruption and secretive decision-making.

In principle, for each industry that requires regulation there can be different, specific regulators, or a general regulator who overlooks all such industries. The tradeoff is that branch-specific regulators have deeper knowledge about their respective industry while the general regulator is easier (and cheaper) to be created and less vulnerable to vested, branch specific interests.

Ukraine already has experience with establishing independent regulatory authorities. Currently two commissions are acting – National Electricity Regulation Commissions (NERC), which sets the domestic wholesale prices for gas and electricity, and the National Commission for Communication Regulation (NCCR) that mainly focuses on Ukraine's telecommunication market. However, performance of both regulators is not that effective. The law on NERC has not been adopted and NERC is acting on the basis of a Presidential Decree[3] since 1998, which adds a certain degree of uncertainty to the performance of the commission. While NERC funding comes mainly from licenses fees and its members are appointed for a specified term, it is still far from being politically independent. Nevertheless, NERC operates reasonably well according to transparency criteria. It publishes its annual reports as well as all decisions. However, reasoning behind its decisions and rules taken by NERC are not always clear and available.

The NCCR is a newly created regulatory body, which due to political problems with appointment of its staff started its operations only after a four-months time lag. Hence, this institution is – at least during its start period – far from being politically independent, and – until now – has no experience in conducting its regulatory mission.

Thus, commencing a regulatory reform in utilities sector policy makers cannot rely only on the existing experience with the regulators. That experience rather has to be reconsidered and substantially improved.

3 What to Regulate and How?

The objective of the regulator should be to protect consumers from monopoly prices while ensuring that the service provider can operate under economically sufficient conditions. To achieve this, regulation can focus on costs and profits of operations, output prices, productivity levels (measured e.g. in factor productivities), on other parameters such as quality levels, or on a mix of them. It can act either prescriptively, i.e. by fixing certain 'accepted' profit levels, or stimulating, i.e. by providing incentives for increasing productivity or reducing costs. However, since the specific task facing the regulator can be very different, i.e. depending on the circumstances under which a respective industry is operating, there is no general blueprint for successful regulatory policy under all possible conditions. Instead, the choice of an appropriate design of regulation is crucial for its success in every specific situation. The most-commonly used forms of regulation are as follows:

First, price levels can be set to cover costs plus some given profit (cost-plus or profit-cap regulation). This purely prescriptive type of regulation is the easiest to implement. If specified in a sufficiently predictable and accountable manner, it is capable to attract investors for large infrastructure projects because it minimizes operating risks for both, investors and government. On the other hand, the fixed rewarding system does not provide incentives to reduce costs or raise productivity and quality levels. Since cost-plus regulation usually sets

[3] No 335/98, April 21, 1998

firm-specific price levels, it also fails to improve competitiveness of different firms. Rather, it can even stimulate manipulation by reporting/creating higher costs. Hence, cost-plus regulation is appropriate only for industries with high external risks and uncertainty, but private participation based on cost-plus regulation should be arranged for short periods only.

The second approach is to simply set the maximum tariff that the firm is allowed to charge (price-cap regulation). In general, this provides an incentive to reduce costs and to raise factor productivity in order to increases profits. Over time, however, price-caps have to be adjusted to prevent extranormal profits. The problem is that if this correction is done for each firm separately, price-cap regulation does not provide strong incentives for cost reduction any more, because higher profits due to lower costs will be reduced through lower output prices. On the other hand, if price-caps are adjusted based on industry averages, this can lead to insufficient treatment of firms, which have to operate under specific conditions such as relatively long networks, low consumer density per square meter etc. Hence, the challenge facing the regulator in price-cap schemes is to find sufficient clusters of firms that are sufficiently big, so that incentives to reduce costs for each firm are not too much reduced by adjusted maximum prices, and still specific enough to consider the natural characteristics of different firms. Obviously, such regulatory approach is much more complex to be implemented since the regulator needs to monitor external (i.e. labor and energy costs) as well as sector-internal developments (i.e. changes in productivity) in order to adjust the price cap. This type of regulation also implies higher risks for business operations.

Table 1
Comparison of different approaches for regulation

	Regulatory approaches			
	Cost plus/ROR	**Price cap**	**Yardstick competition**	**Comments**
Incentives for				
Productivity growth	Low	Medium	High	
Priorities				
Covering costs	+	+	+	
Improving competitiveness	-	+	+	
Encouraging cost reduction	-	+	+	Potential for price reduction
Encouraging productivity growth	-	+	+	Potential for cost and price reduction
Simplicity of implementation	+	-	-	

Source: 'Coming In From The Cold: Improving District Heating Policy In Transition Economies', OECD/IEA 2004, own considerations.

The third approach is to compare productivity levels[4] of different firms that for reasons such as regional separation cannot directly compete with one another (Yardstick competition). Based on this comparison the regulator identifies the practices of best-performing firms in the sample. Then, he adjusts the firm-specific targets of other firms accordingly in order to force them to adopt the identified best practices. In this way, the regulator set tailor-made, firm-specific

[4] Several definitions exist for *productivity*. In this paper, we define *productivity* as the ability of a firm to produce a given output with a minimum set of inputs.

development targets without distorting incentives by hurting the best performers. In other words, all firms are put in conditions conducive to competition. As a result, a seemingly monopolized industry can still reap the fruits of competition such as enhancing technological advances, improving product and service quality and reducing production costs. However, this methodology is obviously rather complex to be applied and cannot be implemented over night.

In summary, cost-plus regulation is easy to implement but fails to stimulate cost reduction. Price-cap regulation delivers such incentives, however to a limited degree and at the expense of complexity. Finally, Yardstick competition is the most complex approach to implement, but it also creates the strongest incentives towards cost reduction and productivity increases. This discussion is also summarized in table 1.

4 Proposal for regulatory scheme in water supply

The current situation of the utility sector in Ukraine is characterized by tariff levels below operational costs and by a relatively high use of energy input per unit of output due to largely depleted and outdated installations, excessive losses etc. Obviously, preventing the sector from collapsing requires cost-covering tariff levels as well as reduced costs of operation through increased energy efficiency. In principle, all types of regulation are capable to ensure such cost-covering tariff levels. However, as discussed in the previous section, only price-cap regulation and Yardstick competition give sufficient incentives for reducing costs and increasing energy efficiency. Furthermore, empirical studies (see Box 1) find large differences in costs and factor productivity across water supply firms with a relatively big share of poorly performing firms. Hence, an appropriate regulatory scheme should set the strongest-possible incentives to reduce costs and improve management and factor productivity. Against this background it appears that **Yardstick competition** is the **optimal regulatory tool** for Ukraine's water supply industry. To demonstrate how this could be implemented we will now present a concrete example for the case of Ukraine's water supply industry. Starting from the present situation, Yardstick competition can be gradually introduced in the following three steps:

Step 1:

The starting point for the necessary regulatory reform is to establish an independent regulatory authority. Possible candidates are the State Committee On Utilities and Housing, the Anti-Monopoly Committee, or the NERC. Alternatively, a new institution can be founded. From an economic rather than from a political perspective, either one of these institutions could perform the task as long as it fulfills the above mentioned criteria of coherence, predictability, capacity, independence, accountability, and transparency as good as possible, and applies a sufficient regulatory approach as we will describe in the next two steps.

Step 2:

To ensure equal starting conditions for all firms we propose introducing price-cap regulation for an initial period of 2 to 3 years. Therefore, prices should be set for each firm separately at recent historical costs levels (e.g. at the average of reported costs for 2004 and 2005).[5] In order for tariffs to account for changes in inputs prices an indexation system will be necessary. In general, several existing indices such as CPI or PPI can be used. However to match future price developments as closely as possible to the true costs of operation we propose using an industry-specific cost index that has to be computed on the basis of price developments for the main input factors (labor and energy) weighted by shares computed from the reported

[5] Using previously reported information avoids giving incentives for over reporting of cost levels as it e.g. the case for cost-plus regulation. Setting firm-level rather than e.g. oblast-level prices is justified because of significant differences in observed cost levels across firms (see Figure A-1 in the appendix for differences in costs of water suppliers by Oblast).

information. We therefore propose that changes of Price-Caps for each single firm (ΔP_f) should be given by an index value ***CI***, which replicates changes in average cost in the industry:[6]

$$\Delta P_f = \boldsymbol{CI} \quad (1)$$

In addition, during the second stage of the reform the regulator should already start preparing for the introduction of Yardstick competition. Therefore, a data base and data collection system should be set up to enable the regulator to conduct productivity analyses for all firms in the industry. During this phase of reform the regulator have to start a quantitative research of productivity analysis of firms in the sector, in particular, the correct empirical model for analysis have to be chosen among the range of possible ones.[7] This will deliver first insights into productivity changes and potential sources of productivity growth and cost reduction in the industry. It will also give the regulator the opportunity to establish and improve the necessary methodology in a dialogue with all stakeholders and to increase their understanding of the regulatory approach that will be used in the third step.

Step 3:

After the initial transition period, the regulator should move to Yardstick competition. Under this regulatory regime, changes in the Price-Caps for each single firm (ΔP_f) are now determined by the average cost index ***CI*** minus a firm-specific factor $\boldsymbol{X_f}$:

$$\Delta P_f = CI - X_f \quad (2)$$

Before we present some first calculations of the firm-specific factor X_f for Ukraine's water suppliers, we first discuss the underlying principles based on the following example. Assume that input costs for an industry are expected to increase by 5% on average during next years (***CI***=5%) and that the regulator finds from comparing the productivity levels of different firms that a specific one could produce the same output by using 2 percent less inputs.[8] To enforce this 2% increase in productivity the regulator sets the X-factor for this firm at X_f=2% so that its Price-Cap (regulation target) is only allowed to change by ΔP_f = 5%-2% = 3%.[9] In words, the firm is forced to improve its productivity since its output price is allowed to grow at only a smaller rate than average input costs are expected to do. The example can be further expanded by assuming that already efficient firms will continue to improve their productivity. If e.g. the regulator knows that Total Factor Productivity of the industry grows by 3% in the relevant period[10], he will increase all firm-specific X-factors by another 3%. In this case, the X-factor for the inefficient firm in our example will be set to X_f=2%+3%=5% such that its Price-Cap remains unchanged (ΔP_f = 5%-5%). In this case, the firm is forced to improve its

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[6] For more details see e.g. Bernstein and Sappington (1999). Setting the X Factor in Price-Cap Regulation Plans. *Journal of Regulatory Economics* (Vol.16), pp.5-25.

[7] E.g. there should be decided what inputs and outputs to include in the final model.

[8] Which means that other firms in the industry have demonstrated that such a more efficient production is possible.

[9] The calculation in this example requires strict initial cost coverage without that the firm earns extranormal profits. This in particular means that capital costs are already included in the cost formula. Otherwise, a 2% increase in input efficiency cannot be achieved by a corresponding 2% reduction of the output price. Rather, the formula must also consider the relevant profit/cost ratio. However, this is not necessary in our reform proposal since initial cost coverage has already been enforced in the first step.

[10] To calculate overall TFP change in an industry requires additional empirical analysis, for which the panel data of major performance indicators of enterprises for several years is needed.

productivity level since its output price has to remain unchanged while input costs are expected to increase.

On the basis of empirical results of a first productivity analysis for water-supplying firms in Ukraine (Box 1) we will now demonstrate how firm-specific X-factors could be specified in practice. Table 2, which shows technical productivity scores for 232 Vodokanals, marks the starting point for this discussion.[11] As the *Productivity Index* in Column (4) indicates, Vodokonals of *Truskavets* and *Komsomolks* operate most efficiently, while Vodokanals of *Novomoskovsk*, *Artemovsk* or *Hmelnik* are the least efficient ones in our sample. The index level of 0.10 means that productivity of those firms – that is the productivity of the factors they are using – stands at only 10% of what best-performing firms with an index level of 1.00 demonstrate. In other words, closing the productivity gap relative to the industry champion(s) the poorly performing *Vodokanals* could reduce their input costs by 90% while keeping output levels constant.

Box 1
Productivity levels of water supply firms in Ukraine – Empirical Evidence

In paper A01/2005 'Assessing productivity of water supply in Ukraine' we calculate productivity scores in order to assess and compare production productivity at the enterprise level.* Our study finds substantial differences in productivity levels across firms in the sector. This result is not surprising, since the industry has been operating in an isolated fashion and influenced by populist decisions of local policy makers rather than by competitive pressure and hard budget constraints. Comparing the large differences in productivity levels of the Ukrainian samples with results of similar studies for other countries in e.g. Asia and South America, where firms have been operating under more sophisticated regulatory schemes, demonstrates that productivity-oriented regulation has a huge potential for improving performance (and thus, reducing costs of operation) of Ukrainian water suppliers.

* Given the limited ability of firm-level data, we measure technical productivity scores using the data envelopment analysis (DEA). DEA allows estimating productivity score on the basis of any inputs and outputs, (that is, we do not have to have data on all inputs and outputs of the production process). It involves mathematical programming to construct a non-parametric piece-wise surface (i.e. a production frontier) over the data. A production frontier represents the maximum output that can be produced for a given amount of input and thus identifies best-practice performance in a sample of firms. The most efficient firms form a frontier (i.e. they lie exactly on a frontier), while less efficient firms lie below this frontier. Then, productivity scores are calculated relative to this surface.

To use this information for calculation of firm-specific X-factors we need to recall that this factor should consider two components, a) firm-specific requirements for improving individual productivity levels relative to better performing firms, and b) industry-wide requirements for improving *Total Factor Productivity*. A first example for how those X-factors could be calculated is given in column (5). For these calculations, we have assumed that Total Factor Productivity is expected to increase by not more than 1% per year over the next five years.[12] For the same period, we require each firm with an initial *Productivity Index* of less than 1.00 to cut its productivity gap by e.g. half. In general, it is a political discussion how much of the inefficiency

[11] The data was collected in 2002 as a part of the project of Danish Cooperation for Environment in Eastern Europe (DANCEE), Ministry of Environment of Denmark and Ukrainian State Committee for Housing and Municipal Economy.

[12] Estimation of overall TFP changes in the sector did not revealed steady continuous changes that could be set as an average goal for the sector. In fact, TFP measure changes in opposite directions during 2000-2004 years. However, to illustrate the method we believe that an annual increase of 1% for the water supply industry still appears to be justified.

have to be caught up by firms.[13] This have to be decided be the regulator. In this case, the *Vodokanals* of *Novomoskovsk*, *Artemovsk* or *Hmelnik* will have to reduce their productivity gap by (1-0.1)/2=45% or 7.7% p.a. over the next five years.[14] Hence, the X-factor for the *Vodokanals* of *Truskavets* and *Komsomolks* is set at 1%, which is the expected sector-wide increase of *Total Factor Productivity*, while e.g. the X-factor for the *Vodokanals* of *Novomoskovsk*, *Artemovsk* or *Hmelnik* is set equal to 1%+7.7%=8.7%. Finally, combining these firm-specific X-factors with the expected change of index ***CI*** (change of input costs) gives the overall changes for firm-specific price caps (ΔP_f, see description above).

Table 2

Calculation of firm-specific X-factors, 2002[15]

Rank	*Region*	*City*	*Productivity level*	*TFP change %*	*Firm-specific goal, %*	*X-factor, per year %*
	2	*3*	*4*	*5*	*6*	*5+6*
1	Donetsk	Komsomolsk	1.00	1.00	0.00	1.00
1	L'viv	Truskavets	1.00	1.00	0.00	1.00
...	...	...	...	...		...
6	Vinnytsya	Pogrebiche	0.91	1.00	0.88	1.88
7	Donetsk	Zhdanovka	0.88	1.00	1.17	2.17
7	Zakarpatska	Mezhgorye	0.88	1.00	1.17	2.17
...	...	...	...	...		...
33	Donetsk	Nikolaevka	0.64	1.00	3.36	4.36
38	Chernihiv	Borzna	0.63	1.00	3.45	4.45
40	Zhytomyr	Olevsk	0.62	1.00	3.54	4.54
40	Donetsk	Maryinka	0.62	1.00	3.54	4.54
42	Chernihiv	Bobroviza	0.61	1.00	3.63	4.63
...	...	...	...	...		...
232	Dnipropetrovsk	Novomoskovsk	0.10	1.00	7.71	8.71
232	Donetsk	Artemovsk	0.10	1.00	7.71	8.71
232	Vinnytsya	Hmelnik	0.10	1.00	7.71	8.71

Source: Own calculations

5 Conclusion

The current technical and financial state of Ukraine's utility sector is very poor. Unprofitable frame conditions, frequent political interventions into price setting as well as the lack of strong political will to implement structural reforms diminish significantly the attractiveness of the sector for investments. To solve these problems it is necessary to ensure transparent and reliable conditions for economic activities in the sector. Ukrainian policy makers have

[13] Inefficiency scores are also not transferred 1 for 1 into the Price Cap Formula because of methodological distrust.

[14] Since $\sqrt[5]{(1 + 0.45)} = 1.077$

[15] Sample. See Table A-2 in the Appendix for the full table.

increasingly realized that this can best be achieved by introducing an independent regulatory authority. However, we have argued in this paper that experiences with independent regulation in other sectors of Ukraine's economy have been rather mixed so that a regulatory reform in the utility sector cannot rely only on the existing experience. In particular, the construction of an appropriate regulatory scheme is not a trivial task. In fact, answering the question of **"how to regulate?"** appears to be much **more important** than solving the issue of "who regulates?", on which the current political debate tends to focus. In European regulatory practice discussions about the most appropriate regulation scheme are also continue. The UK regulatory experience, which is based on Yardstick competition scheme, tends to be more successful in providing appropriate incentives for industries.

For the case of the utility sector in Ukraine we believe that regulation should simultaneously achieve three important goals. It should ensure that prices are cost-covering, it should give incentives to reduce costs, and it should stimulate (and, if necessary, force) firms to improve management and factor productivity. Against this background, we propose **Yardstick competition** as the appropriate regulatory mechanism. As this scheme is rather complex to introduce, we also outline a strategy for its gradual introduction over a 3-5 years period. Moreover, based on a unique data set on Ukrainian Vodokanals we demonstrate the methodology that the regulator should use and show how this approach can be made operational for the case of Ukraine. Although our analysis is rather preliminary in nature, it already provides robust and meaningful results. This should be used as a basis for additional and more sophisticated quantitative work.

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Appendix

Figure A-1

Mean, Standard Deviation (stdev), Maximum and Minimum of Aggregate Energy and Labor Costs of Vodokanals by Oblast (in UAH, 2002)

